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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DISCLAIMER

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Table of Contents

Executive Summary

For the duration of this project, the Irish Green Building Council (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 that would need to be guided due to the lack of knowledge of the circular economy in the industry. IGBC created a mail course with five 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 (GPP) 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 project's 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 focuses on the later stage of the construction process, and mainly on the downcycling of materials. To reduce overall resource consumption and embodied carbon, a radically different approach that focuses on the earliest stage of design projects is needed. Funded by EPA's Green Enterprise scheme, IGBC held circularity workshops with architects, structural

engineers, quantity surveyors (QSs) and mechanical and electrical (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, highlighted the challenges specifiers and designers face and showed which parts of the circularity 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 three sets of webinar series and nine 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 an 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 an 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 (Including Any Promotional/Dissemination Activities)

The project was divided into four 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 in order 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 nine 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 × 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 1,882 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 nine standalone webinars which added up to nine hours of extra learning. In total, 27 hours of circularity webinars was organised, resulting in 27.5 hours of learning. See appendix for more information.

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 postgraduate 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 TU Dublin.

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 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. See list in appendix.

WP1.5 Green Public Procurement Training

KPI – GPP training – 100 trainees.

How many people were reached: 100+ trainees (including recording).

What was delivered – The IGBC collaborated with GUPP in October 2022 to deliver GPP training to professionals. On 24 October 2022, Rachel Loughrey and Stephen Barrett from the IGBC gave a presentation on GPP, 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. 1,000 attendees.

How many people were reached: 1,402 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 at universities throughout Ireland. See appendix.

Work Package 2: Collaborate

WP2.1 Questionnaire on impact of tools prior to and post workshop[2]

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.

[2] 40 people were surveyed

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.

WP2.2 Five workshops with full design team on five case studies

KPI – Carry out workshops with five 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.

How many people were reached: Six design teams [29 people].

What was delivered – A workshop was held facilitated by Jos de Krieger and Lizanne Dirkx of Superuse. Each team that 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. Six interdisciplinary design teams attended; CAIRN, PM Group, RKD, IPUT, ORS, GGDA. 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, EPA's Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects were presented. EPA's resource and waste inventory template and the general guidance were 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).

WP2.3 Five circularity strategy reports and workshop reports

KPI – Five circularity strategy reports noting ideas and barriers identified.

How many people were reached: Six design teams [29 people].

What was delivered – After the two workshops, the six design teams created six 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 changes 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 a 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 are an issue for clients.

- Lack of awareness in the construction industry. Refer to the appendix 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: Six organisations (Regenerate Tool) and six organisations (Carbon Designer Tool)

What was delivered – A survey report (see appendix). 100% of the participants of the circularity workshops stated that they benefited 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 on 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 for full report and feedback of the 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 five 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 [1162 projects are now registered] and received six case studies of a range of projects from offices to factories. Refer to appendix 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. Refer to appendix for the report on testing of circular tools.

WP2.6 Minimum three 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 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 were 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 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.

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 Level(s) template for public bodies for Green Public Procurement. The Level(s) objectives were researched, and the most aligned circularity objectives were chosen and put in simple-to-use templates with sections focused on extra guidance and helpful tools. IGBC created a policy handbook that introduces professionals working in local authorities and other state organisations to some of the key green indicators that should be applied in public

construction projects. The Level(s) templates that IGBC created were integrated into this handbook (see appendix).

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 one's 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 focused on meeting Building Regulations such as Part L and were not aware of the importance of implementing circularity principles into projects.
- Convincing people to lease lighting, furniture, lifts, etc. in Ireland was difficult as we do not have systems set up for leasing at a large scale.

Lessons learned include:

- It is important to hold meetings post the workshops to see if the design teams are implementing circularity principles throughout the eight RIAI work stages rather than just at Stages 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[3], it would be helpful for workshops to be run focused on how and when one should engage with the Articles 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[4]; it would be helpful to have training focused on reducing construction waste at each of RIAI Stages 1–8.
- 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.
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6. Project Outcomes (Short- to Long-Term Outcomes Expected and How These Will Be Tracked)

<u>This project led to several short-term outcomes including:</u>

- 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.
- The Carbon Designer Tool, which aids design teams to easily calculate the embodied carbon of buildings. The number of people using the tool is tracked through OneClick LCA. Currently, 1,162 projects have been registered.
- 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.

<u>Long-term outcomes from the project include:</u>

- Hosting circularity workshops and presentations. These will be tracked through an attendance report on the IGBC website.

[3] Waste statistics - Statistics Explained (europa.eu)
[4] Waste statistics - Statistics Explained (europa.eu)

- 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 the 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 sectors 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 the 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://www.epa.ie/publications/circular-economy/resources/CDWasteGuidelines.pdf

Acronyms and Annotations

GPP – green public procurement

HPI – Home Performance Index

IGBC – Irish Green Building Council

M&E – mechanical and electrical

QS – quantity surveyor

RIAI – Royal Institute of the Architects of Ireland

UKGBC – UK Green Building Council

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)

IRISH GREEN BUILDING COUNCIL

IGBC Circularity Resources

IGBC Resources & Circularity Hub

	Title	Weblink
	IGBC Resources and Circularity Hub	Resources & Circularity – Irish Green Building Council (igbc.ie)
	Some videos that might interest you:	
	Introduction to the Regenerate Tool by Charles Gillot, University of Sheffield	Circularity in Practice Webinar Series – Introduction to the REGENERATE circularity design tool (vimeo.com)
	Case Studies from Denmark and Cork by Klaus Jensen & Mia Scheel (RUM Architects) presenting Circle House in the Netherlands, and Ailbhe Cunningham, presenting Test Site in Cork	Circularity in Practice Webinar Series – Case Studies: Denmark & Cork (vimeo.com)
	Products and Materials, by Elaine Butler from the Circular Design Institute and Darragh Lynch, architect for the Rediscovery Centre in Dublin	Circularity in Practice Webinar Series : Products and Materials (vimeo.com)
	Combating C&D Waste by Warren Phelan from RPS Engineering and Mark Kelly from Galway and Mayo Institute of Technology (GMIT	Circularity in Practice Webinar :Combatting C&D Waste (vimeo.com)
	Lessons from the cutting edge at TUDelft in the Netherlands, with Prof. Dr-Ing. Tillmann Klein, Dr-Ing. Olga Ioannou, Dr R.J. Geldermans MSc, and Dr Dipl.-Ing. Alexander Wandl	Circularity in Practice: Lessons from the cutting edge with TUDelft, Netherlands (vimeo.com)

Courses

	Title	Weblink
	Postgraduate Diploma in Circular Economy Leadership for the Built Environment. **Deadline to Apply: 31 July**	Postgraduate Diploma in Science in Circular Economy Leadership for the Built Environment | ATU - Atlantic Technological University (gmit.ie)
	Circular Economy: An Introduction	MOOC: Circular Economy: An Introduction | TU Delft Online
	Healthier Materials & Sustainable Building	Healthier Materials & Sustainable Building | Parsons School of Design (newschool.edu)

Video list

Duration	Title	Weblink
2 mins	Bringing Embodied Carbon Upfront	https://www.youtube.com/watch?v=2h0WxP3jJPU&t=10s
13 mins	TEDx Talk, Construction: The Circular Revolutions, by David Cheshire	https://www.youtube.com/watch?v=kEZMMRqL_Xc
1 Hour	World Green Building Council Circular Economy Webinar	https://www.igbc.ie/resources/wgbc-circular-economy-webinar/
3 mins	Reuse of Building Materials: Will It Soon Be the norm in Europe?	https://www.youtube.com/watch?v=iPCkn3HV6pY
1 Hour	Developing Circular Economy Concepts for Buildings	https://www.igbc.ie/resources/developing-circular-economy-concepts-for-buildings/
1.5 Hours	Introducing the EU Green Deal and the Circular Economy	https://www.igbc.ie/resources/introducing-the-eu-green-deal-and-the-circular-economy/
1.5 Hours	Circular Cities	https://www.igbc.ie/resources/circular-cities/
1 Hour	Reusing Materials – Buildings as Material Banks	https://www.igbc.ie/resources/reusing-materials-buildings-as-material-banks/
1 Hour	Is Mass Timber One Route to Circularity?	https://www.igbc.ie/resources/is-mass-timber-one-route-to-circularity/
1.5 Hours	Introducing Life Cycle and Whole Life Carbon Thinking	https://www.igbc.ie/resources/introducing-life-cycle-and-whole-life-carbon-thinking/
1 Hour	Introduction to Whole Life Carbon and LCA	https://www.igbc.ie/resources/introduction-to-whole-life-carbon-and-lca/
1 Hour	Life Cycle Assessment for Investors	https://www.igbc.ie/resources/life-cycle-assessment-for-investors/
1 Hour	EPD for Manufacturers and Specifiers	https://www.igbc.ie/resources/environmental-product-declarations-for-manufactures-and-specifiers/
1 Hour	How to Compare Data in EPD	https://www.igbc.ie/resources/how-to-compare-data-in-epd/
4 mins	The Circular Building (ARUP)	https://www.arup.com/perspectives/the-circular-building
9 hours	ACANs Circular Series	https://www.youtube.com/playlist?list=PLODflxxI5877Pi7ywxt2b9qj9ekQEuOPG

Reading list

Title	Weblink
Regenerate website	https://urbanflows.ac.uk/regenerate/
Regenerate Circularity Resources	https://regenerate.urbanflows.ac.uk/resources/
Carbon Designer Tool	https://www.igbc.ie/carbon-designer-for-ireland/
IGBC Climate Change	https://www.igbc.ie/igbc-ipcc-report/
EPA Design Out Waste Fact Sheet	https://www.epa.ie/publications/research/waste/Design-Out-Waste-Factsheets.pdf
EPA Article 27 register	https://www.epa.ie/apps/article27register/
EPA Article 28 information	https://www.epa.ie/our-services/licensing/waste/end-of-waste-art-28/
Waste Plan for the Circular Economy plan and infographic	https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/
Construction and Demolition Waste Management Plan Guidelines	https://www.epa.ie/publications/circular-economy/resources/construction-and-demolition-waste-management-plan-guidelines.php
Reusing foundations research	https://www.istructe.org/IStructE/media/Public/TSE-Archive/2020/A-short-guide-to-reusing-foundations.pdf
The test site project in Cork (reversible foundations example)	https://testsitekyrlsquay.ie/architectural-interventions/
Reversible foundations examples (car tyres)	https://www.ce-awards.co.uk/blog-post/408/Sustainability-SECBE-Awards-2020-finalist---Holy-Trinity,-Tulse-Hill
Material Passports information (ORMS)	https://orms.co.uk/insights/materialpassports/
Material Passports (BAMB)	https://www.bamb2020.eu/topics/materials-passports/
Material Passport example	https://orms.co.uk/insights/material-passport-vision/

Excess Material Exchange (Resource Passports)	https://excessmaterialsexchange.com/nl/news/resources-passports-circular-economy/
Material Passport (podcast)	https://www.architectsjournal.co.uk/news/aj-climate-champions-podcast-rachel-hoolahan-on-material-passports?utm_term=Autofeed&utm_medium=Social&utm_source=LinkedIn#Echobox=1638382884
Material marketplace (EME)	https://excessmaterialsexchange.com/en_us/
Material marketplace (Madaster)	https://madaster.com/
Furniture leasing (Ireland)	https://officefurniturerentals.ie/#1590781756514-848c55c5-238d
Furniture rental (Ireland)	https://www.cortglobal.com/ireland/dublin/
Elevator leasing	https://www.mitsubishi-elevators.com/m-use/
Light leasing (Ireland)	https://urbanvolt.com/services/light
Irish Brownfield Network	http://www.irelandbrownfieldnetwork.com/
EPA Guidance on stone and soil by-products (Article 27)	https://www.epa.ie/publications/licensing--permitting/waste/Guidance_on_Soil_and_Stone_By_Product.pdf
Level(s) – the European framework for sustainable buildings	https://ec.europa.eu/environment/levels/lets-meet-levels/how-does-levels-work_en
Design for deconstruction research paper	file:///C:/Users/rache/Downloads/DesignforDeconstruction_anappraisal_DDT.pdf
Brick reclamation and reuse	https://www.sciencedirect.com/science/article/pii/S2666165920300028
The Handbook to Building a Circular Economy	The Handbook to Building a Circular Economy - 2nd Edition - David Che (routledge.com)
The Reuse Atlas	The Re-Use Atlas: A Designer's Guide Towards the Circular Economy - 1s (routledge.com)
Biobased Materials	220718_J1261-CKIC-NetZero-Playbook-3.pdf (builtbn.org)

IGBC WEBINAR DATES

IGBC brought together an expert team of specialists such as David Cheshire – Aecom, Mark Kelly – GMIT, Andrew Waugh – Waugh Thistleton Architects and Christian Van Maaren – Excess Material Exchange 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 nine standalone webinars which added up to nine hours of extra learning. In total 27 hours of circularity webinars were organised resulting in 27.5 hours of learning.

The webinar series ***Building Circularity*** ran from 10 February to 10 March 2021, each Wednesday for five weeks. 795 people attended this webinar series. This webinar series consisted of the following:

Total Attendees	Title	Speaker	Weblink
186	**Bringing Embodied Carbon Upfront**	David Cheshire, AECOM	Developing Circular Economy concepts for buildings – Irish Green Building Council (igbc.ie)
175	**Circular Cities**	Flavie Lowres BRE, Ben Cartwright BRE, Andrea Charlson, LWARB	Circular Cities – Irish Green Building Council (igbc.ie)
160	**Reusing Materials – Buildings as Material Banks**	Christian Van Maaren, Materials Exchange	Reusing Materials –Buildings as Material Banks – Irish Green Building Council (igbc.ie)
114	Aistriú: **Introducing lifecycle and whole life carbon thinking** webinar	CITA	Introducing Life Cycle and Whole Life Carbon Thinking – Irish Green Building Council (igbc.ie)
160	**Is Mass Timber One Route to Circularity?**	Andrew Waugh, Waugh Thistleton Architects	Is Mass timber one route to circularity? – Irish Green Building Council (igbc.ie)

The webinar series ***Circularity in Practice*** ran from 18 August to 15 September 2021, each Wednesday for five weeks. 195 people attended this webinar series, which consisted of the following:

Total Attendees	Title	Speaker	Weblink
47	**Introduction to the Regenerate Tool**	Charles Gillot, University of Sheffield	Circularity in Practice Webinar Series – Introduction to the REGENERATE circularity design tool (vimeo.com)
39	**Case Studies from Denmark and Cork presenting Circle House in the Netherlands, and Test Site in Cork**	Klaus Jensen & Mia Scheel (RUM Architects), Ailbhe Cunningham	Circularity in Practice Webinar Series – Case Studies: Denmark & Cork (vimeo.com)
44	**Products and Materials**	Elaine Butler, Circular Design Institute, Darragh Lynch, architect for the Rediscovery Centre in Dublin	Circularity in Practice Webinar Series: Products and Materials (vimeo.com)
39	**Combatting C&D Waste**	Warren Phelan, RPS Engineering, Mark Kelly, Galway and Mayo Institute of Technology (GMIT)	Circularity in Practice Webinar Combatting C&D Waste (vimeo.com)
26	**Lessons from the cutting edge at TU Delft in the Netherlands**	Prof. Dr-Ing. Tillmann Klein, Dr-Ing. Olga Ioannou, Dr R.J. Geldermans MSc, Dr Dipl.-Ing. Alexander Wandl	Circularity in Practice: Lessons from the cutting edge with TUDelft, Netherlands (vimeo.com)

The webinar series ***Routes to Circularity,*** ran from the 14th of September to the 2nd of November 2022, each Wednesday for 8 weeks. 526 people attended this webinar series. This webinar series consisted of the following:

Total Attendees	Title	Speaker	Weblink
94	**Biological Materials and Circular Products**	Tom Robinson,Breathaboard, Paul Lynch, Ecococon, Patrick Gately, Graphenstone	Routes to Circularity Webinar series- Biological Materials and Circular Products - Irish Green Building Council (igbc.ie)
56	**Biological Materials**	Oksana, BIOHM	Routes to Circularity Webinar series- Biological Materials - Irish Green Building Council (igbc.ie)
58	**Case Study: Material reuse in Ireland and pre-demolition audits**	Phillipa King, Southern Waste Region, Limerick 2030	Routes to Circularity- Case Study : Material Reuse in Ireland and pre demolition audits - Irish Green Building Council (igbc.ie)
57	**Circular Building Toolkit**	Conor Hayes, ARUP	Routes to Circularity-Circular Building Toolkit - Irish Green Building Council (igbc.ie)
72	**Material Passports and Zero Waste Sites**	Rachel Hoolahan, ORMS, Alan Cawley, Sisk	Routes to Circularity-Material Passports and Zero Waste Sites - Irish Green Building Council (igbc.ie)
69	**Material reuse: marketplace and construction waste**	Sam Chapman, K-Briq, Knut Sverre Westby, Loopfront	Routes to Circularity-Material reuse: marketplce and construction waste - Irish Green Building Council (igbc.ie)
63	**Sheeps Wool**	Pat Byrne, Agile Committee, Liam Donohoe, Sheeps Wool Product	Routes to Circularity Sheeps Wool - Irish Green Building Council (igbc.ie)
57	**Biological Materials and Circular Products**	Tom Wooley, Niall Crosson, Ecological Building Systems	Routes to Circularity-Biological Materials and Circular Products - Irish Green Building Council (igbc.ie)

366 people attended one- off circularity webinars that the IGBC organised. These included the following.

Total Attendees	Title	Speaker	Weblink
24	**SmartWaste** Webinar	Stuart Blofeld, BRE	Smart Waste Webinar – Irish Green Building Council (igbc.ie)
150	**Introducing the EU Green Deal and the Circular Economy**	CITA, GMIT, IGBC and CIOB	Introducing the EU Green Deal and the Circular Economy – Irish Green Building Council (igbc.ie)
41	Collaboration with CITA: **Exploring the role of clients and design teams in catalysing the transition towards a Circular Built Environment**	Immaculada Simó, Ignasi Cubiñà, and Jordi París (Case Study in Spain)	Aistriú: Exploring the role of clients and design team in catalyzing the transition towards a Circular Built Environment – Cita
42	What IGBC does: **Circularity**	Rosemarie Mac Sweeney and Stephen Barrett, IGBC	What IGBC does – Circularity – Irish Green Building Council
20	CITA Aistriu Webinar: **Circularity**	Ben Cartwright, BRE Group, Alan Cawley, Sisk, and Brian Kennedy, Vision Built	n/a
20	**Introduction to Circularity in Construction**	Stephen Barrett and Rosemarie Mac Sweeney from IGBC for Henry J Lyons Architects	n/a
24	**SmartWaste** Demo	Stuart Blofeld, BRE	Online SmartWaste Product Demo_IGBC.mp4 (vimeo.com)
45	**Addressing Construction Waste**	Leon Faust of Swiss Architects Declare & Rachel Loughrey of IGBC	AD_IRL_October_2022 on Vimeo

IRISH GREEN BUILDING COUNCIL

IGBC CARBON DESIGNER TRAINING DATES

IGBC organised **15** Carbon Designer Tool trainings, as follows.

Date	Title
03/11/2021	RIAI Conference & Expo (Carbon Designer Tool Live Demos), Stephen Barrett
15/12/2021	Carbon Designer Training
03/12/2021	Carbon Designer Tool Presentation by Stephen Barrett at the Better Homes Conference
01/02/2021	Carbon Designer Demo for Architects Declare Ireland Webinar
19/01/2022	Carbon Designer Demo
16/02/2022	Carbon Designer Demo
04/03/2022	Carbon Designer Demo for KSN
09/03/2022	Carbon Designer Demo for Community of Practice
16/03/2022	Carbon Designer Demo
20/04/2022	Carbon Designer Demo
15/06/2022	Carbon Designer Demo
24/08/2022	Carbon Designer Demo
01/09/2022	Carbon Designer Demo
03/10/2022	Carbon Designer Demo
01/11/2022	Carbon Designer Demo

IRISH GREEN BUILDING COUNCIL

IGBC PRESENTATIONS

Throughout 2021 and 2022, IGBC gave several presentations at events and conferences.

The events were as follows:

Total Attendees	Date	Title
600	03/11/2021	RIAI Conference & Expo
107	03/12/2021	Carbon Designer Tool Presentation by Stephen Barrett, IGBC, at the Better Homes Conference
45	01/02/2011	Carbon Designer Demo for Architects Declare Ireland Webinar
600	05/10/2022	RIAI Conference & Expo
35	19/10/2022	Guest lecture on Circularity and the Built Environment to TUD Architecture Students by Rachel Loughrey, IGBC
15	19/10/2022	Circularity in design workshop using the Regenerate Tool by Rachel Loughrey, IGBC, for TUD Architecture

IRISH GREEN BUILDING COUNCIL

Circular Life

Pre- and Post-Survey Results
Regenerate Workshops

Pre-workshop survey

- Most attendees stated that their knowledge of the circular economy was poor or fair.
- Most attendees had not tried to implement the circular economy on their projects.

Barriers

Barriers that were felt from attendees include:

- Knowledge and cost
- Capital cost where private developers are not incentivised to consider circularity or invest in advice in this regard
- Regulations in particular relation to fire
- Quality; structural integrity; traceability; availability
- Knowledge
- Inertia in the Construction industry and the cost / regulatory challenges of doing something genuinely innovative
- Availability of various alternative systems that meet client requirements. We aim to get the best products out there but sometimes the clients need specific criteria to be met. Client more than likely to be cost- and time-driven to meet deadlines
- Robustness, fire, and progressive collapse requirements
- Lack of opportunities to distribute or procure materials theatre recycled
- Time to explore options in projects, lac of early engagement with potential contractor, client not wanting to deviate from traditional construction methodology
- Cost to developers
- Cost to clients, availability of suitable recyclable materials which allow disassembly easily
- Clients' buy-in
- Procurement – i.e. public procurement restrictions in relation to product naming at specification level, difficulty in engagement with suppliers & contractors
- Cost, availability of appropriate materials / design solutions, lack of knowledge of options
- Design inertia arising from previous design projects
- Resources, time. Dedicated personnel ideally required. Client commitment and buy-in. Contractor and skilled personnel
- Knowledge. Materials cost & availability. Time pressures. Client engagement
- Cost. Client awareness
- Budget and scheduling constraints

Goals

The attendees of the workshop stated the goals they wished to gain from the workshop:

- Update industry knowledge, trends and understand what is practical to implement immediately to promote circular economy
- Broader appreciation of principles and supports that are out there to 'move the dial' and see sustainability and circularity as KPIs in construction projects

- More knowledge and understanding to facilitate implementation on future projects and things to be aware of going forward

- An appraisal of solutions and understanding of what is achievable
- To understand common practices and what should be considered moving forward
- Better insight on how we approach circularity in the concept stage of design and bring the client with us along the way
- Better understanding of circularity and IGBC
- A greater understanding of the Circular Economy and how we can apply it our projects
- Learning
- To get an understanding of how circular design strategies can be applied to FOCAS
- Greater knowledge of circularity process, and what tools and resources are available to engineers and designers to help them implement LCA solutions in projects.
- Get an understanding of the positive initiatives which can be simply embedded in project designs
- Better understanding of circularity and methods to implement it into design
- An element of knowledge and understanding of the principles of the circular economy that we may begin introducing them into our design process
- Greater understanding about how we can positively affect circularity
- More information and examples of sustainable options in Ireland
- Deepen and grow my knowledge of the whole design and onsite construction stages and how we can implement circularity in our own projects. My role in construction compliance means I am overlapping with both and want to help facilitate circularity in our construction design stages and importantly on our up-and-running construction sites

Post workshop survey

- Most of the people who attended the workshop said that their knowledge of the circular economy approved
- Most of the people who attended the workshop have now tried to implement circular economy principles

Regenerate Tool Review

- Most of the attendees have not used the Regenerate Tool after attending the workshop.
- Most people benefited from using the Regenerate Tool.
- Most people found the Regenerate tool good.
- The workshop attendees found the following aspects of the Regenerate Tool good:
  i. Detail in architectural and structural materials is very good
  ii. It sets out all the stages of a project and the different elements that need to be considered for a circular economy so it can act as a prompt and ensure elements are not missed

iii. Easy to use, useful prompts for early level design
iv. It prompts you to think about key circular principles
v. It prompts you to think twice about material selection, life cycle and construction methods
vi. It makes you question your current approach
vii. It helps to start the thought process of circularity early in a project rather than as an afterthought
viii. The tool is useful and offers a high-level approach to incorporating circularity in design
ix. 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
x. Pie charts/Dashboards are good visuals

The attendees had the following suggestions about how the Regenerate Tool could be improved:

i. Improve the Electrical and Mechanical Services sections
ii. There is a lot of duplication across stages; it would be good if information could be pre-populated by ticking a box or etc. if this info is the same as what had been filled in previously in the tool
iii. The published report could include at appendix questions and responses for easier reference in meetings etc.
iv. The process could do with a third-party reviewer as it relies on the design team giving honest answers
v. If the tool could be targeted to different sketch design stage, detailed technical design and construction stage?
vi. The tool should be more flexible to accommodate zones, aspects of industrial plant buildings and material input. It should also look for more input from engineers on specifics of approach taken to increase circularity, e.g eliminate waste in design. It should also allow the users to generate a more detailed report, which would align more to new Irish EPA Construction Resource and Waste Management Plan requirements. These being linked would strengthen the value and use of the tool from design stages onwards
vii. User interface could be more user-friendly and leaner. Once one saves changes one has to keep going right back to the start and clicking through each interface. External links to more circular databases, for example, materials, waste, ICE etc.

Carbon Designer Tool

Most attendees have not tried the Carbon Designer Tool.

- One attendee had feedback about the Carbon Designer Tool:
- i. The Carbon Designer Tool is useful for quick studies at early stage – e.g. it was used to compare structural options
- For feedback on how the Carbon Designer Tool could be improved, one attendee stated:
- ii. The carbon designer tool is not good for M&E design; why is there no rating for Ireland commercial buildings that factors in Irish weather patterns?

Circularity in General

- Most of the attendees said that they have discussed circularity at design team meetings after the workshops.
- All the attendees plan to spread awareness of circularity in construction in their office after attending the workshops.
- Most attendees said that they will sometimes consider designing buildings that can be adapted for change of use, change of user needs and climate change.
- Most attendees said that they will sometimes consider designing for disassembly in the design process after attending the workshop.
- Most attendees said that they sometimes think of how materials are reused or recycled at the end of life.
- Most attendees stated that they will sometimes specify reused, recycled and biological materials in their projects.
- Most attendees stated that they will sometimes create a strategy for disassembly and to map out what materials from the existing building can be reused.

Barriers

The attendees noted the following barriers to implementing a circular economy in construction:

a. Lack of a readily available market for processing used materials
b. Lack of knowledge among all designers in the project
c. Ignorance by clients. Advertising on this issue needs to occur
d. Specification of materials suitable for reuse is very feasible and will be pushed; however, in a public contracting context reuse of materials is difficult. Much detail consideration is required to understand contractual implications; for example, it is not allowed to name products, which makes this process difficult
e. Education of the design team
f. Expectations in the market for prime assets
g. Cost of implementation
h. Various teams have different agendas – the site /construction team may focus on getting the job done within a tight programme. The QS team may focus on cost of materials.
i. Client and contractor awareness and contribution
j. Warranties on reused materials or new types of circular materials is an issue for our clients
k. Big lack of awareness in the construction industry of the monetary, environmental and resource value of the circular approach to design
l. Market lacks common everyday products which designers can choose for circular design, disassembly at end of life, etc.
m. Certification of reused materials. Sourcing reusable materials. Client persuasion. Identifying the circular economy and circularity at the different levels and defining boundaries

Achievements

a. Good awareness of the circularity transition in Ireland, and the resources available to learn more about this
b. New knowledge and insight
c. The workshop showed useful prompts on elements to consider as the design progresses. We were unable to answer many of the question positively due to lack of detail and confirmations at our early design stage; however, to achieve circularity introduction the concept at this early stage is necessary. An element to the tool that would allow for target setting and then checking against targets as design progresses would be beneficial
d. A better knowledge overall and a good system to prompt thought on the subject
e. A 'think twice' approach
f. Better awareness of circular design strategies and I hope to continue to advance my knowledge in this area
g. More understanding
h. Great to cross-collaborate with different team members and link to improve and implement circular design principles
i. Insight into developments re circularity and how it is an important aspect to embed into one's design at early stage and throughout all design stages. Knowledge and some expertise to impart to clients and colleagues to advance and promote circularity in design. The importance of promoting the adoption of circular economic thinking in construction projects and how there is still a lot to be done to achieve same

Analysis

From the results of the pre-workshop survey, most attendees stated their knowledge of the circular economy as 'poor' or 'fair'. This was noted as a big barrier to implementing circular principles into their project and offices. The goal of most attendees was to advance their knowledge of the circular economy.

From the post-workshop survey results, it is evident that the attendees' knowledge of the circular economy improved immensely. This knowledge gave the attendees confidence to implement circular principles into their projects.

Regarding the results of the tools, there was an enthusiastic response to the Regenerate Tool when the workshop was being led. However, most attendees stated that they had not utilised the Regenerate Tool since the workshop. This maybe implies that there may need to be a follow-up workshop at each stage of the project, so the teams are utilising the tool to its fullest potential.

The Carbon Designer Tool has not been utilised within this group of attendees. From discussions during the workshops, it was clear that there is a dissociation between embodied carbon and circularity. The interconnectedness of the two elements needs to be highlighted more.

Post-workshop, one of the main barriers was the lack of awareness in general about the circular economy. Most of the participants stated that they plan to spread awareness about

circularity and buildings in their offices and to their clients. This is a big success. Two of the attendees from MOLA Architects organised a follow-up call with the IGBC on how best to implement circularity into all their projects in their office going forward.

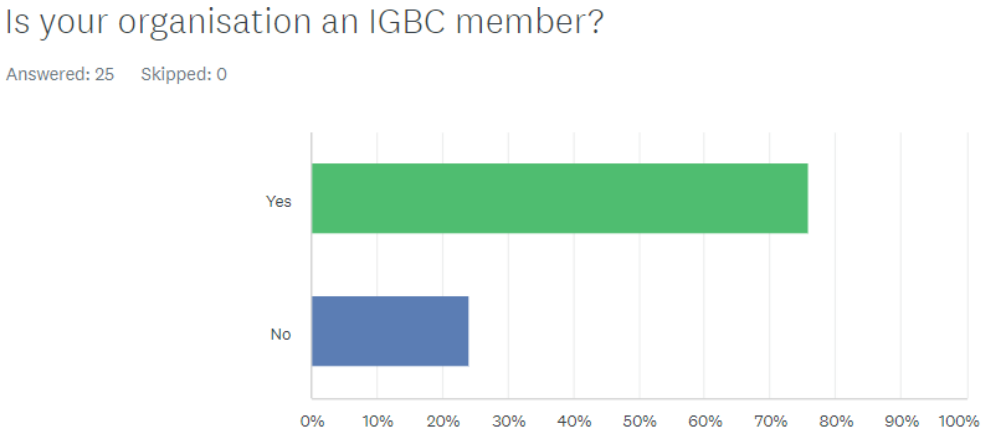
Another barrier post workshop is the lack of a material marketplace for secondary materials in Ireland. This is very linked to another of IGBC projects called CMEx. CMEx is a project focusing on accelerating the construction industry's transition to a circular economy by creating an online platform to facilitate the reuse of construction and demolition materials that would be normally considered as waste in Ireland.

From the post-workshop results, it is unmistakeable that there have been several achievements from these workshops. The main achievement has been the gaining of knowledge and deep understanding of the circular economy in general and about how to implement circular strategies in projects. Now the attendees have the confidence to spread awareness of the importance of implementing circular principles in buildings, such as design for deconstruction, design for adaptability, circular material selection and resource efficiency, in their offices going forward.

Pre-Workshop Questionnaire

Questions and Responses

Q1. Is your organisation an IGBC member?



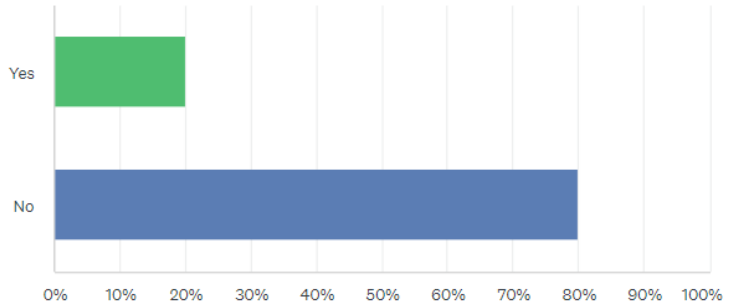
ANSWER CHOICES	RESPONSES	
Yes	76.00%	19
No	24.00%	6
TOTAL		25

Figure 1: Responses to Question 1

Q2. Have you undertaken any training with the IGBC in the past?

Have you undertaken any training with the IGBC in the past?

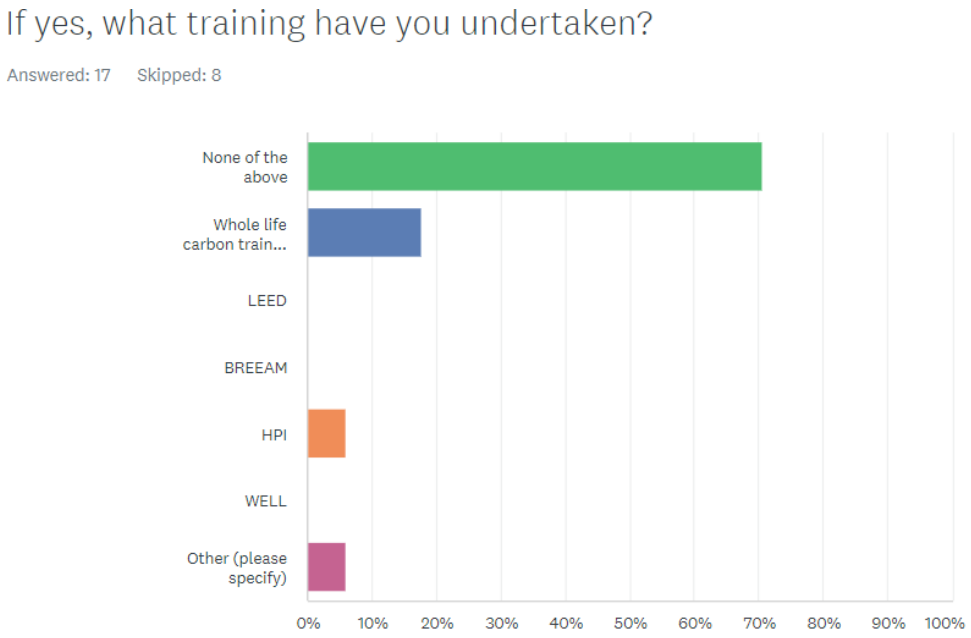
Answered: 25 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	20.00%	5
No	80.00%	20
TOTAL		25

Figure 2: Responses to Question 2

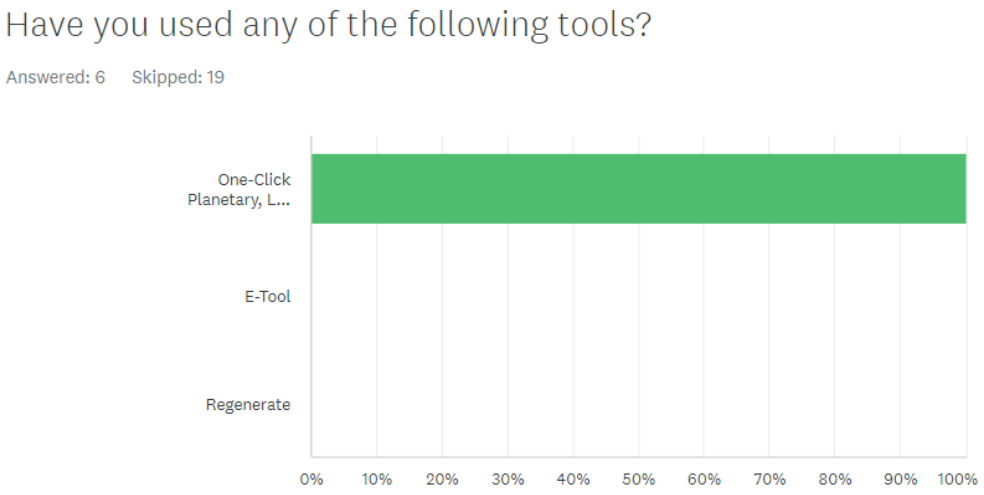
Q3. If yes, what training have you undertaken?



ANSWER CHOICES		RESPONSES	
None of the above		70.59%	12
Whole life carbon training		17.65%	3
LEED		0.00%	0
BREEAM		0.00%	0
HPI		5.88%	1
WELL		0.00%	0
Other (please specify)	Responses	5.88%	1
TOTAL			17

Figure 3: Responses to Question 3

Q4. Have you used any of the following tools?

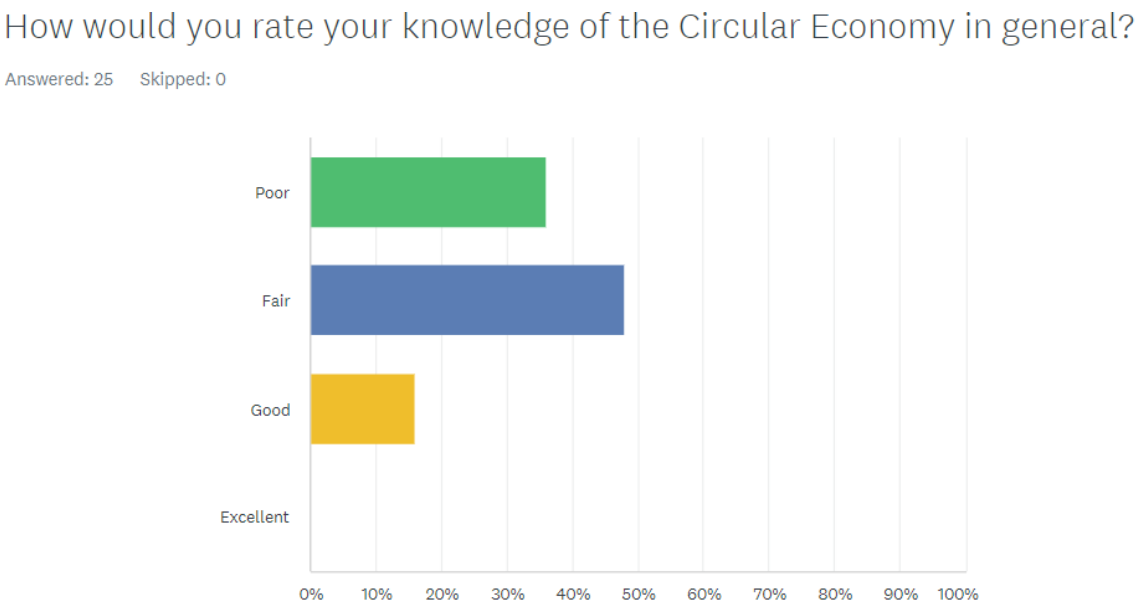


ANSWER CHOICES	RESPONSES	
One-Click Planetary, LCA, or Carbon Designer Tool	100.00%	6
E-Tool	0.00%	0
Regenerate	0.00%	0
TOTAL		6

Comments (1)

Figure 4: Responses to Question 4

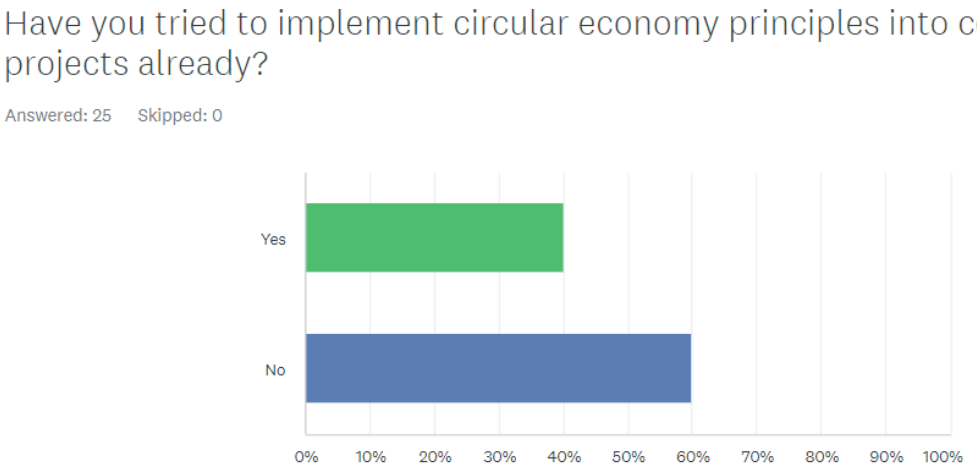
Q5. How would you rate your knowledge of the Circular Economy in general?



ANSWER CHOICES	RESPONSES	
Poor	36.00%	9
Fair	48.00%	12
Good	16.00%	4
Excellent	0.00%	0
TOTAL		25

Figure 5: Responses to Question 5

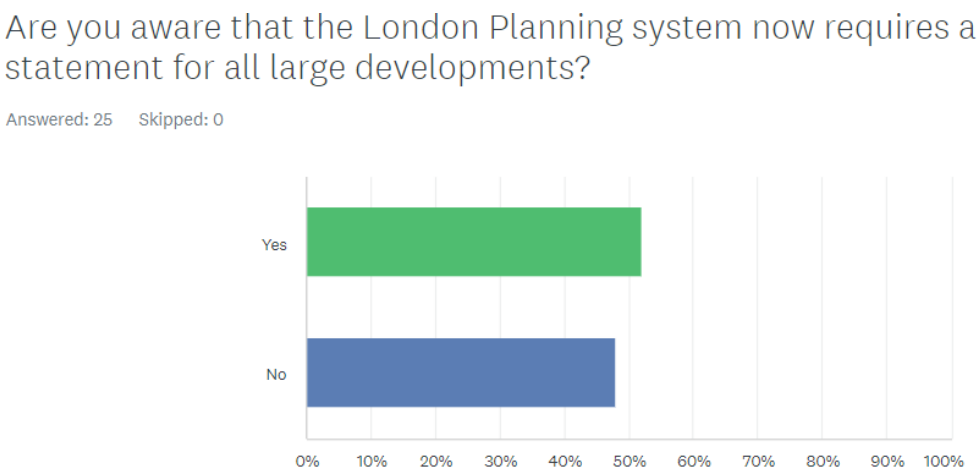
Q6. Have you tried to implement circular economy principles into construction projects already?



ANSWER CHOICES	RESPONSES	
Yes	40.00%	10
No	60.00%	15
TOTAL		25

Figure 6: Responses to Question 6

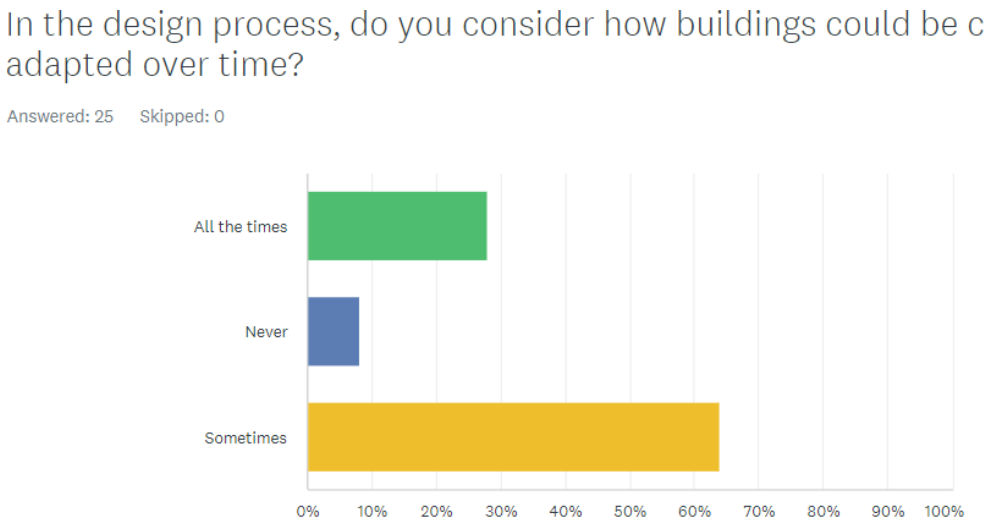
Q7. Are you aware that the London Planning system now requires a circularity statement for all large developments?



ANSWER CHOICES	RESPONSES	
Yes	52.00%	13
No	48.00%	12
TOTAL		25

Figure 7: Responses to Question 7

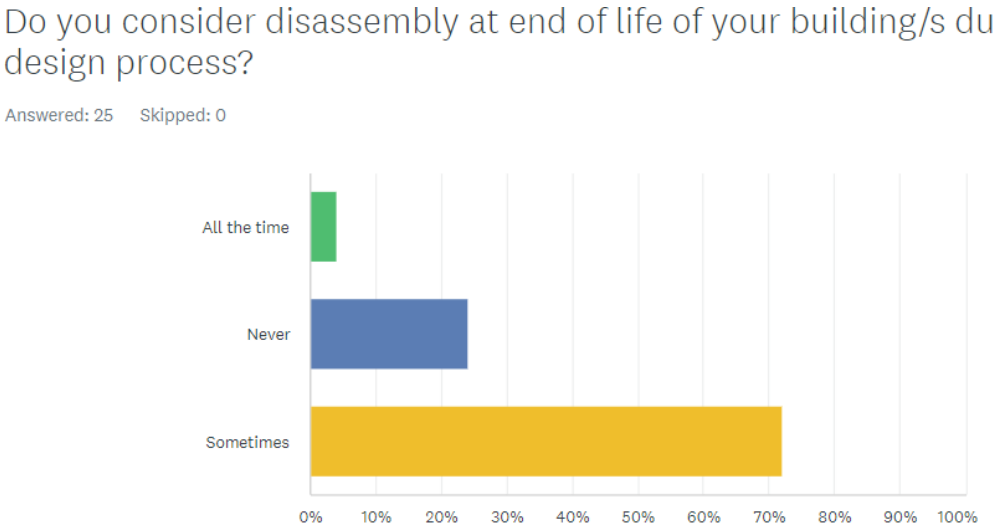
Q8. In the design process, do you consider how buildings could be adapted over time?



ANSWER CHOICES	RESPONSES	
All the times	28.00%	7
Never	8.00%	2
Sometimes	64.00%	16
TOTAL		25

Figure 8: Responses to Question 8

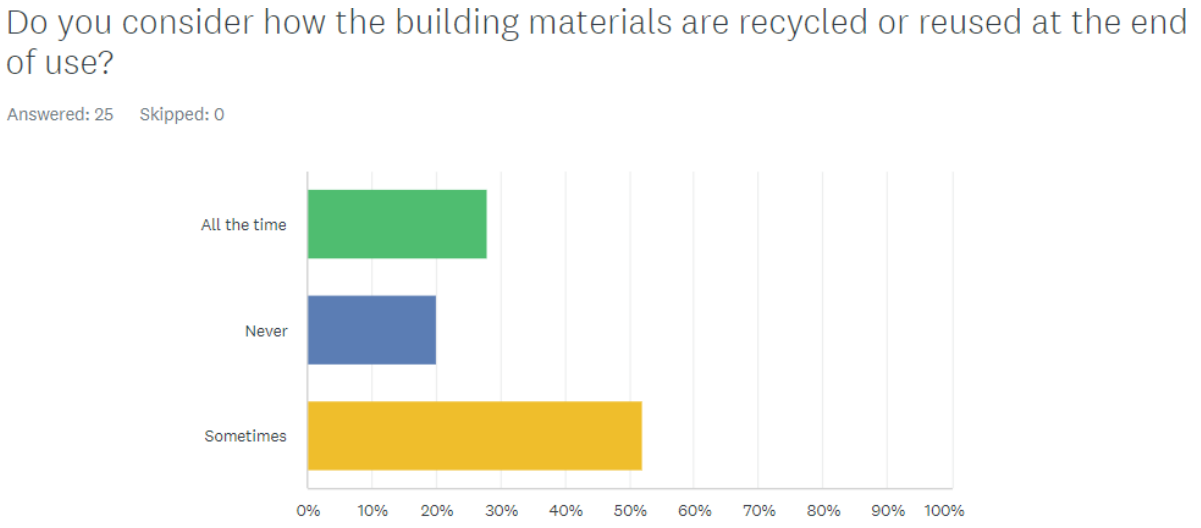
Q9. Do You consider disassembly at end of life of your building/s during your design process?



ANSWER CHOICES	RESPONSES	
All the time	4.00%	1
Never	24.00%	6
Sometimes	72.00%	18
TOTAL		25

Figure 9: Responses to Question 9

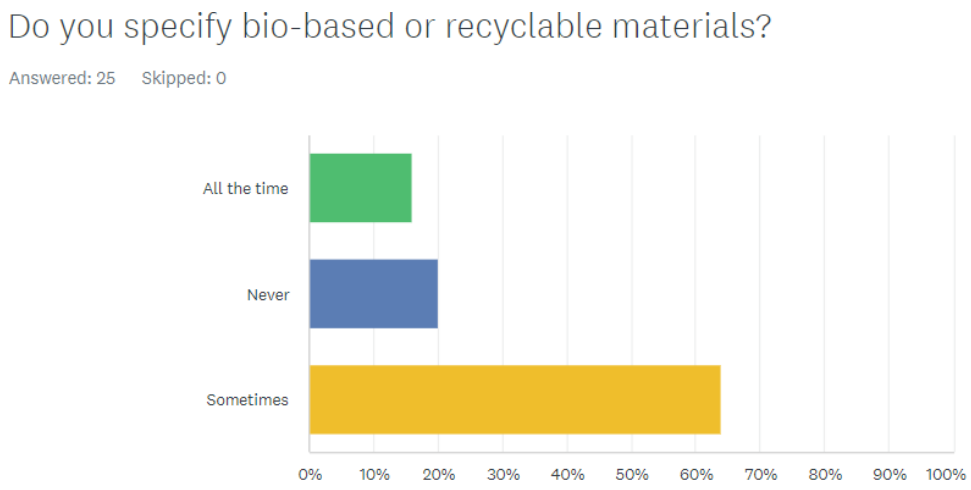
Q10. Do you consider how the building materials are recycled or reused at the end of use?



ANSWER CHOICES	RESPONSES	
All the time	28.00%	7
Never	20.00%	5
Sometimes	52.00%	13
TOTAL		25

Figure 10: Responses to Question 10

Q11. Do you specify bio-based or recyclable materials?



ANSWER CHOICES	RESPONSES	
All the time	16.00%	4
Never	20.00%	5
Sometimes	64.00%	16
TOTAL		25

Figure 11: Responses to Question 11

Q12. What barriers do you consider in relation to implementing circularity in your projects?

Capital cost where private developers are not incentivised to consider circularity or invest in advice in this regard	View respondent's answers	Add tags
10/11/2021 10:07		
Knowledge and cost	View respondent's answers	Add tags
10/11/2021 10:07		
Regulations in particular relation to fire	View respondent's answers	Add tags
10/11/2021 10:06		
Quality; structural integrity; traceability; availability	View respondent's answers	Add tags
10/11/2021 10:05		
knowledge	View respondent's answers	Add tags
10/11/2021 09:58		

Inertia in the Construction industry and the cost / regulatory challenges of doing something genuinely innovative

10/11/2021 09:43 View respondent's answers Add tags

availability of various alternative systems that meet client requirements. we aim to get the best products out there but sometimes the clients need specific criteria to be met. client more than likely to be cost and time driven to meet deadlines.

10/11/2021 09:17 View respondent's answers Add tags

Robustness, fire and progressive collapse requirements

10/11/2021 09:04 View respondent's answers Add tags

lack of opportunities to distribute or procure materials theatre recycled.

10/11/2021 08:49 View respondent's answers Add tags

Time to explore options in projects, lac of early engagement with potential contractor, client not wanting to deviate from traditional construction methodology.

Cost to developers

10/11/2021 08:03 View respondent's answers Add tags

Cost to clients, availability of suitable recyclable materials which allow disassembly easily.

10/11/2021 07:59 View respondent's answers Add tags

Client buy in

9/11/2021 18:01 View respondent's answers Add tags

procurement - ie. public procurement restrictions in relation to product naming at specification level, difficulty in engagement with suppliers & contractors

9/11/2021 17:49 View respondent's answers Add tags

cost, availability of appropriate materials / design solutions, lack of knowledge of options

9/11/2021 17:11 View respondent's answers Add tags

Design inertia arising from previous design projects

9/11/2021 16:30 View respondent's answers Add tags

Resources, time. Dedicated personnel ideally required. Client commitment and buy in. Contractor and skilled personnel.

9/11/2021 16:11 View respondent's answers Add tags

Knowledge. Materials cost & availability. Time pressures. Client engagement.

9/11/2021 16:01 View respondent's answers Add tags

Cost. Client awareness

8/11/2021 12:56 View respondent's answers Add tags

Budget and scheduling constraints

8/11/2021 11:30 View respondent's answers Add tags

Q13. What do you hope to gain from these facilitated sessions?

☐	Update industry knowledge, trends and understand what is practical to implement immediately to promote circular economy	10/11/2021 10:07	View respondent's answers Add tags
☐	Knowledge	10/11/2021 10:07	View respondent's answers Add tags
☐	Better knowledge	10/11/2021 10:06	View respondent's answers Add tags
☐	in depth knowledge	10/11/2021 09:58	View respondent's answers Add tags
☐	broader appreciation of principles and supports that are out there to 'move the dial' and see sustainability and circularity as kpi's in construction projects		
☐	more knowledge and understanding to facilitate implementation on future projects and things to aware of going forward	10/11/2021 09:17	View respondent's answers Add tags
☐	An appraisal of solutions and understanding of what is achievable.	10/11/2021 09:04	View respondent's answers Add tags
☐	knowledge of these opportunities.	10/11/2021 08:49	View respondent's answers Add tags
☐	To understand common practices and whaw should be considered moving forward	10/11/2021 08:48	View respondent's answers Add tags
☐	Better insight on how we approach circularity in the concept stag of design and bring the client with us along the way	10/11/2021 08:08	View respondent's answers Add tags

Better understanding of circularity and IGBC

10/11/2021 08:03 View respondent's answers Add tags

A greater understanding of the Circular Economy and how we can apply it our projects.

10/11/2021 07:59 View respondent's answers Add tags

Learning

9/11/2021 18:01 View respondent's answers Add tags

to get an understanding of how circular design strategies can be applied to FOCAS

9/11/2021 17:49 View respondent's answers Add tags

Greater knowledge of circularity process, and what tools and resources are available to engineers and designers to help them implement LCA solutions in projects.

Get an understanding of the positive initiatives which can be simply embedded in project designs

9/11/2021 16:30 View respondent's answers Add tags

Better understanding of Circularity and methods to implement it into design

9/11/2021 16:11 View respondent's answers Add tags

An element of knowledge and understanding of the principles of the circular economy that we may begin introducing them into our design process.

9/11/2021 16:01 View respondent's answers Add tags

Greater understanding about how we can positively affect circularity.

8/11/2021 12:56 View respondent's answers Add tags

More information and examples of sustainable options in Ireland

Deepen and grow my knowledge of the whole design and onsite construction stages and how we can implement circularity in our own projects. My role in construction compliance means I am overlapping with both and want to help facilitate ciruclarity in our construction design stages and also importantly on our up and running construction sites.

8/11/2021 10:01 View respondent's answers Add tags

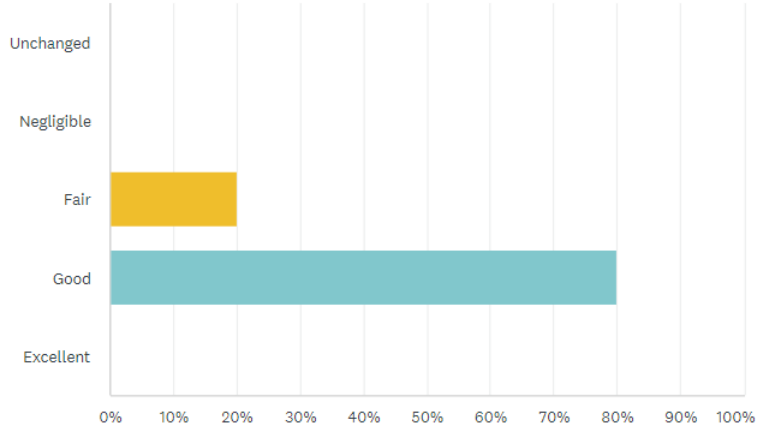
Post-Workshop Questionnaire

Questions and Responses

Q1. How would you rate the improvement in your knowledge of the Circular Economy in general since participating in this training?

How would you rate the improvement in your knowledge of the Circular Economy in general since participating in this training?

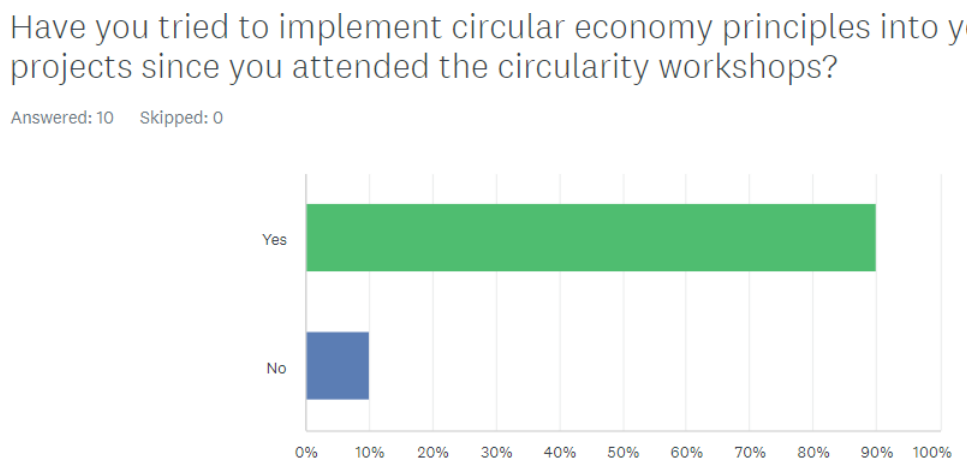
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Unchanged	0.00%	0
Negligible	0.00%	0
Fair	20.00%	2
Good	80.00%	8
Excellent	0.00%	0
TOTAL		10

Figure 1: Responses to Question 1

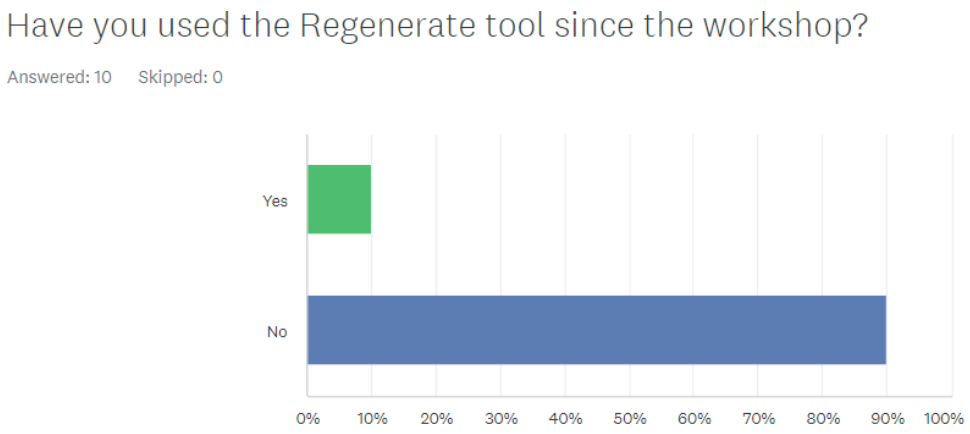
Q2. Have you tried to implement circular economy principles into your design projects since you attended the circularity workshops??



ANSWER CHOICES	RESPONSES	
Yes	90.00%	9
No	10.00%	1
TOTAL		10

Figure 2: Responses to Question 2

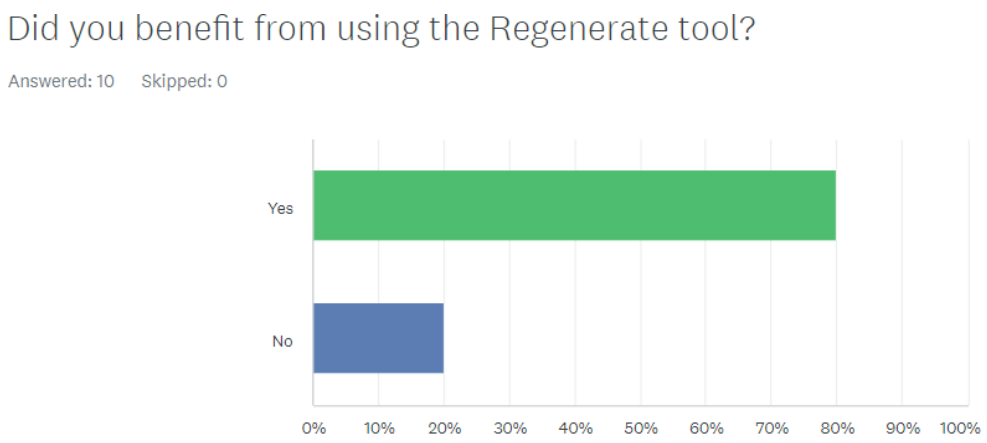
Q3. Have you used the Regenerate tool since the workshop?



ANSWER CHOICES	RESPONSES	
Yes	10.00%	1
No	90.00%	9
TOTAL		10

Figure 3: Responses to Question 3

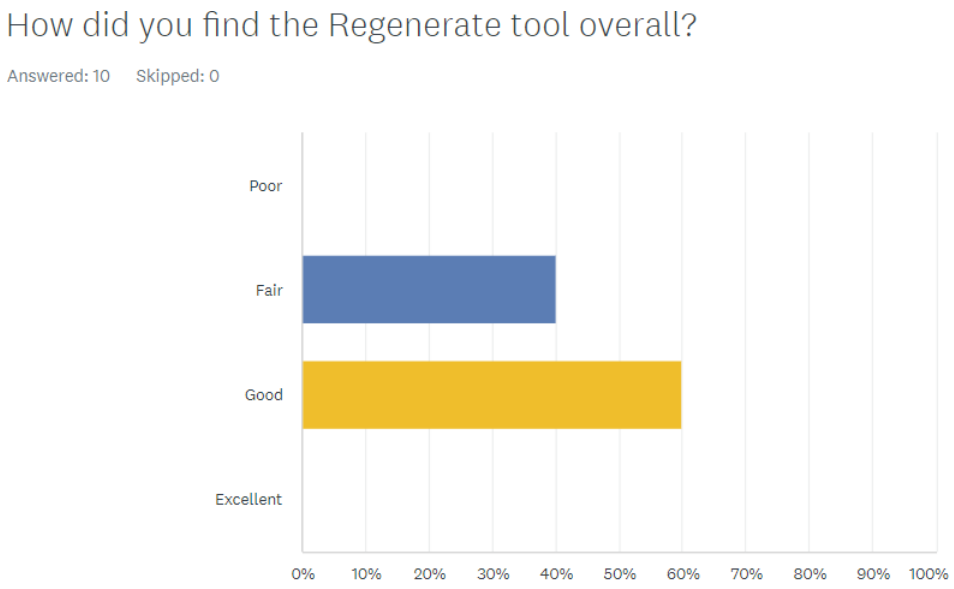
Q4. Did you benefit from using the Regenerate tool?



ANSWER CHOICES	RESPONSES	
Yes	80.00%	8
No	20.00%	2
TOTAL		10

Figure 4: Responses to Question 4

Q5. How did you find the Regenerate tool overall?



ANSWER CHOICES	RESPONSES	
Poor	0.00%	0
Fair	40.00%	4
Good	60.00%	6
Excellent	0.00%	0
TOTAL		10

Figure 5: Responses to Question 5

Q6. What did you find good about the Regenerate tool?

Showing **8** responses

Prompting the user to think more in depth about ones design. Collaboration is key with all design team members and the tool promotes and encourages collaboration. Piecharts/Dashboards are good visuals.	View respondent's answers	Add tags
4/7/2022 6:32 PM		
Detail in Architectural and Structural Materials is very good, but is very light in Electrical and Mechanical Services	View respondent's answers	Add tags
4/1/2022 10:31 AM		
It sets out all the stages of a project and the different elements that need to be considered for a circular economy so it can act as a prompt and ensure elements are not missed.	View respondent's answers	Add tags
4/1/2022 8:09 AM		
Easy to use Useful prompts for early level design	View respondent's answers	Add tags
3/29/2022 4:40 PM		
It prompts you to think about key circular principles	View respondent's answers	Add tags
3/29/2022 12:49 PM		
It prompts you to think twice about material selection, life cycle and construction methods.	View respondent's answers	Add tags
3/24/2022 9:16 AM		
It makes you question your current approach, it helps to start the thought process of circularity early in a project rather than an after thought	View respondent's answers	Add tags
3/11/2022 1:54 PM		
The tool is useful and offers a high level approach to incorporating circularity in design.	View respondent's answers	Add tags
3/8/2022 2:01 PM		

Figure 6: Responses to Question 6

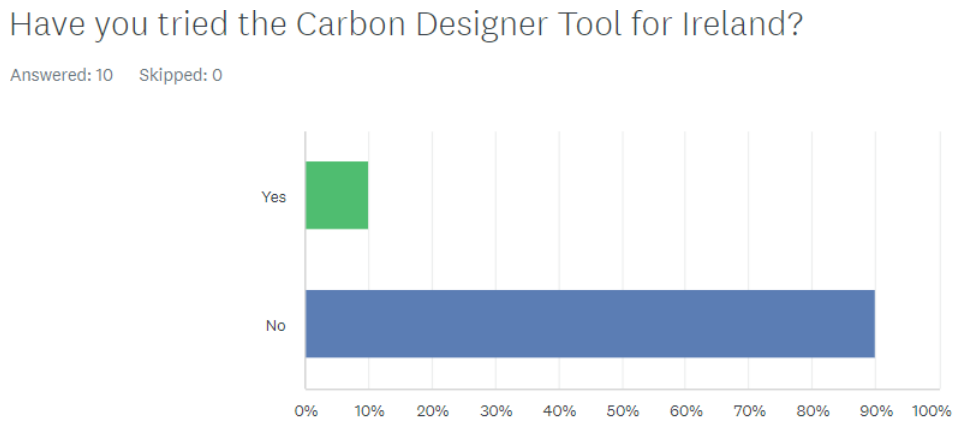
Q7. Do you have any suggestions about how the Regenerate tool could be improved?

Showing **7** responses

☐	User interface could be more user friendly and leaner. Once one saves changes one has to keep going right back to the start and clicking through each interface. External links to more circular databases for example , materials, waste, ICE etc.	4/7/2022 6:32 PM	View respondent's answers Add tags
☐	Improve the Electrical and Mechanical Services sections	4/1/2022 10:31 AM	View respondent's answers Add tags
☐	There is alot of duplication across stages, it would be good if information could be pre-populated by ticking a box or etc. if this info is the same as what had been filled in once previously in the tool.	4/1/2022 8:09 AM	View respondent's answers Add tags
☐	The published report could include at appendix questions and responses for easier reference in meetings etc	3/29/2022 4:40 PM	View respondent's answers Add tags
☐	The process could do with a third party reviewer as it relies on the design team giving honest answers.	3/29/2022 12:49 PM	View respondent's answers Add tags
☐	If the tool could be targeted to different sketch design stage, detailed technical design and construction stage?	3/24/2022 9:16 AM	View respondent's answers Add tags
☐	The tool should be more flexible to accomodate zones, aspects of industrial plant buildings and material input. It should also look for more input from engineers on specifics of approach taken to increase circularity e.g eliminiate waste in design. It should also allow the users to generate a more detailed report, which would align more to new Irish EPA Construction Resource and Waste Management Plan requirements. Both being linked would strengthen the value and use of the tool from Design stages onwards.	3/8/2022 2:01 PM	View respondent's answers Add tags

Figure 7: Responses to Question 7

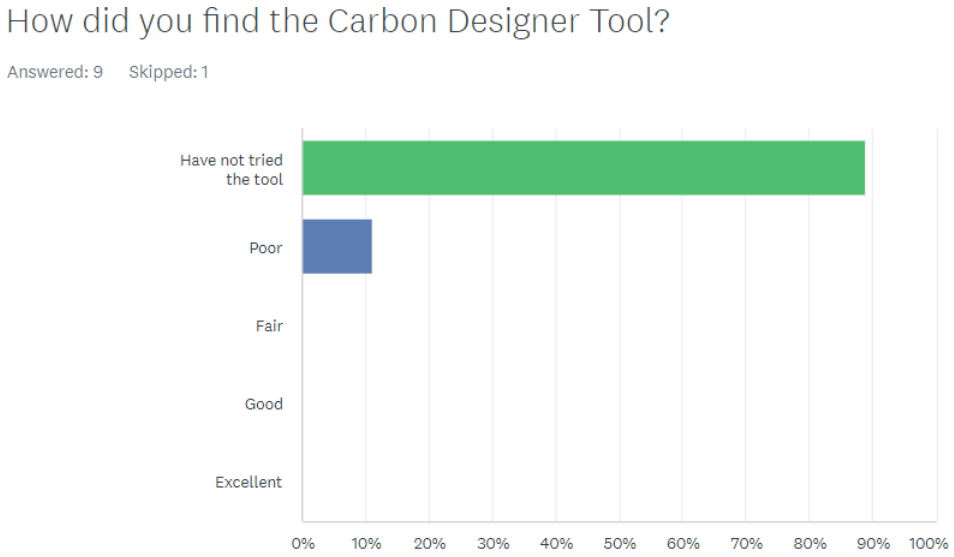
Q8. Have you tried the Carbon Designer Tool for Ireland?



ANSWER CHOICES	RESPONSES	
Yes	10.00%	1
No	90.00%	9
TOTAL		10

Figure 8: Responses to Question 8

Q9. How did you find the Carbon Designer Tool?



ANSWER CHOICES	RESPONSES	
Have not tried the tool	88.89%	8
Poor	11.11%	1
Fair	0.00%	0
Good	0.00%	0
Excellent	0.00%	0
TOTAL		9

Figure 9: Responses to Question 9

Q10. What did you find good about the Carbon Designer Tool?

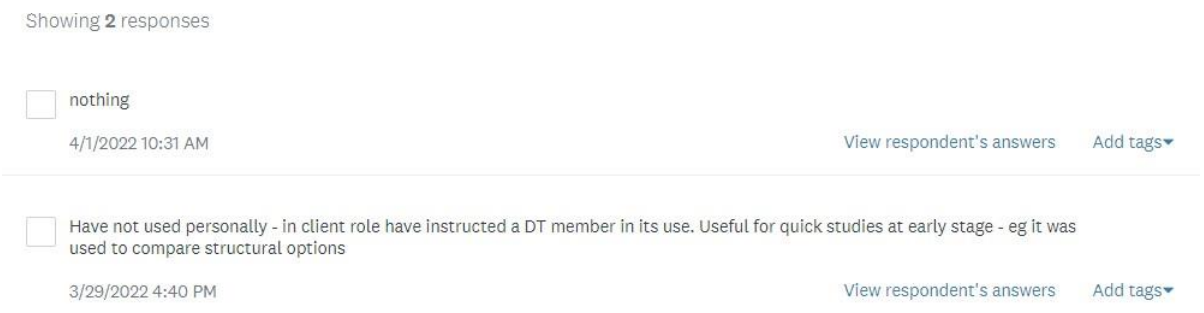


Figure 10: Responses to Question 10

Q11. What could be improved in the Carbon Designer Tool?

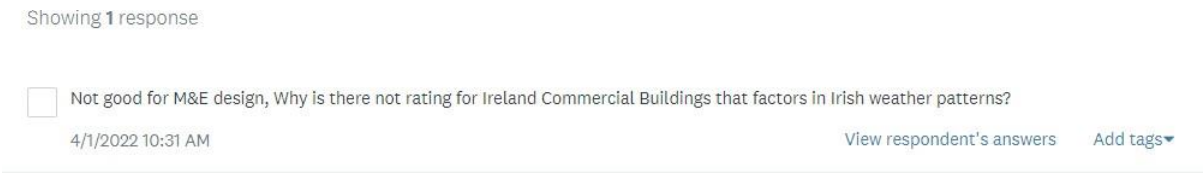
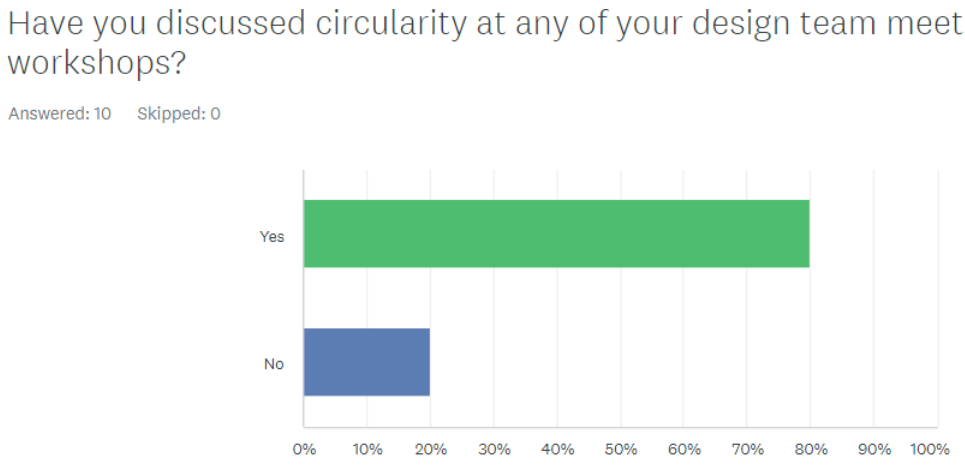


Figure 11: Responses to Question 11

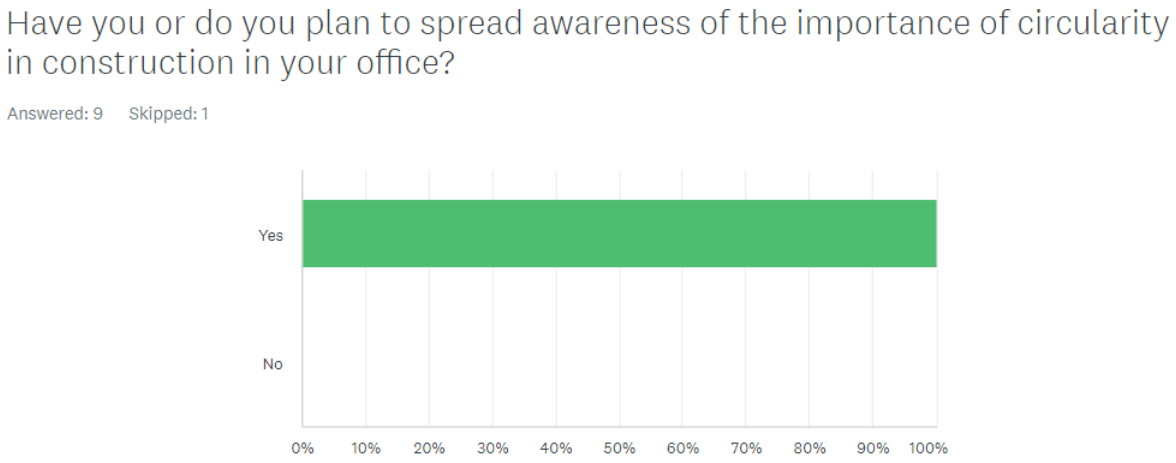
Q12. Have you discussed circularity at any of your design team meetings since the workshops?



ANSWER CHOICES	RESPONSES	
Yes	80.00%	8
No	20.00%	2
TOTAL		10

Figure 12: Responses to Question 12

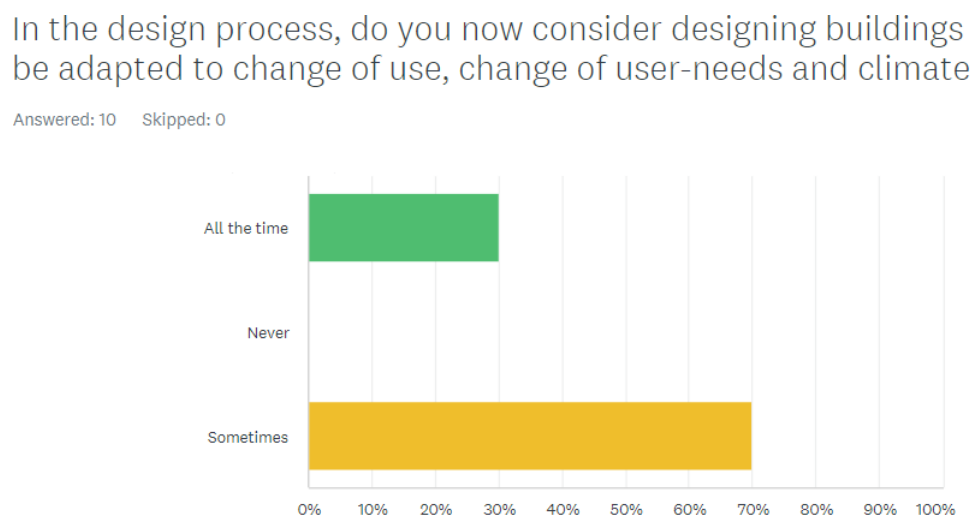
Q13. Have you or do you plan to spread awareness of the importance of circularity in construction in your office?



ANSWER CHOICES	RESPONSES	
Yes	100.00%	9
No	0.00%	0
TOTAL		9

Figure 13: Responses to Question 13

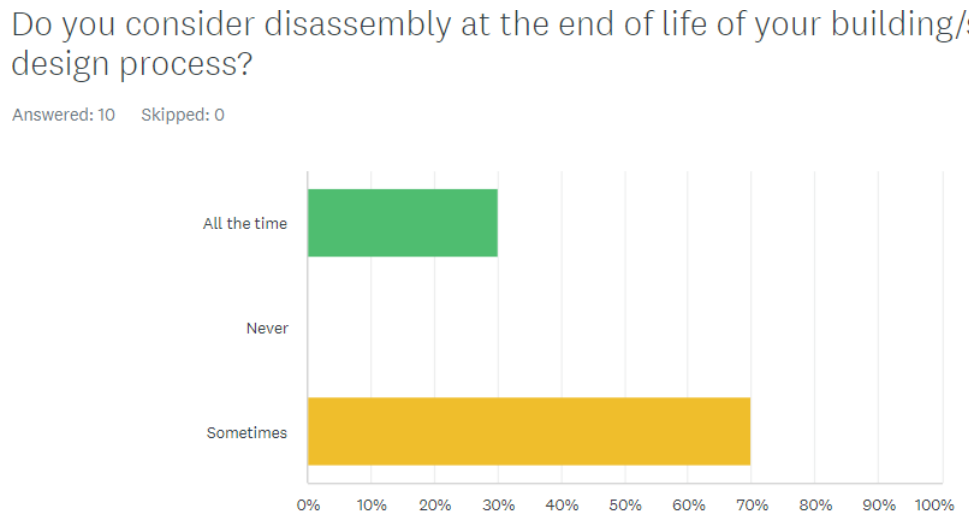
Q14. In the design process, do you now consider designing buildings so they can be adapted to change of use, change of user-needs and climate change?



ANSWER CHOICES	RESPONSES	
All the time	30.00%	3
Never	0.00%	0
Sometimes	70.00%	7
TOTAL		10

Figure 14: Responses to Question 14

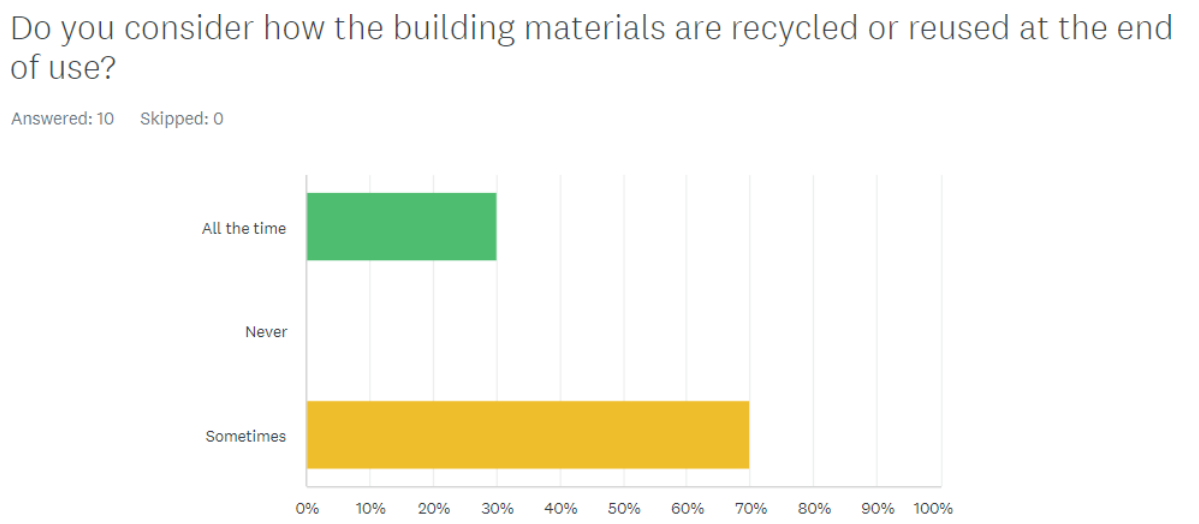
Q15. Do you consider disassembly at the end of life of your building/s during your design process?



ANSWER CHOICES	RESPONSES	
All the time	30.00%	3
Never	0.00%	0
Sometimes	70.00%	7
TOTAL		10

Figure 15: Responses to Question 15

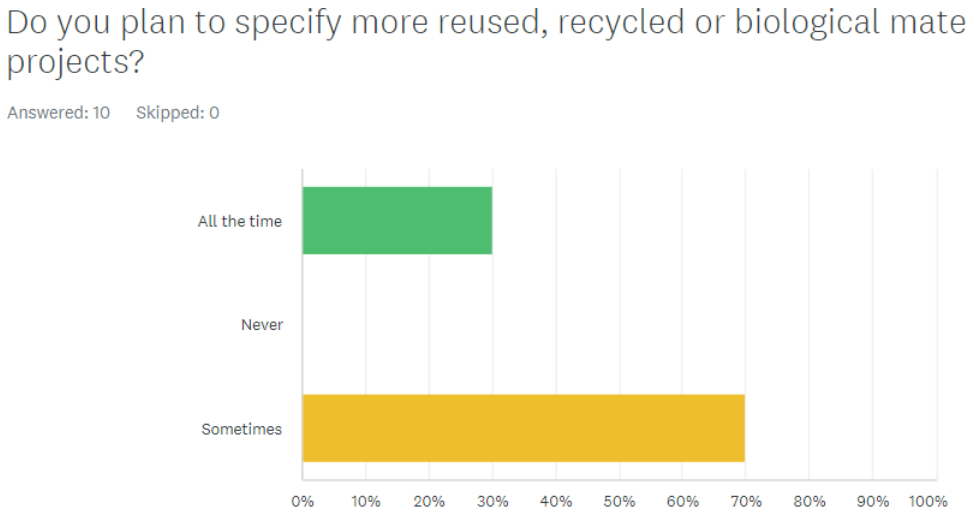
Q16. Do you consider how the building materials are recycled or reused at the end of use?



ANSWER CHOICES	RESPONSES	
All the time	30.00%	3
Never	0.00%	0
Sometimes	70.00%	7
TOTAL		10

Figure 16: Responses to Question 16

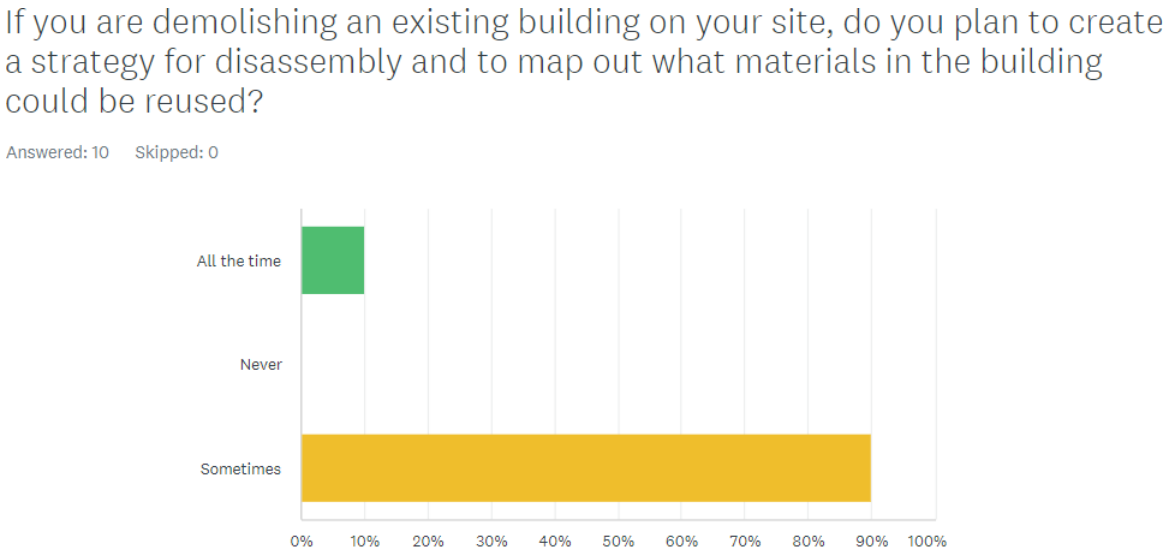
Q17. Do you plan to specify more reused, recycled or biological materials in your projects?



ANSWER CHOICES	RESPONSES	
All the time	30.00%	3
Never	0.00%	0
Sometimes	70.00%	7
TOTAL		10

Figure 17: Responses to Question 17

Q18. If you are demolishing an existing building on your site, do you plan to create a strategy for disassembly and to map out what materials in the building could be reused?



ANSWER CHOICES	RESPONSES	
All the time	10.00%	1
Never	0.00%	0
Sometimes	90.00%	9
TOTAL		10

Figure 18: Responses to Question 18

Q19. What barriers do you consider in relation to implementing circularity in your projects?

Showing **9** responses

Certification of reused materials. Sourcing reusable materials. Client persuasion. Identifying the circular economy and circularity at the different levels and defining boundaries	View respondent's answers	Add tags
4/7/2022 6:32 PM		
Ignorance by Clients. Advertising on this issue needs to occur	View respondent's answers	Add tags
4/1/2022 10:31 AM		
Lack of knowledge among all designers in the project.	View respondent's answers	Add tags
4/1/2022 8:09 AM		
Lack of a readily available market for processing used materials	View respondent's answers	Add tags
3/30/2022 9:44 AM		
Specification of materials suitable for re-use is very feasible and will be pushed however in a public contracting context re-use of materials is difficult. Much detail consideration is required to understand contractual implications. for example it is not allowed to name products which makes this process difficult	View respondent's answers	Add tags
3/29/2022 4:40 PM		
Education of the design team Expectations in the market for prime assets Cost of implementation	View respondent's answers	Add tags
3/29/2022 12:49 PM		
Various teams have different agendas - the site /construction team may focus on getting the job done within a tight programme. The QS team may focus on cost of materials.	View respondent's answers	Add tags
3/24/2022 9:16 AM		
Client and contractor awareness and contribution	View respondent's answers	Add tags
3/11/2022 1:54 PM		
-Warranties on reused materials or new types of circular materials is an issue for our clients. -Big lack of awareness in the construction industry of the monetary environmental and resource value of the circular approach to design. -Market lacks common everyday products which designers can choose for circular design, dissassembly at end of life etc.	View respondent's answers	Add tags
3/8/2022 2:01 PM		

Figure 19: Responses to Question 19

Q20. What have you gained from these circularity workshops and feedback?

Showing **10** responses

Insight into developments re. circularity and how it is an important aspect to embed into ones design at early stage and throughout all design stages. Knowledge and some expertise to impart to clients and colleagues to advance and promote circularity in design. The importance of promoting the adoption of circular economic thinking in construction projects and how there is still a lot to be done to achieve same.

4/7/2022 6:32 PM View respondent's answers Add tags

Learning

4/1/2022 10:31 AM View respondent's answers Add tags

Good awareness of the circularity movement in Ireland, and the resources available to learn more about this.

4/1/2022 8:09 AM View respondent's answers Add tags

New knowledge and insight

3/30/2022 9:44 AM View respondent's answers Add tags

the workshop was a useful prompt on elements to consider as hte design progresses. We were unable to answer many of hte question positively due to lack of detail and confirmations at our early design stage, however to acieve circularlity introduction the concepts at this early stage is necessary. An element to the tool that would allow for target setting and then checking against targets as design progresses would be beneficial

3/29/2022 4:40 PM View respondent's answers Add tags

A better knowledge overall and a good system to prompt thought on the subject

3/29/2022 12:49 PM View respondent's answers Add tags

A "think twice" approach.

3/24/2022 9:16 AM View respondent's answers Add tags

Better awarness of circular design stragetys and I will hope to continue to advance my knowledge in this area.

3/16/2022 10:05 PM View respondent's answers Add tags

More understanding

3/11/2022 1:54 PM View respondent's answers Add tags

Great to cross collaborate with different team members and link to improve and implement circular design principles.

3/8/2022 2:01 PM View respondent's answers Add tags

Figure 20: Responses to Question 20

IRISH GREEN BUILDING COUNCIL

Circular Life

Survey Results
Carbon Designer Tool

Carbon Designer Tool

- 71.43% of the people surveyed would recommend the tool to professionals to reduce their carbon emissions.
- 50% of the people surveyed had tried the Carbon Designer Tool.
- The reason for people not using the tool included:
  - The opportunity hasn't arisen yet – however it may be possible in next six months
  - no time
- The tool is being used mostly on housing (57.14%) and is also used on offices (14.29%) and industrial (14.29%).
- It took the people surveyed between one hour and half a day to use the tool.

Embodied Carbon in General

- 25% of the people surveyed stated that they discussed embodied carbon in their offices.
- 50% of the people surveyed stated that they sometimes discussed embodied carbon in their offices.

Positive Aspects of the Tool

- Intuitive
- Quick
- Easy to use
- Simple
- Good for beginners

Negative Aspects of the Tool

- Sometimes hard to find materials
- Would not be required for more experienced users
- It produces a lot of information relatively quickly, which can be overwhelming. Not confident in the output. Benchmarks for building categories would be useful.
- Sometimes hard to find materials
- The tool is more suited to commercial buildings
- The answers didn't make logical sense. When I tried making changes there would sometimes be zero impact so I lost faith in the tool.
- Wouldn’t be required for more experienced users, though that was not its intention I believe

Missing building elements of the tool

- 70% of the people surveyed stated they could not find every element they needed.
- Missing elements:
  - Steel balconies
  - Cavity-pumped insulation
  - C24 timber

Improvements to the tool mentioned

- It was stated by one person surveyed that the tool is fit for purpose
- More detail

Barriers to implement low embodied carbon materials into designs

- It was stated by one person surveyed that the tool is fit for purpose
- Client resistance
- Design team resistance
- Budget
- If it costs more then clients won't engage
- Embed carbon regulations are required to make it the industry norm
- Fire safety and procurement
- Cost of procurement
- Cost, supply chain & lack of understanding in the market
- Legislation
- Maintenance
- Getting precast concrete supplier to use recycled content / ggbs/ pfa etc.

Analysis

From the results of the survey, most attendees stated their knowledge of embodied carbon was good or fair post using the tool.

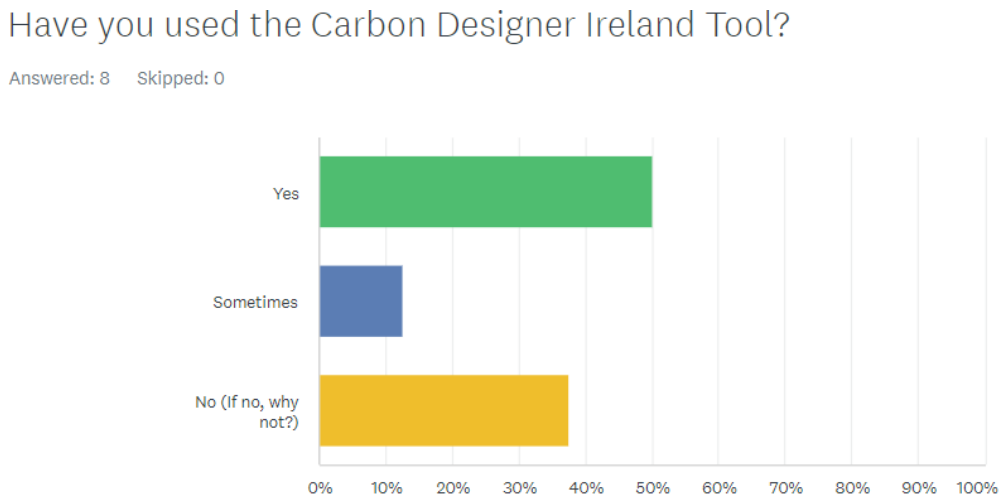
The barriers listed above from the survey results – cost, fire, time, lack of regulation on embodied carbon calculations for buildings, etc. – seem to be hindering the focus on low embodied carbon buildings.

From the results of the survey, the tool overall was a success as over 70% of the people would recommend the tool to a colleague.

Post-Workshop Questionnaire

Questions and Responses

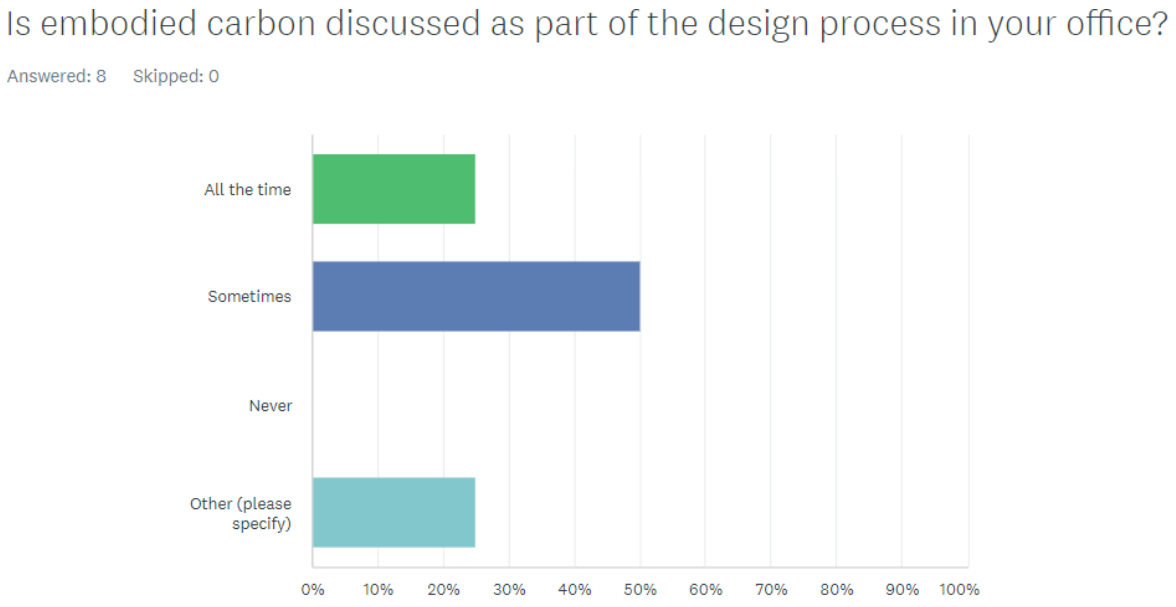
Q1. Have you used the Carbon Designer Ireland Tool?



ANSWER CHOICES		RESPONSES	
Yes		50.00%	4
Sometimes		12.50%	1
No (If no, why not?)	Responses	37.50%	3
TOTAL			8

Figure 1: Responses to Question 1

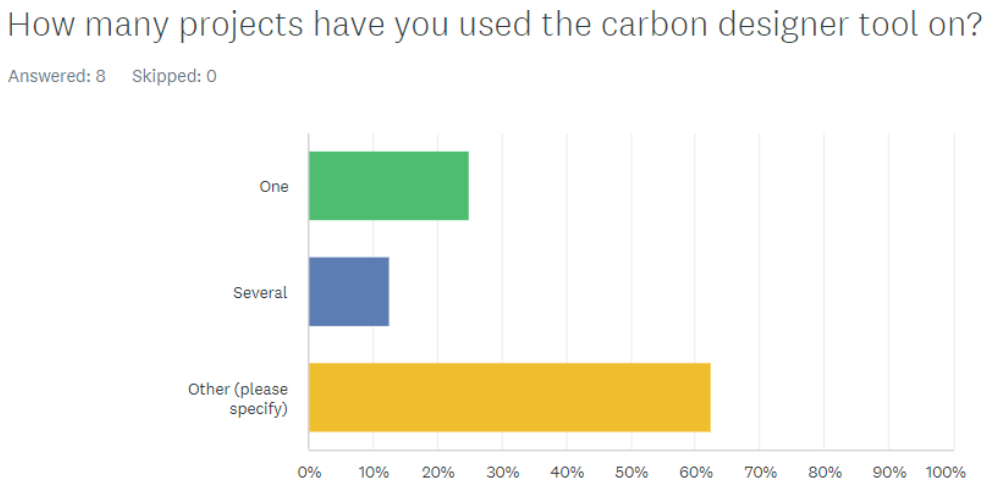
Q2. Is embodied carbon discussed as part of the design process in your office?



ANSWER CHOICES		RESPONSES	
All the time		25.00%	2
Sometimes		50.00%	4
Never		0.00%	0
Other (please specify)	Responses	25.00%	2
TOTAL			8

Figure 2: Responses to Question 2

Q3. How many projects have you used the Carbon Designer Tool on?



ANSWER CHOICES		RESPONSES	
One		25.00%	2
Several		12.50%	1
Other (please specify)	Responses	62.50%	5
TOTAL			8

Figure 3: Responses to Question 3

Q4. What type of buildings have you used the tool on?

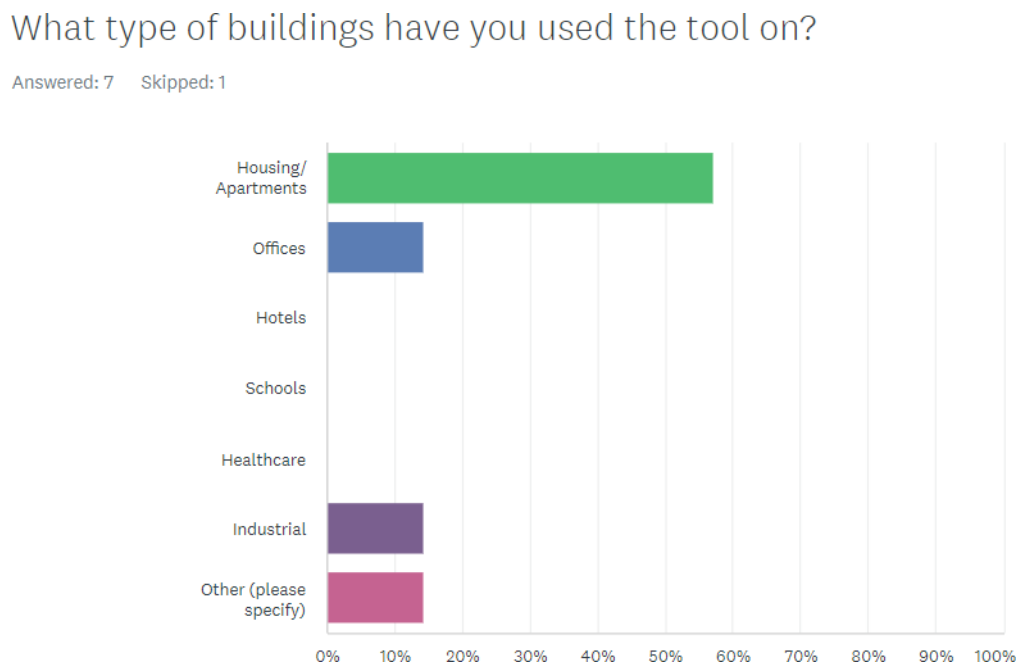


Figure 4: Responses to Question 4

Q5. Approximately how long did it take you to complete the carbon assessment? Note: Please state the type of building this time is referring to.

Time	Building Type
1 hour 30 mins	Housing
1 hour	Small mixed-use building (office and creche)

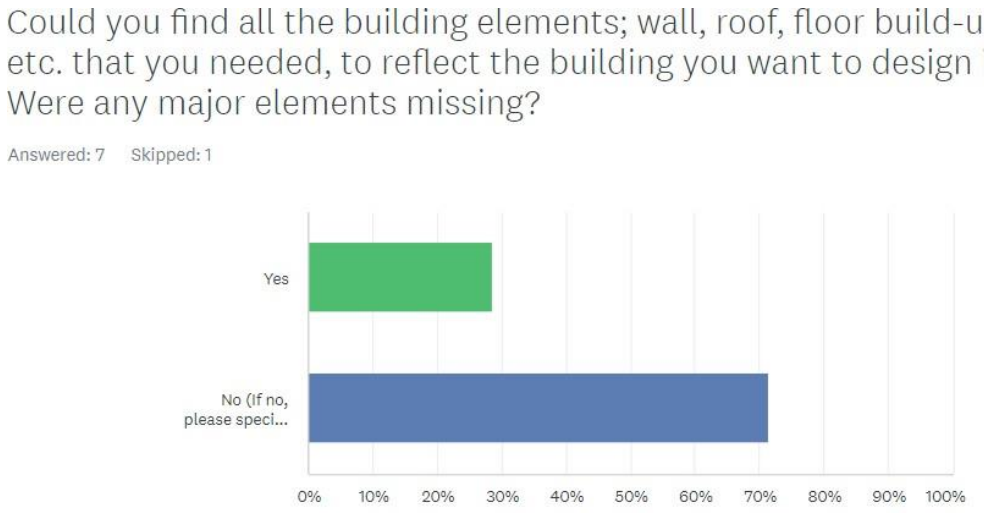
Q6. What were the positive aspects of the tool?

- It produces a lot of information relatively quickly. Easy to track the impact of material choices
- Intuitive
- Quick, easy to use
- Simplicity
- Simple to use, good for beginners

Q7. What were the negative aspects of the tool?

- It produces a lot of information relatively quickly, which can be overwhelming. Not confident in the output. Benchmarks for building categories would be useful.
- Sometimes hard to find materials.
- We found that for heavy mass industrial buildings the results don't quite align with our detailed LCA calculations. Given we only work on industrial/pharma type buildings we decided not to use the tool moving forward. We believe the tool is more suited to commercial buildings.
- The answers didn't make logical sense. When I tried making changes there would sometimes be zero impact so I lost faith in the tool.
- Wouldn't be required for more experienced users, though that was not its intention I believe.

Q8. Could you find all the building elements; wall, roof, floor build-ups, materials etc. that you needed, to reflect the building you want to design in the tool? Were any major elements missing?



ANSWER CHOICES		RESPONSES	
Yes		28.57%	2
No (If no, please specify what was missing):	Responses	71.43%	5
TOTAL			7

Figure 8: Responses to Question 8

Q9. Did using the tool result in changes to your material choices or design?

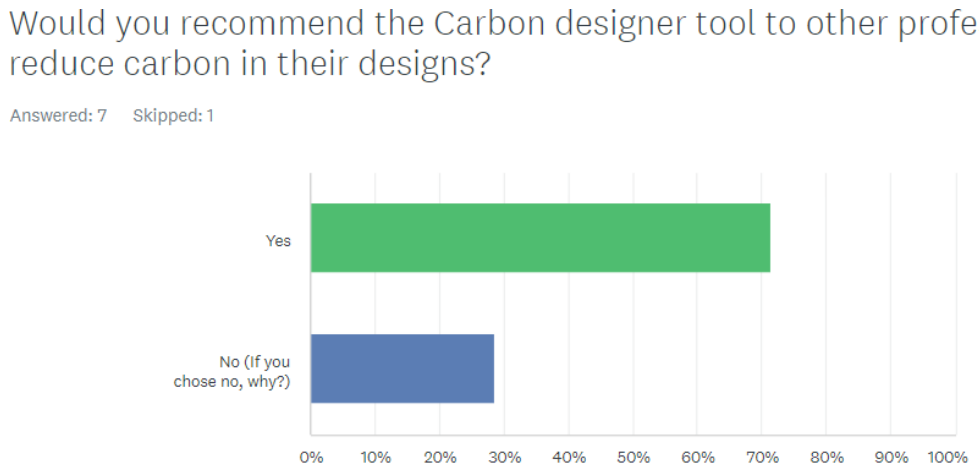
- No. Choices were already made where possible within the budget by using the 'Materials Pyramid'.
- Yes.

Q10. Do you have any suggestions to improve the tool?

- It is neither generic enough to be a 'rule of thumb' tool nor specific enough to calculate the embedded carbon of the specific project. Make it simpler, there are more expert systems to accurately calculate the embedded carbon. A more graphic interface would be useful given the target users.
- It is a good tool, results outputs are nice. I would ask for more detail but that kind of goes against the whole idea of having a simple tool. An experienced oneclick user can complete a more detailed assessment quite easily using the full oneclick software version. If the oneclick tool had the same results output graphics that would be nice.
- I think I just need more training!
- No, its functionality is quite good. It is fit for purpose,
- I can't say at this stage.
- Not yet.

- No.
- No.

Q11. Would you recommend the Carbon Designer Tool to other professionals to reduce carbon in their designs?



ANSWER CHOICES		RESPONSES	
Yes		71.43%	5
No (If you chose no, why?)	Responses	28.57%	2
TOTAL			7

Figure 11: Responses to Question 11

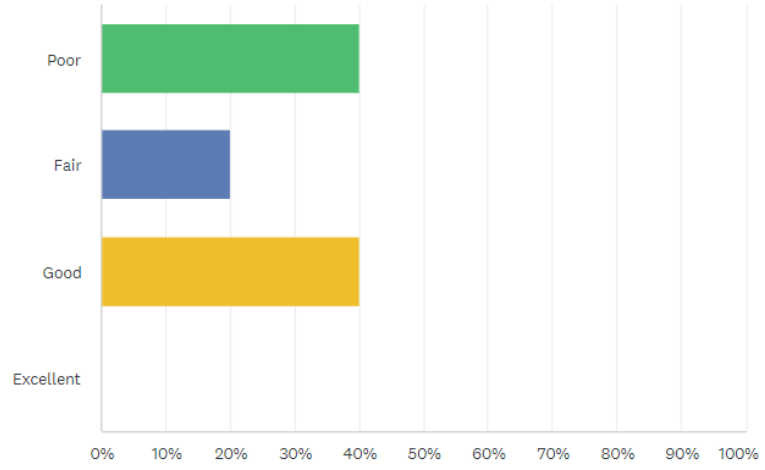
Q.12 What barriers do you encounter in implementing low embodied carbon materials / structure in your projects?

- Client resistance. Design team resistance. BUDGET! If it costs more then clients won't engage. Embed Carbon regulations are required to make it the industry norm.
- Fire safety and procurement.
- Cost of procurement.
- Cost, supply chain & lack of understanding in the market.
- Legislation. Cost. Maintenance.
- Getting precast concrete supplier to use recycled content / ggbs / pfa etc.

Q13. How would you rate the improvement in your knowledge of embodied carbon since using the Carbon Designer Tool?

How would you rate the improvement in your knowledge of embodied carbon since using the carbon designer tool?

Answered: 5 Skipped: 3

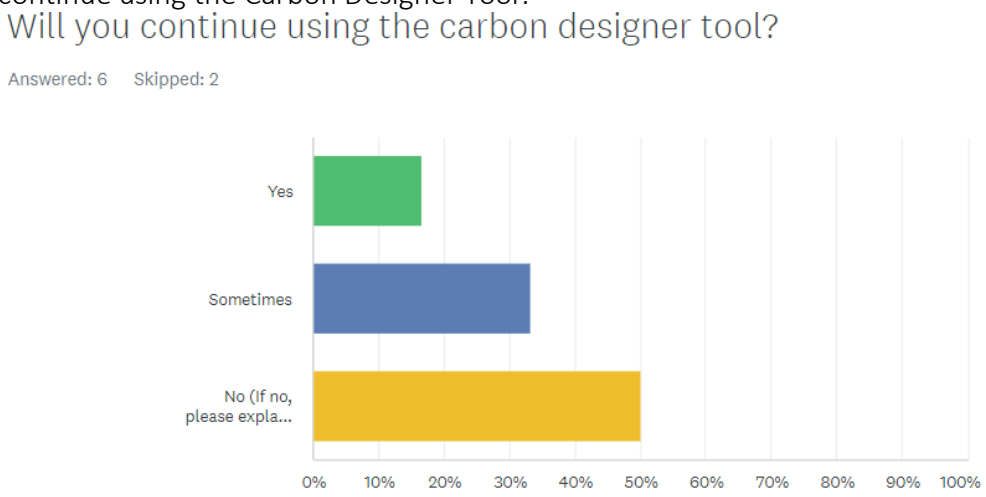


ANSWER CHOICES	RESPONSES	
Poor	40.00%	2
Fair	20.00%	1
Good	40.00%	2
Excellent	0.00%	0
TOTAL		5

Comments (1)

Figure 13: Responses to Question 13

Q14. Will you continue using the Carbon Designer Tool?



ANSWER CHOICES		RESPONSES	
Yes		16.67%	1
Sometimes		33.33%	2
No (If no, please explain why below):	Responses	50.00%	3
TOTAL			6

Figure 14: Responses to Question 14

IRISH GREEN BUILDING COUNCIL

Facilitated Circular Design Workshops & Case Studies (WP2)

Progress Report **CONFIDENTIAL**

Rosemarie Mac Sweeney & Rachel Loughrey January 2022

CIRCULARLife

epa GreenEnterprise

Contents

Project Summary

About the CIRCULARlife Project:

To date the discussion in Ireland on circularity in buildings has focused on downcycling of materials, waste audits already within existing buildings and finding uses for waste, such as reuse of aggregates and other recycled materials. A different approach is needed in order to design out the need for downcycling at the earliest stage of the project and to radically reduce overall resource consumption and embodied carbon.

IGBC intends to trial circularity tools with designers to help drive greater uptake and to identify the most useful approaches. The application of tools and indicators is a good way of identifying gaps and where the infrastructure is lacking in building a truly circular economy for construction as it immediately identifies what is difficult to apply in the Irish context and why.

As part of the project IGBC will also create learning materials, deliver webinars, and carry out training workshops with members and others in the sector to assist designers and developers to incorporate circularity into their projects. This project is funded by EPA Green Enterprise.

Acknowledgements

This project is funded by the Environmental Protection Agency of Ireland's Green Enterprise Programme. The Carbon Designer Tool for Ireland is co-funded by the Land Development Agency (LDA).

1. Introduction

This report outlines progress on the work that has been completed to date for Work Package 2 (WP2) of the CIRCULARlife Project.

1.1. Objectives of WP2 outlined in the Description of Work:

- To trial tools on real world projects to assess their impact on the design process.
- To measure their impact on design practice.
- To identify barriers in the application of certain strategies.
- To publish recommendations on results and integrate case studies into education and training.

1.2. Description of tasks in WP2 outlined in the Description of Work:

This work package will:

- Carry out workshops with 5 design teams and contractors at RIAI stages 1–2 of projects to develop a 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 Construction waste template.
- Carry out a questionnaire pre workshop and post workshop to assess the impact of the workshop and any tools used on the design, whether tool influences the measures included. Which measures in the tool were useful.
- Develop a report on the workshop on reactions on the day by the participants and on ideas and barriers identified.
- 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.

List of Expected Deliverables:

- Questionnaire on impact of tools prior to and post workshop
- 5 x workshops with full design team.
- 5 circularity strategy reports
- 5 no. workshop reports
- Overall report on impact of tools including feedback (month 18) with set of recommendations.

Expected Outcome:

- Set of recommendations and case studies on 5 projects for use in education and policy.

Progress to date:

- The IGBC carried out a questionnaire prior the first circularity workshop.
- The first circularity workshop was organized by the IGBC with six design teams. It was facilitated by two members of **Superuse**; an architectural practice based in the Netherlands with

significant expertise in circular design. The workshop's purpose was to introduce the teams to the circular economy and the built environment. Prior to the workshop, each design team sent on information of their project which was forwarded to Superuse. The two facilitators from Superuse went through the circularity topics covered in the presentation and related it back to the individual projects. A Miro board was used in the workshop so the participants could actively engage with the workshop.

- A second Circularity Workshop took place with each of the design teams individually. The IGBC made a brief presentation about circularity and the built environment and the use of the **Regenerate** tool. In these interactive workshops a structured circular sustainability strategy and statement for each project was created using the **Regenerate** tool. This is intended to replicate the approach of the Greater London Plan requirement to integrate circularity into all larger developments. This circularity statement created in this workshop will be updated throughout the project stages.
- After the second workshop an in-depth list of circularity resources was sent to each member of the six design teams based on the various topics of discussion and queries that arose during the workshop.
- IGBC will review the circularity statements received and provide feedback to each team in the coming weeks.

2. Workshop Design

2.1. Facilitation

The original proposal included for a circularity design workshop, facilitated by David Cheshire, and using the Regenerate Tool developed by David Cheshire and the University of Sheffield. The workshop facilitation budget was set at approx. €6000. However, when David Cheshire was invited to facilitate his fee was far more than the budget £15,000, and alternative solutions were required. As the co- developers of the Regenerate Tool, the University of Sheffield was then asked if they would be prepared to facilitate the workshop for the proposed budget. They declined, as they did not have the personnel or resources to lead a workshop. Instead, they offered to give a free webinar tutorial, which we ran and recorded on 18/08/2021[1]. We then sought quotes from facilitators both nationally and

[1] Regenerate Tutorial Webinar: https://vimeo.com/588861438/274e784769

internationally, who could not only facilitate a workshop, but who would have construction and design expertise and experience.

The following facilitators were invited to quote but were eventually ruled out:

Facilitator Options	Details
David Cheshire, **AECOM** https://aecom.com/ david.cheshire@aecom.com	• Invited to quote for facilitation 10/3/21 • Quoted £15k-£20k 7/4/21 • Over budget/Ruled out
Steven Beckers, **Lateral Thinking Factory** http://www.lateralthinkingfactory.com/ contact@lateralthinkingfactory.com steven@lateralthinkingfactory.com info@lsdg.be	• Invited to quote for facilitation 15/6/21 • E-mail bounced back • Tried alternative e-mail 15/6/21 • No reply • Tried second alternative e-mail 19/7/21 • No reply by 1/10/2021/Ruled out
Michel Weijers, **C2C Lab** https://c2c-lab.org/home/ jolie@c2cexpolab.eu info@c2cexpoloab.eu	• Invited to quote for facilitation 9/7/21 • No reply • Follow up e-mail sent to Jolie 21/7/21 • Follow up e-mail sent to info 26/7/21 • No reply by 1/10/2021/Ruled out
Mo Smit, **Bouwtuin & TU Delft** https://bouwtuin.wordpress.com/ info@bouwtuin.nl	• Invited to quote for facilitation 21/7/21 • No reply by 1/10/2021/Ruled out
Simon O'Rafferty **MCO**	• Invited to quote for facilitation 19/8/21 • Was very interested to quote, but was unable to do so in the timeframe due to illness of company director/Ruled out

The following organisations submitted quotes and were evaluated. Superuse received the highest score and were awarded the tender.

Facilitator	Quote	Details	Comments	
C2CNGO one senior expert from the field of C2C in the building industry and one senior facilitator.	€3200 (doesn't mention VAT)	The duration of the workshop will be around 3 hours. Covers the topics I asked for.	Seems to have lots of experience, digital workshops and facilitation is part of their regular offerings, and have the name C2C that might be a good draw for participants.	
3	4	5	4	16
Circular Design Institute	€2500 + VAT	3 Hour workshop.	Good price, enthusiastic, local so could be good for future events if	

Two facilitators, one interior architect, and one facilitator		Split into two groups. Suggest not doing all 5 topics to delve deeper into most important ones (e.g. energy is covered enough elsewhere etc.)	we make this an ongoing offering, but not very experienced yet.	
3	5	3	4	15
Superuse – no of facilitators will be tailored to suit the number of participants	€4580 (doesn't mention VAT)	2 Hour workshop, & can give examples from their own work, and use Miro	Lots of experience from a construction point of view, shorter workshop (as I had originally suggested 2h, but they may get through more with more facilitators). Their name will not be as much of a draw as C2C though.	
5	2	5	5	17
Test Site – Two facilitators from Test Site, and three needed from IGBC to Assist	€5,000 incl. VAT	2-3 Hour workshop with one architect, and one facilitator	Least experienced of all, but again, local and keen, and could be good for F2F events in future. They have more experience with F2F events.	
2	2	4	4	12
NLMTD 2 Facilitators (not directly from construction sector)	€1500 or €4000	2-3 Hour workshop	Caroline Loeften was recommended by Dutch GBC, but she has now left the organisation, so omitting this quote.	
1	5	4	0	10

3. Facilitated workshop

3.1. About the workshop

The first workshop occurred on **10th of November** between 10am-12.30pm on zoom. Six interdisciplinary design teams were present. The majority included an architect, structural engineer, QS and M&E designer. The workshop was mainly **facilitated by Jos de Krieger**, who is one of the partners of Superuse and has been working on the reuse of materials for over 15 years. He was creative director for Festa and speaker at TedX in Christchurch (NZ) in 2016. Currently he is also a research mentor for TU Delft graduate students at the Faculty of Architecture. The other facilitator was Lizanne Dirkx; a designer and researcher who works in Superuse. This workshop focused on an introduction to a structured approach to circularity. 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 circular, sustainable strategy.

3.2. Activities carried out

A Miro board (www.miro.com) was used during the workshop. This is a virtual interactive drawing board, where each of the participants could brainstorm together. Each team created a Miro account prior to the workshop with one of the teams' email addresses. This allowed the team to have some practice with the basic functionalities of Miro, such as dragging a post it, typing a text in the board, and drawing arrows between parts. An invitation was sent on the day of the workshop which allowed the participants to participate in the board set up by Superuse.

Prior to the workshop, each team sent IGBC and Superuse information about their project. This included a written description, a 2D plan and a 3D image. All this information was collated in a Miro board sheet for each design team. The teams were split up into two break out rooms with three teams in each room. One facilitator from Superuse led the breakout room. One member of the IGBC was in each room and they observed the activities.

During the interactive part of the workshop, the facilitators went through each project and looked at four topics of circularity: Design for Adaptability, Design for Deconstruction, Circular Material Selection and Resource Efficiency. Ideas were noted by Jos or Lizanne and the participants placed virtual post it with their thoughts on the interactive Miro board. Circularity concepts and barriers were discussed amongst the team. Jos and Lizanne gave guidance about the best circularity approaches for each project.

4. Follow-up Regenerate workshop

4.1. About the workshop

The follow-up second workshops were 1-1 workshops with a member of the IGBC and each of the individual six integrated design teams. In this workshop the Regenerate tool was used. The Regenerate tool is a free building circularity engagement and assessment tool. It was created by the University of Sheffield with advice from David Cheshire of AECOM. The purpose of the tool is to implement the circular economy within the built environment. The tool is not

about obtaining design information. The tool asks questions such as have you thought about this or taken this action, and you answer yes or no or to be determined. It is very important to repeatedly revisit the tool as design changes are made throughout the project. The tool can be used to compare design iterations to see which is the more circular design choice. The tool is a self-certification tool with supporting statements/evidence.

The tool was developed as the Greater London Authority now requires a Circular Economy Statement to be submitted for planning for all significant developments in London. This was implemented as the GLA has recognised that half the waste material in London arises from the built environment. There are 86 Circularity Criteria across 4 key Circularity Principles in the Regenerate Tool.

- Design for Adaptability (24)
- Design for Deconstruction (19)
- Circular Material Selection (26)
- Resource Efficiency (17)

These workshops took place with the following six design teams on the following dates and times (the organisation named is the lead organisation for each design team):

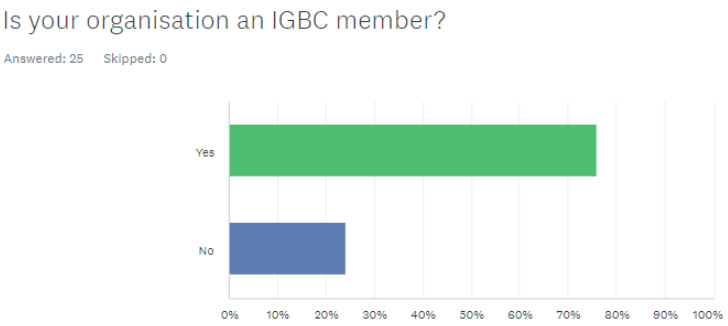
- **CAIRN**- 2 December 2021 (10am-12pm)
- **PM Group**- 7 December 2021 (10am-12pm)
- **RKD**- 8 December 2021 (2pm-4pm)
- **IPUT**- 14 December 2021 (2pm-4pm)
- **ORS**- 17 December 2021 (10am-12pm)
- **GGDA**- 20 December 2021 (2pm-4pm)

At the beginning, the team state their circularity goal. This can either be basic, partial, or full circularity. This is noted at the top of the tool in a dropdown box. With each circularity question prompt, the team discussed amongst themselves the appropriate answer; either a yes, no, or to be determined answer. The chosen team member then wrote down evidence of their answer in the box provided. This evidence could be a drawing reference, facts about the project or a note to contact the company who would know the precise answer. Post each section the team could see an overview of how they were doing regarding circularity in their project. The percentage that the team is reaching regarding their circularity is shown in each of the five sections**:** site, structure, skin, services, space. The circularity statement is produced in pdf format when each section is completed.

5. Pre-Workshop Questionnaire

5.1. Questions and Responses

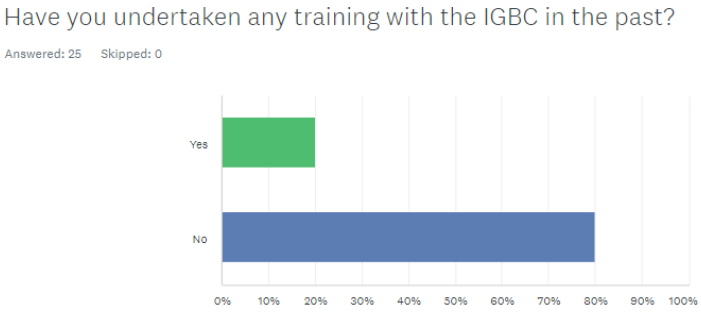
Q1. Is your organisation an IGBC member?



ANSWER CHOICES	RESPONSES	
Yes	76.00%	19
No	24.00%	6
TOTAL		25

Figure 1: Responses to Question 1

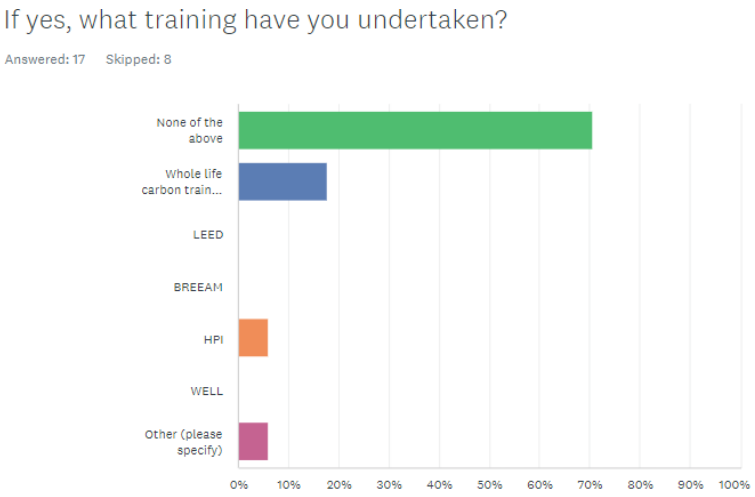
Q2. Have you undertaken any training with the IGBC in the past?



ANSWER CHOICES	RESPONSES	
Yes	20.00%	5
No	80.00%	20
TOTAL		25

Figure 2: Responses to Question 2

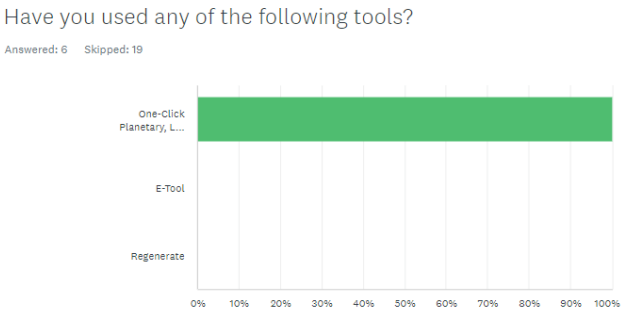
Q3. If yes, what training have you undertaken?



ANSWER CHOICES		RESPONSES	
None of the above		70.59%	12
Whole life carbon training		17.65%	3
LEED		0.00%	0
BREEAM		0.00%	0
HPI		5.88%	1
WELL		0.00%	0
Other (please specify)	Responses	5.88%	1
TOTAL			17

Figure 3: Responses to Question 3

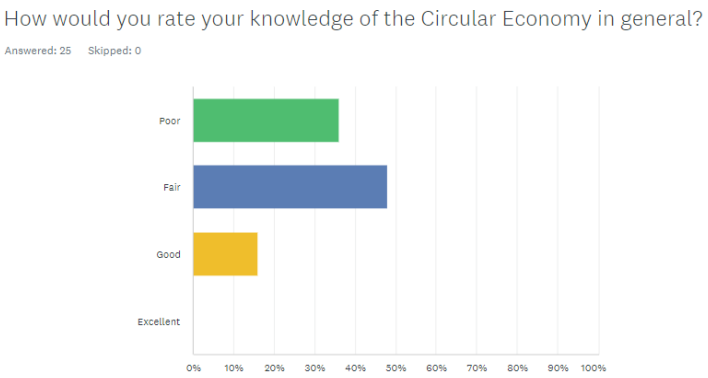
Q4. Have you used any of the following tools?



ANSWER CHOICES	RESPONSES	
One-Click Planetary, LCA, or Carbon Designer Tool	100.00%	6
E-Tool	0.00%	0
Regenerate	0.00%	0
TOTAL		6

Figure 4: Responses to Question 4

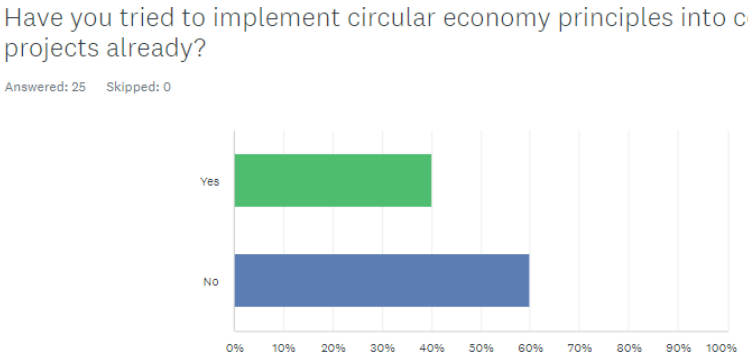
Q5. How would you rate your knowledge of the Circular Economy in general?



ANSWER CHOICES	RESPONSES	
Poor	36.00%	9
Fair	48.00%	12
Good	16.00%	4
Excellent	0.00%	0
TOTAL		25

Figure 5: Responses to Question 5

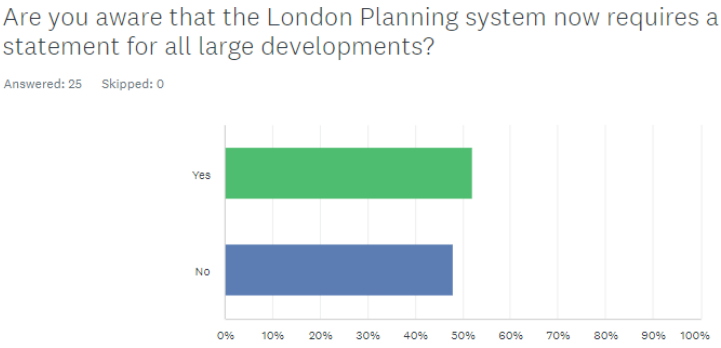
Q6. Have you tried to implement circular economy principles into construction projects already?



ANSWER CHOICES	RESPONSES	
Yes	40.00%	10
No	60.00%	15
TOTAL		25

Figure 6: Responses to Question 6

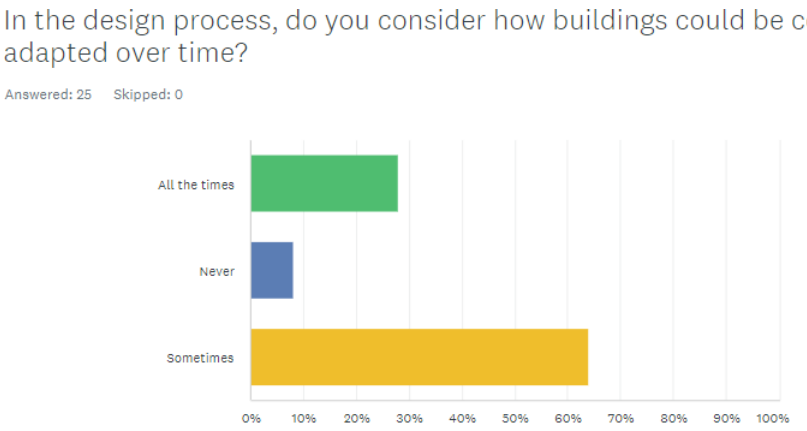
Q7. Are you aware that the London Planning system now requires a circularity statement for all large developments?



ANSWER CHOICES	RESPONSES	
Yes	52.00%	13
No	48.00%	12
TOTAL		25

Figure 7: Responses to Question 7

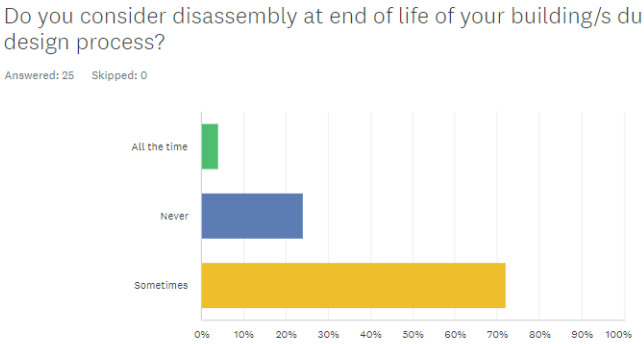
Q8. In the design process, do you consider how buildings could be adapted over time?



ANSWER CHOICES	RESPONSES	
All the times	28.00%	7
Never	8.00%	2
Sometimes	64.00%	16
TOTAL		25

Figure 8: Responses to Question 8

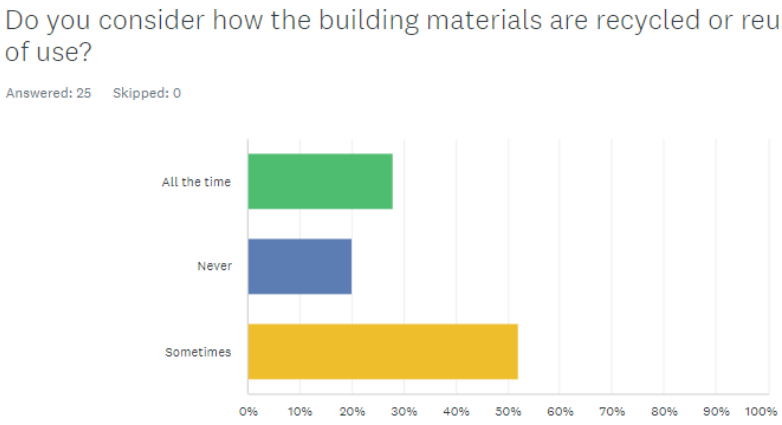
Q9. Do you consider disassembly at end of life of your building/s during your design process?



ANSWER CHOICES	RESPONSES	
All the time	4.00%	1
Never	24.00%	6
Sometimes	72.00%	18
TOTAL		25

Figure 9: Responses to Question 9

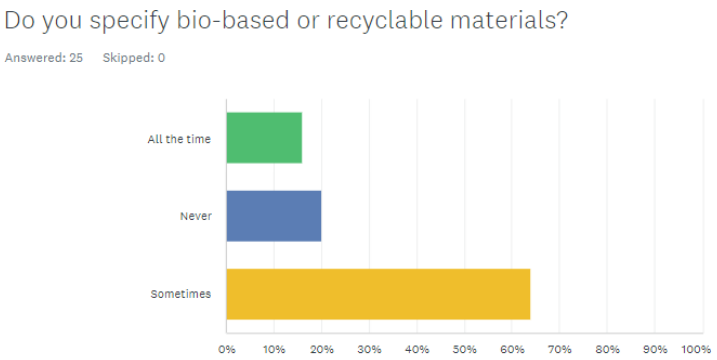
Q10. Do you consider how the building materials are recycled or reused at the end of use?



ANSWER CHOICES	RESPONSES	
All the time	28.00%	7
Never	20.00%	5
Sometimes	52.00%	13
TOTAL		25

Figure 10: Responses to Question 10

Q11. Do you specify bio-based or recyclable materials?



ANSWER CHOICES	RESPONSES	
All the time	16.00%	4
Never	20.00%	5
Sometimes	64.00%	16
TOTAL		25

Figure 11: Responses to Question 11

Q12. What barriers do you consider in relation to implementing circularity in your projects?

Note: This was an open-ended question where participants were invited to type in their own responses. There were 20 responses as follows:

☐	Capital cost where private developers are not incentivised to consider circularity or invest in advice in this regard 11/10/2021 10:07 AM	View respondent's answers	Add tags
☐	Knowledge and cost 11/10/2021 10:07 AM	View respondent's answers	Add tags
☐	Regulations in particular relation to fire 11/10/2021 10:06 AM	View respondent's answers	Add tags
☐	Quality; structural integrity; traceability; availability 11/10/2021 10:05 AM	View respondent's answers	Add tags
☐	knowledge 11/10/2021 9:58 AM	View respondent's answers	Add tags
☐	Inertia in the Construction industry and the cost / regulatory challenges of doing something genuinely innovative 11/10/2021 9:43 AM	View respondent's answers	Add tags
☐	availability of various alternative systems that meet client requirements. we aim to get the best products out there but sometimes the clients need specific criteria to be met. client more than likely to be cost and time driven to meet deadlines. 11/10/2021 9:17 AM	View respondent's answers	Add tags
☐	Robustness, fire and progressive collapse requirements 11/10/2021 9:04 AM	View respondent's answers	Add tags
☐	lack of opportunities to distribute or procure materials theatre recycled. 11/10/2021 8:49 AM	View respondent's answers	Add tags
☐	Time to explore options in projects, lac of early engagement with potential contractor, client not wanting to deviate from traditional construction methodology. 11/10/2021 8:08 AM	View respondent's answers	Add tags
☐	Cost to developers 11/10/2021 8:03 AM	View respondent's answers	Add tags
☐	Cost to clients, availability of suitable recyclable materials which allow disassembly easily. 11/10/2021 7:59 AM	View respondent's answers	Add tags

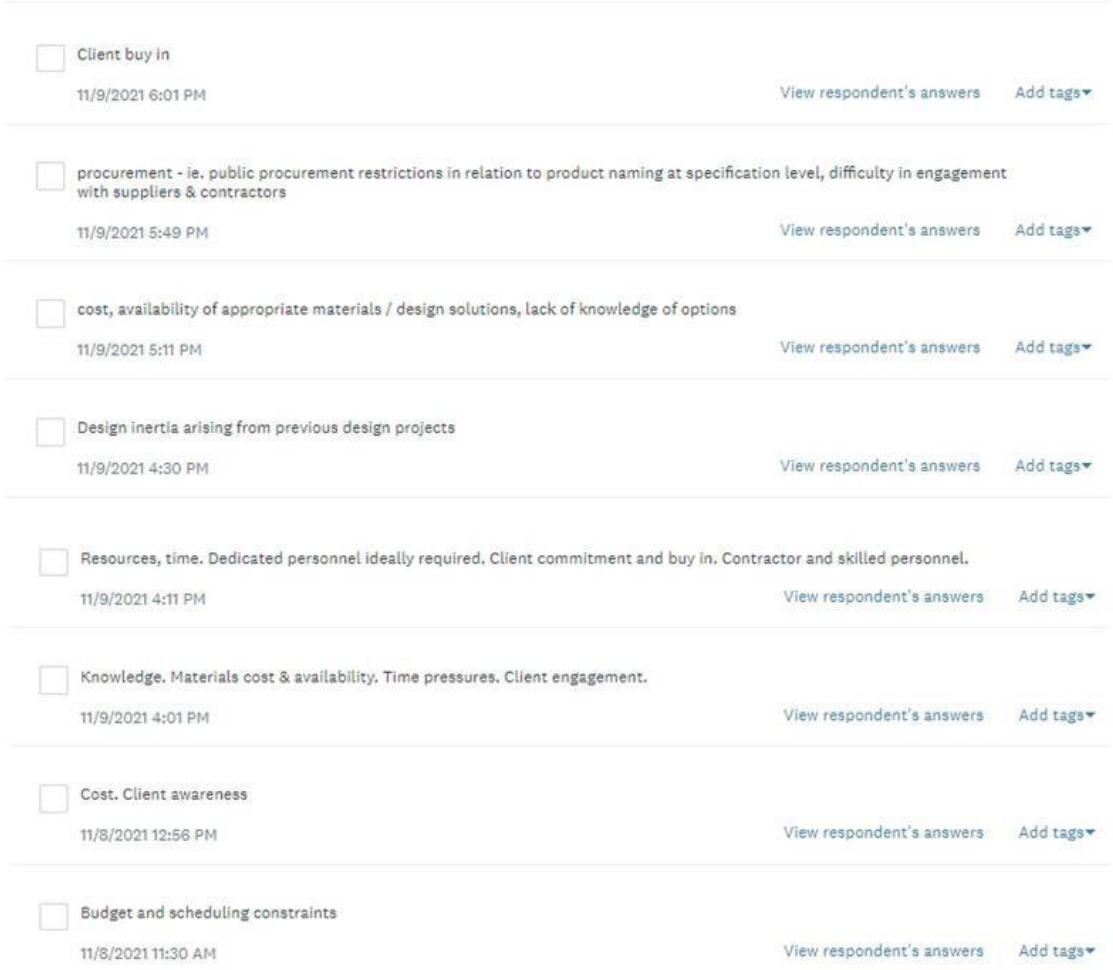
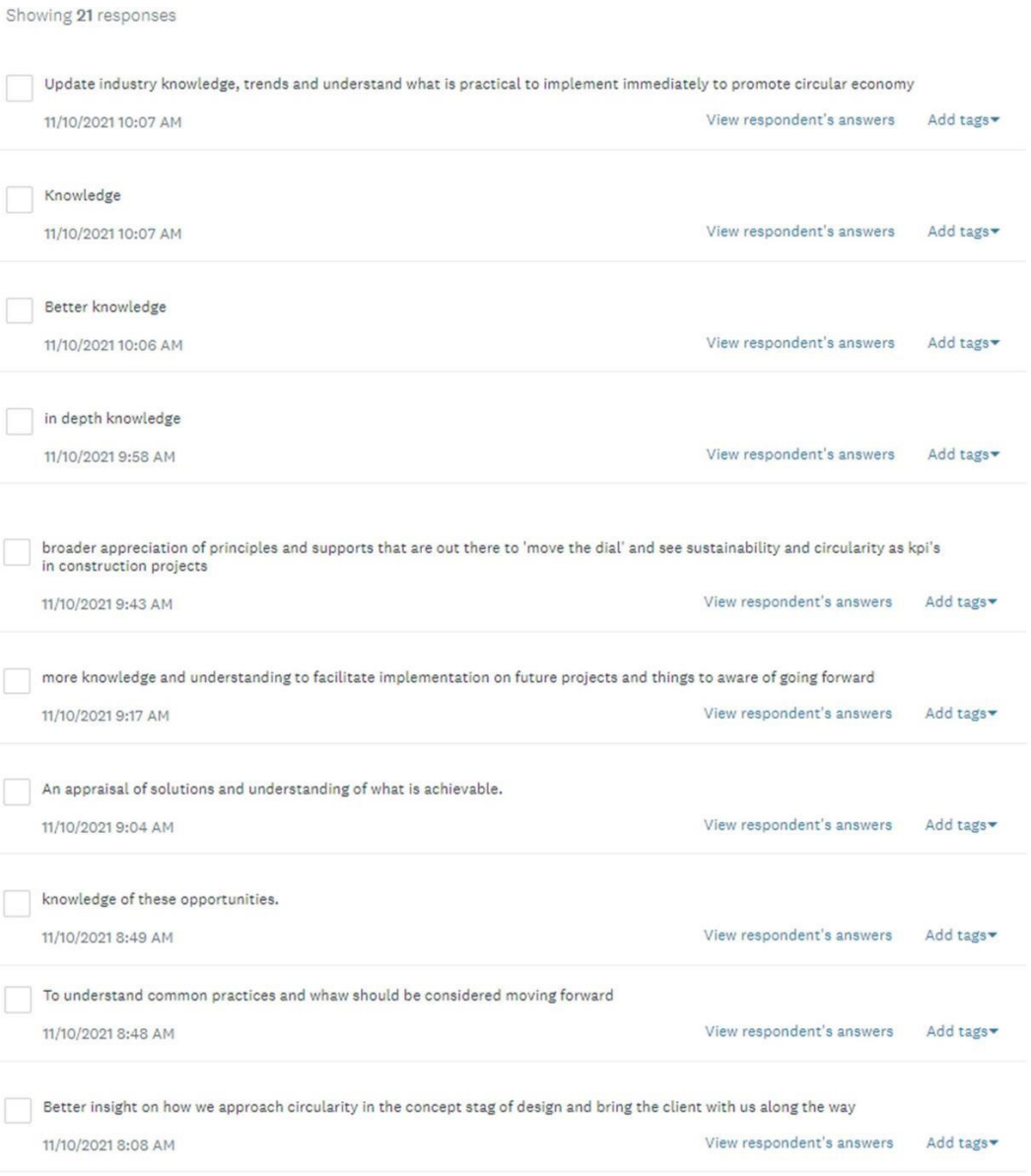


Figure 12: Responses to Question 12

Q13. What do you hope to gain from these facilitated sessions?

Note: This was also an open-ended question. There were 21 responses.



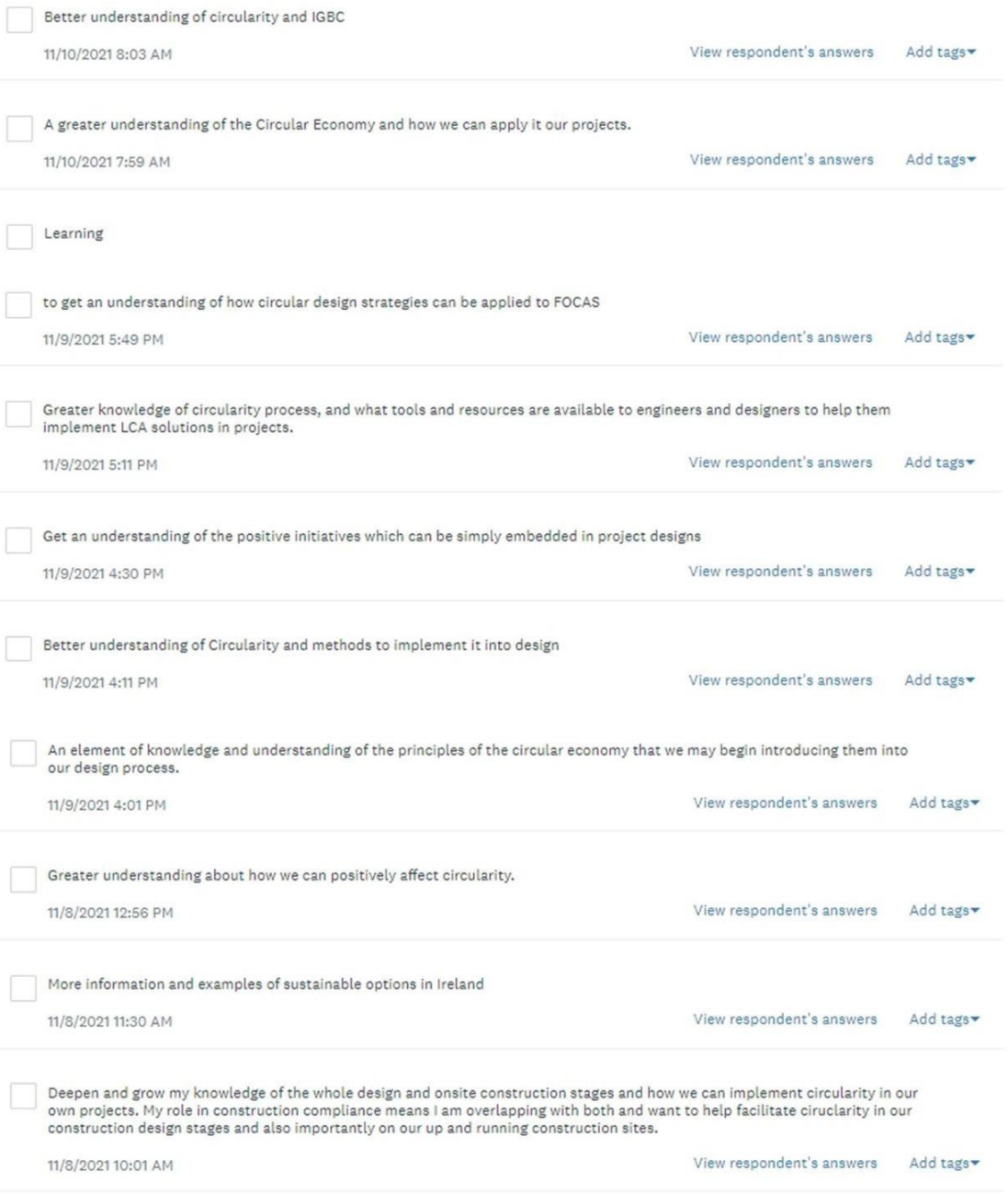


Figure 13: Responses to Question 13

6. Case Study 1

6.1. Project details

Building type: Office/ Extension of a pharmaceutical factory

Building location: West Coast, Ireland

Team name: PM group

Team members: Barry McDermott, Barry Donovan, David Wall, Áine Monaghan, Orna Fox, Kevin McEvoy

Description of the project:
The building 1 East Extension development consists of the construction of a three-storey office extension to the front of the existing Building 1, alterations to the existing internal layouts, alterations to the existing vehicular entrance/exits, new car parking spaces, alterations to existing campus roadways and footpaths, hard and soft landscaping, bicycle shelter, signage, lighting, and all associated site works. The existing office building is 2 storeys, and the proposed phase 3 Expansion building will be 3 storeys, abutting the existing building. Natural light to the existing office area will be maintained by the construction of an internal atrium between the existing and new areas. The second floor will be set back slightly from the front façade to reduce the visual impact and ensure the new expansion building nestles into the surrounding existing building to avid overpowering it aesthetically. The total floor area for the East Extension is 5,600 metre squared/60,439 square feet.

6.2. Sustainability Statement

PM group team are focusing on several sustainability actions for this office/pharmaceutical factory extension, such as:

- The team is aiming for partial circularity for this project.
- The team plan to reuse bricks from the existing façade that is to be demolished in the interior atrium of the new build.
- The team are aiming for LEED silver for this new build.
- The team have designed the floors to be 3 metres in height from floor to ceiling to make the building adaptable.
- The team are using a metal composite cladding panel for the façade – which is a rail track system with a brick slip as a rain screen on rails. This system can be easily deconstructed.
- The team are interested in exploring the inclusion of material passports for materials in this new build.
- The team have included reversible foldable walls to allow for adaptability in the spaces.
- The team plan to specify water based low VOC paints.
- The team are interested in leasing lighting, furniture etc. for this new build.
- The team are currently using the tool One click LCA to calculate the whole life carbon of the new build.

7.1. Project Details

Building type: Housing

Building location: Co. Meath, Ireland

Team name: RKD

Team members: Karolina Backman, Harry Browne, Paul Davey, Barry O'Neill, Anthony Horan, Donal Crowe

Description of the project:

The proposed development features a total of 452 new homes which are located in 12 neighbourhoods in Co. Meath, each with its own central communal court space that can play host to a variety of community and recreational functions.

7.2. Sustainability Statement

RKD team are focusing on several sustainability actions for this housing development, such as:

- The team are aiming for full circularity for this project.
- The team are interested in designing in extra thickness to the foundation so the housing units could be extended and adapted in the future.
- The team are planning to specify a natural insulation such as wood fibre insulation.

8. Case Study 3

8.1. Project Details

Building type: Extension of a pharmaceutical factory

Building location: Co. Meath, Ireland

Team name: ORS

Team members: Brian Collentine, Cormac Geoghegan, Luke Martin, Alan Kenna

Description of the project:

The extension works of the pharmaceutical factory consist of an additional four storey processing building added to existing buildings on site. A yard area and staff car park are to be constructed to the, respectively, south, and east of the existing site buildings. A small visitor car park will be constructed to the west of the existing site building.

8.2. Sustainability Statement

ORS team are focusing on several sustainability actions for this pharmaceutical factory extension, such as:

- The team are aiming for basic circularity for this project.
- The team have plans to design an attenuation tank and SuDs for drainage.

- Implement material passports
- Stud partitions for ease of disassembly and adaptability in the future

9. Case Study 4

9.1. Project Details

Building type: Research facility

Building location: TU Dublin, Grangegorman, Dublin, Ireland

Team name: GDAA

Team members: Catherine Opdebeeck, Louise Cotter, Cian Murphy, David Coughlan, Dave Fleming, Michael Dawkins

Description of the project:

This project is a 4,500m^2 postgraduate research facility accommodating a combination of specialist laboratory spaces and office/meeting spaces. The project is at the start of CWMF Work Stage 1.

9.2. Sustainability Statement

GGDA team are focusing on several sustainability actions for this research facility, such as:

- The team are aiming for partial circularity for this project.
- The team added 20% for drainage for future climate change events.
- The team have designed the building so it can be adapted to be transformed into offices, laboratory, or education facilities.
- The floor to ceiling heights have been designed to allow for adaptability in the future.
- The team are avoiding secondary finishes in the build.
- The team are thinking of specifying reusable hoarding in the tender documentation.
- The building will be prefabricated off site so there will be less waste.

10. Case Study 5

10.1. Project Details

Building type: Housing

Building location: Enniskerry village, Co. Wicklow, Ireland

Team name: CAIRN

Team members: Ronan Lonergan, Hannah Cotrell, Peter O'Dwyer, Margret Dolan, Naomi Lloyd

Description of the project:

This project consists of 165 unit housing and duplex scheme with a standalone creche, along the periphery of Enniskerry village. The site plan is designed to frame the view of the Sugarloaf Mountain. The project seeks to take advantage of the beautiful Enniskerry scenery.

10.2. Sustainability Statement

CAIRN's team are focusing on several sustainability actions for this housing development, such as:

- The team are aiming for full circularity for this project.
- The window sizes allow for adaptability.
- The houses are flexible in relation to fire safety as they will be deigned with 60-minute fire protected walls.
- The material from site extraction will be nearly balanced.
- The excess soil will be reused on another CAIRN site.

11. Case Study 6

11.1. Project Details

Building type: Office

Building location: 29 Earlsfort Terrace, Dublin City Centre, Ireland

Team name: IPUT

Team members: Paul Cleary, Eoin Flanagan, Darragh Canning, Adrian Ryan

Description of the project:

The development is an office that is 200,00m sq. The site is located at the southern end of Dublin's inner city where the Central Business District extends towards the Grand Canal. The site's location presents an opportunity to create a built insertion in an area of rich historical, cultural, and architectural significance that will complement and contribute to the urban character of the local and wider context. Located on the north-east corner of an established city block, the site serves as a terminating vista for long views when approached from north, south, east and west – an ideal location for a building of exemplary design and landmark quality.

11.2. Sustainability Statement

CAIRN's team are focusing on several sustainability actions for this housing development, such as:

- The team are aiming for partial circularity for this project.
- The project aim is net zero carbon emissions. The team have taken guidance from LETI (Publications | LETI) and RCIS (whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf (rics.org)) to conduct a whole life carbon assessment of the project.
- The team conducted fourteen studies to explore the lowest embodied carbon structure.
- The team have designed the services units larger than needed. Thus, the services can be adapted to other building types.
- The design team used solar gain parametric modelling for their glazed façade.
- The team were interested in implementing material passports.

12. Conclusions & Recommendations

Each of the participants of the circularity workshops stated that they benefited greatly from the workshops and in utilising the Regenerate tool.

The workshop with Superuse gave the design team members a foundation level of knowledge about the circular economy and the built environment which allowed them to discuss in more depth their circularity ambitions in their project in the second workshop whilst using the Regenerate tool.

Regarding the Regenerate tool, several statements from members of the integrated design teams were recorded, such as:

- *'The Regenerate tool is very useful to introduce circularity at early design stage.'*
- *'I found the tool very useful.'*
- *'The Regenerate tool is a great tool to use to record the project's circular process.'*

Since the tool was being used at early design stage, several of the teams used the tools to test out different variations of the design to see which is the more circular option, i.e., if using a timber or concrete structure would be a better option. This allows a concise conversation about circularity to occur with direct evidence from the tool. Utilising a carbon calculator tool, such as the IGBC Carbon Designer tool, along with the Regenerate circularity tool allows the design team to make the most sustainable decisions at the outset of the project.

The IGBC are currently reviewing the circularity statements produced at the second circularity workshop and are sending each design team feedback about their project. This feedback will focus on how the team can move the project towards a more circular design and to encourage that circularity is implemented at each design stage.

The IGBC intend to send feedback to the Regenerate creators so the tool can be more beneficial to future users.

Appendices

1. Circularity Statements

regenerate

Cookstown

Project Creator
My New Team

Category
Team

Project Description
Housing

Project Information

165 no. dwellings, consisting of 105 no. 2-storey units, 56 no. 3-storey Duplex units and 4 no. 2-storey maisonette apartment units.

Credit Summary

Design for Adaptability

Selected Circularity Aim: Full Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	50%	50%	Partial Circularity
Structure	7	70%	70%	Basic Circularity
Skin	6	100%	100%	Full Circularity
Services	2	100%	100%	Full Circularity
Space	4	100%	100%	Full Circularity
Total	20	83%	83%	Partial Circularity

Design for Deconstruction

Selected Circularity Aim: Full Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	5	100%	100%	Full Circularity
Skin	3	60%	60%	Partial Circularity
Services	3	75%	75%	Partial Circularity
Space	4	100%	100%	Full Circularity
Total	15	79%	79%	Basic Circularity

Circular Material Selection

Selected Circularity Aim: Full Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	100%	Full Circularity
Structure	5	71%	71%	Basic Circularity
Skin	3	50%	50%	Basic Circularity
Services	4	67%	67%	Partial Circularity
Space	4	67%	67%	Partial Circularity
Total	17	65%	65%	Basic Circularity

Resource Efficiency

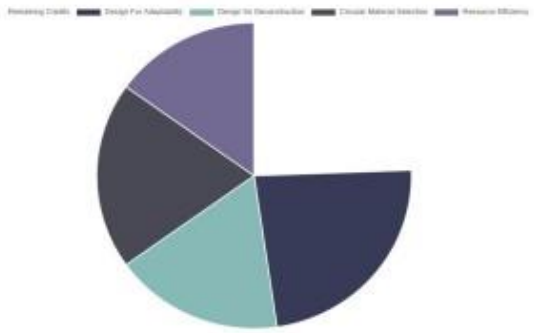
Selected Circularity Aim: Full Circularity

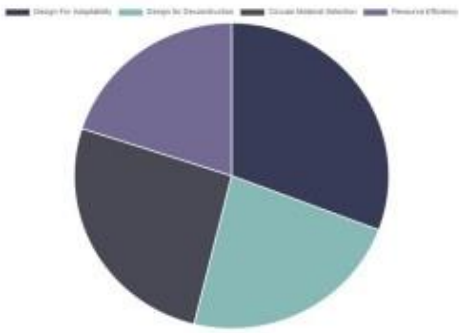
Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	3	75%	75%	Partial Circularity
Structure	3	75%	75%	No Rating Achieved
Skin	3	100%	100%	Full Circularity
Services	2	67%	67%	Partial Circularity
Space	2	67%	67%	Partial Circularity
Total	13	76%	76%	Basic Circularity

regenerate

Cookstown

Awarded Credits by Circularity Principle





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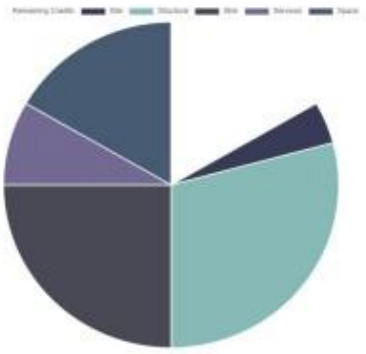
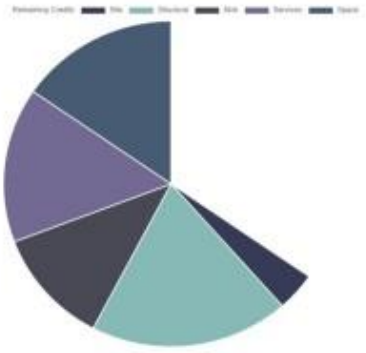
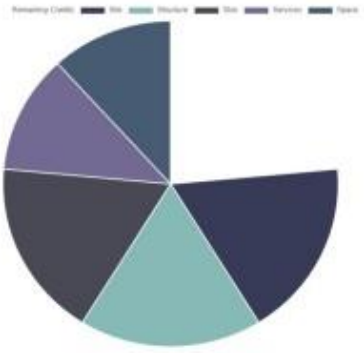


Design for Deconstruction

Circular Material Selection



Resource Efficiency



regenerate

Cookstown

Recycling and Waste (GLA)

Construction Waste (New Build Water Source)

	t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled
Excavation						
Demolition						
Construction						

Construction Waste (Existing Building Water Source)

	t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled
Excavation						
Demolition						
Construction						

Municipal Waste

	t/annum	t/annum/person	% reused offsite	% recycled offsite	% composted onsite	% to landfill/not reused or recycled % composted onsite
New Build						
Existing Building						

regenerate

Cookstown

GLA Table Two

Section A: Conserve Resources

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
A1: Minimising the quantities of materials used												
A2: Minimising the quantities of other resources used (energy, water, land)												
A3: Specifying and sourcing materials responsibly and sustainably												

regenerate

Cookstown

GLA Table Two

Section B: Design to Eliminate Waste (and for Ease of Maintenance)

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
B1: Design for reusability / recoverability / adaptability / flexibility												
B2: Design out construction, demolition, excavation and municipal waste arising												

regenerate

Cookstown

GLA Table Two

Section C: Manage Waste

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
C1: Demolition waste (how waste from demolition of the layers will be managed)												
C2: Excavation waste (how waste from excavation will be managed)												
C3: Construction waste (how waste arising from construction of the layers will be reused or recycled)												
C4: Municipal waste (how the building will be designed to support operational waste management)												

regenerate

Technological University Dublins' FOCAS Research Institute (CONCRETE FRAME)

Project Creator
TIFI

Category
Team

Project Description
Post graduate research institute containing a combination of laboratory and office spaces

Project Information

A new purpose built c.4,500m2 building relocating FOCAS to the TU Dublins' city campus at Grangegorman from its current city centre location

Credit Summary

Design for Adaptability

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	50%	Partial Circularity
Structure	9	100%	90%	Partial Circularity
Skin	6	150%	100%	Full Circularity
Services	2	100%	100%	Full Circularity
Space	2	67%	50%	Basic Circularity
Total	20	106%	83%	Partial Circularity

Design for Deconstruction

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	2	50%	40%	No Rating Achieved
Skin	2	67%	40%	Basic Circularity
Services	3	100%	75%	Partial Circularity
Space	3	100%	75%	Partial Circularity
Total	10	71%	53%	No Rating Achieved

Circular Material Selection

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	100%	Full Circularity
Structure	3	43%	43%	No Rating Achieved
Skin	3	75%	50%	Basic Circularity
Services	3	75%	50%	Basic Circularity
Space	3	75%	50%	Basic Circularity
Total	13	65%	50%	No Rating Achieved

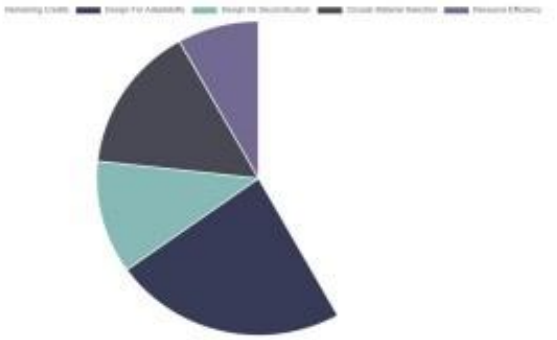
Resource Efficiency

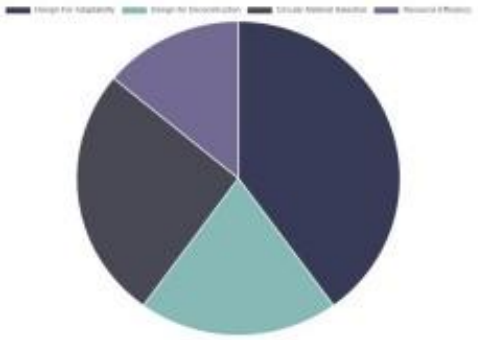
Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	2	67%	50%	Basic Circularity
Structure	2	50%	50%	No Rating Achieved
Skin	1	50%	33%	No Rating Achieved
Services	1	50%	33%	Basic Circularity
Space	1	50%	33%	Basic Circularity
Total	7	54%	41%	No Rating Achieved

regenerate
Technological University Dublins' FOCAS Research Institute (CONCRETE FRAME)

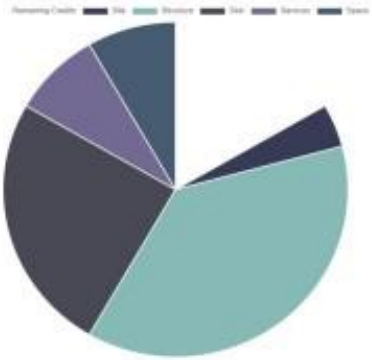
Awarded Credits by Circularity Principle



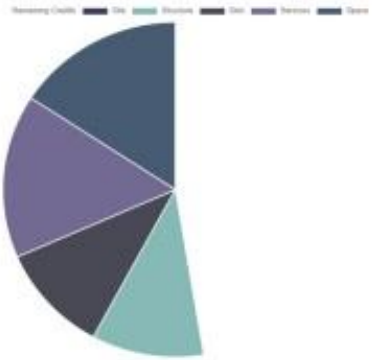


Awarded Credits by Building Layer

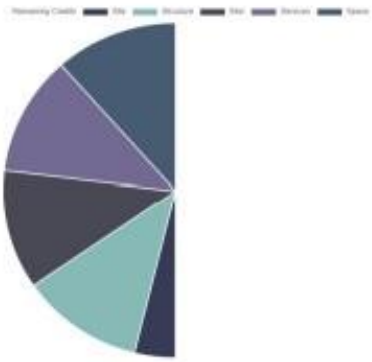
Design for Adaptability



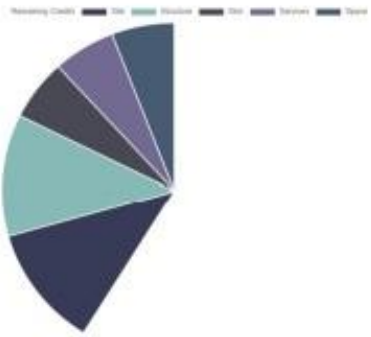
Design for Deconstruction



Circular Material Selection



Resource Efficiency



regenerate
Technological University Dublins' FOCAS Research Institute (CONCRETE FRAME)

Recycling and Waste (RILA)

Construction Waste (New Build Water Source)

	t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled
Excavation						
Demolition						
Construction						

Construction Waste (Existing Building Water Source)

	t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled
Excavation						
Demolition						
Construction						

Municipal Waste

	t/annum	t/annum/person	% reused offsite	% recycled offsite	% composted onsite	% to landfill/not reused or recycled % composted onsite
New Build						
Existing Building						

regenerate
Technological University Dublins' FOCAS Research Institute (CONCRETE FRAME)

GLA Table Two

Section A: Conserve Resources

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
A1: Minimising the quantities of materials used												
A2: Minimising the quantities of other resources used (energy, water, land)												
A3: Specifying and sourcing materials responsibly and sustainably												

regenerate
Technological University Dublins' FOCAS Research Institute (CONCRETE FRAME)

GLA Table Two

Section B: Design to Eliminate Waste (and for Ease of Maintenance)

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
B1: Design for reusability / recoverability / adaptability / flexibility												
B2: Design out construction, demolition, excavation and municipal waste arising												

regenerate
Technological University Dublins' FOCAS Research Institute (CONCRETE FRAME)

GLA Table Two

Section C: Manage Waste

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
C1: Demolition waste (how waste from demolition of the layers will be managed)												
C2: Excavation waste (how waste from excavation will be managed)												
C3: Construction waste (how waste arising from construction of the layers will be reused or recycled)												
C4: Municipal waste (how the building will be designed to support operational waste management)												

regenerate

Earlsfort Terrace

Project Creator
Eoin Flanagan

Category
Personal

Project Description
Commercial Office Development

Project Information

11 Storey New Build Office Development

Credit Summary

Design for Adaptability

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	50%	Partial Circularity
Structure	9	100%	90%	Partial Circularity
Skin	4	100%	67%	Partial Circularity
Services	2	100%	100%	Full Circularity
Space	3	100%	75%	Partial Circularity
Total	19	100%	79%	Basic Circularity

Design for Deconstruction

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	2	50%	40%	No Rating Achieved
Skin	3	100%	60%	Partial Circularity
Services	2	67%	50%	Basic Circularity
Space	1	33%	25%	No Rating Achieved
Total	8	57%	42%	No Rating Achieved

Circular Material Selection

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	2	29%	29%	No Rating Achieved
Skin	2	50%	33%	No Rating Achieved
Services	1	25%	17%	No Rating Achieved
Space	2	50%	33%	No Rating Achieved
Total	7	35%	27%	No Rating Achieved

Resource Efficiency

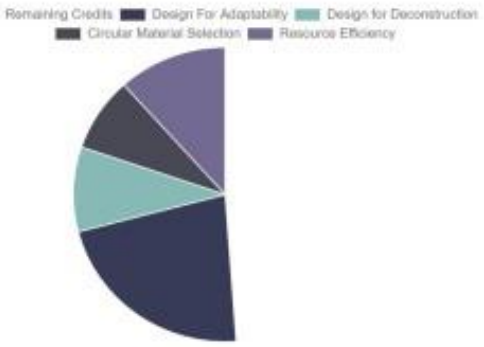
Selected Circularity Aim: Partial Circularity

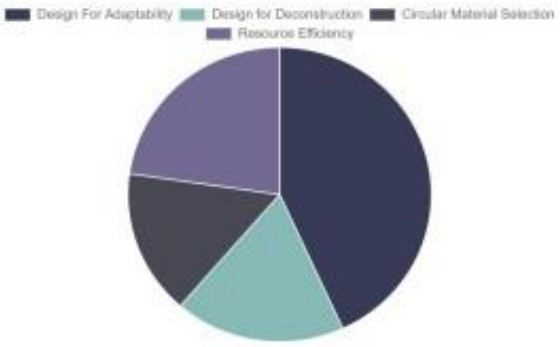
Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	2	67%	50%	Basic Circularity
Structure	2	50%	50%	No Rating Achieved
Skin	2	100%	67%	Partial Circularity
Services	2	100%	67%	Partial Circularity
Space	2	100%	67%	Partial Circularity
Total	10	77%	59%	Basic Circularity

regenerate

Earlsfort Terrace

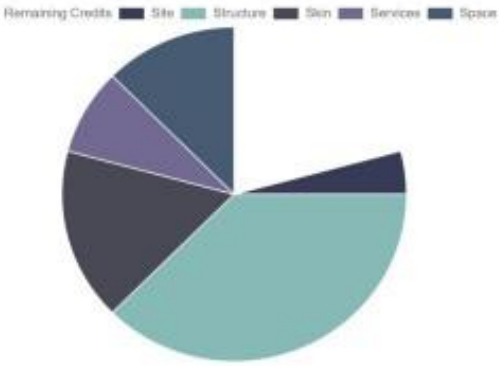
Awarded Credits by Circularity Principle



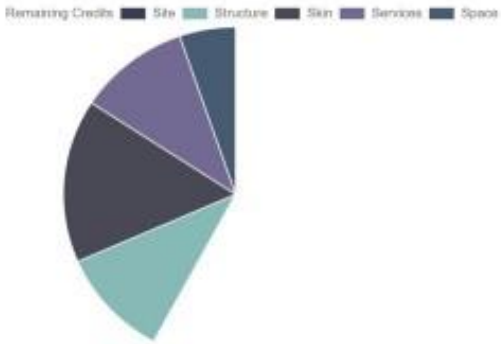


Awarded Credits by Building Layer

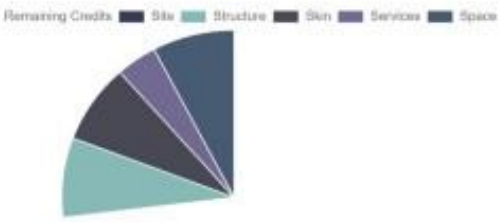
Design for Adaptability



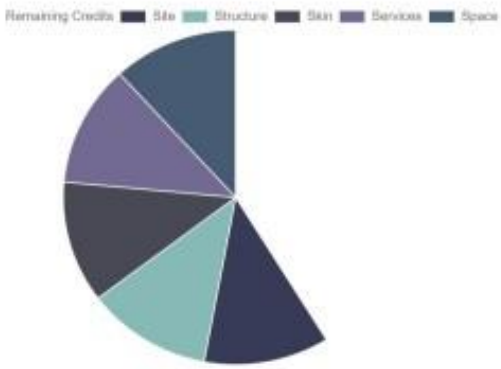
Design for Deconstruction



Circular Material Selection



Resource Efficiency



regenerate

Franklin Pharmaceutical Facility Extension

Project Creator
Cormac Geoghegan

Category
Personal

Project Description
The development will consist of 1) demolition of existing storage shed to facilitate the construction of the proposed works, 2) the construction of a four-storey production extension to the east of the existing production building, 3) the construction of a new single storey dock leveller structure to the south of the existing production building, 4) the alteration of the elevations and existing floor plans to accommodate revised and additional office space within the existing production building, 5) the construction of an 386sq.m. single storey extension to the south of the existing Feed Building, 6) the construction of 14 No. of storage tanks of various sizes and 3 No. underground storage tanks located throughout the yard, 7) all landscaping, car parking, visitor car park access, weighbridge, site services and all associated site works above and below ground.

Project Information

Credit Summary

Design for Adaptability

Selected Circularity Aim: Basic Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	50%	Partial Circularity
Structure	8	135%	81%	Basic Circularity
Skin	2	67%	33%	No Rating Achieved
Services	2	100%	100%	Full Circularity
Space	3	300%	75%	Partial Circularity
Total	16	124%	67%	Basic Circularity

Design for Deconstruction

Selected Circularity Aim: Basic Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	3	100%	60%	Basic Circularity
Skin	3	150%	60%	Partial Circularity
Services	2	100%	50%	Basic Circularity
Space	3	150%	75%	Partial Circularity
Total	11	110%	58%	Basic Circularity

Circular Material Selection

Selected Circularity Aim: Basic Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	100%	Full Circularity
Structure	4	100%	57%	Basic Circularity
Skin	4	133%	67%	Partial Circularity
Services	4	133%	67%	Partial Circularity
Space	3	100%	50%	Basic Circularity
Total	16	114%	62%	Basic Circularity

Resource Efficiency

Selected Circularity Aim: Basic Circularity

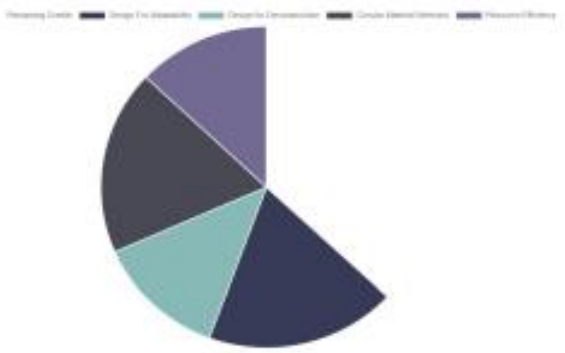
Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating

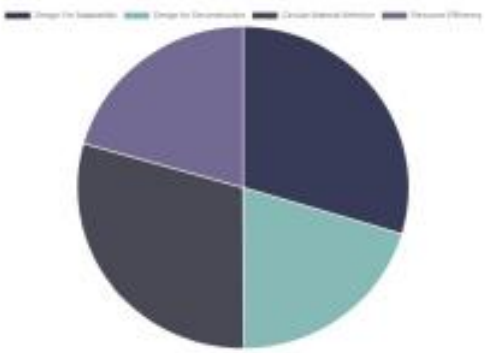
Site	1	50%	25%	No Rating Achieved
Structure	4	100%	100%	Full Circularity
Skin	3	150%	100%	Full Circularity
Services	0	17%	6%	No Rating Achieved
Space	3	300%	100%	Full Circularity
Total	11	112%	66%	Basic Circularity

regenerate

Franklin Pharmaceutical Facility Extension

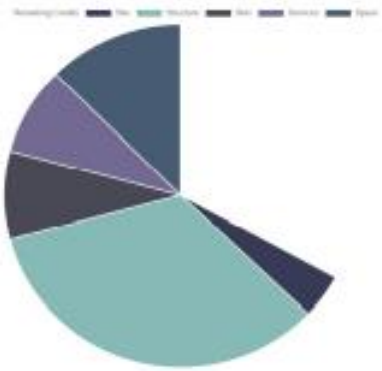
Awarded Credits by Circularity Principle





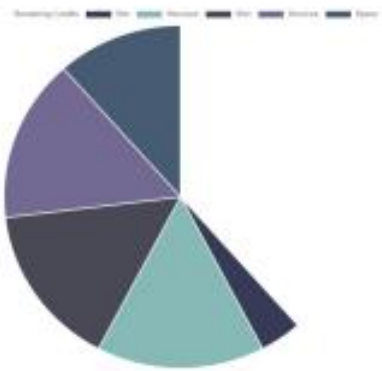
Awarded Credits by Building Layer

Design for Adaptability

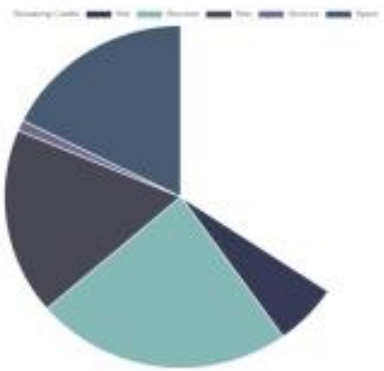


Design for Deconstruction

Circular Material Selection



Resource Efficiency



regenerate

Franklin Pharmaceutical Facility Extension

Recycling and Waste (BLA)

Construction Waste (New Build Water Source)

	t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled
Excavation						
Demolition						
Construction						

Construction Waste (Existing Building Water Source)

	t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled
Excavation						
Demolition						
Construction						

Municipal Waste

	t/annum	t/annum/person	% reused offsite	% recycled offsite	% composted onsite	% to landfill/not reused or recycled % composted onsite
New Build						
Existing Building						

GLA Table Two

Section A: Conserve Resources

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
A1: Minimising the quantities of materials used												
A2: Minimising the quantities of other resources used (energy, water, land)												
A3: Specifying and sourcing materials responsibly and sustainably												

GLA Table Two

Section B: Design to Eliminate Waste (and for Ease of Maintenance)

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
B1: Design for reusability / [illegible]ility / adaptability / flexibility												
B2: Design out construction, demolition, excavation and municipal waste arising												

regenerate

Building 1 - Extension - Workstage 2-3

Project Creator
2 - IGBC Circularity Workshop - 2

Category
Team

Project Description
Office / Pharma

Project Information

This Building 1 East Extension development consists of the construction of a three storey office extension to the front of the existing Building 1, alterations to the existing internal layouts, alterations to existing vehicular entrance/exits, new car parking spaces, alterations to existing campus roadways and footpaths, hard & soft landscaping, bicycle shelter, signage, lighting, and all associated site works. The existing office building is 2 storeys, and the proposed Phase 3 Expansion building will be 3 storeys, abutting the existing building. Natural light to the existing office area will be maintained by the construction of an internal atrium between the existing and new areas. The second floor will be set back slightly from the front façade to reduce the visual impact and ensure the new expansion building nestles into the surrounding existing building to avoid overpowering it aesthetically. The total floor area for the East Extension is 5,600m2 / 60,439ft2

Credit Summary

Design for Adaptability

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	2	200%	100%	Full Circularity
Structure	6	86%	80%	Basic Circularity
Skin	5	125%	83%	Partial Circularity
Services	0	0%	0%	No Rating Achieved
Space	3	100%	75%	Partial Circularity
Total	16	95%	75%	Basic Circularity

Design for Deconstruction

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	3	75%	60%	Basic Circularity
Skin	4	133%	80%	Partial Circularity
Services	0	0%	0%	No Rating Achieved
Space	3	100%	75%	Partial Circularity
Total	10	77%	53%	No Rating Achieved

Circular Material Selection

Selected Circularity Aim: Partial Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	100%	Full Circularity
Structure	2	29%	29%	No Rating Achieved
Skin	3	75%	50%	Basic Circularity
Services	0	0%	0%	No Rating Achieved
Space	1	25%	17%	No Rating Achieved
Total	7	33%	27%	No Rating Achieved

Resource Efficiency

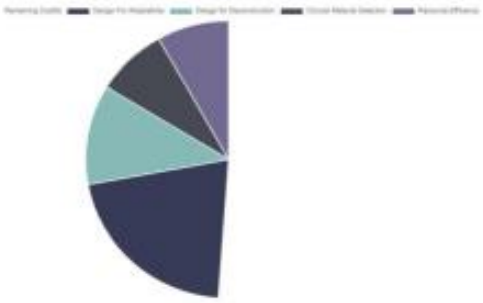
Selected Circularity Aim: Partial Circularity

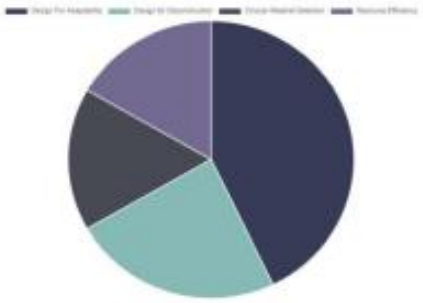
Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	2	50%	50%	No Rating Achieved
Skin	2	100%	67%	Partial Circularity
Services	1	50%	33%	Basic Circularity
Space	2	100%	67%	Partial Circularity
Total	7	54%	41%	No Rating Achieved

regenerate

Building 1 - Extension - Workstage 2-3

Awarded Credits by Circularity Principle





Awarded Credits by Building Layer

Design for Adaptability

Design for Deconstruction

Circular Material Selection

Resource Efficiency

regenerate
Building 1 - Extension - Workstage 2-3

Bill of Materials

Site

Element	Material	Material quantity (kg)	Material intensity (kg/m2 GIA or NIA)	Recycled content (% by value)	Corresponding kgCO2e (optional)	Corresponding kgCO2e/m2 (optional)	Reused content (% by value) (optional)	Estimated reusable materials (kg/m2) (optional)	Estimated recyclable materials (kg/m2) (optional)	Additional information
ROADS										
FOOTPATHS	Concrete									
FOOTPATHS	Paving									
SOIL										

regenerate
Building 1 - Extension - Workstage 2-3

Bill of Materials

Structure

Element	Material	Material quantity (kg)	Material intensity (kg/m2 GIA or NIA)	Recycled content (% by value)	Corresponding kgCO2e (optional)	Corresponding kgCO2e/m2 (optional)	Reused content (% by value) (optional)	Estimated reusable materials (kg/m2) (optional)	Estimated recyclable materials (kg/m2) (optional)	Additional information
STRUCTURE/ SUBSTRUCTURE	Foundations - Concrete Grade C30/37	49400			18,837t					
STRUCTURE / SUBSTRUCTURE	Foundations Lean mix concrete Grade C12/15 Dmax20;	23000			6,5t					
FOUNDATIONS	Sundries - Movement Joints Two part polysulphide sealant;	720000			185t					
STRUCTURE	Structural Steel Profiles UB, UC, PFC, - 20% Recycled	127000		20	334t					
SUBSTRUCTURE	T0 -Crushed Granular Fill	275000			3,8t					
SUBSTRUCTURE	T1 - Crushed Rock	275000			3,8t					
SUBSTRUCTURE	T3 - Blinding	1829000			21t					
STRUCTURE	Steel Profiles CHS, SHS - 20% Recycled Content	17000		20	49t					

regenerate
Building 1 - Extension - Workstage 2-3

Bill of Materials

Skin

Element	Material	Material quantity (kg)	Material Intensity (kg/m2 GIA or NIA)	Recycled content (% by value)	Corresponding kgCO2e (optional)	Corresponding kgCO2e/m2 (optional)	Reused content (% by value) (optional)	Estimated reusable materials (kg/m2) (optional)	Estimated recyclable materials (kg/m2) (optional)	Additional information
CLADDING	Quadcore Karrier Panel	20,332 (Refer to Additional Comments)	14.4		104.4t					EPD - BRE 14.4kg/m2 1412 m2 = 20,222kg https://www.igbc.ie/wp-content/uploads/2017/09/BENCHMARK-Quadcore-Karrier-Panel-EPD-BREGENEPD000166.pdf
CLADDING	Tata Standing Seam - Prisma	11,3000 (Refer to Additional Comments)	8.0		32t					0.7mm Gauge @ 8.0kg/m2 weight Approx 1412 m2 = 11,300 kg
CURTAIN WALLING	METAL	To be Confirmed								
GLAZING	GLASS	To be Confirmed								
ENVELOPE	Brick Slips	51,884	68 (Approx)		15t					
ROOF	Bituminous Membrane Double Layer	21,800 (Double Layer Bituminous)	4.5		15t					
ROOF	Metal Deck 1.5mm J1	35,087	25.55		102t					
ROOF	Insulation	52,096	32		279t					
ROOF	Fixings	To Be Confirmed								
ENVELOPE	Hot Dipped Galv'd Zinc Coated Sheeting Rails	4000			12t					
CLADDING	Corium HPSW 200 Plastisol Backing System	5,106			15t					0.7mm Gauge @ 8.0kg/m2 weight Approx 627m2 = 5,106kg
ENVELOPE	Brick Slip - Hit & Miss Blue and	20,128	68		4.6t					

Bill of Materials

Services

Element	Material	Material quantity (kg)	Material intensity (kg/m2 GIA or NIA)	Recycled content (% by value)	Corresponding kgCO2e (optional)	Corresponding kgCO2e/m2 (optional)	Reused content (% by value) (optional)	Estimated reusable materials (kg/m2) (optional)	Estimated recyclable materials (kg/m2) (optional)	Additional information
To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed. No Services Input for Project

regenerate
Building 1 - Extension - Workstage 2-3

Bill of Materials

Space

Element	Material	Material quantity (kg)	Material intensity (kg/m2 GIA or NIA)	Recycled content (% by value)	Corresponding kgCO2e (optional)	Corresponding kgCO2e/m2 (optional)	Reused content (% by value) (optional)	Estimated reusable materials (kg/m2) (optional)	Estimated recyclable materials (kg/m2) (optional)	Additional information
Walls	Wallboard	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed	To Be Confirmed			
Walls	Studs									
Walls	Insulation									

regenerate
Building 1 - Extension - Workstage 2-3

Recycling and Waste (GLA)

Construction Waste (New Build Water Source)

t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled
0.159	0	0	1.7	97.2	1.1
0.0849	0	0	0	60	40
0.675	0	0	100	0	0

Construction Waste (Existing Building Water Source)

t/m2 GIA or NIA t/£100k value	% reused onsite	% recycled onsite	% reused offsite	% recycled offsite	% to landfill/not reused or recycled

Municipal Waste

t/annum	t/annum/person	% reused offsite	% recycled offsite	% composted onsite	% to landfill/not reused or recycled	% composted onsite

regenerate
Building 1 - Extension - Workstage 2-3

GLA Table One

New Development

Phase / Building / Area	Steering Approach	Explanation	Supporting Analysis / Studies / Surveys / Audits
Circular Economy Approach for the New Development	Approach: Based on a heirarchy of actions. 1 - Design Out, i.e. Is there a need for it? 2 - Reclaim - Can materials be reclaimed instead of using new? 3 - Remanufactured - Can remanufactured components be used over new? 4 - Materials & Product Selection: - Use Cradle to Cradle products. Use materials with recycled content. Design for disassembly - Consider short term leasing - e.g. lights, lifts. - Arrangement for return to manufacturer at end of life	Natural Ventilation and Thermal Mass, to consider this design strategy thus reducing Mechanical Ventilation requirements for heating and cooling.	

regenerate

Building 1 - Extension - Workstage 2-3

GLA Table One

Existing Site

Phase / Building / Area	Steering Approach	Explanation	Supporting Analysis / Studies / Surveys / Audits
Circular Economy Approach for the Existing Site	Existing site is confined space with no scope for re-use of all soil etc. Can this be re-distributed and reused		

regenerate
Building 1 - Extension - Workstage 2-3

GLA Table One

Municipal Waste During Operation

Phase / Building / Area	Steering Approach	Explanation	Supporting Analysis / Studies / Surveys / Audits
Circular Economy Approach for the Municipal Waste During Operation	Reduce-reuse-recycle (3Rs) principle that prevents the generation of wastes and turns wastes into resources		

regenerate
Building 1 - Extension - Workstage 2-3

GLA Table Two

Section A: Conserve Resources

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Pro and Quanti
A1: Minimising the quantities of materials used	-Use just in time delivery efficiently, with efficient logging system to reduce material waste, spoilage from excess deliveries. - Reuse, relocation of smoking shelter onsite - Examine potential for reuse of lighting columns and bases (exteriors of building)	Consider use of crushed concrete, stone form site as backfill to fill to 'make up levels 250mm' foundations - Use precast concrete walls, manholes, foundations for site where possible.	-Consider reuse of current external wall/paving bricks in new paving on pavement into building entrance/pavements instead of fresh concrete/tarmac (use attractive, layout in paving to build in history, reuse feature).	-Consider reuse of current windows in a new facade, by redesign for external walls, roof.		-Use wooden floors (solid oak) to reduce use of treatment, chemicals, energy required for floor materials.	-Look at options for upcycling, reclaiming current benchwork by rework, redesign to meet current staff needs. - Look at remanufacture of office furniture by local company to upcycle it in new office setting. - Consider equipment from other company facilities in the region for lab equipment.	-Use just in time delivery efficiently, with efficient logging system to reduce material waste, spoilage from excess deliveries.		-Design teams challenged to design differently, consider circular approach to design -Cost to client -Quality Assurance - Sourcing materials in local region	Designers-set ideas, examine costs, availability Engineers-Assess quality, costs and buy in from client. Client-Buy in and willingness to accept alternative designs, spend more on longer lasting, more sustainable materials options where required. feasability of approaches Construction team-implement the actions listed	-Set out in Design repo plans. -Use EPDs and quality certs where applicable. - Use LEED system for scoring, accreditatic Get consultatior buy in, involvement from design into the resource managemer plan
A2: Minimising the quantities of other resources used (energy, water, land)	-Design Build on existing urban footprint, space. - Consider use of eco grid paving (grass crete) to allow surface water infiltration, reduce urban runoff on external paving areas.	-Use precast concrete walls, manholes, foundations for site where possible. - Prefrabricate materials offsite for assembly onsite (e.g HVAC ducts or partition walls).	-Rainwater harvesting from new and existing and new roof area through gutters, downpipes to feed building toilets, sinks (non drinking water supply)	-Consider use of biodegradable insulation materials (cellulose/hemp & biodegradable Insulation) for roof, walls, floors -Use Insulation wools like Knauf Glass mineral wool for heat/acoustic/fire resistant Insulation (made of 80% recycled glass), bio based diner resin. No formaldehydes added, low embodied energy	-Setup leasing contract with light fitting manufacturer (e.g Siemens) to fit lighting in building and provide upgrades, service to building lighting (energy efficiency). - Use low flow and sensor taps -Aerated showerheads (reduce water use)		-Put in place less bins in final build to encourage less disposal of single use waste (no bin at desk) -Put in place recycling and compost bins (stations in each office area). -Put in place drinking water stations (less single use bottles of water).			-Sourcing energy service provider to do this service in Ireland (energy upgrades-lighting)	-Designers-set ideas, examine costs, availability Engineers-Assess quality, costs and buy in from client. - Client-Buy in and willingness to accept alternative designs, spend more on longer lasting, more sustainable materials options where required. feasibility of approaches - Construction team-implement the actions listed	Set out in Design repo plans. -Use EPDs and quality certs where applicable. - Use LEED system for scoring, accreditatic Get consultatior buy in, involvement from design into the resource managemer plan

regenerate
Building 1 - Extension - Workstage 2-3

A3: Specifying and sourcing materials responsibly and sustainably	-Use only FSc certified timber for fencing, setup of site compound, hoardings, stopboards, signage. - Consider use of Cradle to Cradle Certified materials for building where possible.	-Use of BES6001 concrete with Ecocem (GGBS) content for foundations, curtain walls and main exterior walls. - Use of CARES Steel for manholes covers, sumps etc.	-Use of CARES Steel for upright beams -Use of BES6001 concrete with Ecocem (GGBS) for walls	-Use insulation wools like Knauf Glass mineral wool for heat/accoustic/fire resistant insulation (made of 60% recycled glass), bio based diner resin. No formaldehydes added, low embodied energy. - Consider use of biodegradable insulation materials (cellulose/hemp & biodegradable insulation) for roof, walls, floors		-Use low VOC paints inside building where required -Use FSc certified wood in new furniture where applicable.				-Design teams challenged to design differently, consider circular approach to design -Cost to client - Obtaining all certification - Sourcing materials in local region (market is still developing for Cradle to Cradle materials)	-Designers-set ideas, examine costs, availability - Engineers- Assess quality, costs and buy in from client. - Client-Buy in and willingness to accept alternative designs, spend more on longer lasting, more sustainable materials options where required. feasibility of approaches Construction team- implement the actions listed	-Set out in Design reports, plans. -Use of EPDs and quality certs where applicable. - Use LEED system for scoring, accreditation. - Get consultation, buy in, involvement from designers into the resource management plan

regenerate
Building 1 - Extension - Workstage 2-3

GLA Table Two

Section B: Design to Eliminate Waste (and for Ease of Maintenance)

	Site	Substructure	Superstructure	Envelope	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions & Who, When	Plan to Prove and Quantify
B1: Design for reusability / ~~recoverability~~ / adaptability / flexibility	-Assess possibilities for use of screws, click connections instead of adhesives for insulation and radon sheets onto steel, floors and walls where used (easier removal of materials at end of building life).	-Use of bolts, studs for steel upright beams connecting to concrete floor, base (ease of dissassembly of steel and concrete on building change, reuse)	-Look at using rubber matting (recycled rubber ideally) for roof membrane, surface which can reclaimed for recycling (end of life) -Use of cellulose insulation in roof membrane or walls where appropriate. -Use of AM Ecoboard for acoustic insulation where suitable (made of recycled materials, VOC Free, 30 min fire resistance, vapour tight, VOC free, fully recyclable). -Use plain wooden skirting (oak) to reduce needs for paints (reusable at end of life)	-Consider use of wooden cladding inside of metal cladding outside the building (2nd floor) (e.g larch) may not need treatment for weather. -Use mortarless bricks for external facade (can be reclaimed at end of life) -Use separable click screw click and clamp type connections for facade assembly (e.g external cladding) for ease of assembly (construction) and dissassembly (end of life) - Use Aluminum Frame windows instead of PVC (recycling, disassembly at end of life)	-Leave bigger void spaces in floors, walls for ducts and wiring and future services. -Setup leasing contract with light fitting manufacturer (e.g Siemens) to fit adaptable light fittings in building and provide upgrades, service to building lighting (energy efficiency). -Consider use of cardboard ducting (Gatorduct- which is hydrophobic treated, fire retardant treated and recyclable at end of life).	-Make internal walls easy to dismount and reinstall as partitions, to change size of rooms, offices if required	-Simplify furniture mountings (desks) to walls so they can be removed relocated for new work stations, areas with new rooms as required.			-Design teams challenged to design differently, consider circular approach to design -Client 'buy in' -Quality Assurance - Cost of sourcing alternative materials	-Designers-set ideas, examine costs, availability Engineers- Assess quality, costs and buy in from client. - Client-Buy in and willingness to accept alternative designs, spend more on longer lasting, more sustainable materials options where required, feasibility of approaches - Construction team- implement the actions listed	

regenerate

Ratoath Masterplan

Project Creator
Ratoath Masterplan

Category
Team

Project Description
452 dwellings, creche and local retail

Project Information

Credit Summary

Design for Adaptability

Selected Circularity Aim: Full Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	2	100%	100%	Full Circularity
Structure	9	90%	90%	Partial Circularity
Skin	6	100%	100%	Full Circularity
Services	2	100%	100%	Full Circularity
Space	3	75%	75%	Partial Circularity
Total	22	92%	92%	Partial Circularity

Design for Deconstruction

Selected Circularity Aim: Full Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	0	0%	0%	No Rating Achieved
Structure	2	40%	40%	No Rating Achieved
Skin	4	80%	80%	Partial Circularity
Services	3	75%	75%	Partial Circularity
Space	2	50%	50%	Basic Circularity
Total	11	58%	58%	Basic Circularity

Circular Material Selection

Selected Circularity Aim: Full Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	1	100%	100%	Full Circularity
Structure	3	43%	43%	No Rating Achieved
Skin	3	50%	50%	Basic Circularity
Services	3	50%	50%	Basic Circularity
Space	2	33%	33%	No Rating Achieved
Total	12	46%	46%	No Rating Achieved

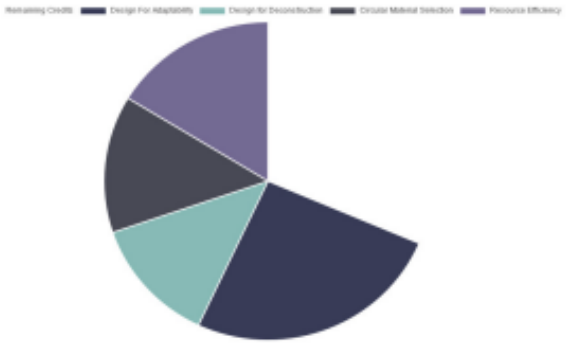
Resource Efficiency

Selected Circularity Aim: Full Circularity

Building Layer	Credit Total	Percentage of Selected Circularity Aim	Percentage of Total Credits	Awarded Circularity Rating
Site	3	75%	75%	Partial Circularity
Structure	4	100%	100%	Full Circularity
Skin	3	100%	100%	Full Circularity
Services	2	67%	67%	Partial Circularity
Space	2	67%	67%	Partial Circularity
Total	14	82%	82%	Partial Circularity

regenerate
Ratoath Masterplan

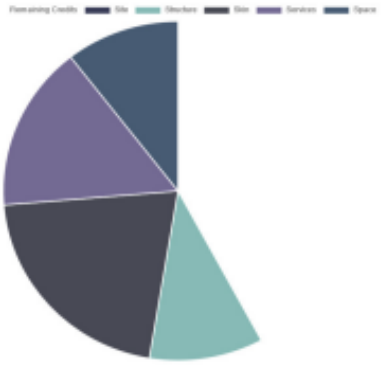
Awarded Credits by Circularity Principle



Awarded Credits by Building Layer

Design for Adaptability

Design for Deconstruction



Circular Material Selection

Resource Efficiency

IRISH GREEN BUILDING COUNCIL

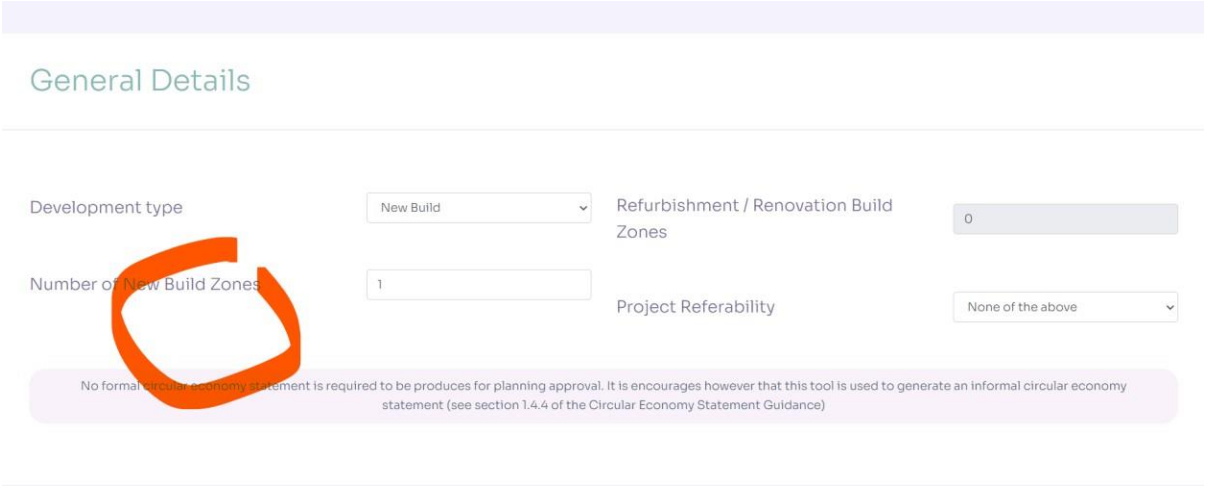
Regenerate Tool

Feedback from IGBC Circularity Workshops

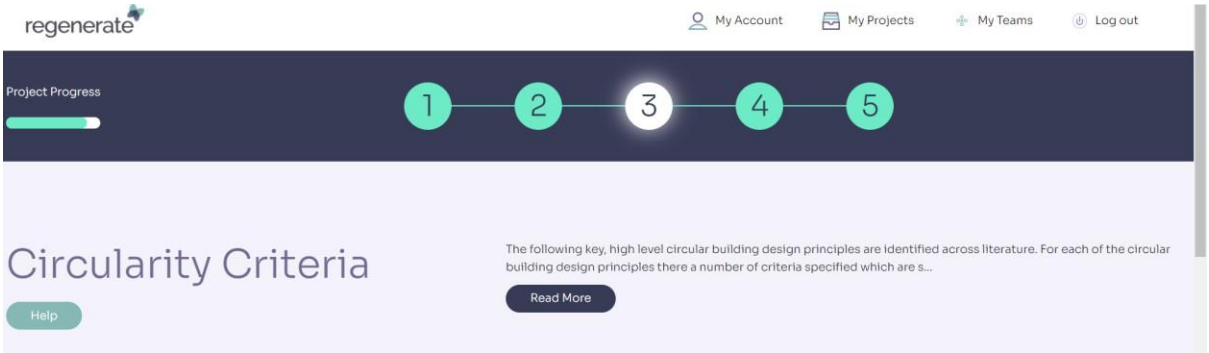
06/04/2022

Feedback from Circularity Workshops

- Detail about architectural and structural materials is very good.
- It sets out all the stages of a project and the different elements that need to be considered to implement circularity in the project. It acts as a prompt and ensures elements are not missed.
- Easy to use. Useful prompts for early level design.
- It prompts you to think about key circular principles.
- It prompts you to think twice about material selection, life cycle and construction methods.
- 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.
- The tool is useful and offers a high-level approach to incorporating circularity in design.
- The tool is great as a recording device and points you in the right direction.
- Improve the electrical and mechanical services sections.
- There is a lot of duplication across stages. It would be good if information could be pre-populated by ticking a box etc., if this info is the same as what has been filled in previously in the tool.
- The published report could include appendix questions and responses for easier reference in meetings etc.
- The process could do with a third-party reviewer as it relies on the design team giving honest answers.
- If the tool could be targeted to different design stages such as sketch design stage, detailed technical design and construction stage that would be good.
- The tool should be more flexible to accommodate zones, aspects of industrial plant buildings and material input. It should also look for more input from engineers on specifics of approach taken to increase circularity, e.g eliminate waste in design. It should also allow the users to generate a more detailed report, which would align more to the new Irish EPA Construction Resource and Waste Management Plan requirements. The two being linked would strengthen the value and use of the tool from design stages onwards.
- Project page is hard to navigate.
- Confusion about what a Zone is.



- Questions about reusing materials were found to be confusing.
- One team stated that the tool was not made for housing but rather for bigger developments.
- There is a limitation to the tool as there are just yes or no or to be determined answers.
- There is no option to copy the existing project and make modifications, so it takes full data re-entry. A useful area for possible improvement to allow speedier testing of variants.
- One team stated that the tool is not set up for new builds.
- One team stated the tool reached lower hanging fruit but not higher hanging fruit.
- Most teams were unclear about the Circular Economy Statement Preparation sections (Bill of Materials, Recycling and Waste, GLA Table 1, GLA Table 2).
- One team stated that a ‘not-applicable’ choice would be good.
- One person stated that it would be nice if you could click on the numbers on the top of the page to navigate the sections:



- One team said that the wording is confusing, e.g. words like ‘stuff’ are unclear.

1.

- The way the users of the tool could go back and change their answers when they score low in a section may make them change their answers but not fully explain how they are going to make the design more circular.
- Trade-offs were questioned in the tool, for example adding extra depth for the foundation would allow the building to be extended vertically but would add extra embodied carbon to the building.
- Too much repetition.
- One team stated the tool is set up for greenfield sites rather than brownfield sites.
- The notes of evidence/supporting statements/justification are not included in the PDF.

IRISH GREEN BUILDING COUNCIL

Carbon Designer Case Studies

WP2

Rachel Loughrey

CIRCULARLife

GreenEnterprise epa

Contents

Project Summary

About the CIRCULARlife Project:

To date, the discussion in Ireland on circularity in buildings has focused on downcycling of materials, waste audits already within existing buildings and finding uses for waste, such as reuse of aggregates and other recycled materials. A different approach is needed in order to design out the need for downcycling at the earliest stage of the project and to radically reduce overall resource consumption and embodied carbon.

IGBC intends to trial circularity tools with designers to help drive greater uptake and to identify the most useful approaches. The application of tools and indicators is a good way of identifying gaps and where the infrastructure is lacking in building a truly circular economy for construction as it immediately identifies what is difficult to apply in the Irish context and why.

As part of the project IGBC will also create learning materials, deliver webinars, and carry out training workshops with members and others in the sector to assist designers and developers to incorporate circularity into their projects. This project is funded by EPA Green Enterprise.

Acknowledgements

This project is funded by the Environmental Protection Agency of Ireland's Green Enterprise Programme. The Carbon Designer Tool for Ireland is co-funded by the Land Development Agency (LDA).

1. Introduction

This report highlights six projects that have used the Carbon Designer Tool.

2. Case Study 1

2.1. Describe

Building type: Office Building

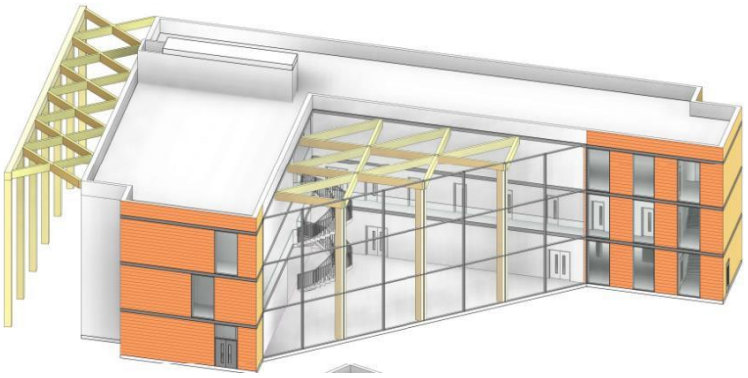


Figure 1 Maynooth Office

Building location: Maynooth

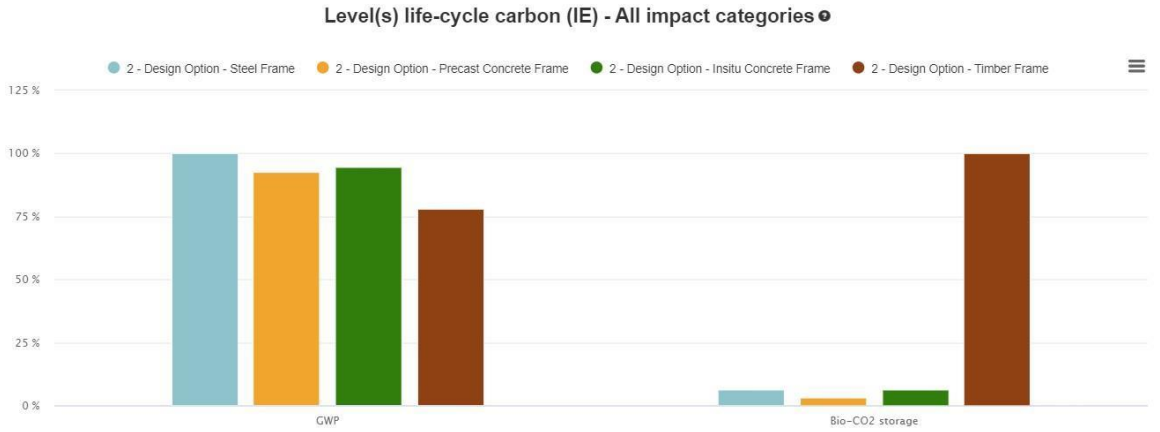
Team name: Scott Tallon Walker

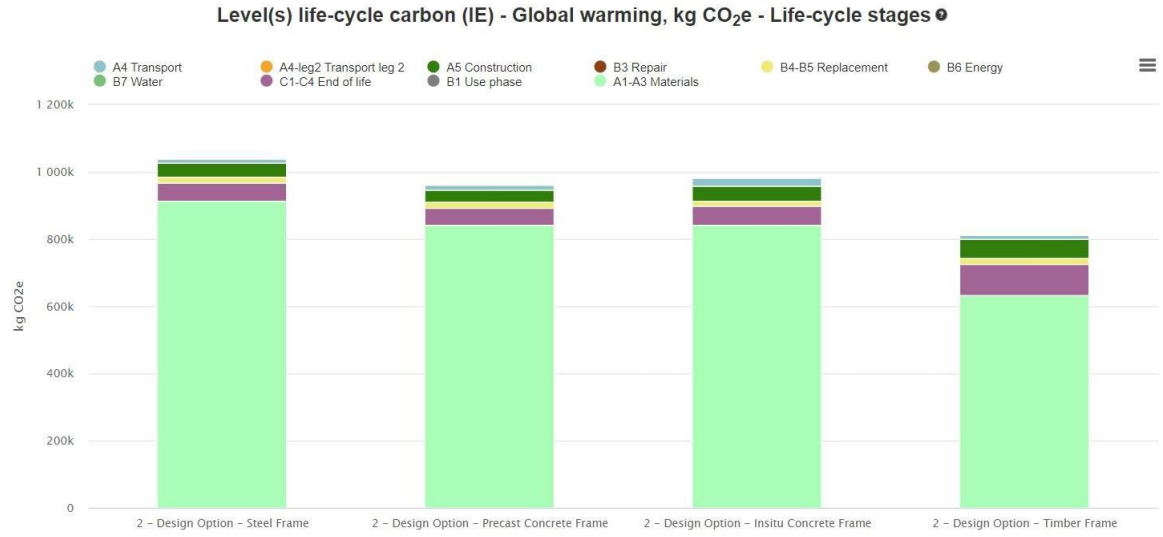
Gross Floor Area (m^2): 3640

Overview: Four design options and their carbon impact were explored using the carbon designer tool;

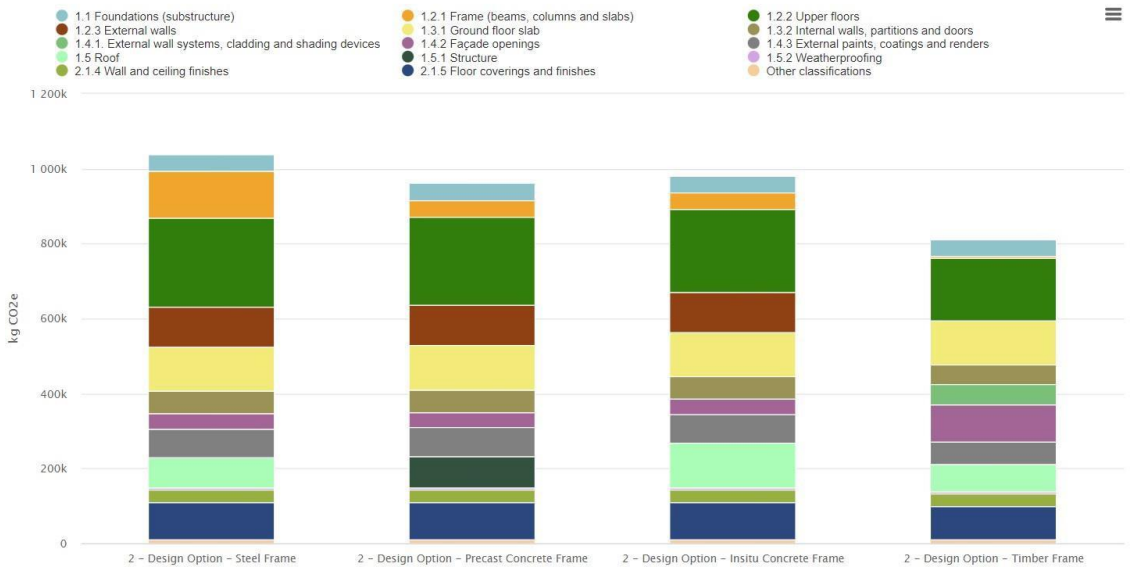
- Design Option - Steel Frame
- Design Option - Precast Concrete Frame
- Design Option - Insitu Concrete Frame
- Design Option - Timber Frame

Results:

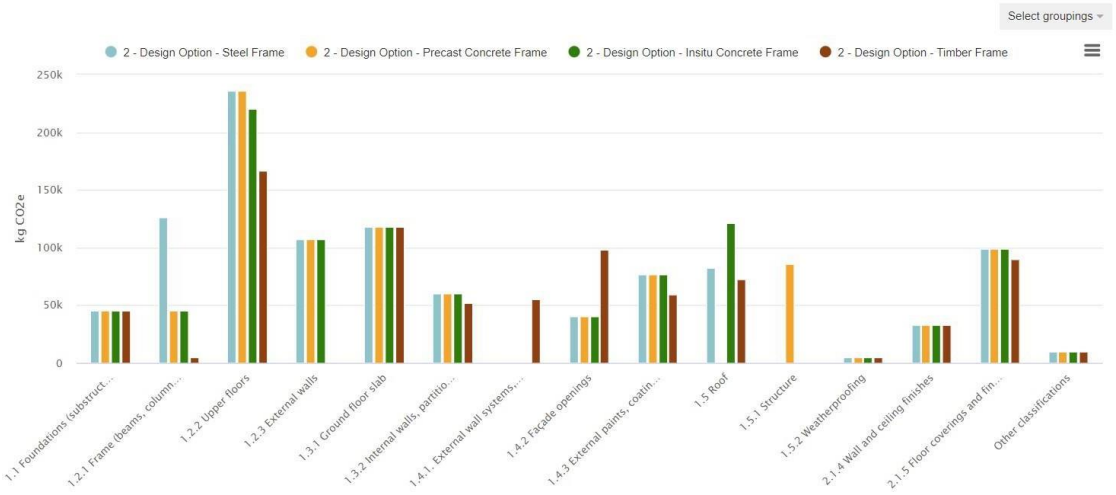

Level(s) life-cycle carbon (IE) - All impact categories
2 - Design Option - Steel Frame
2 - Design Option - Precast Concrete Frame
2 - Design Option - Insitu Concrete Frame
2 - Design Option - Timber Frame
125 %
100 %
75 %
50 %
25 %
0 %
GWP
Bio-CO2 storage

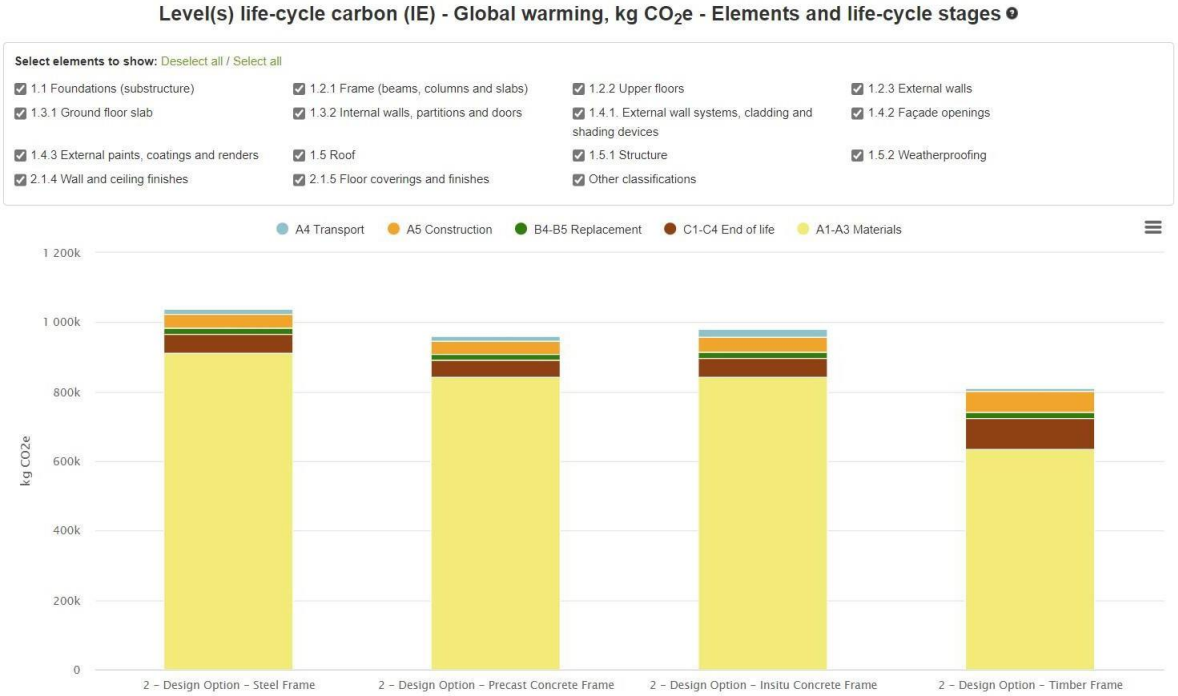

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Life-cycle stages
A4 Transport
B7 Water
A4-leg2 Transport leg 2
C1-C4 End of life
A5 Construction
B1 Use phase
B3 Repair
A1-A3 Materials
B4-B5 Replacement
B6 Energy
1 200k
1 000k
800k
600k
400k
200k
0
kg CO2e
2 - Design Option - Steel Frame
2 - Design Option - Precast Concrete Frame
2 - Design Option - Insitu Concrete Frame
2 - Design Option - Timber Frame

Level(s) life-cycle carbon (IE) - Global warming, kg CO_2e - Elements

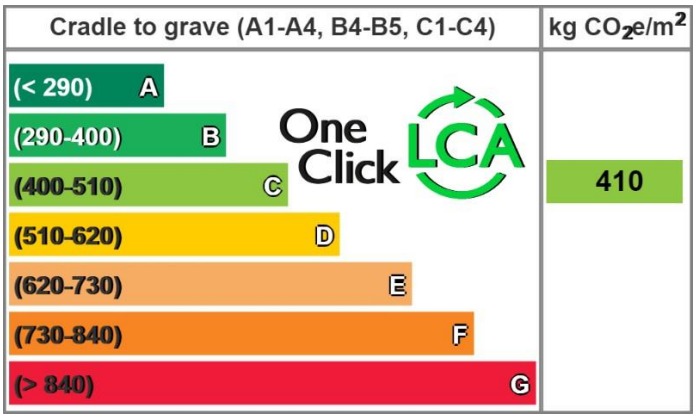


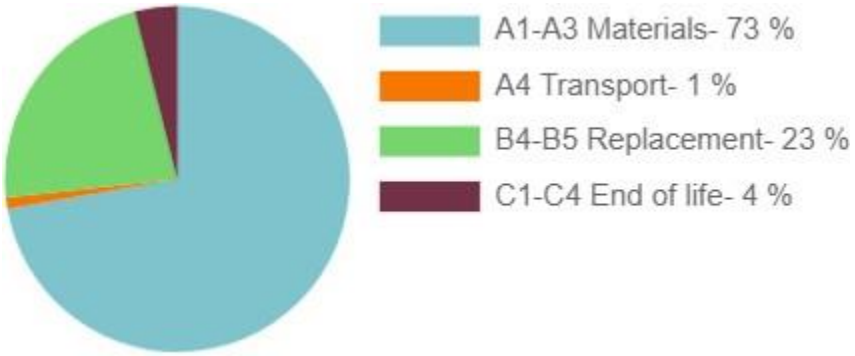
Level(s) life-cycle carbon (IE) - Global warming, kg CO_2e - Compare elements

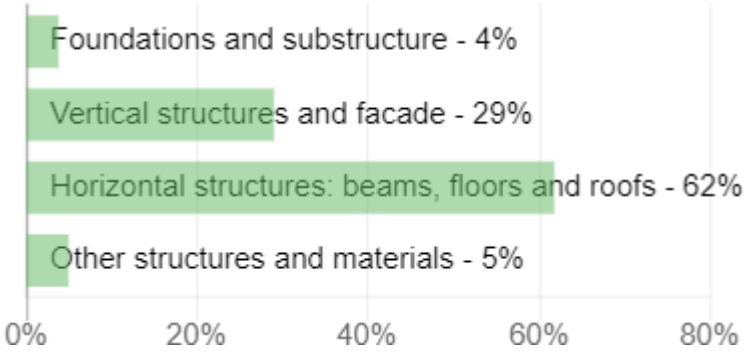




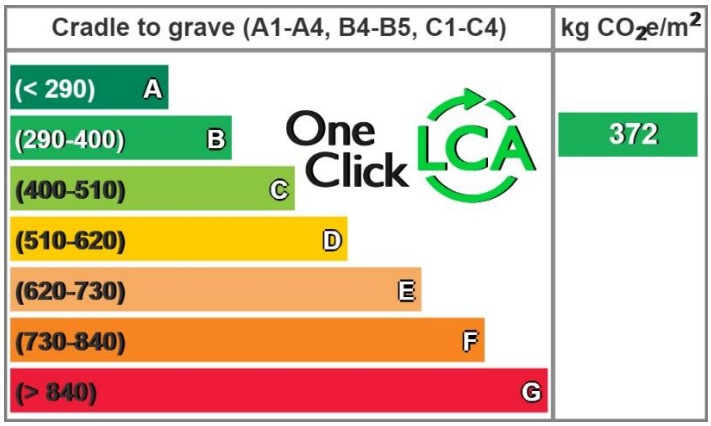
Overview of results (Design Option: Steel Frame)

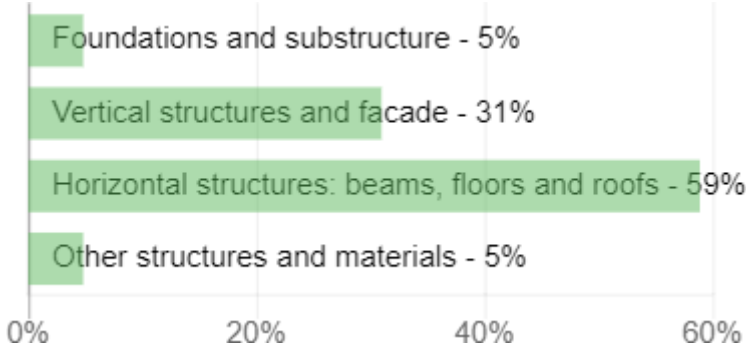




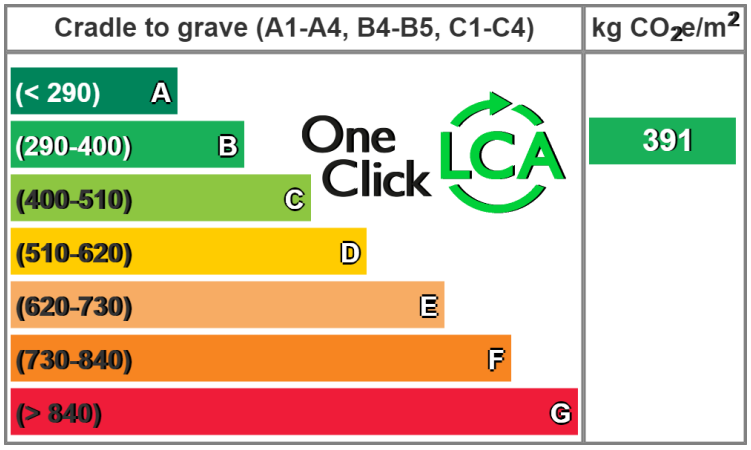


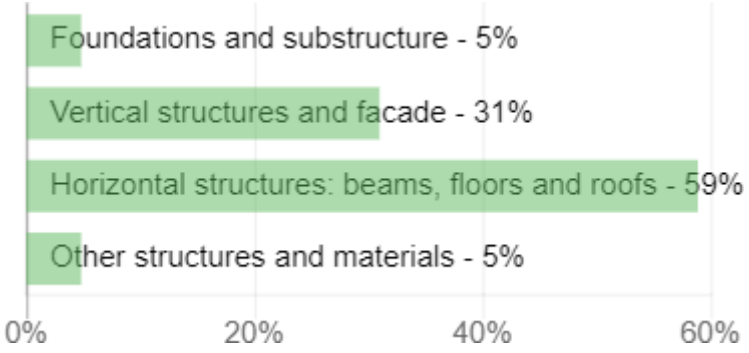
Overview of results (Design Option: Precast Concrete Frame)





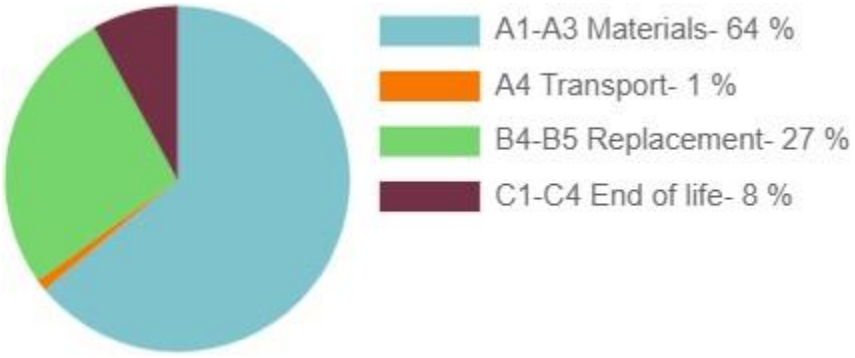
Overview of results (Design Option: Insitu Concrete Frame)

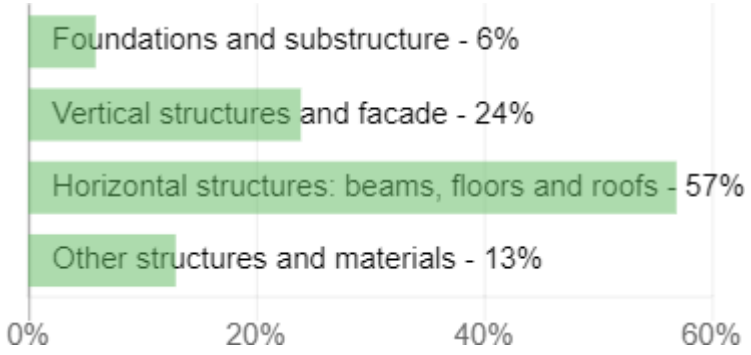




Overview of results (Design Option: Timber Frame)

Cradle to grave (A1-A4, B4-B5, C1-C4)	kg CO_2e/m^2
(< 290) A (290-400) B (400-510) C (510-620) D (620-730) E (730-840) F (> 840) G	331


A1-A3 Materials- 64 %
A4 Transport- 1 %
B4-B5 Replacement- 27 %
C1-C4 End of life- 8 %


Foundations and substructure - 6%
Vertical structures and facade - 24%
Horizontal structures: beams, floors and roofs - 57%
Other structures and materials - 13%
0%
20%
40%
60%

3. Case Study 2

3.1. Describe

Building type: Factory

Building location: M1 Business Park in Courtlough, Dublin

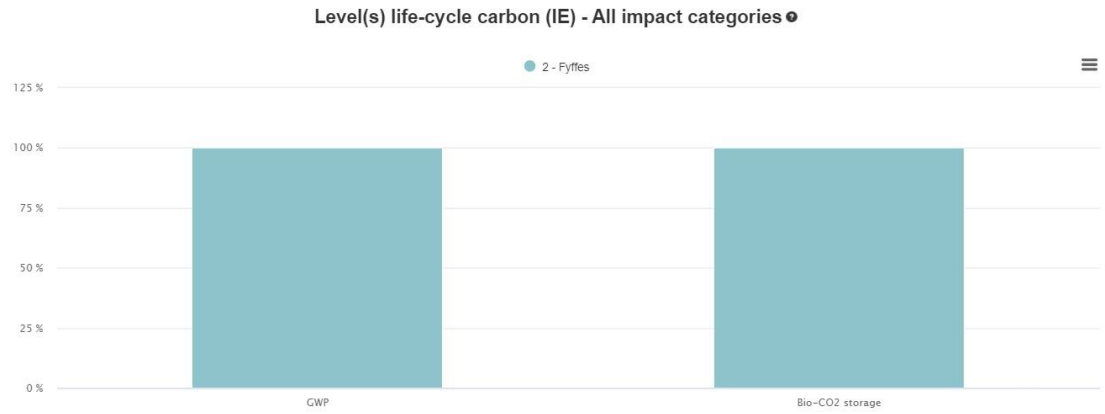
Gross Floor Area (m²): 9323

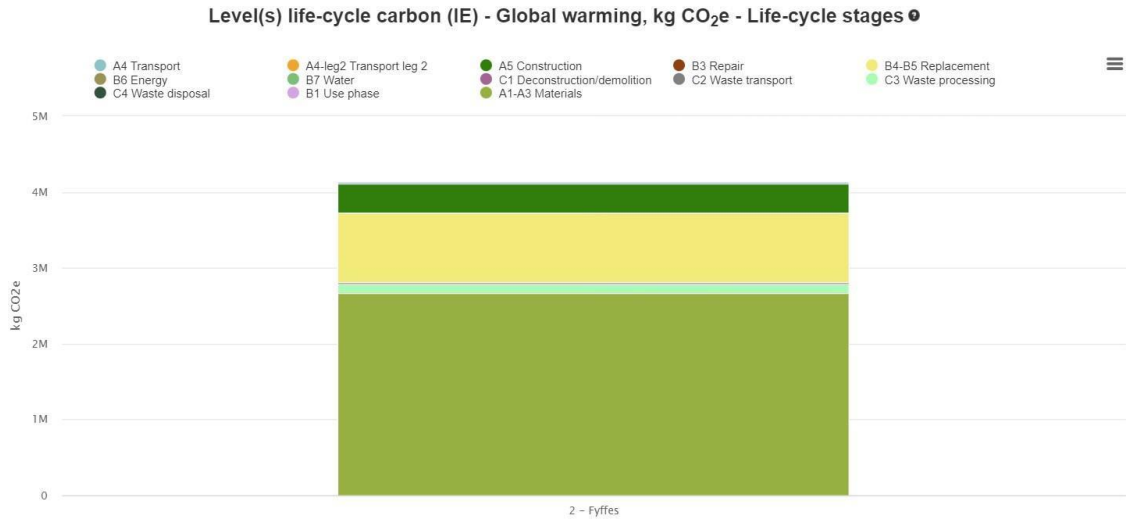
Team name: Scott Tallon Walker

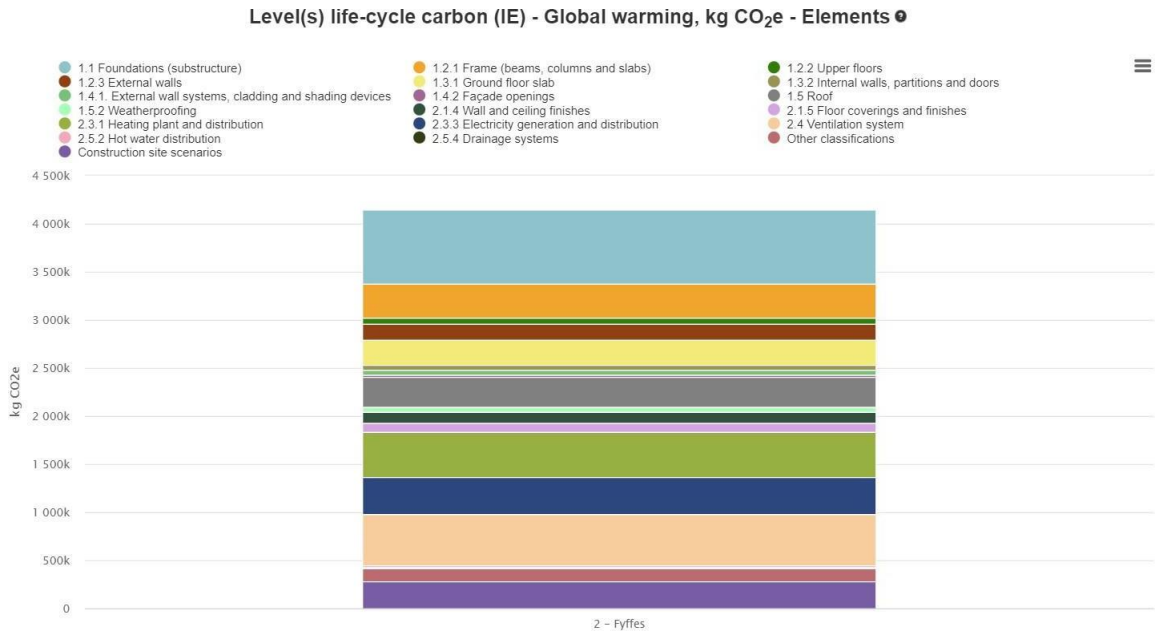
Overview: Design options and their carbon impact were explored using the carbon designer tool;

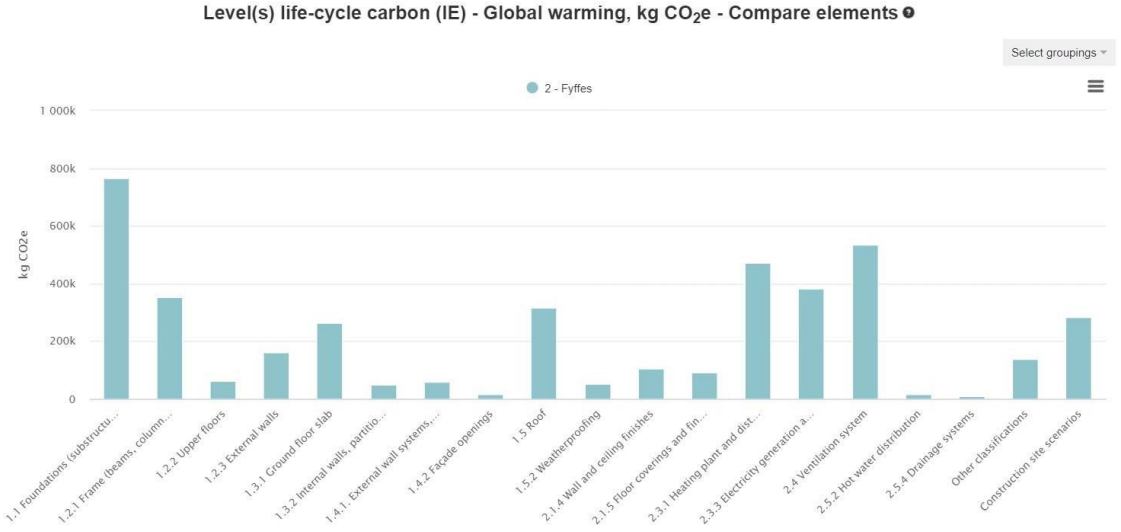
- Design Option - Steel Frame

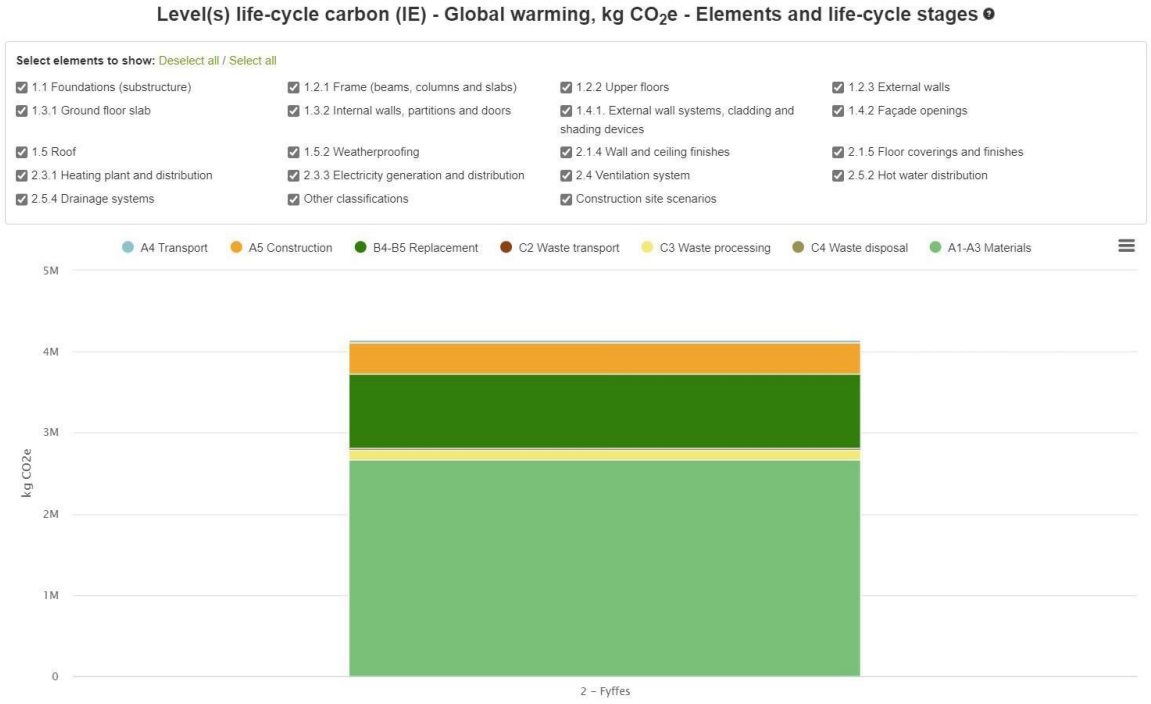
Results:


Level(s) life-cycle carbon (IE) - All impact categories
2 - Fyffes
125 %
100 %
75 %
50 %
25 %
0 %
GWP
Bio-CO2 storage

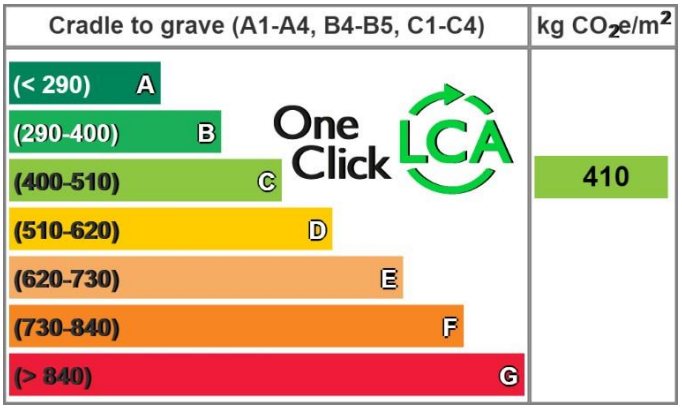

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Life-cycle stages
A4 Transport
A4-leg2 Transport leg 2
A5 Construction
B3 Repair
B4-B5 Replacement
B6 Energy
B7 Water
C1 Deconstruction/demolition
C2 Waste transport
C3 Waste processing
C4 Waste disposal
B1 Use phase
A1-A3 Materials
5M
4M
3M
2M
1M
0
kg CO2e
2 - Fyffes

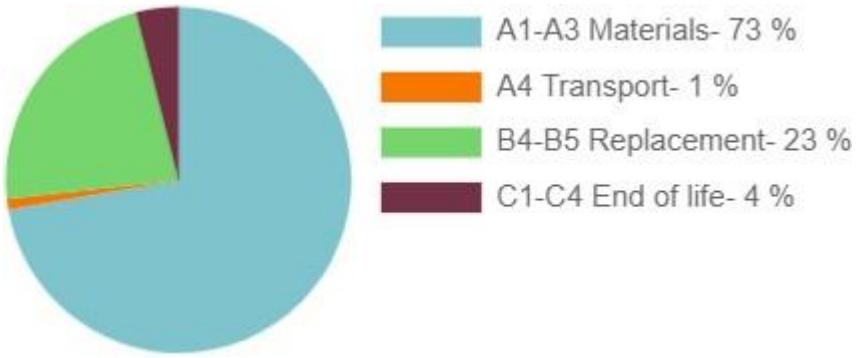

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Elements
1.1 Foundations (substructure)
1.2.1 Frame (beams, columns and slabs)
1.2.2 Upper floors
1.2.3 External walls
1.3.1 Ground floor slab
1.3.2 Internal walls, partitions and doors
1.4.1. External wall systems, cladding and shading devices
1.4.2 Façade openings
1.5 Roof
1.5.2 Weatherproofing
2.1.4 Wall and ceiling finishes
2.1.5 Floor coverings and finishes
2.3.1 Heating plant and distribution
2.3.3 Electricity generation and distribution
2.4 Ventilation system
2.5.2 Hot water distribution
2.5.4 Drainage systems
Other classifications
Construction site scenarios
4 500k
4 000k
3 500k
3 000k
2 500k
2 000k
1 500k
1 000k
500k
0
kg CO2e
2 - Fyffes

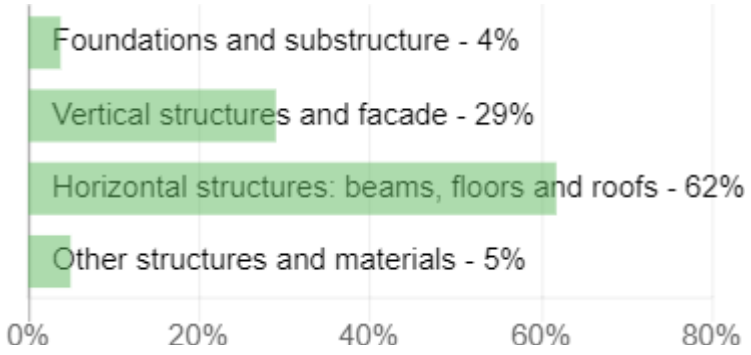

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Compare elements
Select groupings
2 - Fyffes
1 000k
800k
600k
400k
200k
0
kg CO2e
1.1 Foundations (substructu...
1.2.1 Frame (beams, column...
1.2.2 Upper floors
1.2.3 External walls
1.3.1 Ground floor slab
1.3.2 Internal walls, partitio...
1.4.1. External wall systems,...
1.4.2 Façade openings
1.5 Roof
1.5.2 Weatherproofing
2.1.4 Wall and ceiling finishes
2.1.5 Floor coverings and fin...
2.3.1 Heating plant and dist...
2.3.3 Electricity generation a...
2.4 Ventilation system
2.5.2 Hot water distribution
2.5.4 Drainage systems
Other classifications
Construction site scenarios



Overview of results:






Foundations and substructure - 4%
Vertical structures and facade - 29%
Horizontal structures: beams, floors and roofs - 62%
Other structures and materials - 5%
0%
20%
40%
60%
80%

4. Case Study 3

4.1. Describe

Building type: Educational Building

Building location: Kane Building, UCC, Cork

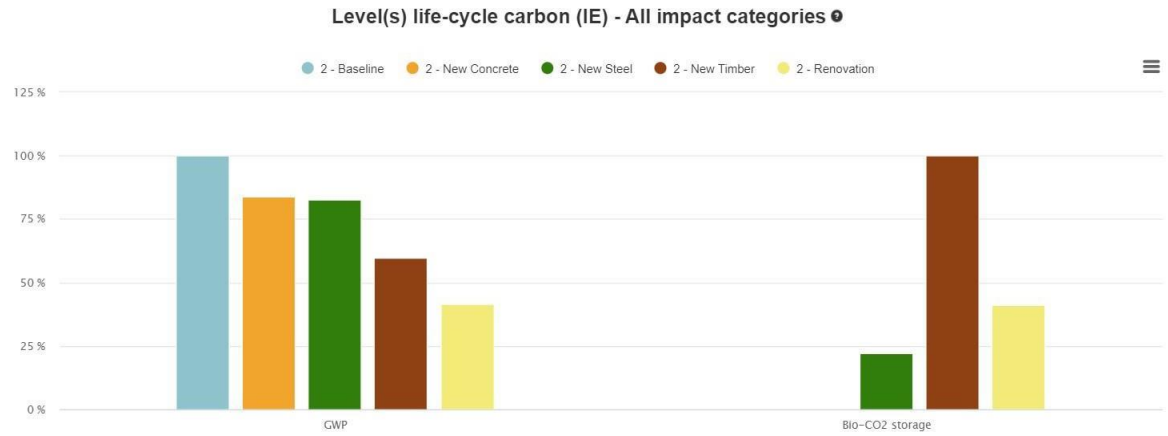
Gross Floor Area (m^2): 14,106

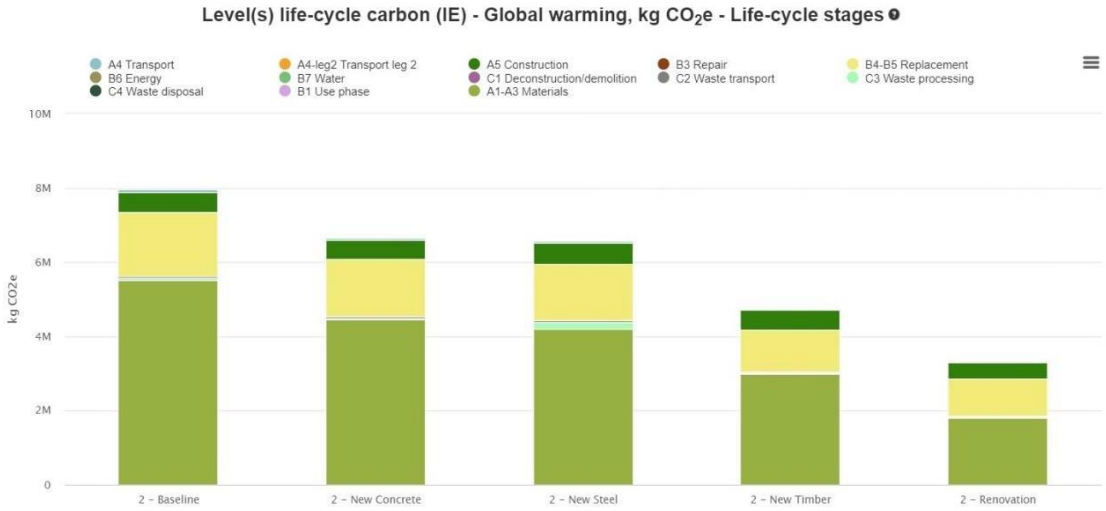
Team name: Scott Tallon Walker

Overview: Design options and their carbon impact were explored using the carbon designer tool;

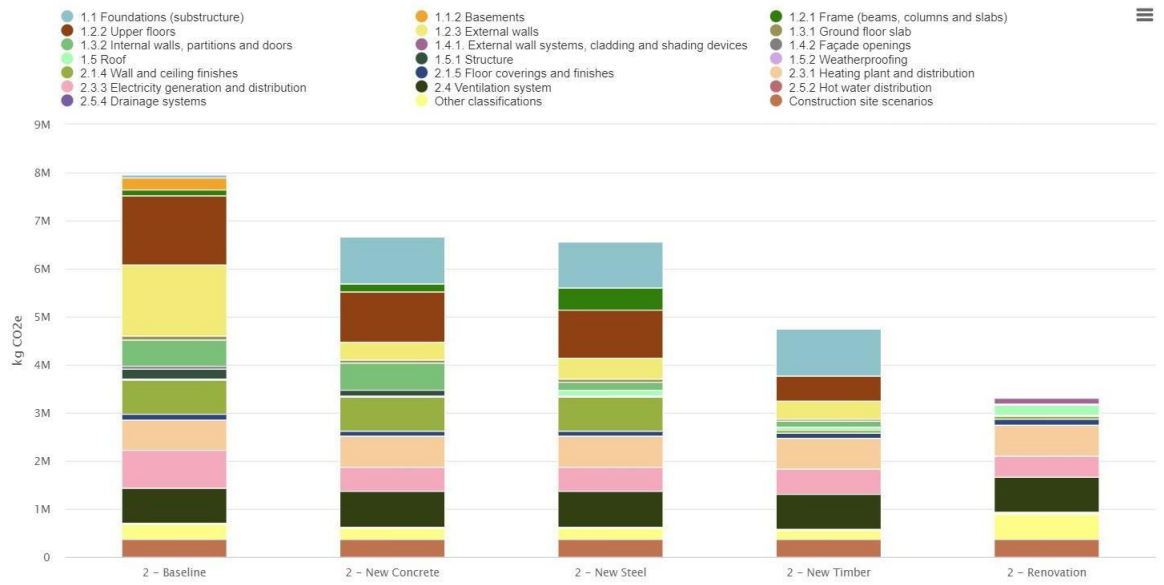
- Baseline
- New Concrete
- New Steel
- New Timber
- Renovation

Results:

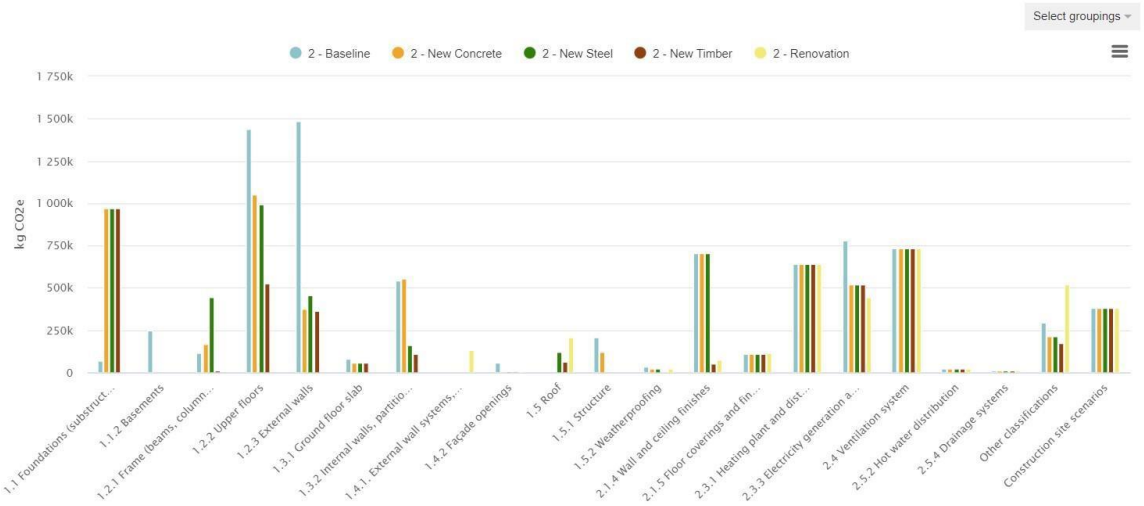

Level(s) life-cycle carbon (IE) - All impact categories
2 - Baseline
2 - New Concrete
2 - New Steel
2 - New Timber
2 - Renovation
125 %
100 %
75 %
50 %
25 %
0 %
GWP
Bio-CO2 storage

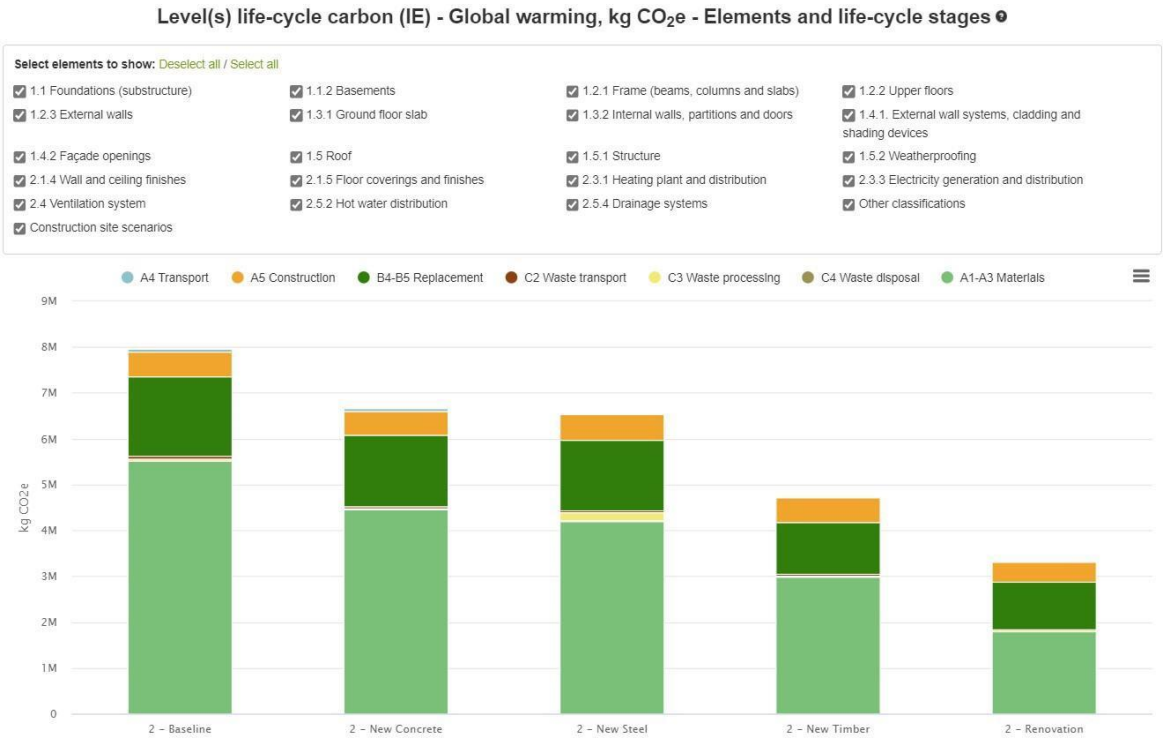

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Life-cycle stages
A4 Transport
B6 Energy
C4 Waste disposal
A4-leg2 Transport leg 2
B7 Water
B1 Use phase
A5 Construction
C1 Deconstruction/demolition
A1-A3 Materials
B3 Repair
C2 Waste transport
B4-B5 Replacement
C3 Waste processing
10M
8M
6M
4M
2M
0
kg CO2e
2 - Baseline
2 - New Concrete
2 - New Steel
2 - New Timber
2 - Renovation

Level(s) life-cycle carbon (IE) - Global warming, kg CO_2e - Elements

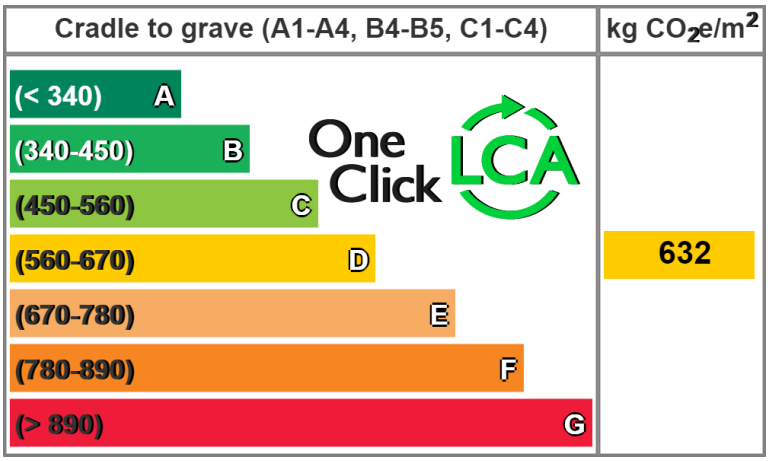


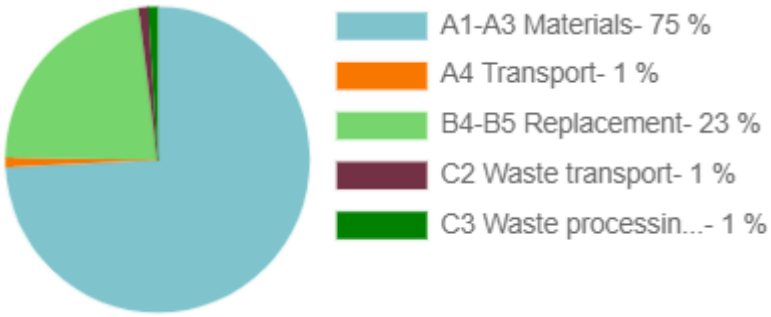
Level(s) life-cycle carbon (IE) - Global warming, kg CO_2e - Compare elements

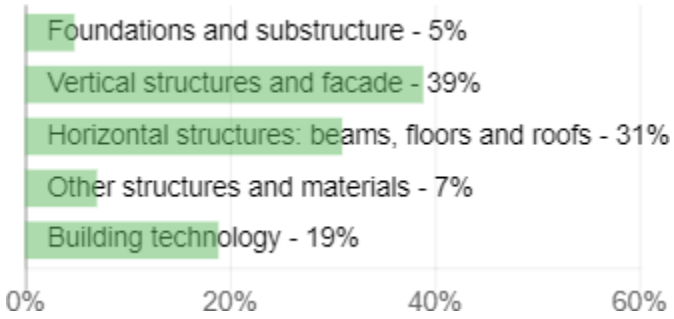




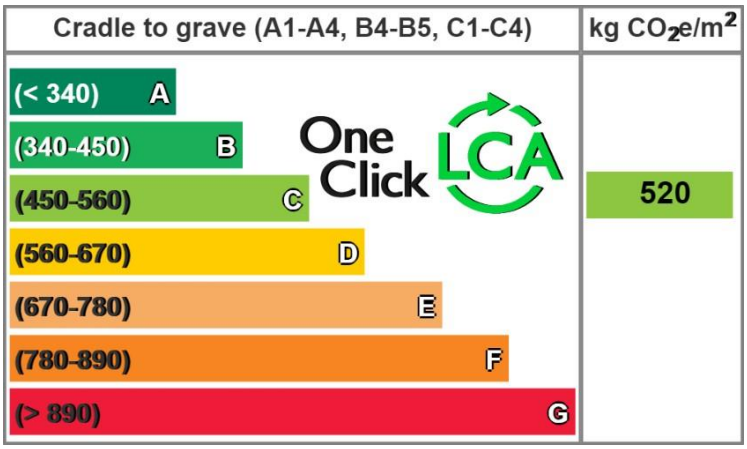
Overview of results (Design Option: Baseline)

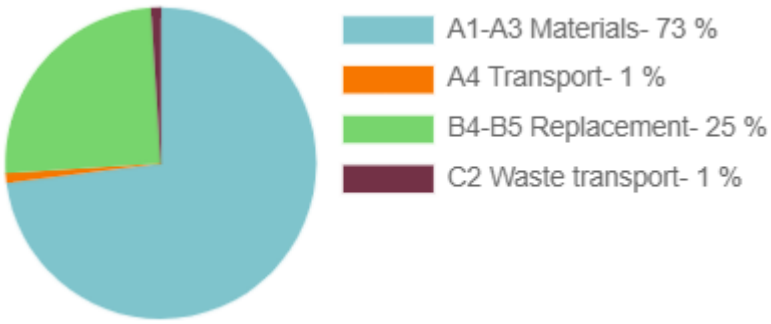


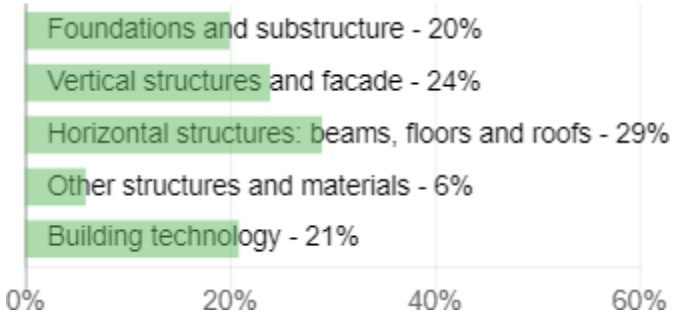




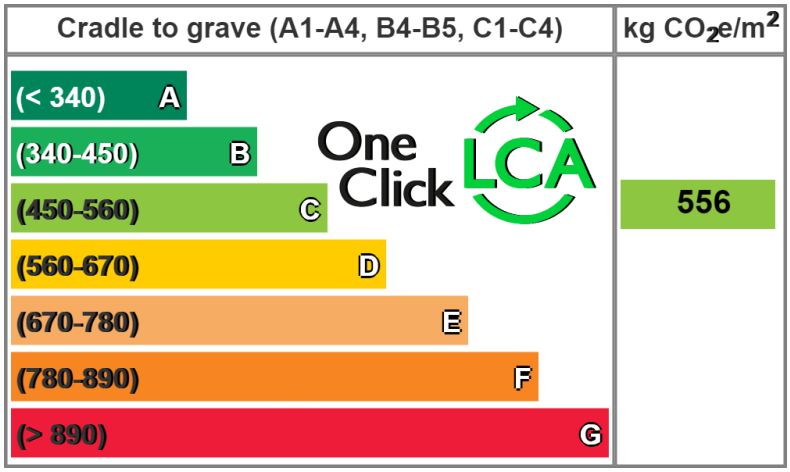
Overview of results (Design Option: New Concrete)

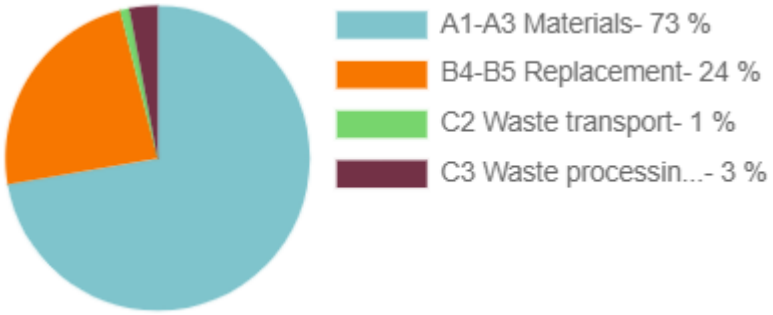


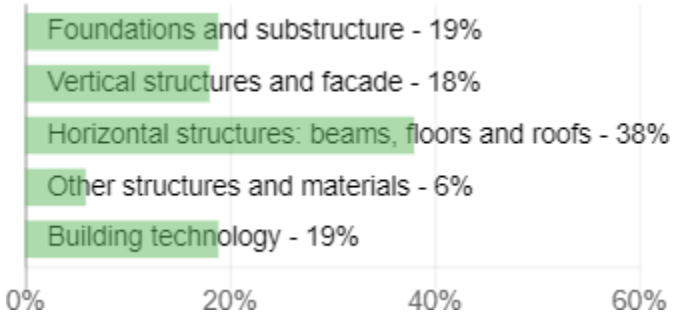




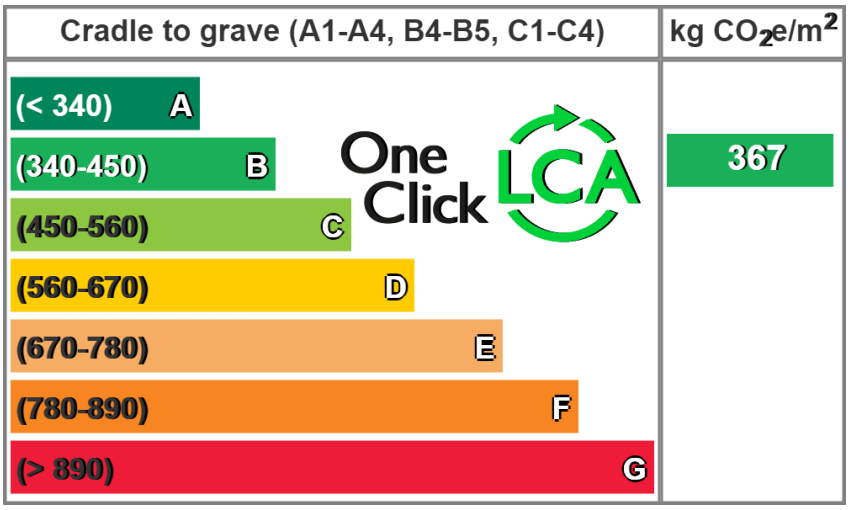
Overview of results (Design Option: New Steel)

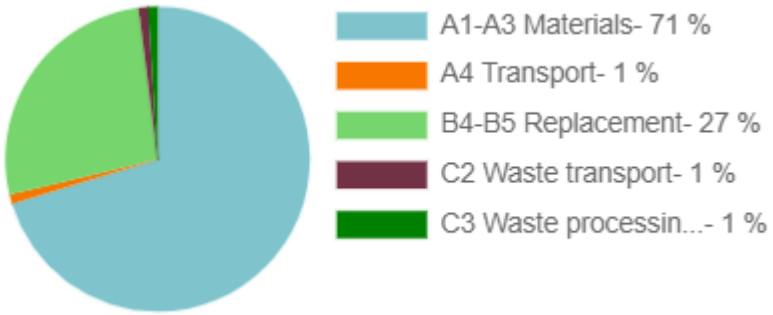


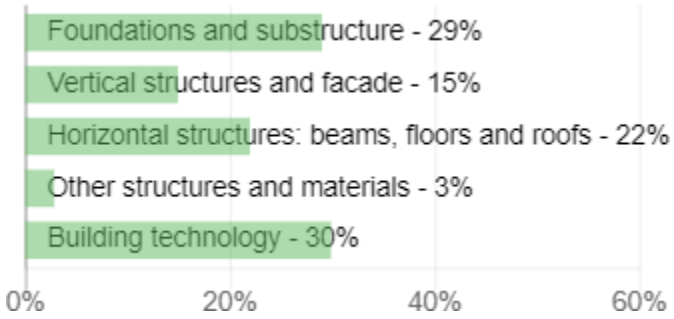




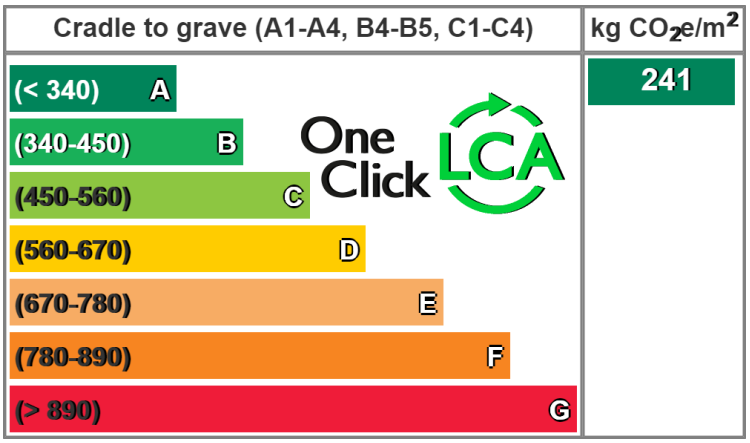
Overview of results (Design Option: New Timber)



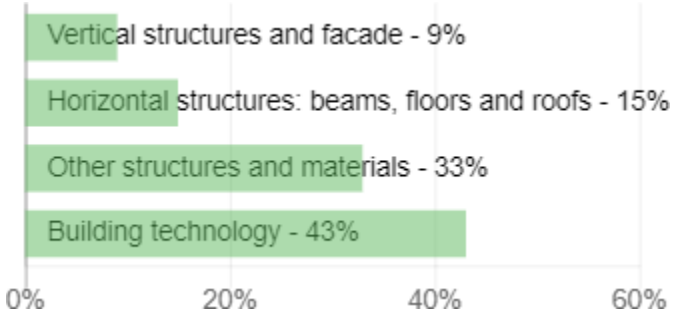




Overview of results (Design Option: New Timber)


Cradle to grave (A1-A4, B4-B5, C1-C4)
kg CO2e/m2
241
(< 340) A
(340-450) B
(450-560) C
(560-670) D
(670-780) E
(780-890) F
(> 890) G
One Click LCA

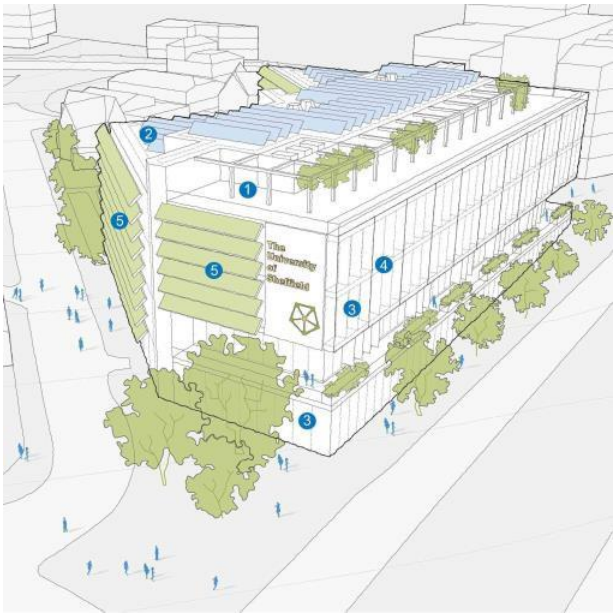

A1-A3 Materials- 65 %
B4-B5 Replacement- 33 %
C2 Waste transport- 1 %
C3 Waste processin...- 1 %


Vertical structures and facade - 9%
Horizontal structures: beams, floors and roofs - 15%
Other structures and materials - 33%
Building technology - 43%
0%
20%
40%
60%

5. Case Study 4

5.1. Describe

Building type: University of Sheffield - Central Teaching Laboratory Building



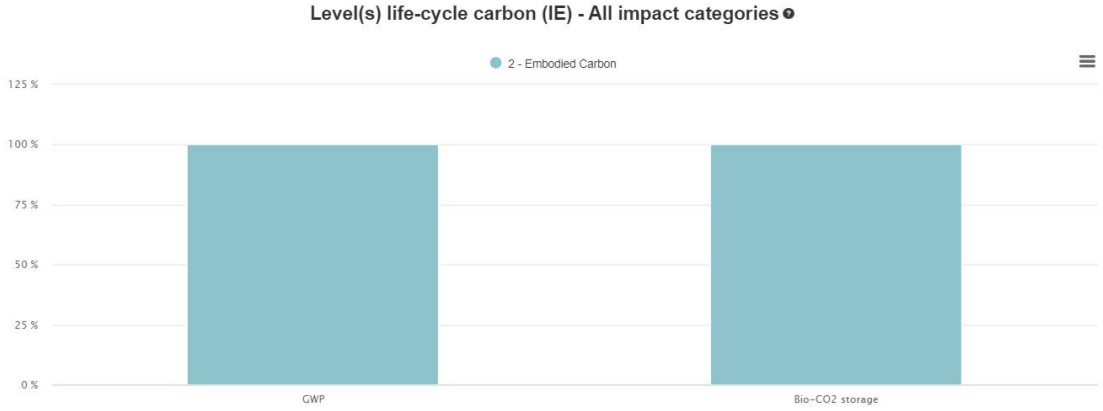
Building location: Sheffield

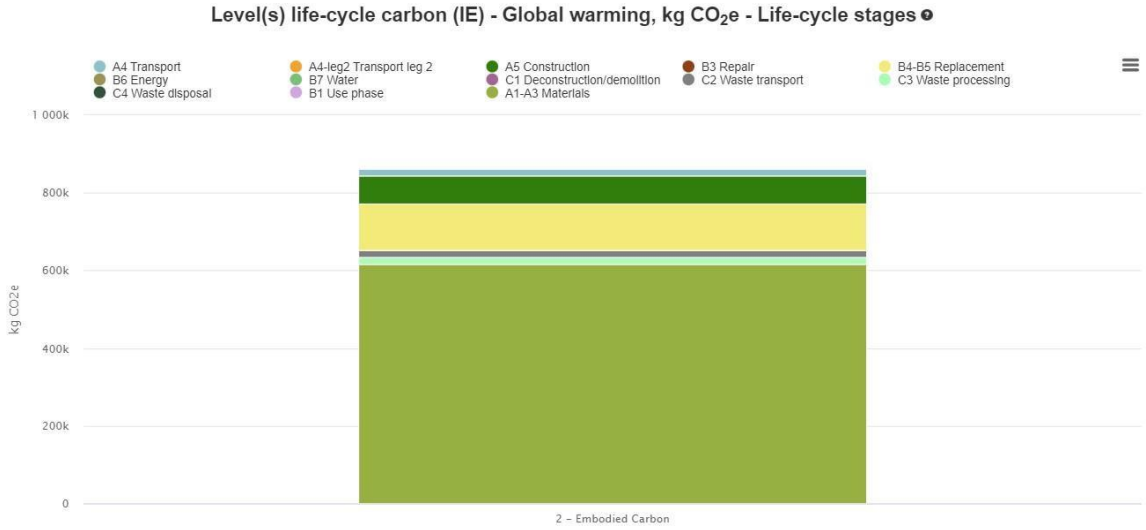
Gross Floor Area (m^2): 1349

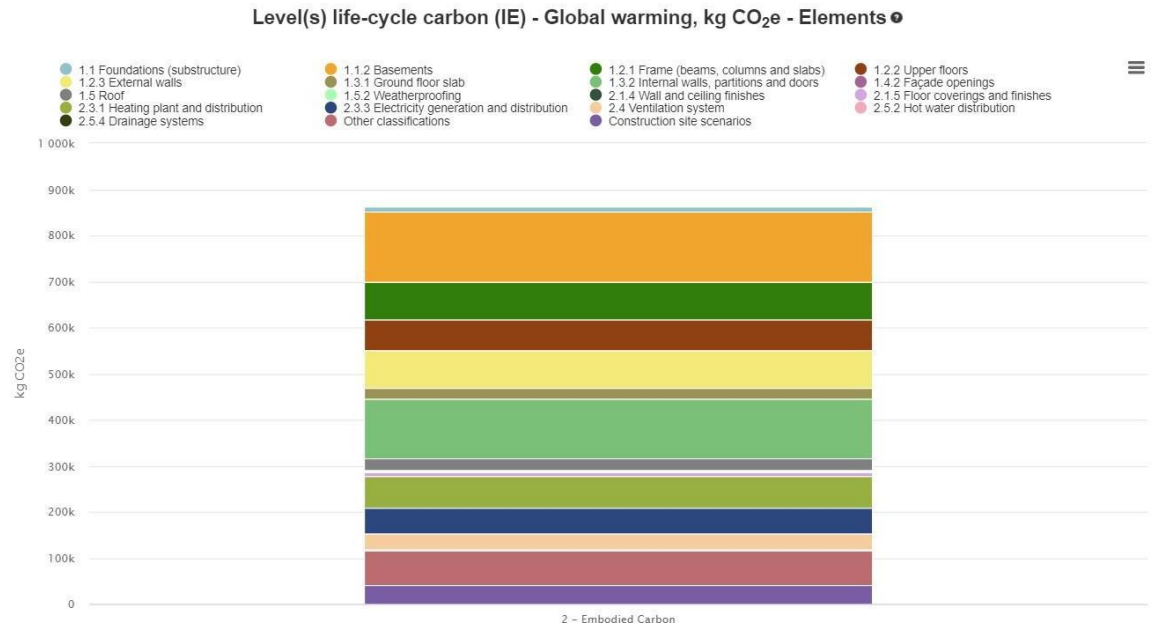
Team name: Scott Tallon Walker

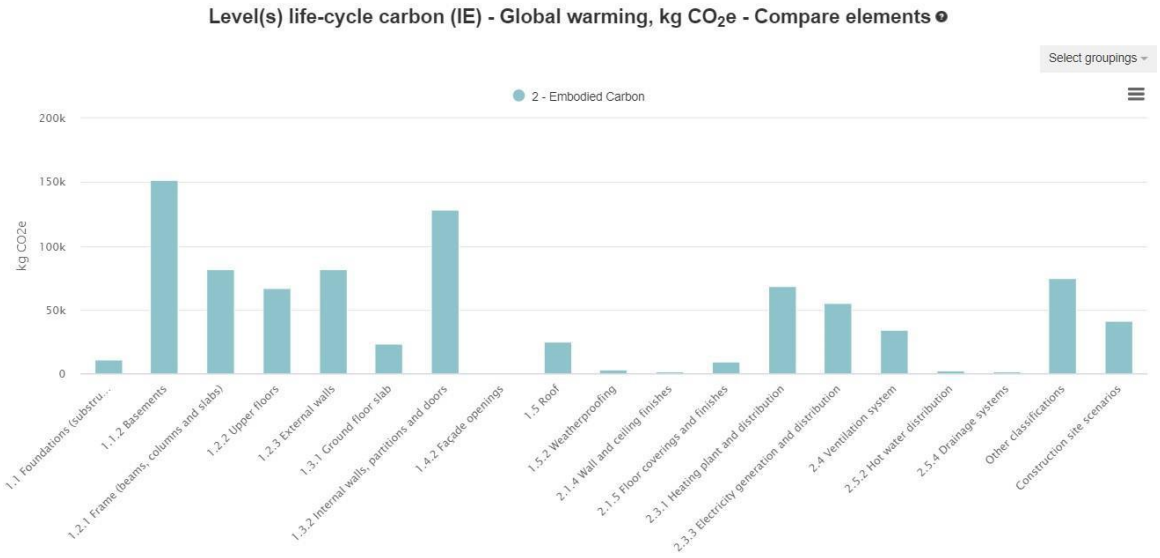
Overview: General embodied carbon was explored

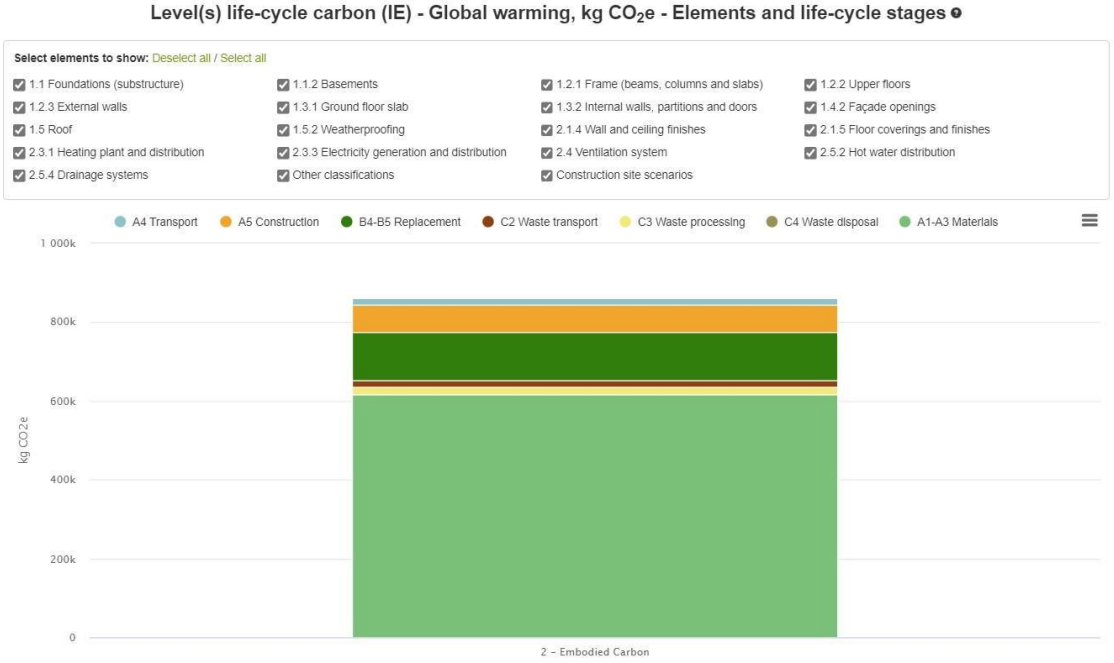
Results:


Level(s) life-cycle carbon (IE) - All impact categories
2 - Embodied Carbon
125 %
100 %
75 %
50 %
25 %
0 %
GWP
Bio-CO2 storage

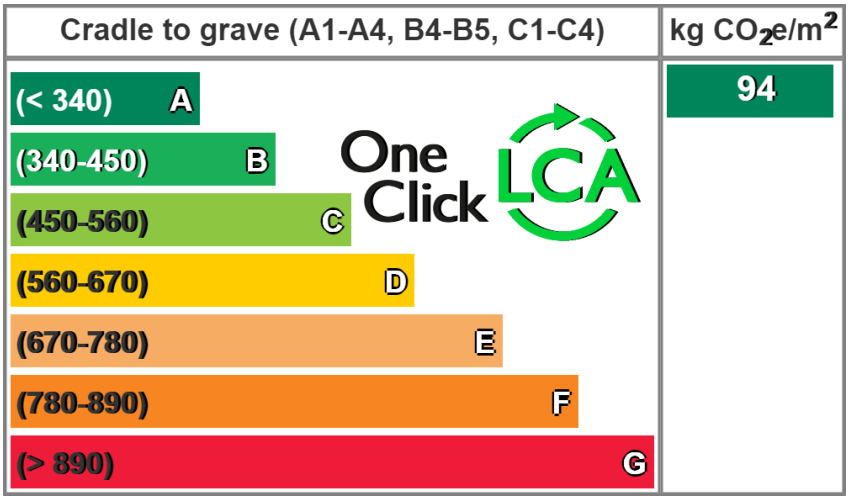

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Life-cycle stages
A4 Transport
B6 Energy
C4 Waste disposal
A4-leg2 Transport leg 2
B7 Water
B1 Use phase
A5 Construction
C1 Deconstruction/demolition
A1-A3 Materials
B3 Repair
C2 Waste transport
B4-B5 Replacement
C3 Waste processing
1 000k
800k
600k
400k
200k
0
kg CO2e
2 - Embodied Carbon

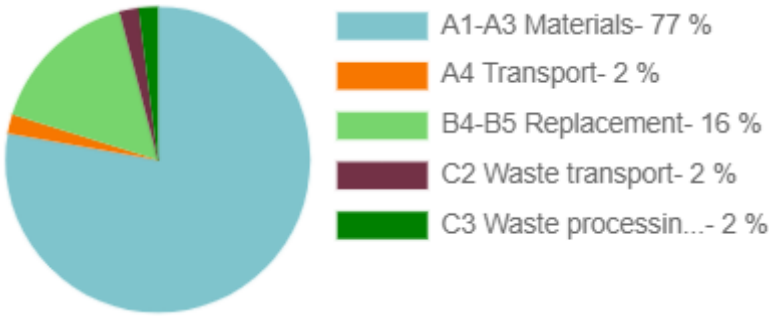

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Elements
1.1 Foundations (substructure)
1.1.2 Basements
1.2.1 Frame (beams, columns and slabs)
1.2.2 Upper floors
1.2.3 External walls
1.3.1 Ground floor slab
1.3.2 Internal walls, partitions and doors
1.4.2 Façade openings
1.5 Roof
1.5.2 Weatherproofing
2.1.4 Wall and ceiling finishes
2.1.5 Floor coverings and finishes
2.3.1 Heating plant and distribution
2.3.3 Electricity generation and distribution
2.4 Ventilation system
2.5.2 Hot water distribution
2.5.4 Drainage systems
Other classifications
Construction site scenarios
1 000k
900k
800k
700k
600k
500k
400k
300k
200k
100k
0
kg CO2e
2 – Embodied Carbon

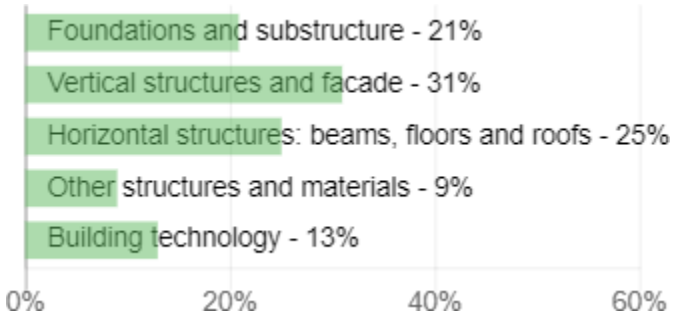

Level(s) life-cycle carbon (IE) - Global warming, kg CO2e - Compare elements
Select groupings
2 - Embodied Carbon
200k
150k
100k
50k
0
kg CO2e
1.1 Foundations (substru...
1.1.2 Basements
1.2.1 Frame (beams, columns and slabs)
1.2.2 Upper floors
1.2.3 External walls
1.3.1 Ground floor slab
1.3.2 Internal walls, partitions and doors
1.4.2 Façade openings
1.5 Roof
1.5.2 Weatherproofing
2.1.4 Wall and ceiling finishes
2.1.5 Floor coverings and finishes
2.3.1 Heating plant and distribution
2.3.3 Electricity generation and distribution
2.4 Ventilation system
2.5.2 Hot water distribution
2.5.4 Drainage systems
Other classifications
Construction site scenarios



Overview of results (Design Option: Embodied Carbon)







Feedback from Scott Tallon Walker Architects: The tool is great, it is excellent for the quick assessment for early-stage design ideas.

We have mostly been using it as a tool to advise clients on how to proceed with projects in extremely early stages of development.

However, while it is great at comparing various options for new builds, where it becomes a bit clunky is when comparing renovating an existing building against building a new structure (Kane is an example of this). This is a question we are beginning to be asked regularly now by clients – do we renovate + extend our existing building or just build a new structure?

If the Carbon Designer tool could generate material assumptions for renovation works, it would become a really strong tool for advising clients.

Another small criticism is 'Level(s) life-cycle carbon (IE) - All impact categories' graph is not very informative but has the potential to be. If the vertical axes were tonnes CO2 this would be extremely informative, as you could compare the actual embodied carbon values as well as sequestered carbon versus embodied. In the below graph, knowing which design option sequesters the most carbon is of little value to me.

6. Case Study 5

6.1. Describe

Building type: Six storey apartment building with five units per floor which is part of a larger project comprising approximately 120 social and affordable units in total

Building location: Ireland

Gross Floor Area (m^2): NA

Team name: O Briain Beary Architects

Overview: Design options and their carbon impact were explored using the carbon designer tool;

- New Concrete
- New Steel

Results:

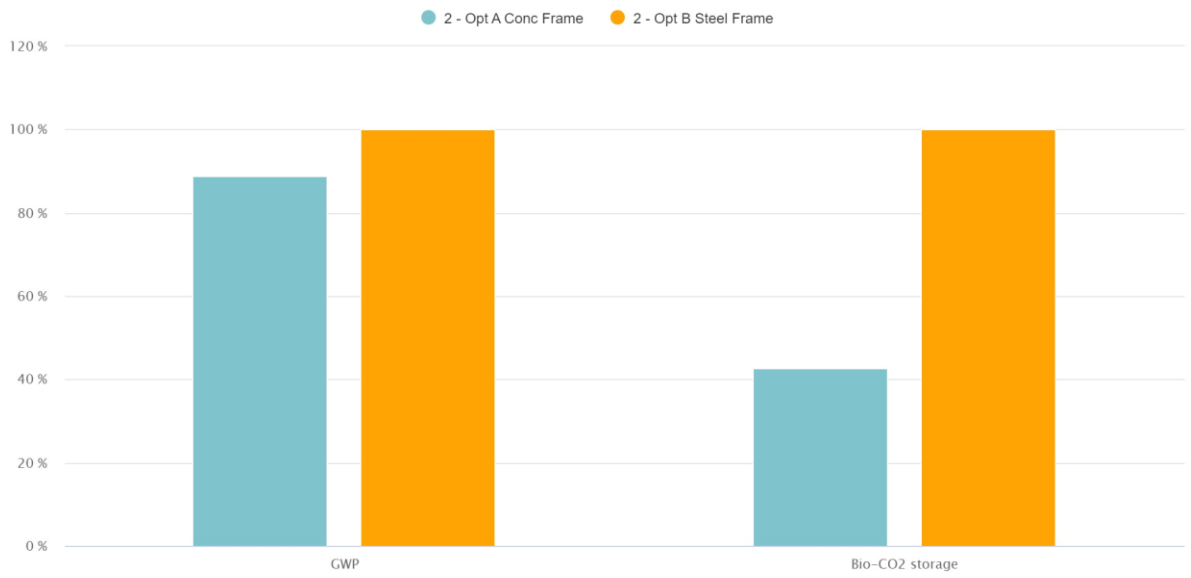


Figure 2 All impact categories

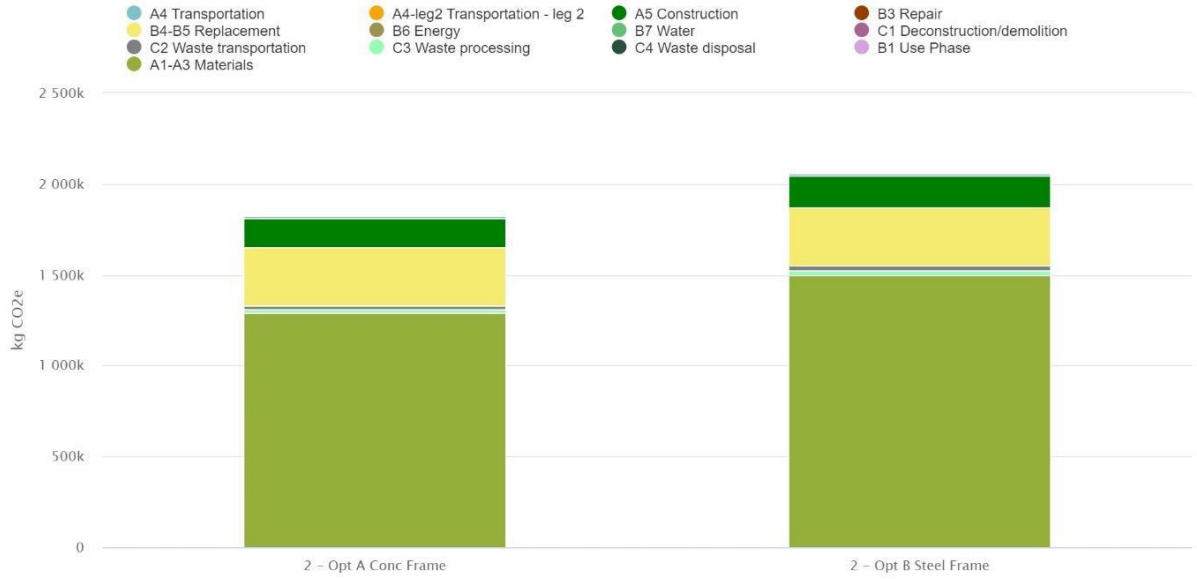


Figure 3 Life cycle stages

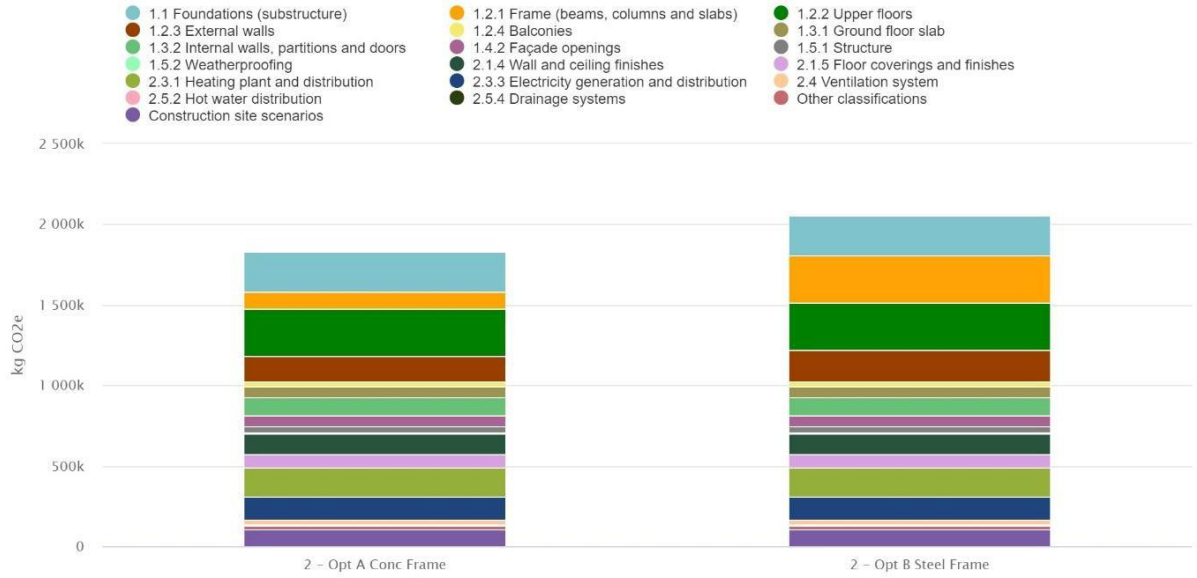


Figure 4 Elements

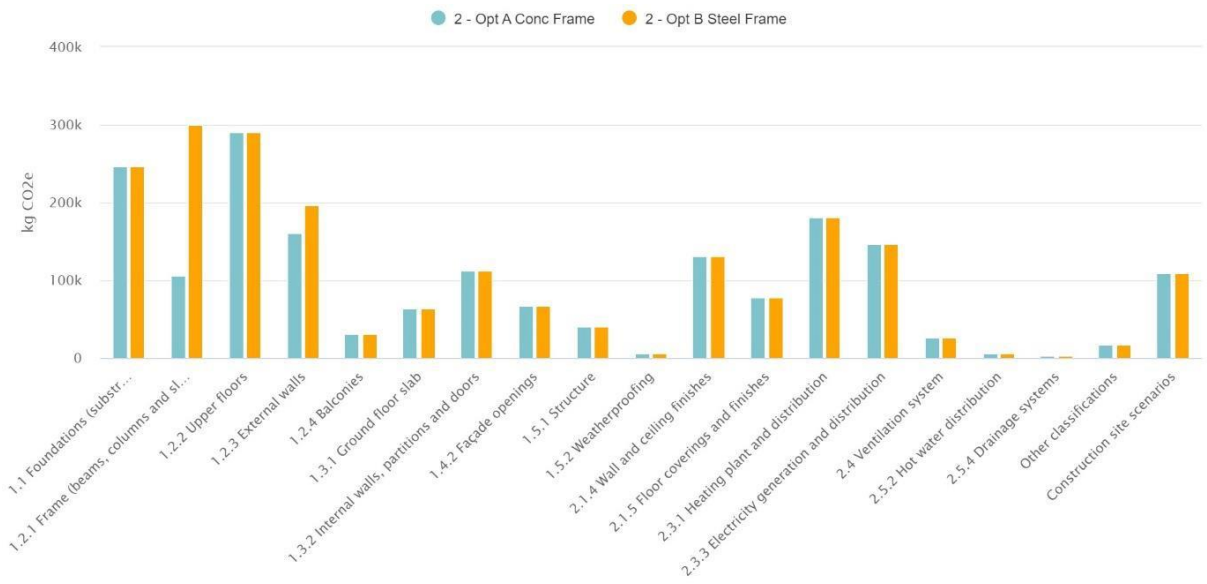


Figure 5 Compare Elements

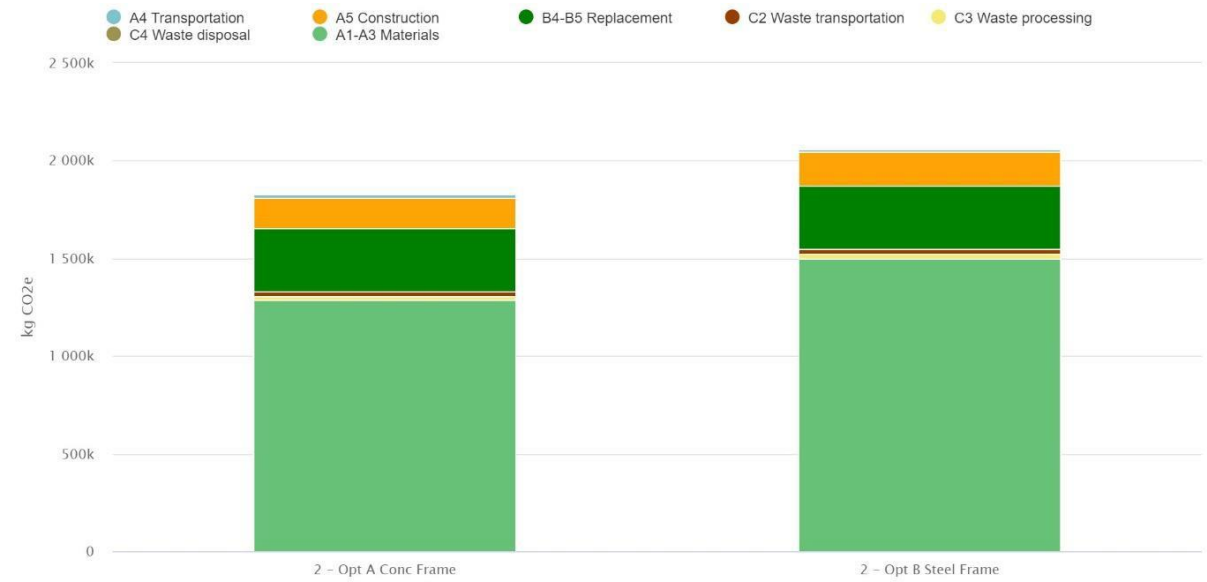


Figure 6 Elements and Life Cycle Stages

Feedback from O Briain Beary Architects: O Briain Beary Architects stated that they couldn't always get the build-ups/materials they wanted and so, for example, ended up choosing concrete sandwich panel, as there didn't seem to be an option for pre-cast concrete panels. For the steel option, although they wanted to put in steel balconies, there was no option for this, so they used concrete balconies instead etc.

7. Case Study 6

7.1. Describe

Building type: Educational Research Unit.

The FOCAS Research Building is the first phase on a proposed research-oriented hub to be constructed adjacent to the existing Central Quad and Greenway Hub Research Buildings on the Grangegorman campus for TU Dublin. The new building will replace the existing FOCAS Research Building located on Camden Row which following construction of the new facility will be disposed of.

The ground floor of the new building is configured as a generous foyer serving the meeting rooms and seminar room. It is a generous space with room to sit and casual workstations overlooking the arcade. A covered service corridor is accessed by a gate to the rear. This would be relocated to the rear of the site when phase 3 is constructed. The typical upper floor plan is organised to support the functionality required for a flexible and economical structure, with a clear and legible configuration of served and service spaces and generous circulation. The laboratories are arranged around the perimeter with workspaces located on either side. A spine of service risers supports the laboratories and creates space for informal break-out areas. Tea stations and toilets are centrally located at the connection point to the Greenway. A 'penthouse' on the roof will accommodate workspaces with panoramic views and a roof terrace accessible to all of the FOCAS community. Mechanical ventilation is minimised through the use of a natural stack ventilation effect through non-laboratory spaces.

A link to the existing adjacent Greenway Hub building is proposed at upper levels to facilitate and encourage collaboration between the research-oriented activities being undertaken in these buildings.

Building location: Grangegorman, Dublin

Gross Floor Area (m^2): 4,065

Team name: Duke McCaffrey

Overview: Design options and their carbon impact were explored using the carbon designer tool;

- New CLT Mass Timber Frame
- New Steel/PC Slab Composite Frame
- New Concrete Frame (Baseline option)

Results:

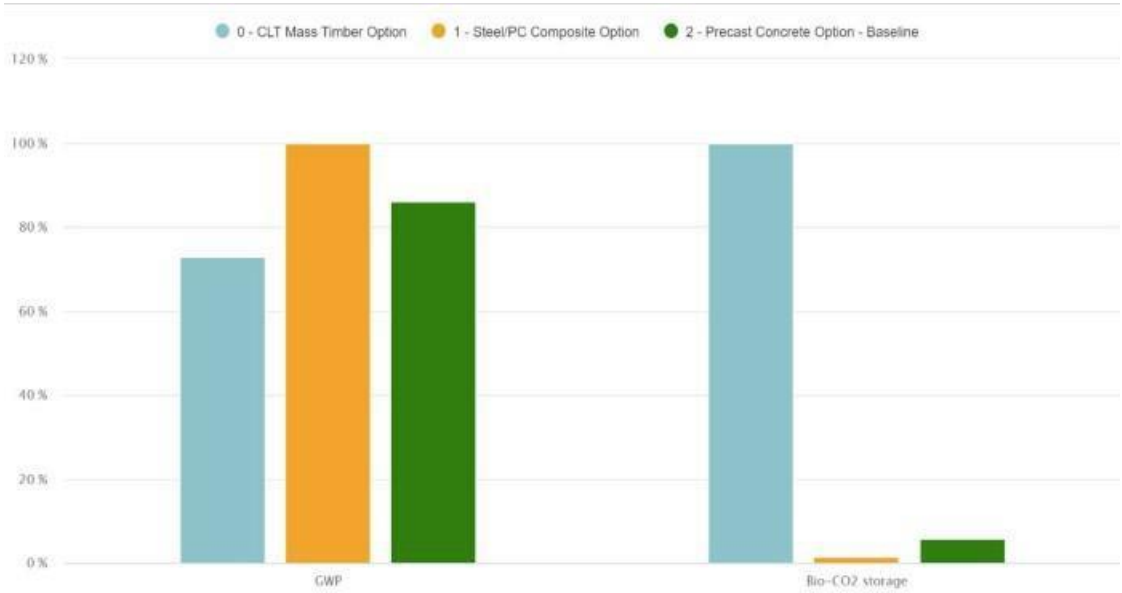


Figure 7 All impact areas

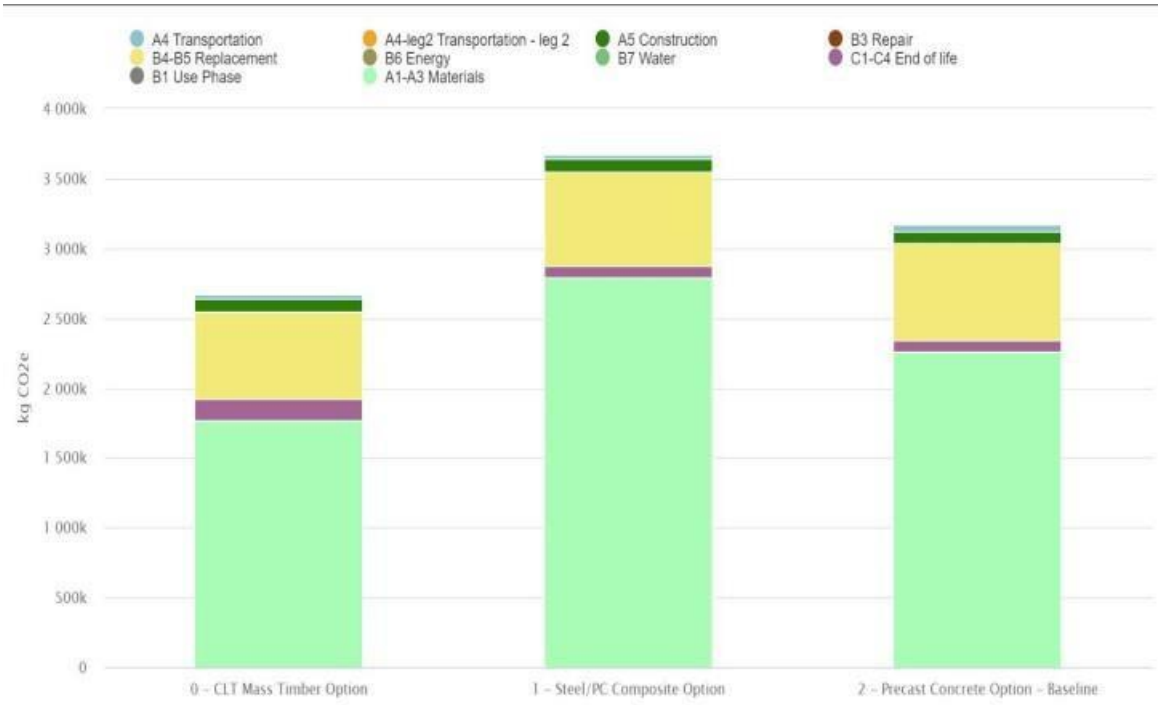


Figure 8 Life Cycle Stages

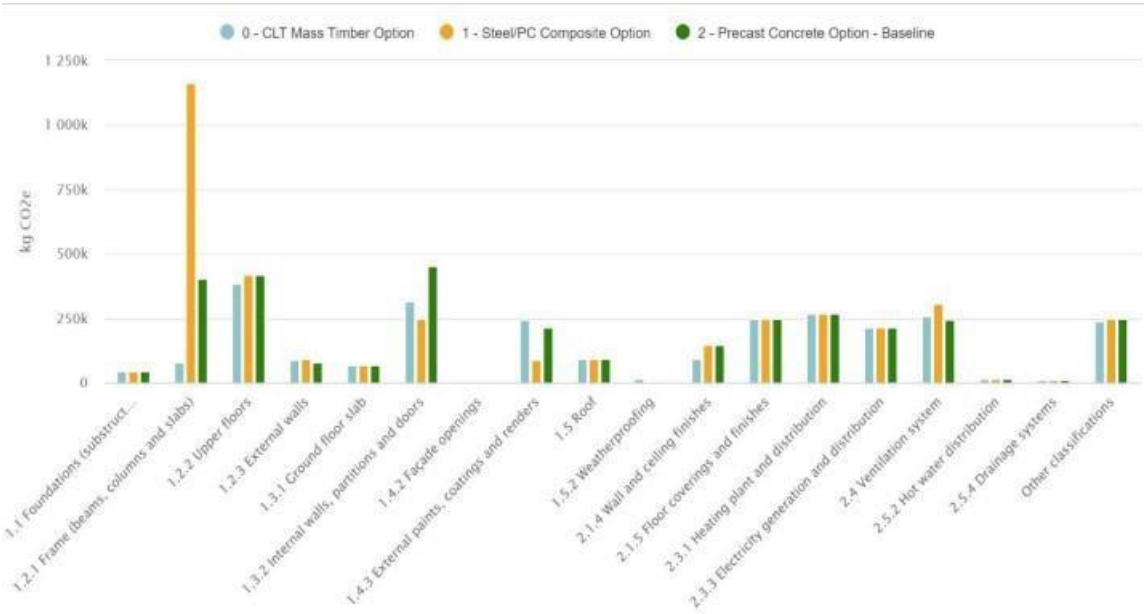


Figure 9 Compare Elements

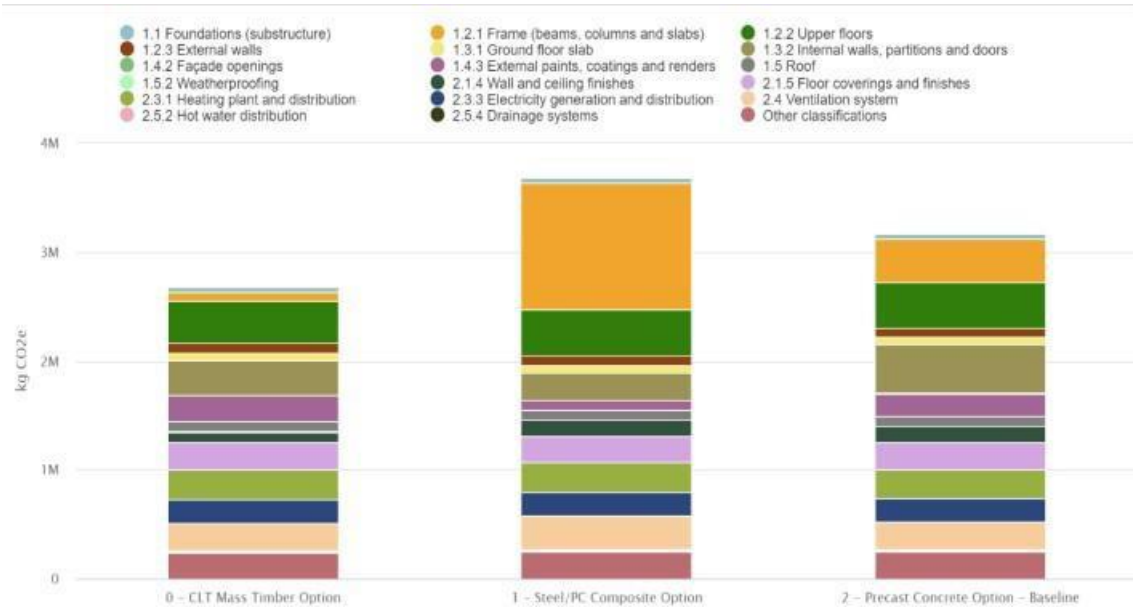


Figure 10 All impact categories

Overview of results (Design Option: CLT)

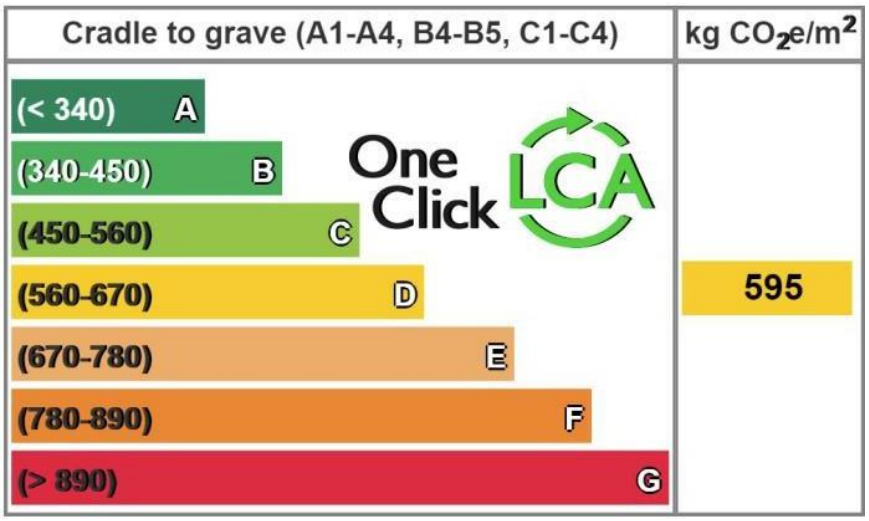


Figure 11 Embodied Carbon Measure

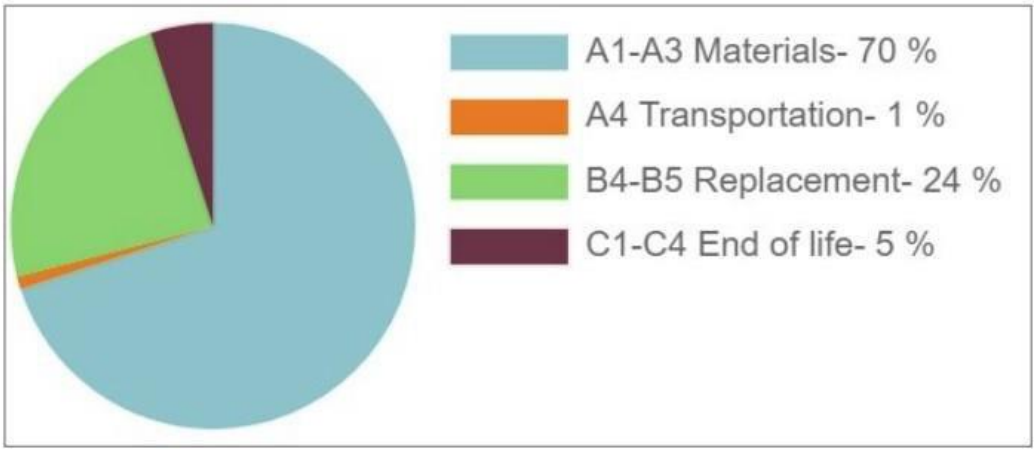


Figure 12 Embodied Carbon by Lifecycle

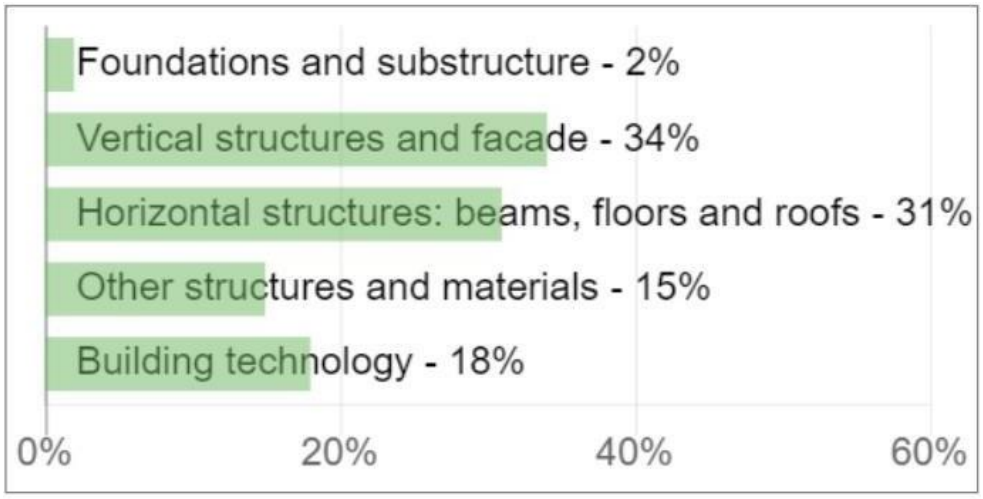


Figure 13 Embodied Carbon by Structure - Life Cycle Stages A1-A3

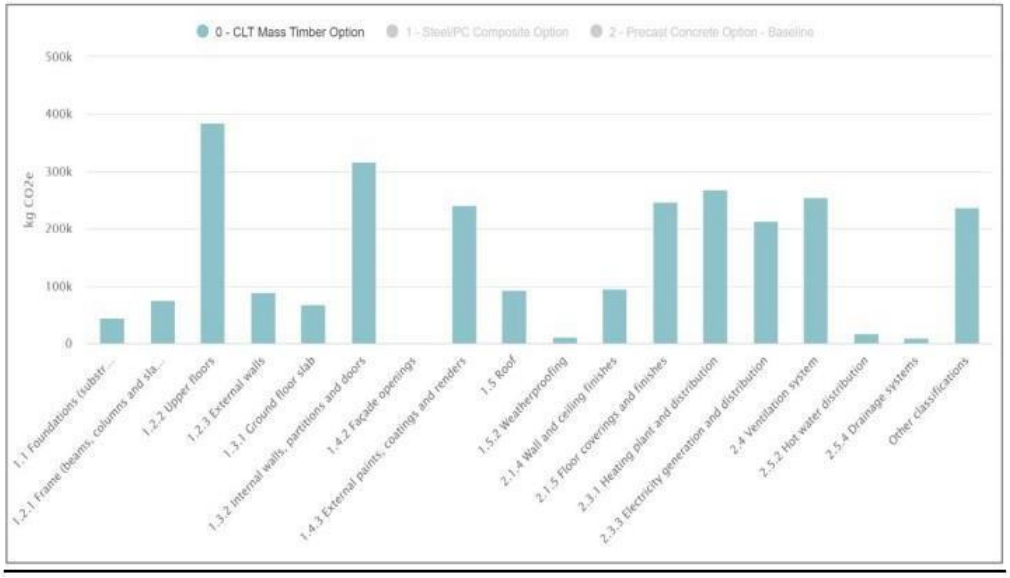


Figure 14 Embodied Carbon- Elemental Comparison

Overview of results (Design Option: Steel/ PC Slab Composite Frame)

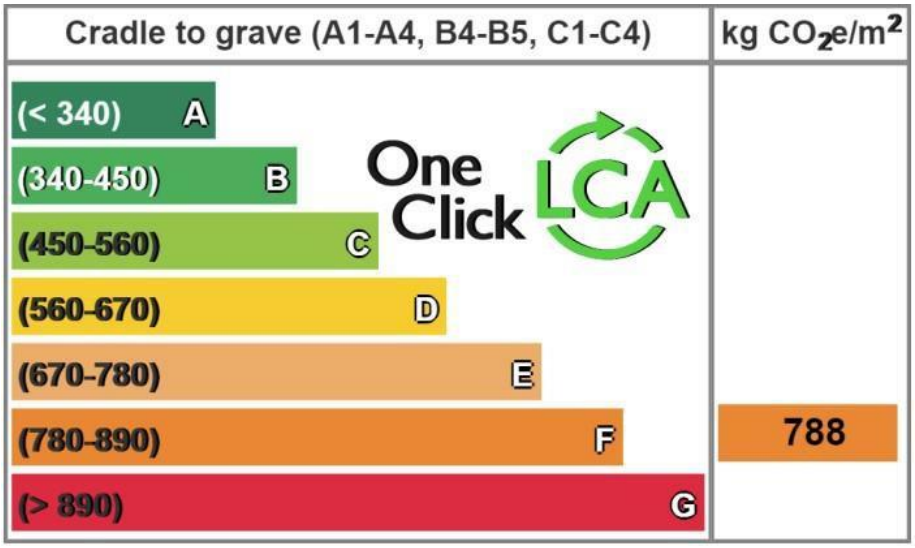


Figure 15 Embodied Carbon Measure

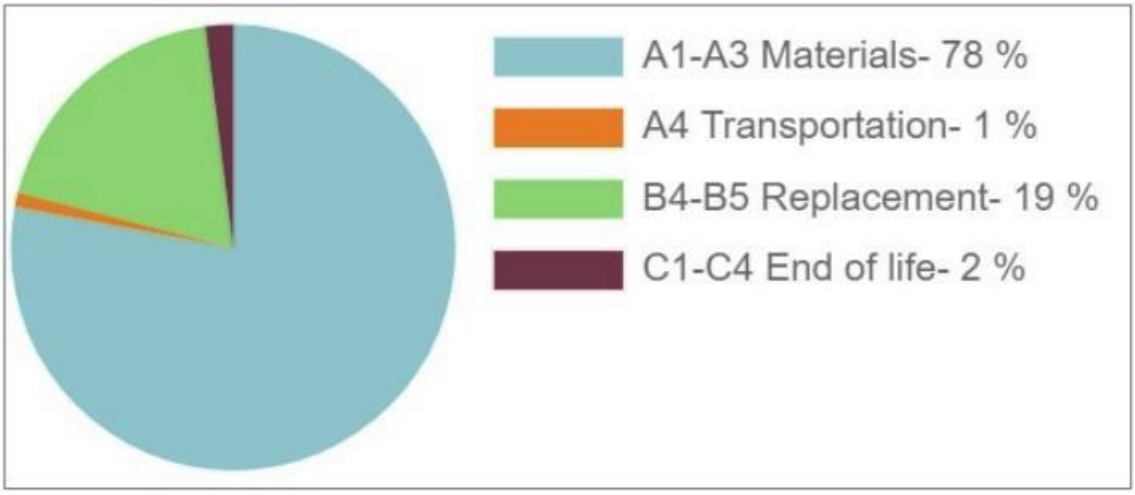


Figure 16 Embodied Carbon by Lifecycle

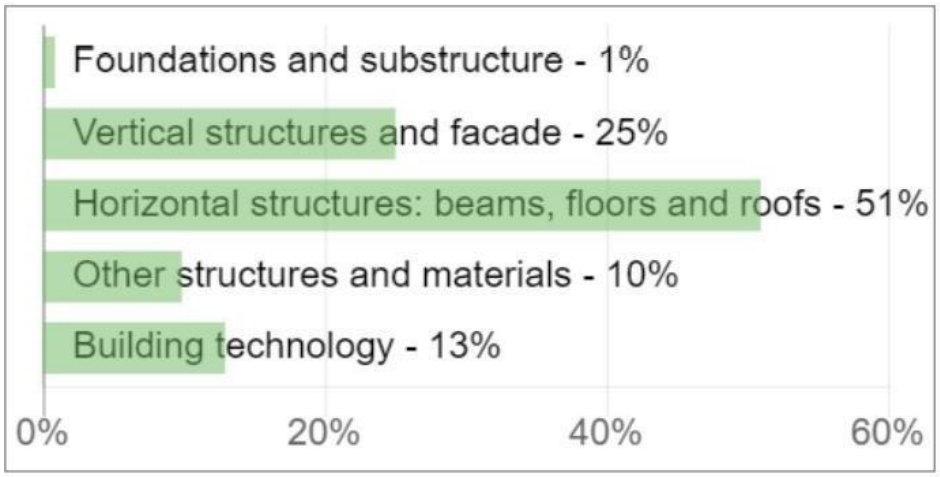


Figure 17 Embodied Carbon by Structure - Life Cycle Stage A1-A3

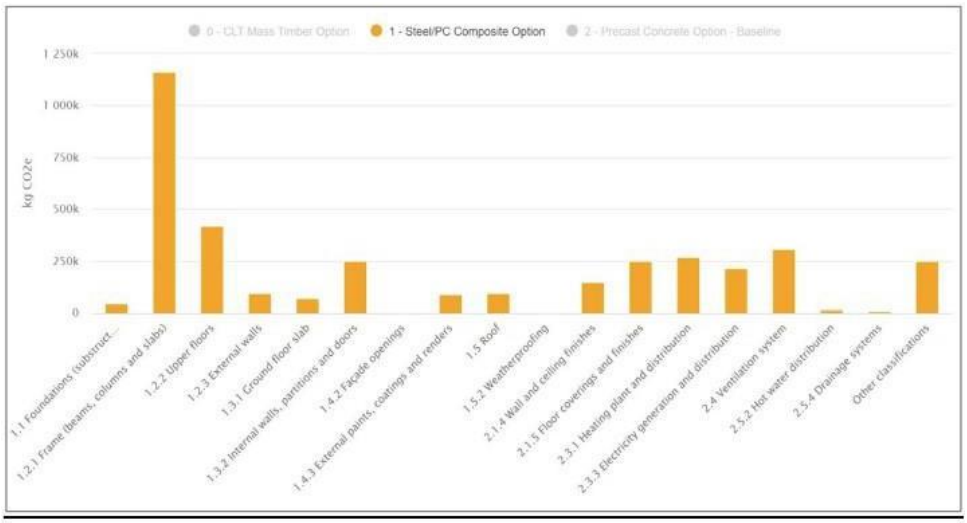


Figure 18 Embodied Carbon Elemental Comparison

Overview of results (Design Option: Concrete Frame (Baseline option**)**

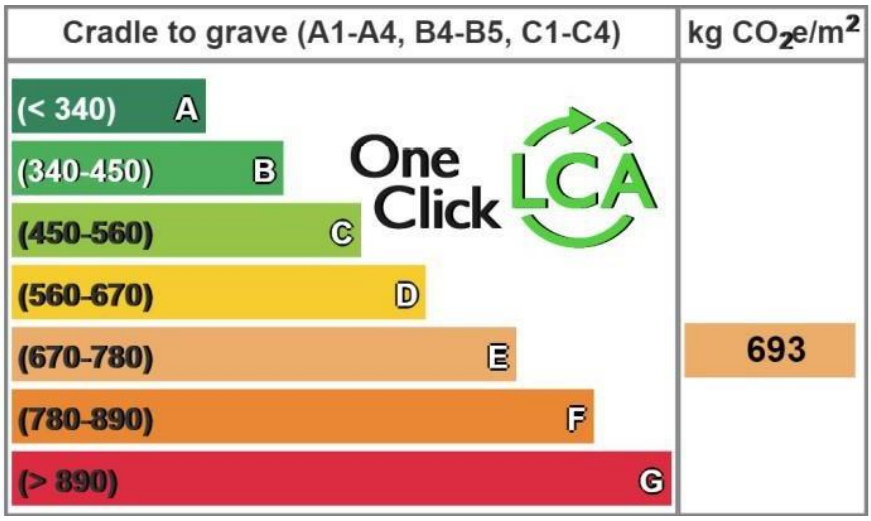


Figure 19 Embodied Carbon Measure

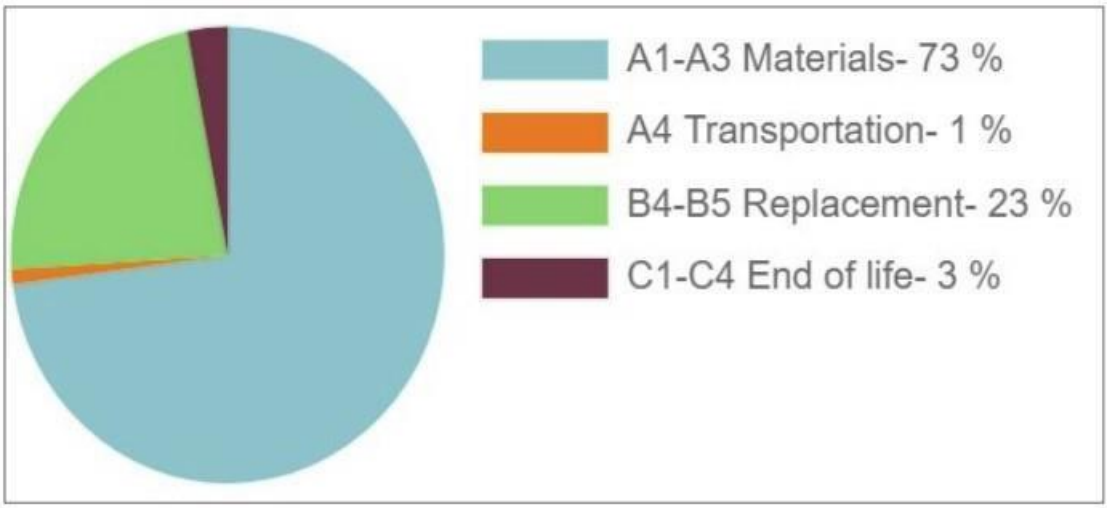


Figure 20 Embodied Carbon by Lifecycle

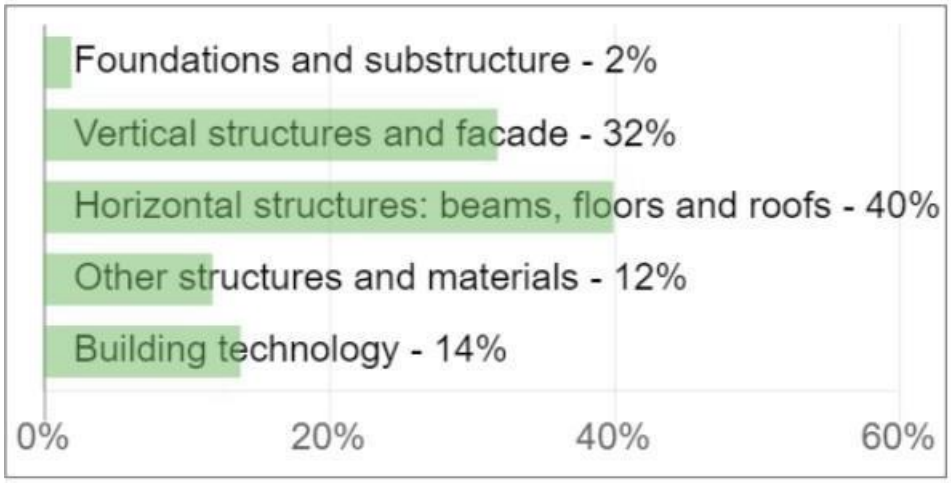


Figure 21 Embodied Carbon by Structure - Lifecycle stages A1-A3

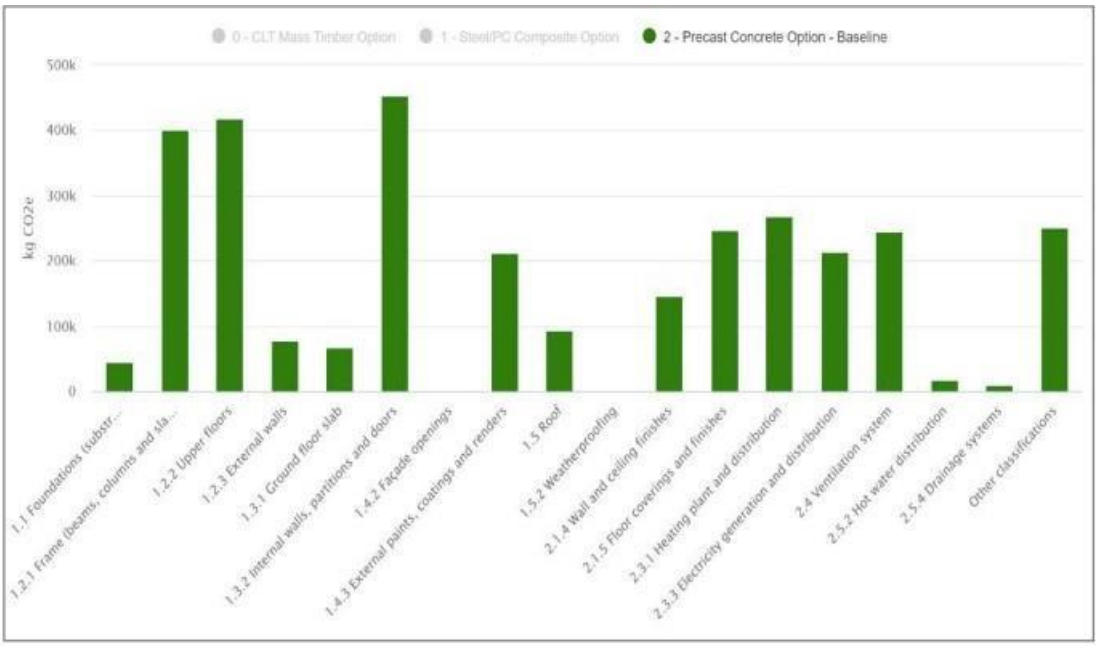


Figure 22 Embodied Carbon Elemental Comparison

Feedback from Duke McCaffrey: 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.

The tool itself was quite intuitive albeit the selection and types of materials available in the drop down menus for example was limited and some manipulation of data was required to ensure that the outcomes reflected the actual volumes of materials required in the Focas RI project – for example, the cross sectional dimensions of some of the CLT members did not reflect the actual cross sections sizes required on the Focas RI project so the quantities were adjusted/manipulated to ensure that the overall volume of materials included in the calculations were aligned with the actual volumes required to ensure comparison of the options on a like for like basis was achieved.

The delineation between some elements was unclear particularly in respect of the external wall's elements such as solid walls, glazing, windows, doors, etc.

IRISH GREEN BUILDING COUNCIL

Circularity Tools

WP2 Research and Testing Rachel Loughrey

CIRCULARLife

epa GreenEnterprise

Contents

Project Summary

About the CIRCULARlife Project:

To date the discussion in Ireland on circularity in buildings has focused on downcycling of materials, waste audits already within existing buildings and finding uses for waste, such as reuse of aggregates and other recycled materials. A different approach is needed in order to design out the need for downcycling at the earliest stage of the project and to radically reduce overall resource consumption and embodied carbon.

IGBC intends to trial circularity tools with designers to help drive greater uptake and to identify the most useful approaches. The application of tools and indicators is a good way of identifying gaps and where the infrastructure is lacking in building a truly circular economy for construction as it immediately identifies what is difficult to apply in the Irish context and why.

As part of the project IGBC will also create learning materials, deliver webinars, and carry out training workshops with members and others in the sector to assist designers and developers to incorporate circularity into their projects. This project is funded by EPA Green Enterprise.

Acknowledgements

This project is funded by the Environmental Protection Agency of Ireland's Green Enterprise Programme. The Carbon Designer Tool for Ireland is co-funded by the Land Development Agency (LDA).

1. Introduction

This report highlights six tools.

2. Tool 1 – Regenerate

Access: [Regenerate - Urban Flows Observatory]

Description:

The Regenerate tool is a free building circularity engagement and assessment tool. It was created by the University of Sheffield with advice from David Chesire of AECOM. The purpose of the tool is to implement the circular economy within the built environment. The tool is not about obtaining design information. The tool asks questions such as have you thought about this or taken this action, and you answer yes or no or to be determined. It is very important to repeatedly revisit the tool as design changes are made throughout the project. The tool can be used to compare design iterations to see which is the more circular design choice.

The tool was developed as the Greater London Authority now requires a Circular Economy Statement to be submitted for planning for all significant developments in London. This was implemented as the GLA has recognised that half the waste material in London arises from the built environment.

There are 86 Circularity Criteria across 4 key Circularity Principles in the Regenerate Tool.

- Design for Adaptability (24)
- Design for Deconstruction (19)
- Circular Material Selection (26)
- Resource Efficiency (17)

The tool is a self-certification tool with supporting statements/evidence.

Review: The IGBC found the Regenerate tool very useful for introducing circularity at an early design stage. It is a good tool to encourage collaboration and the PDF function enables circularity discussion to occur at design team meetings. This would be the tool the IGBC would recommend to its members.

Cost: Free

3. Tool 2 – Loopfront

Access: Loopfront - Recycling and reuse made easy

Description: Loopfront is a material reuse platform, based in Norway and currently operating in Sweden and France. Loopfront creates an easy to access way for people to reuse and recycle materials. It takes materials that would be going to waste and gives them visibility and a traceable digital identity. This allows these materials, which might have gone directly to landfill, to find a second life in an efficient and economical manner. A big part of Loopfront is data reporting, which allows users to see not only the financial benefits of their efforts, but also the environmental data that can assist in gaining access to green financing and project certifications.

Review: IGBC would recommend Loopfront as it makes reusing materials very easy. It produces detail reports on CO2 savings and data on construction waste. It would work well in the Irish industry.

Cost: price starting at 95 euro per month

4. Tool 3 – Circular Buildings Toolkit

Description: Developed by ARUP and the Ellen MacArthur Foundation, this toolkit brings together strategies, case studies and tools for designing more circular buildings, meaning reduced waste and carbon for a healthier planet and healthier people.

In the Circular Building Toolkit, the principles of the circular economy have been translated into a prioritised set of strategies and actions relevant for real estate projects. It has been designed aligned with international policies. The framework is based on relevant international best practices and policies such as: EU Taxonomy and EU Level(s).

The strategies are also aligned with circular economy recommendations from the World Green Building Council as well as National Green Building Councils. The toolkit focuses on creating a circular toolkit for your project focusing on topics such as build nothing, build for long term value, design for longevity, design for adaptability, design for disassembly, refuse unnecessary components, increase material efficiency, reduce the use of virgin materials, reduce the use of carbon intensive materials and design out hazardous/polluting materials.

Review: The IGBC would recommend the Circular Buildings Toolkit as a good foundational tool to begin your circular journey on a project. The case study page is impressive and is a useful resource even if one chooses not to opt for this circular tool.

Cost: Free

5. Tool 4 – SMARTWaste

Access: SmartWaste : Login

Description: SMARTWaste is a flexible, online-reporting platform for all company types across all sectors that can help manage and reduce waste outputs, impacts and costs. It is intended for clients, contractors, owners, operators and occupiers.

It can be used to prepare, implement and monitor site waste management plans (SWMPs). SWMPs describe how materials will be managed efficiently and disposed of legally during construction, explaining how the re-use and recycling of materials will be maximised. This involves estimating how much of each type of waste is likely to be produced and the proportion of this that will be re-used or recycled on site, or removed from the site for re-use, recycling, recovery or disposal.

SMARTWaste can help:

- Save time tracking and reporting against company sustainability targets.
- Compare regional and project performance.
- Give access to all project information in one place.
- Reduce waste, energy and water costs.
- Set and monitor targets to reduce site based impacts.
- Obtain BREEAM and Code for Sustainable Homes credits.

'SMARTWaste Commercial' allows organisations to monitor and manage waste streams across a portfolio of buildings.

Tailor-made international versions of SMARTWaste can be developed to suit the requirements of individual countries, taking into account legal requirements, best practice and local conditions.

Cost: price starting at 1,200 euro per year

Review: The IGBC would recommend the use of the SMARTWaste tool. This tool enables organisations to capture data for their environmental Key Performance Indicators for waste, water, energy, timer (FSC compliance), especially for smaller projects without a dedicated sustainability resource.

SMARTWaste is the leading environmental social and governance (ESG) platform for the built environment. In Ireland, it is currently used by organisations such as Sisk.

6. Tool 5 – Circular Economy and Building Circularity Tool from One Click LCA

Access: [Building Circularity - Circular Economy Tool by One Click LCA]

Description: With One Click LCA Building Circularity, you can track, quantify and optimise the circularity of materials sourced and used, as well as the end-of-life circularity, design for disassembly and adaptability.

The tool aids the incorporation of the following principles of circular economy into your building designs: material sources, design out waste and measure circularity.

With this tool you can also quantify and compare the impacts of your different design choices with the building circularity scores.

This tool is a plug-in of One Click LCA.

Review: The IGBC would recommend the Circular Economy and Building Circularity Tool from One Click LCA for people who correctly are using One Click LCA. However, it is the least accessible in relation to its price and would only suit large organisations.

Cost*:* price starting at 3,490 euro per year

7. Tool 6 – Construction Waste Portal

Access: Home | Construction Waste Portal

Description: ConstructionWastePortal.com is a powerful tool and time-saving marketplace to help you predict, manage, reduce and prevent waste on your project. The portal analyses data from projects across the UK, enabling accurate forecasting, costing and reporting of waste tonnages based on site criteria. The marketplace feature showcases local waste management companies in terms of service and costs.

Accurate waste forecasting, efficient procurement and driving best practice within your supply chain lets you make smart decisions that protect your profit and the planet.

Review: The IGBC would recommend the Construction Waste Portal as an accessible tool to be used for contractors in the construction industry. It is easy to use and is affordable. It is a tool that is currently only used in the UK but the owner is interested in branching out to Ireland.

Cost: price starting at 1,200 euro per year

8. Conclusions & Recommendations

From testing out these six circular tools, the IGBC would recommend using the Regenerate tool starting at early design stage. The Construction Waste Portal is a good tool to use for site waste management. It is more financially accessible than SMARTWaste.

IRISH GREEN BUILDING COUNCIL

Tender Evaluation

WP3 Task T3.1

Pat Barry, Stephen Barrett, Rosemarie Mac Sweeney

19/02/2021

CIRCULARLife

GreenEnterprise epa

Contents

1. Summary

The Irish Green Building Council is seeking to mainstream whole life carbon assessment of buildings over the next two years, within professional practice, the planning permit system, policy and procurement through three projects, BuildingLife, LifeLevel(s) and CIRCULARlife. A major barrier is a lack of basic carbon literacy amongst professionals, policy makers and planners as to the relative impact of carbon at different life stages and what factors in the building design influence this impact. Commercial Building level LCA Tools that require full calculation using material bill of quantities are already being used in Ireland by a limited number of sustainability professionals to carry out detailed carbon assessment of buildings, but only on larger projects. The calculations are often carried out too late in the design process to have any real impact on reducing carbon, usually to achieve credits in BREEAM or LEED. Those who most influence the design at early design stage include the client, the architect and the structural engineer. They must be able to carry out quick assessments and understand the key hotspots in the design, related to early decisions. Procurers and policy makers must be able to set basic benchmarks based on brief and site-specific criteria. The intent is to remove any excuse that basic carbon counting is difficult, time consuming or expensive and make it possible to require some level of assessment in every project, no matter how small, and then build the appetite for more detailed calculation. We propose to do this by providing a simple free early building design stage tool to every construction professional working in Ireland as part of Work Package 3 of the CIRCULARlife project.

Objective of WP3: Adapt an early LCA design stage tool to develop LCA and embodied carbon literacy of impact of early concept design. It will form a key part in the education provision.

Description of work in WP3: The cost of this tool will be co-funded by IGBC members. This work package will adapt an existing cloud-based tool for free use for Irish design professionals on smaller projects. This will be adapted for Irish Part L 2019 to enable early targets to be set and iterations to be made based on simple inputs such as floor plate areas, wall areas, roof areas, foundations, and structure type. This works on the 80:20 principle of minimum inputs to give the most useful impacts allowing results to be developed for simple massing diagrams:

- Tender for tool to minimum 3 software providers.
- IGBC will liaise with software developer and provide the key parameters required to adapt for Ireland.
- Test the tool with a limited number of users.
- Software provider to provide train the trainer training to IGBC to build confidence in the use of the tools amongst professionals.

Acknowledgements

This project is funded by the Environmental Protection Agency of Ireland's Green Enterprise Programme. The proposal stated that IGBC would find a partner to co-fund 50% of the cost of developing the Carbon LCA tool. The Land Development Agency have confirmed that they would like to co-fund if this could be reflected in the co-branding of the tool alongside Green Enterprise. We believe that the active support of the LDA (as potentially the largest influencer of home construction) for the tool will be a major benefit to uptake as part of their strategy is improving the level of education and awareness amongst design teams on embodied carbon and LCA, so working in collaboration with them will accelerate uptake.

2. Tender process

The tenderers were asked the following:

1. Confirm whether interested in providing a tender by 3rd of February.
2. The tenderer should submit a proposal outlining covering the criteria outlined below by 10th February.
3. Based on submissions and set against the criteria outlined below IGBC may shortlist, ask for a demonstration or further detail and negotiate a final offer.

The proposal should

- Set out how it complies with the intent of the brief,
- demonstrate value for money,
- propose a clear methodology for the adaptation setting out what work will be required, and what support is needed from IGBC.

3. Evaluation Criteria

The evaluation criteria are as follows:

- Price

The cost of creating or adapting a tool and maintaining for 3 years for free use in Ireland. The price should state whether inclusive or exclusive of VAT.

- Timeline

How quickly can the tool be adapted and offered to the Irish market? The tenderer should state number of months to create or adapt. This should be backed up with proposed methodology to do this.

- User experience

How easy is it to use by professionals, particularly less technical professionals such as design architects and how quickly they can carry out a basic assessment with little training. IGBC will be offering extensive training in the tool and the tenderer is expected to offer 'train the trainer' to IGBC if needed on all the functionalities. How clear is the interface? How easy is it to download a basic report on the optimization measures? What are the visualization options for analysis and optimization? A demonstration of the tool should be given to the tender adjudication panel. How easily can IGBC create new element buildups?

- Technical quality

Compliance with EN 15978, EU framework - Level(s) etc. How relevant or adaptable to Ireland is the tool? How easy is it to update with Irish relevant elemental build ups and Irish specific data? How technically accurate are the results compared with a full calculation?

- Maintenance

The cost of annual maintenance and technical proposal for maintenance for further two years after 3 year period. What is included in the maintenance, e.g. additional element updates? Include a separate hourly or day rate for further customization of the tool.

- Additionality

What additional functionality, benefits can the tenderer bring to the proposal? This could include calculations for refurbishment.

- Precedence

Is the proposed tool already in use? Can the tenderer provide references from users as to usability and impact on design in practice? Can demonstrate the value of the tool in another market?

Tender Invites

The following companies were invited to tender:

1. CTSB (http://www.cstb.fr/en/)

Headquarters: 84 avenue Jean Jaurès, Champs-sur-Marne, 77447 Marne-la-Vallée Cedex 2, +33 (0)1 64 68 82 82, Email: nibel@ctsb.fr

2. Etool Global (https://etoolglobal.com/)

UK Office: Brighton Junction, 1A Isetta Square, 35 New England Street, Brighton, BN1 4GQ, +44 0131 618 9858, Email: adrian.giles@etoolglobal.com

3. Bionova Ltd (https://www.oneclicklca.com/about-bionova-ltd/)

FINLAND Office: Suvilahdenkatu 10 B, 00500 HELSINKI, +358 40 549 4710

UK Office : The Oast The EMR Centre, New Road, East Malling, Kent ME19 6BJ, +44 7464 350081, Email: panu.pasanen@bionova.fi

4. Aecom (https://aecom.com/contact-us/)

Global HQ: 300 South Grand, Suite 900, Los Angeles, CA 90071, United States, +1 (213) 593-8100, Email: ian.davies@aecom.com

5. Athena SMI (http://www.athenasmi.org/contact-us/)

Head Office, 280 Albert Street, Suite 404, Ottawa, Ontario, Canada K1P 5G8, T: 613 729 9996, Email: info@athenasmi.org

Aecom and Athena declined to respond with a tender proposal.

Tenderer 1: CSTB

Table 1: CSTB Scoring

Criteria	Submitted	Score
Price	Unable to meet the budget criteria – see e-mail to Pat Barry from Sylviane Nibel, 12/2/2021	0/40
Timeline	N/A	0/10
Usability	N/A	0/15
Technical Quality	N/A	0/15
Maintenance	N/A	0/10
Additionality	N/A	0/5
Precedent	N/A	0/5
Total Score		0/100

Tenderer 2: etool Global, Rapid LCA

Table 2: etool Scoring

Criteria	Submitted	Score
Price	Proposed cost for 3 years from launch date in 2021 including costs of annual maintenance: €30,000 Annual maintenance after 3 years: €5,122.00 per year Hourly rate for further customisation of the tool: €97	35/40
Timeline	Timeline provided as follows: **March:** Mockups of required UX changes, Mockups of required Reporting changes, Stakeholder workshops, Determine / design customised take off algorithms for apartments and offices, Determine / design customised baseline buildings **April:** Implement customised take off algorithms (develop, stage, test, release), Implement customised baseline buildings (develop, stage, test, release), **May**: Tune operational algorithms for Irish region and regulations, Link appropriate construction components from eToolLCD template library to relevant typologies / projects, Customise reports (if necessary) and points of payment for additional reporting (if necessary), Beta release **June:** Acceptance testing, Preproduction regression testing, Landing page completion, Customisation of RapidLCA support site where required, Official Production Release	5/10
Usability	RapidLCA can be accessed on any browser or downloaded as an app on IOS or Android smartphones. The home screen includes a number of featured designs for motivation, how the results were achieved, and inspiration for their own designs.	15/15

	Due to the unique nature of RapidLCA, and the intuitive interface, users are able to conduct an LCA with some simple 'Known' inputs, alleviating the need for formal training. Additional support is available with online training videos and a dedicated support portal. The app is currently being used by developers and government authorities in Australia to embed Life Cycle carbon targets and assessment into the planning and building permit application process. The interface allows users from outside the construction and sustainability sectors to accurately and quickly conduct Life Cycle Assessments in under an hour with no training. Users with construction and/or sustainability experience are able to comfortably conduct assessments within 20 minutes.	
Technical Quality	The calculations in RapidLCA conform to the following standards: ● ISO 14040 and 14044 ● EN 15978: Environmental Sustainability of Buildings Calculation method -Whole of building, whole of life LCA RapidLCA is fully compliant with the Level(s) framework for sustainable buildings, and also includes scope for MEP services	10/15
Maintenance	All RapidLCA software updates, at approximately one month intervals. eTool have a dedicated development team to manage enhancements and resolve issues quickly. RapidLCA will be continually developed over the course of the IGBCs use and users will benefit from new features and LCI Data updates at no cost to IGBC. As RapidLCA is a progressive web app, Android, Apple IOS and Web solutions are all developed in the same codebase significantly reducing lead time on introduction of new functionality, small improvements or bug fixes. Summary SLA provided	8/10
Additionality	Low Carbon Inspiration Feed Programme Wide Dashboard Apple, IOS, Android and Web Ready Shareable Project Profile Pages No training required Scope Ability to incorporate decarbonising grids for energy Standard compliant automated reporting	5/5
Precedent	To detailed case studies provided: Witchcliffe Ecovillage & City of Vincent Government Authority	1/5
Total Score		79/100

Tenderer 3: Bionova, Carbon Designer

Table 3: Bionova Scoring

Criteria	Submitted	Score
Price	Fixed cost of 25 000 EUR shall be charged for the adaptation and three years maintenance (calculated from delivery). VAT is not included in the figures, and assuming IGBC is VAT liable, would be reversed to IGBC. Otherwise prevailing rate of VAT is added to the cost. This cost includes standard maintenance including hosting the tool and planned updates for replacing expiring or outdated data and main user support for IGBC, but no additional adaptations or creating or setting up new models or libraries. This cost is to be paid in full within 30 days of the delivery and startup of the service. Annual maintenance cost after the three years period is 6500 EUR excluding VAT/year. Other work required and outside the scope of work above is charged at 150 EUR ex VAT.	37/40
Timeline	Assuming signature of contract during February 2021 and receipt of construction libraries and energy scenarios during by 15 April 2021, the solution can be released in 1,5 months. We have created nine regional Carbon Designer models so have lot of experience in this.	9/10
Usability	We suggest arranging a demonstration of the Carbon Designer either separately, or ahead of the demonstration, possibly viewing relevant portion of this recorded webinar https://www.oneclicklca.com/recorded-webinarcarbon-designer-a-new-approach-to-carbonoptimization/ Carbon Designer is very clear, and it always generates instantly visualisation. Result report can be generated very quickly once the option is defined and saved.	10/15
Technical Quality	Carbon Designer is fully adaptable to Ireland for any aspect referred to in the RFP. New elements can be created very easily. Connecting them to Carbon Designer requires Bionova to review and publish them. Carbon Designer uses the One Click LCA database which shall be updated at cost of Bionova with any Irish EPDs and qualifying other LCA data. Creating these into assemblies is done separately. Calculation results are 100 % identical with full LCA calculation, the entire calculation engine is the same as used in One Click LCA, which is by far the most used building LCA software on the Irish market.	13/15
Maintenance	See additional information to follow	5/10
Additionality	Carbon Designer can as such be used to calculate carbon saving impact of refurbishment. This is done by unselecting elements that are retained from existing building. Carbon Designer; or parts of the assemblies created for it, could also be made available for the One Click LCA Planetary for Ireland. This requires technical review for feasibility, as Planetary covers only about 10 materials	4/5

	categories and others can not be added to it. Separately of this, and as an additional option, life-cycle costing could be connected to it.	
Precedent	One Click LCA Carbon Designer was originally developed for the Norwegian government in 2018. It has been improved ever since and is currently in use in about 30 countries with nine local models and an international model. Carbon Designer is used in a similar manner in Finland where it's sponsored for the marketplace by the Finnish Construction Industry. This module has circa 1000 paying users globally, and well over 200 in the UK. We have a range of users for whom this tool is instrumental in early phase decisions.	5/5
Total Score		83/100

Reviewer Notes & Comments

Due to the close scoring of the two tenders from Bionova and etools, it was decided to revert to tenderers for further clarification on certain points, as follows:

Further questions and answers: Bionova

1) The tender refers to a report generated from carbon designer. The version we can see within OneClick is integrated into the full version, so carbon designer moves into the detail OneClick tool before generating a report. Is it possible to have a direct output from carbon designer and do you have an example of this? The output report is an important part of how it will be presented for say Planning permit reports.

Answer: yes, we can set up license so you have report generation from full One Click LCA but not the other features. Works exactly like full One Click LCA + Carbon Designer except sole way to edit any data is via Carbon Designer. So results page is exactly the same as in One Click LCA with the same tool (e.g. Level(s) or whatever).

2) It states in the tender that modules *When used together with the Level(s) tool as intended here, the Carbon Designer covers modules A1 A3, A4, B4 B5, B6, C1 C4 and module D, and optionally A5.* However it is not clear where these apart from A1-A3 and more where are reported in the output report? Does it allow us to create comparable LCAs comparing different options against a baseline, e.g. national standard, e.g. can we compare say Passive house standard + thicker insulation inputs needed for it with national baseline regulation for both operational and embodied carbon?

Answer: all modules that are part of the tool scope and Carbon Designer region configurations will be shown, including all you mentioned above, except module D which is not shown in Carbon Designer but can be shown in the reports. Yes you can compare standard vs. passive house on whole life cycle. That's a pretty standard use case for Carbon Designer.

3) Clarify - once the Irish assemblies are developed for initial launch of the tool, can additional assemblies be created without incurring additional cost? I note that we cannot create the assemblies ourselves and approve them which reduces some flexibility. Our concern is that it may take more

than 6 weeks to agree all the most appropriate assemblies for Ireland, if we are to engage with our members but don't want to delay to do so. Can we add more later as we get feedback from members on assemblies that may better reflect newer practice? Is this an additional cost? Is there a limit to the number of assemblies? And what is the additional cost for each if you need to approve them? The make up of adapted assemblies included for Ireland will be included in the price up to launch of tool? Is there a limit on specific Irish only assemblies reflecting regulations, climate and Irish practice? Anything thereafter will cost around 150 per assembly.

Answer: no, they can not be added by anyone else than by our database team, who will check them, and it's not free. We do not have per unit list prices but charge them on hours 150 EUR / h. Last set of assemblies we quoted was a bit below 1 hour per dataset I recall; but we might have a price list coming some time as this is asked quite often. For now it's hours based. There is no limit on additional assemblies. (further clarification: yes is included but within reason. Like there can not be more than a dozen external wall assemblies used in practise I think. There's a natural limit to how many different solutions actually are used in commercial practise and we would not start creating trivial variants as those can be adjusted by user. So if user wants to adjust wall thickness a bit they can do it by hand, no need to have one assembly for each possible thickness.)

4) can we create a specific domain name for the tool that is provided as a link direct from our website?

Answer: you can but only to host a marketing page, we can not run the Carbon Designer in any other domain than our own.

Further question and answer: etools

1) We are evaluating the tenders at the moment and we have one query on your tool. We understand that you are using the Ecoinvent inventory for data. Can you clarify whether this is generic only data or whether specific EPD data is also included in the tool? What data is used to generate the preloaded assemblies? If you could expand a little on the data used.

Answer:
eToolLCD the LCA engine behind RapidLCA is data agnostic. Our default database is Ecoinvent but if you want to utilise an Irish national LCI or incorporate EPDs into the data is fine. There might be a bit of misinformation in the market about the LCI data used by eToolLCD, RapidLCA and EPDs capabilities. Yes, we do utilise EcoInvent as our core LCI Source but we have other LCI Sources in the platform as well. What we don't allow users to do is to mix data sources in the same project for the simple reason that it leads to poor design decisions. A good example I heard of recently was a consultant modelling in a competing tool, they swapped out portland cement concrete for a fly-ash blend and the impacts of the project increased. The root cause was users of this tool could choose concrete from all sorts of different LCI sources and EPDs and the two concrete data sets chosen that should have been comparable were not due to geographical, methodological and scope differences. Fortunately in this case everybody knows that fly-ash is less intensive than portland cement so the recommendation to use portland cement in place of fly-ash didn't fly (no pun intended) but it did make the consultant ponder what other net negative design decisions they may have inadvertently been recommending.

Regarding EPDs, we have always been excited about EPDs and shortly after EN15804 was released we provisioned eToolLCD to enable the use of EPDs in whole building LCAs. Our services team who deliver LCA consulting were encouraged to use this functionality at every opportunity to try to reduce carbon with better product selection. eTool quickly identified some risks associated with EPD Data Quality. Some examples below:

- Incomplete Environmental Indicator Scope: It's quite rare that an EPD has all required indicators and all required modules to conduct a like for like, life cycle comparison with a generic or competing product. Fortunately Global Warming Potential is always reported in at least A1-A3 modules. Although it may be unusual for the maintenance, end of life or module D impacts to significantly drive a result there are certainly instances where they do. Thankfully the latest version of EN15804:2019 also ensures a more consistent approach to reporting other life cycle modules beyond A1-3.
- Incomplete Life Cycle Module Scope: Similarly it's quite rare that an EPD has all required life cycle modules to conduct a like for like, life cycle comparison with a generic or competing product. Although it may be unusual for the maintenance, end of life or module D impacts to significantly drive a result there are certainly instances where they do. Thankfully the latest version of EN 15804:2019 also ensures a more consistent approach to reporting other life cycle modules beyond A1-3 but as yet very few EPD have been published to this standard.
- Significant methodological differences between program operators (even for EN15978 compliant EPDs). Thankfully the ECO EPD Platform is working well to address these, and the latest version of EN15804:2019 also tightens things up significantly.
- Poorly executed underlying LCA studies. We've seen multiple instances where EPDs have had to be updated post registration due to data quality issues being identified in the market and continue to identify erroneous results. Although there's no panacea for this issue the transparency of EPDs is quite self-healing as it leads to scrutiny and consequently improvement.

Coupled with the above we also noticed there were generally easier wins for reducing carbon at the whole building level. For the above reasons we haven't been as aggressive in marketing our EPD functionality compared to other LCA tools. The functionality is certainly there and we have eToolLCD users who regularly utilise it. We are delighted that EN 15978:2019 addresses many of the data quality risks and we will soon be improving the EPD functionality further in eToolLCD and RapidLCA. The way this will work in RapidLCA is through 'product suggestions' when the app finds a matching EPD for a generic product. To facilitate a wide selection of products we will likely be loading EPDs automatically into our libraries from the InData platform.

The goal of RapidLCA is to dramatically decarbonise buildings by putting Life Cycle Assessment into the hands of the masses including people who may know nothing about life cycle assessment or sustainable products. It wouldn't be wise for eTool to expect these users to scrutinise and work-around poor quality or incomparable data sets so we're keeping a pretty tight lid on the data quality/comparability available in the tool.

While the OneClick LCA initial price is lower at €25,000 compared to etools quote of €30,000, it should be noted that their annual maintenance cost (€6500 Vs €5122) is higher, as is their customisation rate (€150 Vs 97). Within six years of rollout the prices become roughly equal, after that, OneClick becomes the more expensive option. The timeline for OneClick is only 1.5 months, while etools is 4 months. OneClick also has significantly more experience (precedent) than etools. Both are compliant with EN1598 and both incorporate Level(s). Etools provides little mention on how the tool will be adapted for Irish use, however, OneClick makes several mentions of this, and how it already has been used in

30 countries with 9 local models. The etool application appears to only have three types of building, while OneClick claim to have 13 building types. On the other hand, etool has very nice, user friendly looking reports that would encourage take up. The user interface contains inspirational motivational imagery, slick graphic design, and clean legible pages, with the options to use it on multiple devices, from phones to PC.

Conclusion

Based on the scoring of the tender criteria, and the additional information provided, it has been decided to proceed with the tender from Bionova.

Appendix

(attach tender documents here)

1. Tender Package
2. Correspondence with CSTB
3. Etool Tender
4. OneClick LCA Tender
5. Signed sub-contract with the winning Tenderer

Upcoming events and education: b.ttp5://wlwi.1g

NIBEL Sylviane Feb 12, 2021, 7:08 PM (3 days ago)

to Pat, BERTRAND, VESSON, stephen

Dear Pat Barry,

Thank you very much for your quick and very clear answer. Your explanations clarified important aspects and we have thought more deeply on our proposal.

Even if we assume a budget of 30 k€, and considering that we don't start from scratch, it appears that the budget is to low compared to the amount of work needed to adapt a 'solution Bn LCA tool to the Irish context and product/materialdata, develop an adequate user interface and ensure a 3-year maintenance.

So, we are sorry to tell you that we can't make a proposal meeting your tender specifications within this budget.

Kind regards,

Sylviane Nibel, Lionel Bertrand and Marine Vesson

Energy and Environment department

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Carbon LCA tool for Ireland

Tender Response

RapidLCA

February 2021

Table of contents

eTool Company Overview

eTool's primary aim is to improve the environmental performance of the built form. We achieve this outcome through our core *Life Cycle Design* services. eToolLCD software has been developed for this purpose and provides the ultimate in cost and environmental performance analysis of the built form. Aligned with international standards, eToolLCD is a robust, repeatable, accurate and intuitive solution. Analysing the building's entire environmental footprint from the construction materials and equipment to the operational energy, water use, maintenance and end of life, environmental 'hot spots' are quickly identified. Design options can then be compared to improve the building before a final design is locked in and certified.

Further to the core Life Cycle Design Services, eTool also has substantial experience in LCC (Life Cycle Costing) renewable energy system design, energy management, project management and sustainable construction.

Why work with us?

Credibility

We know what we are doing, and we've done lots of it. We've conducted more LCAs for Rating Schemes and Regulatory Frameworks than any other business and have completed over 450 LCAs of buildings. We have a proven track record and we developed rigorous software that is compliant to EN 15978.

Expertise

We have completed over 450 whole of building Life Cycle Assessments (LCA) ranging from commercial, multi residential, residential and infrastructure projects. We are passionate about the built form and that is our focus. See some of our projects: etoolglobal.com/projects

Design Capability

The core reason for eTool's existence. We will help to improve the design to ensure a high performance outcome. We aim to encourage high performance outcomes in all aspects of your project.

Reputation

We are leaders in the construction LCA industry, see what our clients have to say about their experience with eTool: etoolglobal.com/our-clients

eToolLCD Software

We continually improve our advanced construction LCA software to ensure quick, intuitive, repeatable and accurate life cycle environmental performance estimates for your projects. etoolglobal.com/about-etoollcd

2.1 What will it be used for?

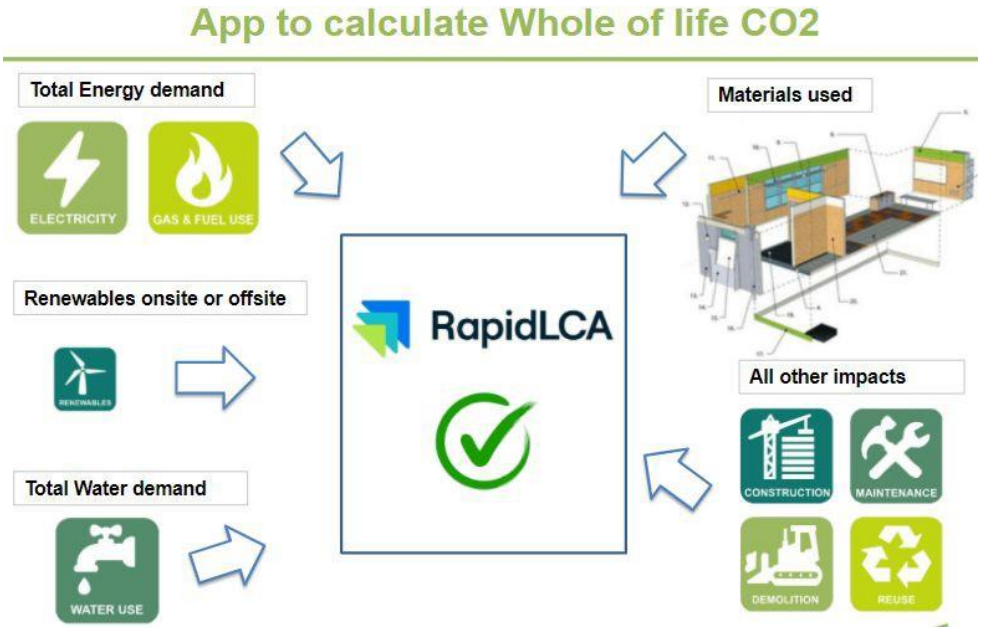
eTool's proposed offering is our 'RapidLCA' design tool. Accessed on any browser or downloaded as an app on IOS or Android smartphones phones, RapidLCA is a rapid, robust sustainability design tool. The app provides inspiration for low carbon design with case studies, and allows users to then create their own low carbon design.

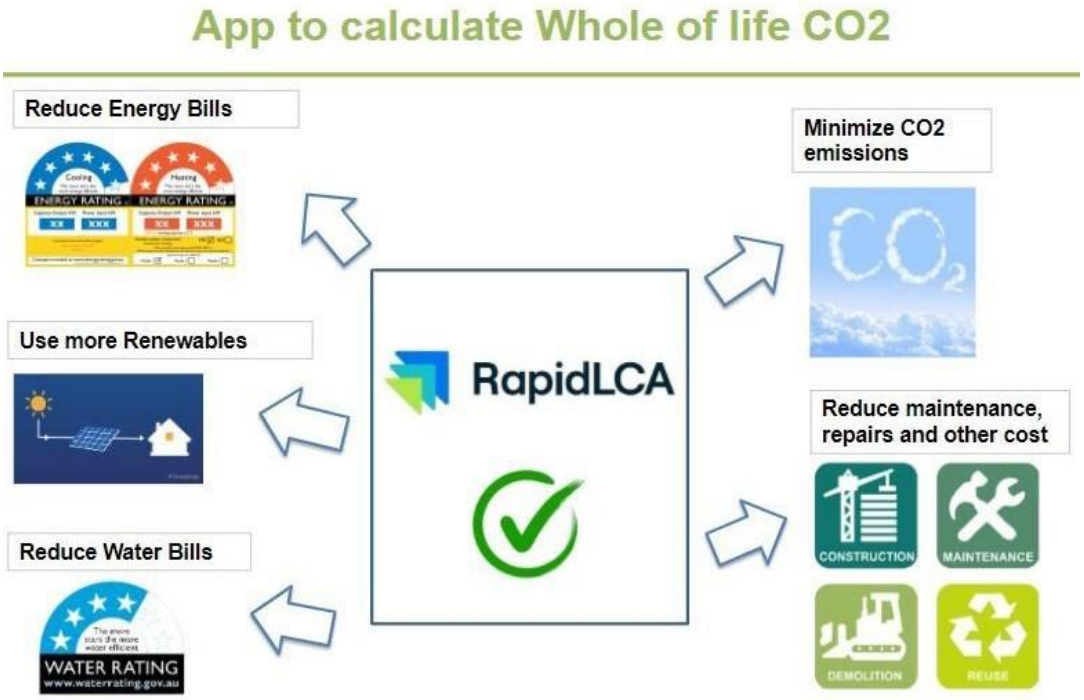
RapidLCA is based on the science of Life Cycle Assessment (LCA), and predicts the carbon footprint of the building over its whole life span. RapidLCA allows users (Construction Professionals, Real Estate Agents, Home Owners) to conduct an LCA with some simple 'Known' inputs in under 20 minutes and optimise the design to reduce the carbon footprint.

With Rapid LCA, the user can:

- Calculate : CO2 footprint of each Plot/Development
- Minimize : Operational and embodied environmental impacts
- Reduce : Occupants energy and water bills
- Balance : Cost and CO2 of development
- Achieve : Understand/set environmental target eg. 50% target or if 100% target (net zero) allowing user to achieve carbon neutrality without the need to buy offset certificates
- Manage the CO2 of large scale developments: Easily monitor and manage CO2 of each plot/development and manage the development in a single platform.
- Certification : Certify your development by a third party, reducing the risk to clients and elevating the professionalism of your service by peer-reviewing your LCA study to ISO 14040 and ISO14044 standards
- Reporting: Customised reports for design approval, built permits, submissions, green loans etc. A certified report will prove that the design is meeting a certain environmental target or outcome.

In Summary, Rapid LCA will allow the user to:





2.2 Interface and User Experience (UX).

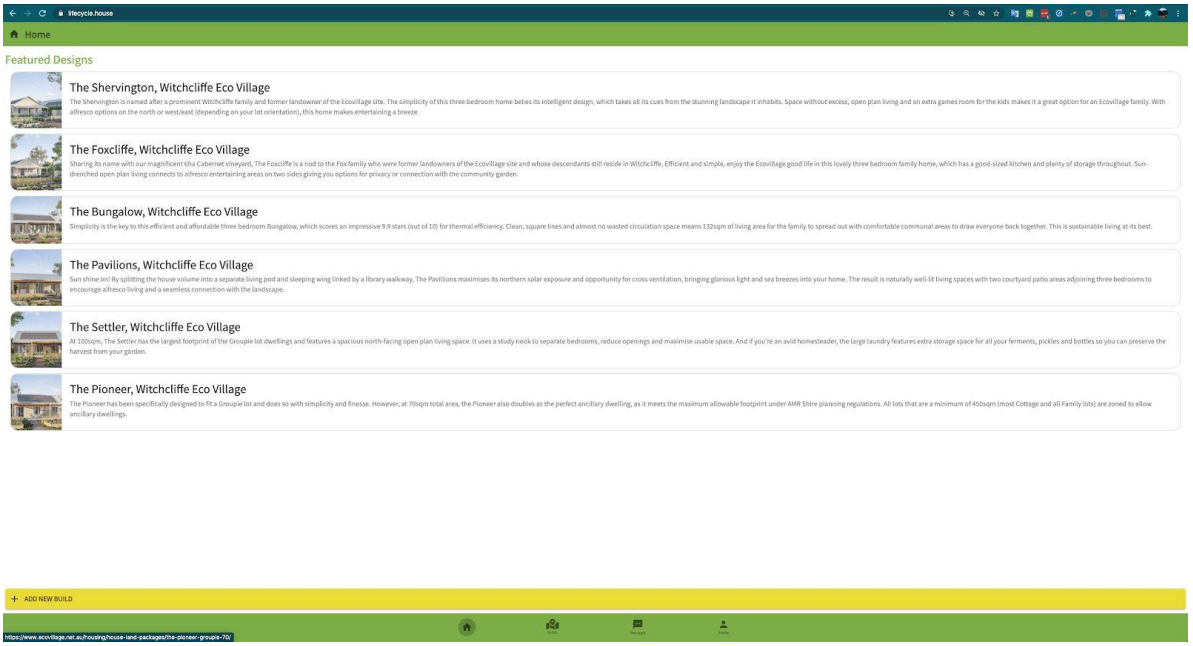
RapidLCA can be accessed on any browser or downloaded as an app on IOS or Android smartphones phones. The home screen includes a number of featured designs for motivation, how the results were achieved, and inspiration for their own designs.

Due to the unique nature of RapidLCA, and the intuitive interface, users are able to conduct an LCA with some simple ‘Known’ inputs, alleviating the need for formal training. Additional support is available with online training videos and a dedicated support portal.

The app is currently being used by developers and government authorities in Australia to embed Life Cycle carbon targets and assessment into the planning and building permit application process. The interface allows users from outside the construction and sustainability sectors to accurately and quickly conduct Life Cycle Assessments in under an hour with no training. Users with construction and/or sustainability experience are able to comfortably conduct assessments within 20 minutes.

Desktop Use:

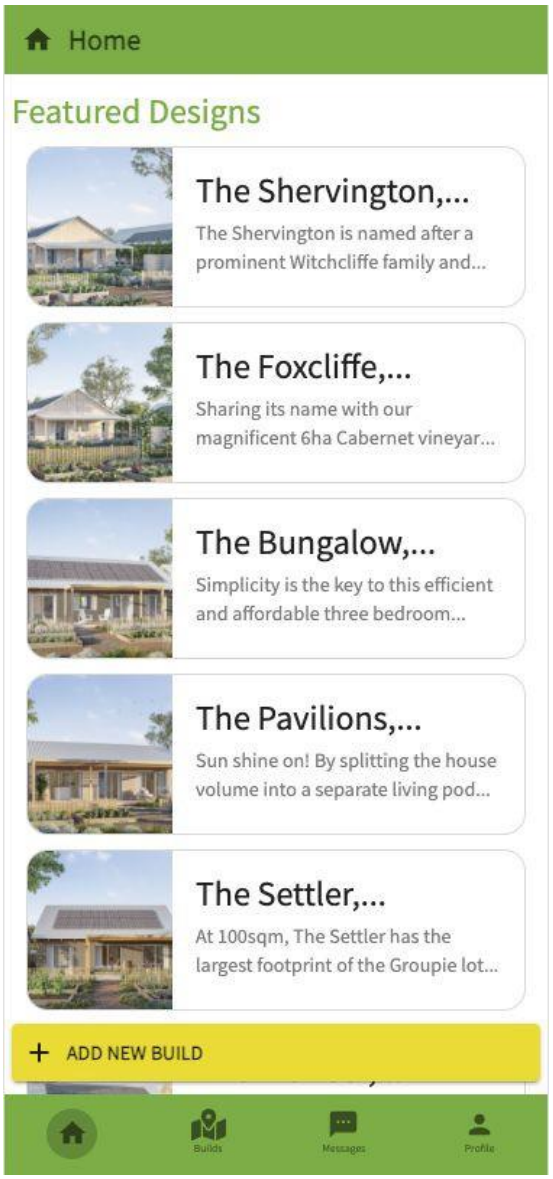
Home page - Low Carbon Design Feed



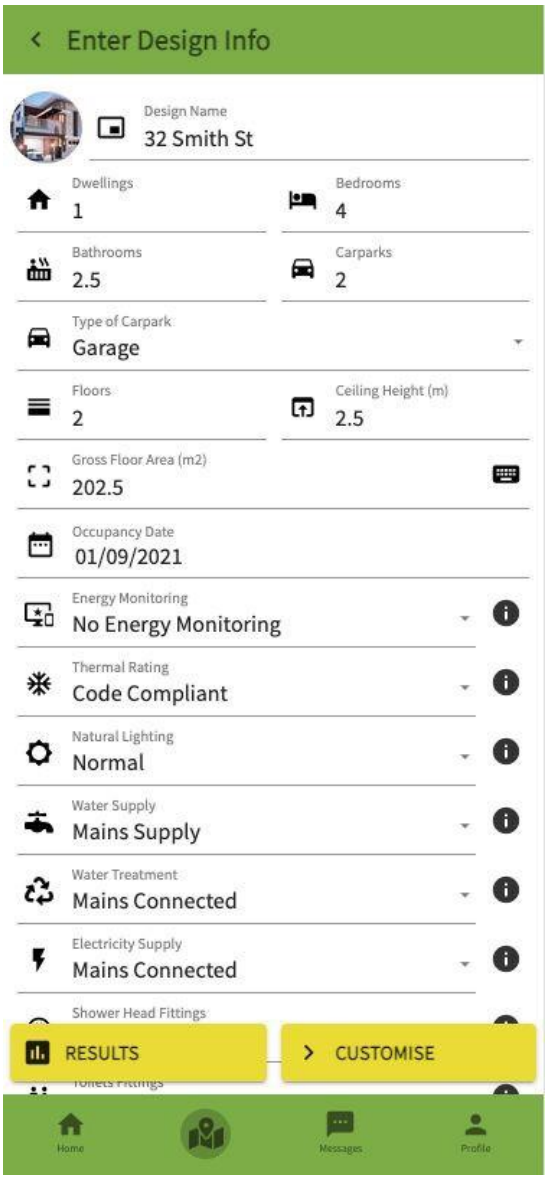
Design Details Page (As Viewed on Desktop)

Mobile use:

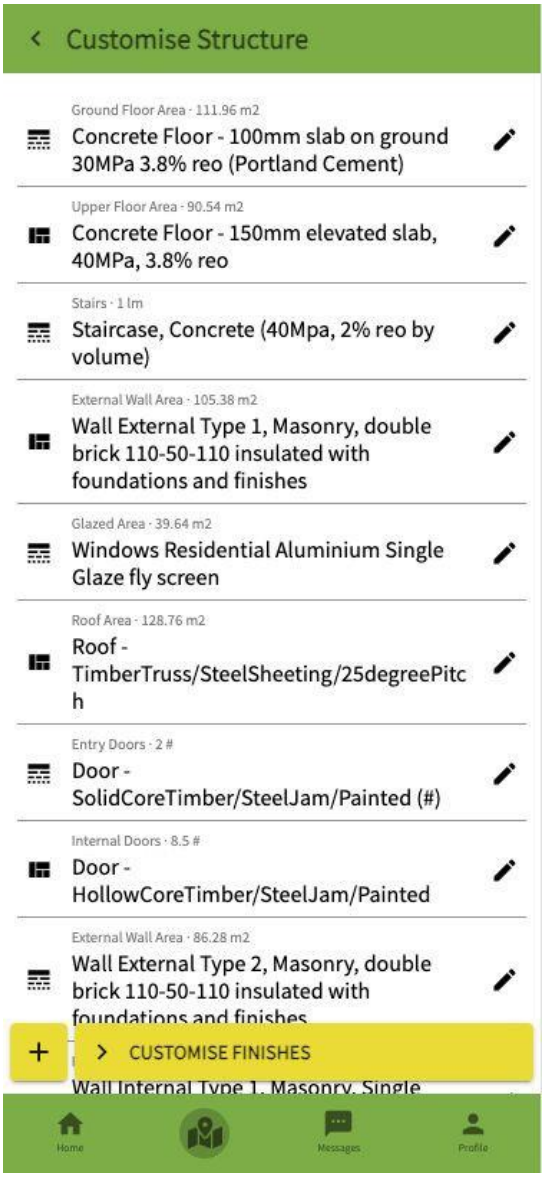
Home page - Low Carbon Design Feed

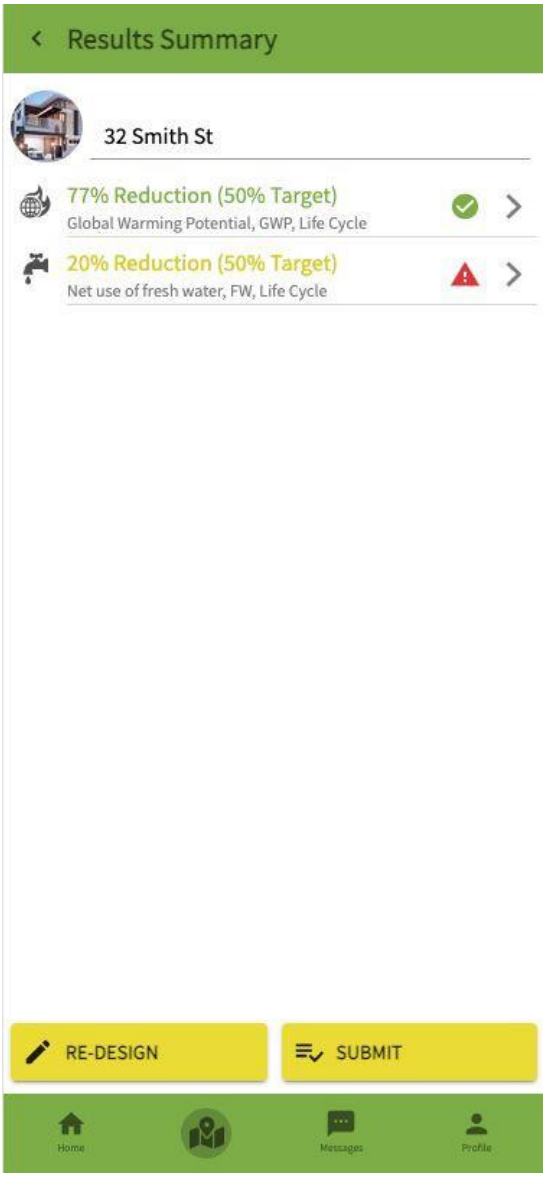


Set and View Targets, Configure Design:

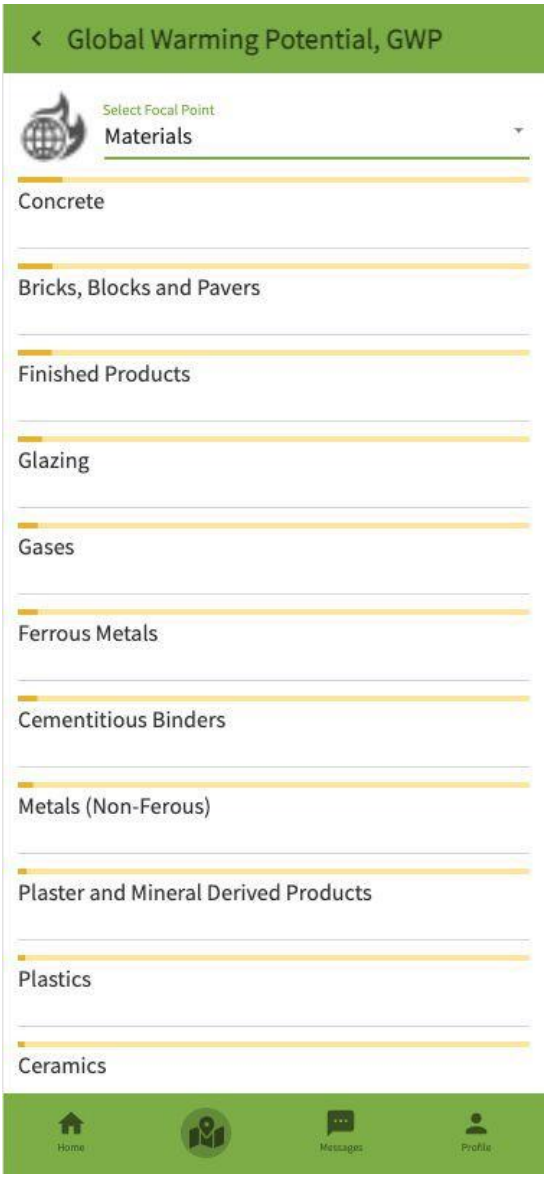


Customise and view preliminary results

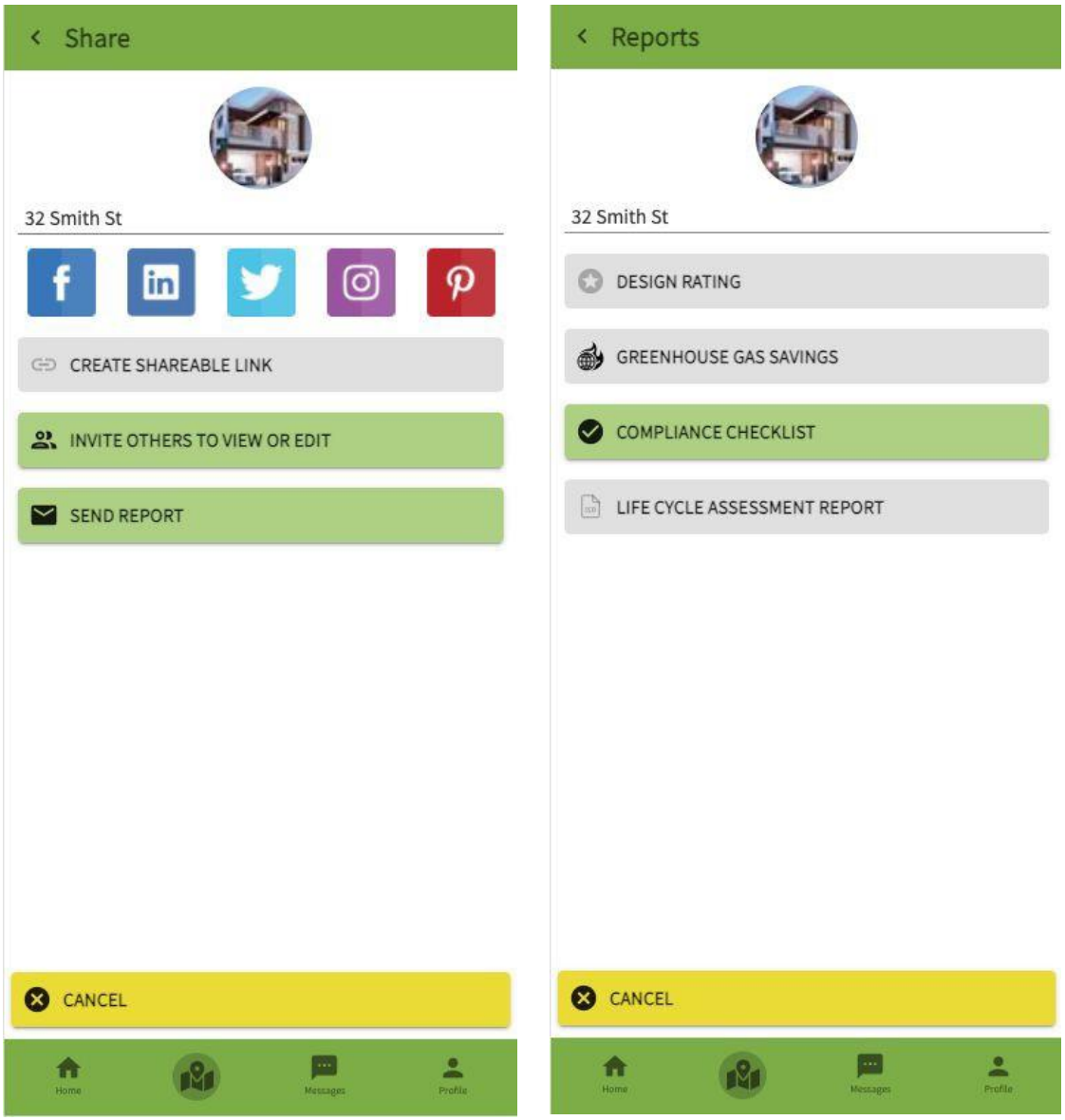




Analyse, Drill Down and Optimise Design



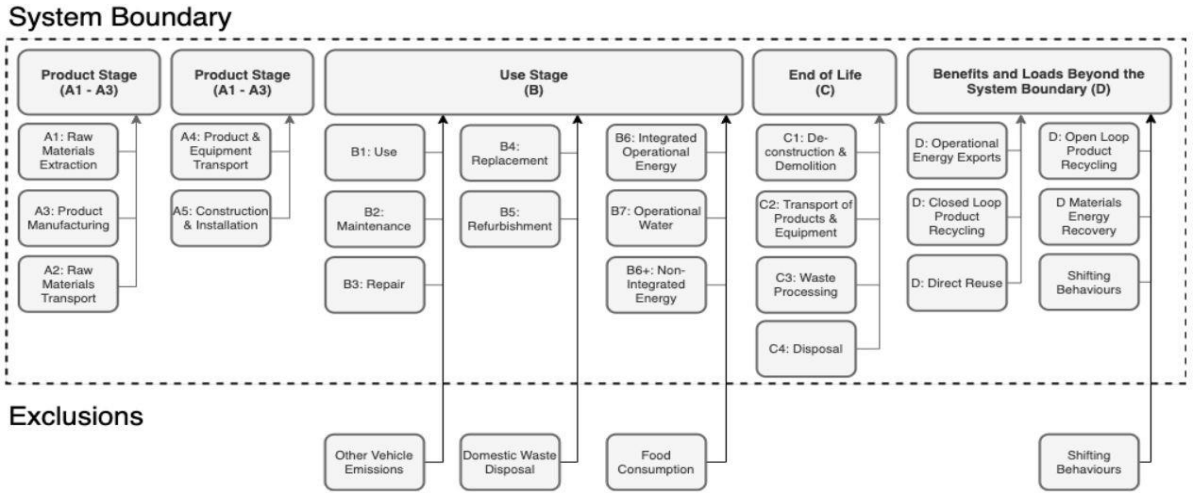
Share Results, Send Reports, Invite Others to View or Edit the LCA



2.3 Technical scope

RapidLCA Compliance with BS EN 15978:2011

The BS EN 15978 standard was adopted by eTool in 2014. The summary below shows how RapidLCA and BS EN 15978 compare:



Alignment with Level(s)

RapidLCA is fully compliant with the Level(s) framework for sustainable buildings, and also includes scope for MEP services https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-01/UM3_Indicator_1.2_v1.1_37pp.pdf

2.3.1 Data and Elements

Building Typologies

RapidLCA can be used for customised take-off algorithms and regionalised baseline buildings for the following typologies:

- Low density housing
- High density housing (apartments)
- Office Buildings

RapidLCA Templates

RapidLCA can draw on eTools unique library of over 10,000 premodelled construction component templates. Benefits to users utilising out templates include:

- Easier for users to repeat results
- More consistent, accurate and comparable assessments
- Geographically more relevant templates
- A deeper understanding of how your LCA works

Grid Decarbonisation

RapidLCA can be customised to create grid decarbonisation scenarios by adjusting the impact coefficient discount rate percentage and discount rate start year. Grid details include reference sources for discount factors and assumptions.

If this is a requirement of IGBC, eTool will set a project up so it's pointing to one of the decarbonising grids. This, however, wouldn't be an option for users, but IGBC's choice about what grid impacts to use.

2.4 Geographic Scope

The LCI and associated default values for new building inventory entries are regionalised to ensure adequate geographic data quality for LCA studies. The current background data of the RapidLCA data sets is EcoInvent 3 which is well documented including detailed methodology papers.

2.5 Maintenance

See details in 'Maintenance' criteria below.

2.6 Development Timeline

See details in 'Timeline' criteria below.

2.7 Branding

Included in the price is a dedicated and custom branded landing site (.com url) directing people to the IGBC projects within RapidLCA.app. Recognition of IGBC, sponsors and other recognised stakeholders would be included on this page and the page can be entirely branded to IGBC's design.

If desired eTool can also provide a dedicated URL (.app domain) for the web app and exclusive release for IGBC with total customisation of branding and colors throughout. Potential additional costs or in-kind recognition of eTool to be negotiated if this level of customised branding is desired.

3.0 Tender Dates and Format/Criteria Price

Most of the functionality required has already been developed in RapidLCA allowing us to deliver incredible functionality at a very low cost. RapidLCA is the culmination of ten years of research into dramatically streamlining Life Cycle Assessment in construction. The tool draws on eToolLCD's vast database of construction projects, large building component library, and calculation engines that align with ISO and EN standards. Duplicating its functionality at comparable costs is not possible. eTool is able to offer RapidLCA for this price due to the small amount of customisation needed for IGBC.

Price	Euro
Proposed cost for 3 years from launch date in 2021 including costs of annual maintenance.	€30,000.00
Annual maintenance rates after 3 years.	€5,122.00 per year
Hourly rate for further customisation of the tool.	€97.00

Inclusions

- Dedicated and custom branded landing site (.com url) directing people to the IGBC projects within RapidLCA.app
- Online training and support portal for users
- Low carbon design feed to continually inspire new users toward low carbon designs
- Customised take-off algorithms and regionalised baseline buildings for the following typologies:
    - Low density housing
    - High density housing (apartments)
    - Office Buildings
- Free migration of data into eToolLCD for LCAs of detailed design phases (for eToolLCD license holders)
- Up to 20 New or Customised Elements (RapidLCA Templates)
- Basic reporting for users to meet IGBC program requirements. Users can run additional detailed reporting eg ready for rating schemes etc, at their own cost, no cost to IGBC
- Access to the eToolLCD construction template library with 10,000's of detailed Life Cycle Inventory data for individual components.

- OECD Whole Building benchmarks for residential (statistical density mix) and offices

Additional Options

- Additional LCI data licences (and costs) applicable for regionalised prefered dataset
- Additional take-off algorithms baseline buildings for other typologies
- Dedicated URL (.app) for the web app, exclusive release for IGBC
- Building Energy Assessment integration (or prediction) for detailed energy calculations

Timeline

As RapidLCA is already built the development process is mainly customisation work with some small extensions. Providing eTool is notified as the preferred tenderer by February 22nd the following timeline is likely achievable.

March:

- Mockups of required UX changes
- Mockups of required Reporting changes
- Stakeholder workshops
- Determine / design customised take off algorithms for apartments and offices
- Determine / design customised baseline buildings

April:

- Implement customised take off algorithms (develop, stage, test, release)
- Implement customised baseline buildings (develop, stage, test, release)

May:

- Tune operational algorithms for Irish region and regulations
- Link appropriate construction components from eToolLCD template library to relevant typologies / projects
- Customise reports (if necessary) and points of payment for additional reporting (if necessary)
- **Beta release**

June:

- Acceptance testing
- Preproduction regression testing
- Landing page completion
- Customisation of RapidLCA support site where required
- **Official Production Release**

User Experience

Apple, Android and Web app (Progressive Web App), very intuitive, no training required. Further information explained in '2.2 Interface and User Experience'.

Technical Quality

It is important to note that RapidLCA is far more than an embodied carbon tool. See '2.3 Technical Scope' for details on the broad scope of RapidLCA assessments. The scope includes all life cycle modules including energy use, energy exports (where applicable), water use, wastewater treatment, end of life recycling etc.

The calculations in RapidLCA conform to the following standards:

- ISO 14040 and 14044
- EN 15978: Environmental Sustainability of Buildings Calculation method - Whole of building, whole of life LCA

eToolLCD is eTool's comprehensive LCA software solution and RapidLCA is essentially a streamlined user interface for the eToolLCD calculation methods and extensive component (template) library. A summary of eToolLCD's quality assurance and external review milestones is provided below:

- 2020: ISO 9001 Year one audit passed.
- 2019: eTool's Quality Management System becomes ISO 9001 certified
- 2019: eToolLCD passes relevant parts of comprehensive PAS 2050 Audit for civil works in the HS2 project
- 2019: eToolLCD used for whole building EPD, study reviewed by Rob Rouwette and EPD published by Environdec / EPD Australasia.
- 2018: eToolLCD formally engaged by HS2 (UK High Speed Rail project, one of the largest infrastructure projects in Europe) to measure, reduce and report on carbon emissions.
- 2016: eToolLCD becomes IMPACT certified by BRE. First external tool to gain certification.
- 2014: Alignment with EN 15978, numerous LCA studies conducted and reviewed externally in 2014.
- 2013: eToolLCD externally reviewed by a third party professional scientist as part of an AusIndustry grant to commercialise the software.

- 2012: eToolLCD reviewed alongside 34 other globally available LCA by researchers. In a paper published in the *International Journal of Climate Change* (Volume 4 Issue 4) the researchers concluded that of the 34 tools reviewed, eToolLCD was of two outstanding examples for carbon assessment of urban developments.

Maintenance

All RapidLCA software updates, at approximately one month intervals. eTool have a dedicated development team to manage enhancements and resolve issues quickly. RapidLCA will be continually developed over the course of the IGBC's use and users will benefit from new features and LCI Data updates at no cost to IGBC.

As RapidLCA is a progressive web app, Android, Apple IOS and Web solutions are all developed in the same codebase significantly reducing lead time on introduction of new functionality, small improvements or bug fixes.

IGBC would benefit from the same Service Level Agreement targets included in eToolLCD terms and conditions, summarised below.

Service Level Targets	
Service Level Target	**Service Level**
Availability (in %)	99.9%
Support Hours	UK and Australian Business Hours: UTC 00:00 through to UTC 17:00 Monday to Friday
Service Hours (Time zone)	24hrs
Support Promise incidents	Aim for zero incidents.
Support Promise requests	No limit for paid subscribers, see below table for service levels.
Recovery Point Objective (RPO)	3 hours
Recovery Time Objective (RTO)	1 hour
System maintenance and changes frequency and time windows (add time zone)	2-4 Week Release Frequency <1 hour per update Normally Conducted on Saturdays mornings UTC
Number of Days/months in advance maintenance windows are announced to end users	Currently updates happen in real time during windows of low use.
Back-up recording and storing server/s	AWS Data Centres Used. Images Taken Every 3 Hours of the Server (including Database). Images Replicated to different region to ensure geographical separation of backups.
Incident priority levels & resolving time per priority level	Critical: 4 hours High: 48 hours Standard: 7 Days Low: > 7 Days Refer to Risk Matrix for Definition of Risk Categories
Time (Years) data is saved in the database	12 months minimum, but in practice data is maintained indefinitely unless subscribers request their data is deleted.

Low Carbon Inspiration Feed

The app presents users with examples of low carbon design as soon as they navigate to it. This feed will be updated as more users share their designs providing the user community with low carbon design inspiration and shifting the 'social norm' of low carbon design performance.

Program Wide Dashboard.

IGBC will be able to monitor the projects using the tool, see the average performance against targets and use the information to identify and promote best practices. The impact of the use of the app can also be quantified and used for marketing purposes, for example, to promote the carbon saved by design teams with IGBC's help via the use of the app.

Apple IOS, Android and Web ready.

RapidLCA is built as a progressive web app and is available for use on any device with a modern browser. Further to this it will be available in the Google Play store for Android devices and the Apple App Store (pending approval of Progressive Web App technology stack). eToolLCD made the decision to make the tool mobile ready in recognition of the significant trend towards mobile devices and to ensure the broadest possible appeal.

Shareable Project Profile Pages

Users can share the highlights and performance of their project. A public summary page is published and a unique link provided that can be shared on social media platforms, initiated from within the app.

No training required

The app has been designed to be used by sales staff with very little technical construction or design knowledge. Auto-validation, basic inputs, in app help, intuitive user experience, extensive pilot testing, automated reporting, top impact identification (for optimisation) all make training redundant. This significantly reduces barriers to entry by reducing time and cost associated with starting LCA.

Scope

Beyond embodied carbon. Other tools focus on embodied carbon only which leads to poor optimisation and unnecessary expenditure in reducing life cycle carbon.

Ability to incorporate Decarbonising grids for energy

If desired projects within the tool can be set up to use decarbonising grid scenarios.

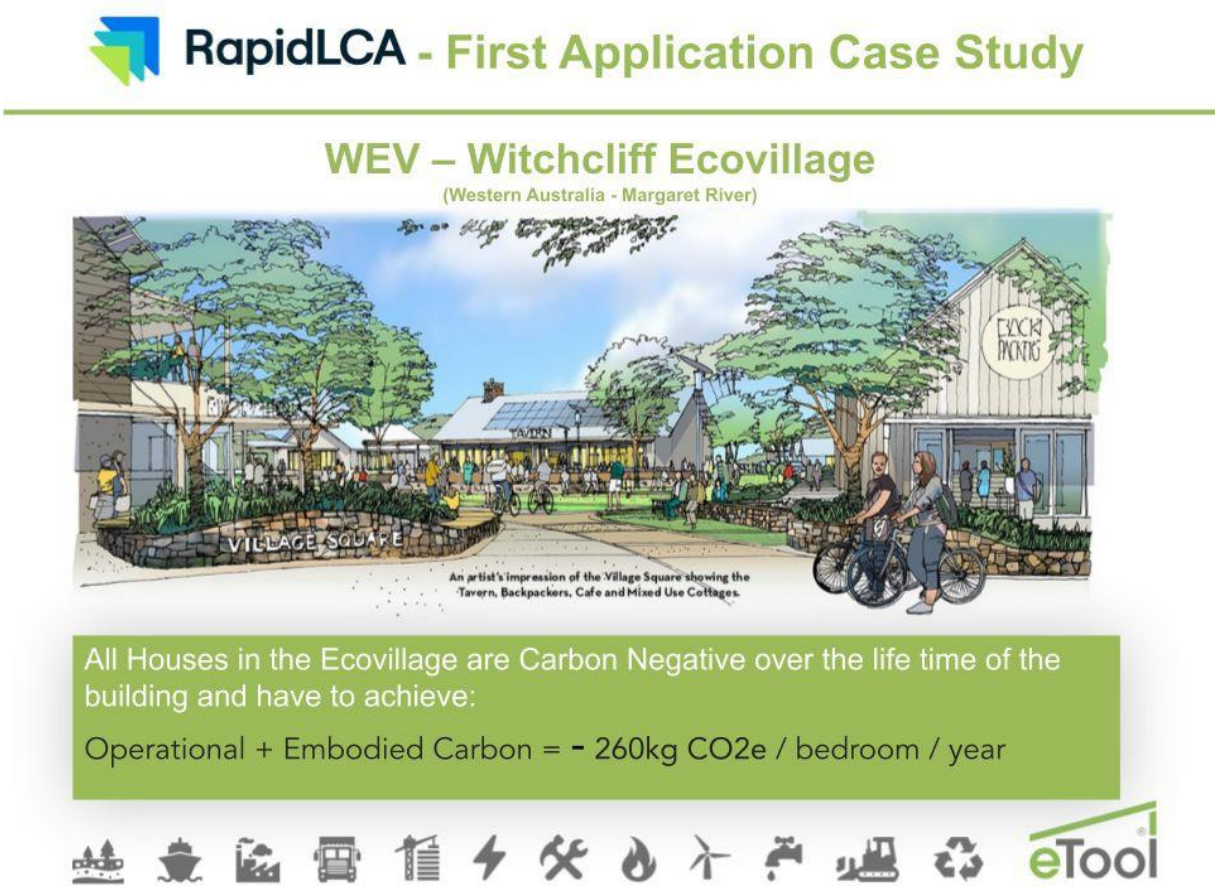
Standard compliant Automated Reporting

RapidLCA allows users to report to ISO and EN standards for Life Cycle Assessment automatically providing technical transparency.

Precedence

Rapid LCA was only officially released in early 2021 but has already been used commercially by both land developers and government authorities. Case studies provided below.

Witchcliffe Eco Village



Witchcliffe Eco Village (https://www.ecovillage.net.au/) is targeting carbon negative buildings as described in their design guidelines. RapidLCA is being used to easily measure the life cycle environmental performance of their designs.

Each home in the village over its life cycle will avoid or offset more greenhouse gas emissions than it produces.

The specific target that has been set is **-260kgCO2e / bedroom / year.** RapidLCA expresses this as a percentage saving versus a benchmark residence, the target being a 105% saving.

Homeowners are conducting their own LCAs with RapidLCA with little or no training and assistance.

The following link will take you to a recently recorded webinar, where Witchcliffe Eco Village discussed their project and RapidLCA https://youtu.be/V66TRkLfZb8

City of Vincent Government Authority

City of Vincent Government Authority are committed to increasing the environmental performance on all new developments in the City of Perth, and have implemented a 50% reduction on whole life carbon emissions compared to the business as usual and a 50% reduction in Freshwater use.

City of Vincent have been actively using RapidLCA on all new developments as a target setting study, and have seen significant improvements compared to their targets.

Example results from a recent study conducted by City of Vincent can be seen in the image below:

City of Vincent Results using RapidLCA

Performance Detail

	Internal Material & Construction	Use Stage Materials & Construction	Integrated Energy Use	Plug Load Energy Use	Water Supply & Treatment	End of Life	Recycling & Energy Export	Total
Global Warming Potential, GWP (kg CO_2 eq / occupant / year)								
Benchmark	865.7	542.9	939.5	822	165.5	135.2	-75.82	3395
Proposed Design	511.6	291.2	-228.1	676.6	82.99	79.66	-744.5	669.5
Difference	354	251.7	1167	145.4	82.6	55.56	668.7	2725
Life Cycle Savings	10%	**7%**	34%	**4%**	**2%**	**2%**	20%	80%
Net use of fresh water, FW (kg / occupant / year)								
Benchmark	3754	1804	1202	1757	83170	616	-286	92019
Proposed Design	1813	1380	-917.2	1446	35162	378.2	-1969	37294
Difference	1940	423.9	2119	310.9	48007	237.7	1683	54725
Life Cycle Savings	**2%**	**0%**	**2%**	**0%**	52%	**0%**	**2%**	59%

Global Warming Potential, GWP (Life Cycle)

80% Saving against a target of 50%

Net use of fresh water, FW (Life Cycle)

59% Saving against a target of 50%

The following link will take you to a recently recorded webinar, where City of Vincent discussed their project and RapidLCA https://youtu.be/-dMU9OYxbc8

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EARLY PHASE CARBON ASSESSMENT TOOL FOR IRELAND

Irish Green Building Council in confidence – 3 February 2021

INTRODUCING ONE CLICK LCA & CARBON DESIGNER

COMPLIANCE WITH THE BRIEF & ANSWERS TO BRIEF CRITERIA

COST AND COMMERCIAL TERMS

CONTACT DETAILS

World’s leading construction carbon platform

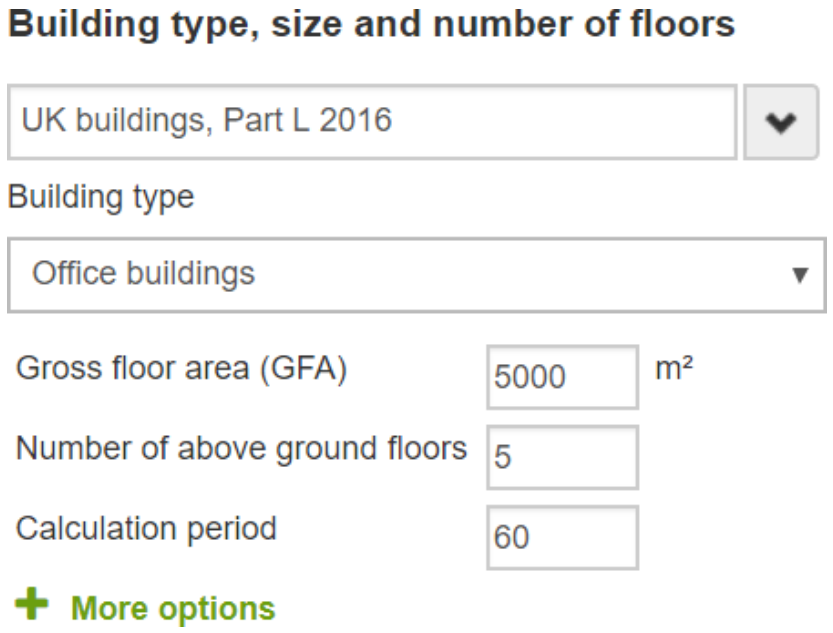
THE FACTS

100+ COUNTRIES
40+ CERTIFICATIONS
90 000+ DATASETS
10+ INTEGRATIONS
30+ INHOUSE STAFF
10+ YEARS AAA-RATED

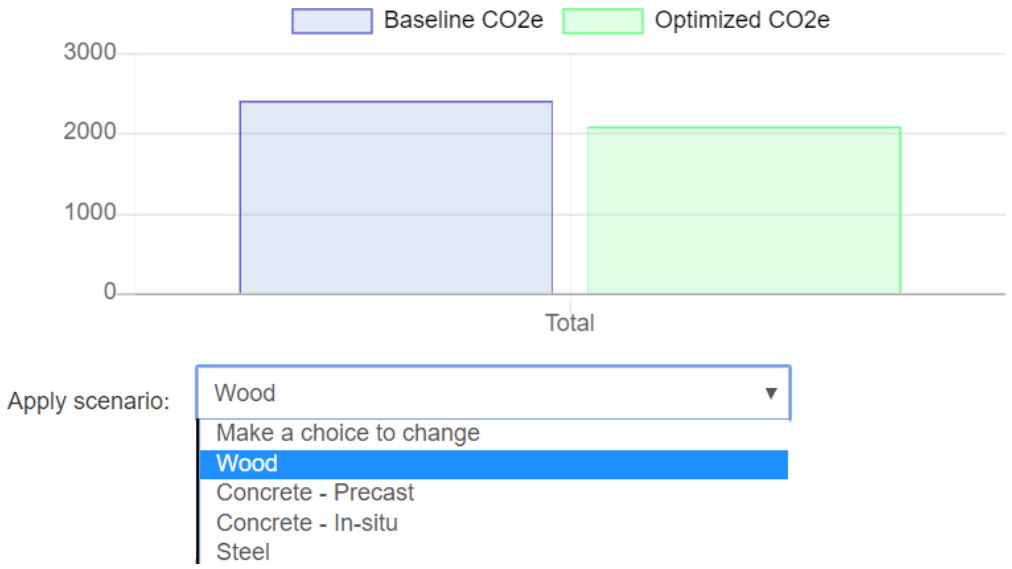
CONNECTING THE ENTIRE INDUSTRY

Carbon Designer requires only bare minimum information to allow quantifying results & options

MINIMUM DATA REQUIRED



EASY OPTIONEERING



Assess carbon in minutes for any building , any scope & any geometry, or as a shoebox

One Click LCA

ANY SCOPE, ANY REGION

Building parameters

- [x] Foundations and substructure
- [x] Ground Slab
- [x] Structure
- [x] Enclosure
- [x] Finishes
- [ ] Services (beta)

Building type, size and number of floors

- Norwegian reference building v2019.1
- European reference building v2019.1
- Southern United States (ASHRAE 90.1 zones 2 & 3)
- Northern United States (ASHRAE 90.1 zones 4 & 5)
- Canada (ASHRAE 90.1 zones 5 & 6)
- Finnish reference building
- UK buildings, Part L 2016

IMPORT SHAPE, OR USE SHOEBOX

Building dimensions

Height	29	m
Width	39	m
Depth	18	m
Internal floor height	3.3	m
Column spacing distance	9	m

+ Import areas from Excel

Minimum scope of data is sufficient but the tool allows editing most assumptions

Project materials scope

Building parameters

- [x] Foundations and substructure
- [x] Ground Slab
- [x] Structure
- [x] Enclosure
- [x] Finishes
- [ ] Services (beta)

Building type, size and number of floors

UK buildings, Part L 2016

Building type

Office buildings

Gross floor area (GFA)	5000	m²
Number of above ground floors	5	
Calculation period	60	years

+ More options

Scenarios

Baseline scenario: Not applied

Comparison scenario: Not applied

Cancel | Calculate areas | Create Baseline

Building dimensions

Height	18	m
Width	61.1	m
Depth	18	m
Internal floor height	3.3	m
Maximum column spacing distance	9	m
Load bearing internal walls	0	%
Number of staircases	1	
Total number of floors	5	
Shape Efficiency Factor	1.1	
Gross internal floor area (GIFA)	5000	m²

+ More parameters

Building structures

Edit areas if necessary.

Foundations and substructure		
Foundation	5000	m²
Frost Insulation	158	m
Cleanliness layer	1000	m²
Ground Slab		
Ground slabs	1000	m²
Structure		
Floor slabs	4000	m²
Columns	432	m
Beams	720	m
Load bearing internal walls	0	m²
Balconies	50	m²
Staircases	18	m
Enclosure		
Underground walls	0	m²
External walls	1828	m²
Windows	1000	m²
External doors	20	m²
Roof slab	1000	m²
Roofs	1000	m²
Finishes		
Internal walls	4842	m²
Floor finishes	4723	m²
Ceiling finishes	4723	m²

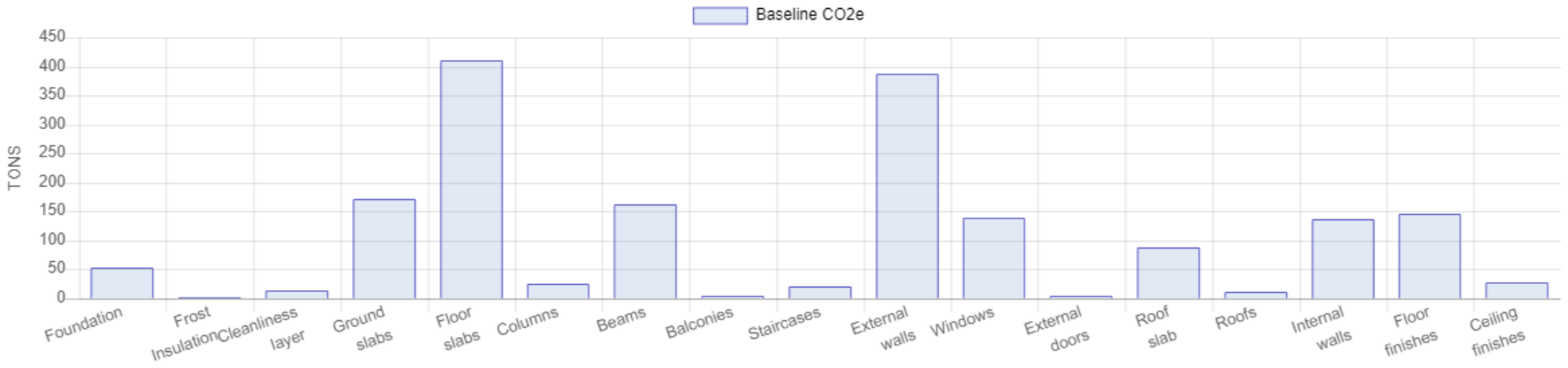
Carbon Designer gives results instantly and

allows quick creation of a range of options

Carbon Designer: Project carbon breakdown

Baseline CO_2e **360 kg/m²** Optimized CO_2e **- kg/m²** Carbon change **-%** / **- tons CO_2e** Assumptions

Select groupings



Apply scenario: Make a choice to change

- Make a choice to change
- Wood
- Concrete - Precast
- Concrete - In-situ
- Steel

BUILDING ELE	Amount	Tons CO_2e	Carbon Share

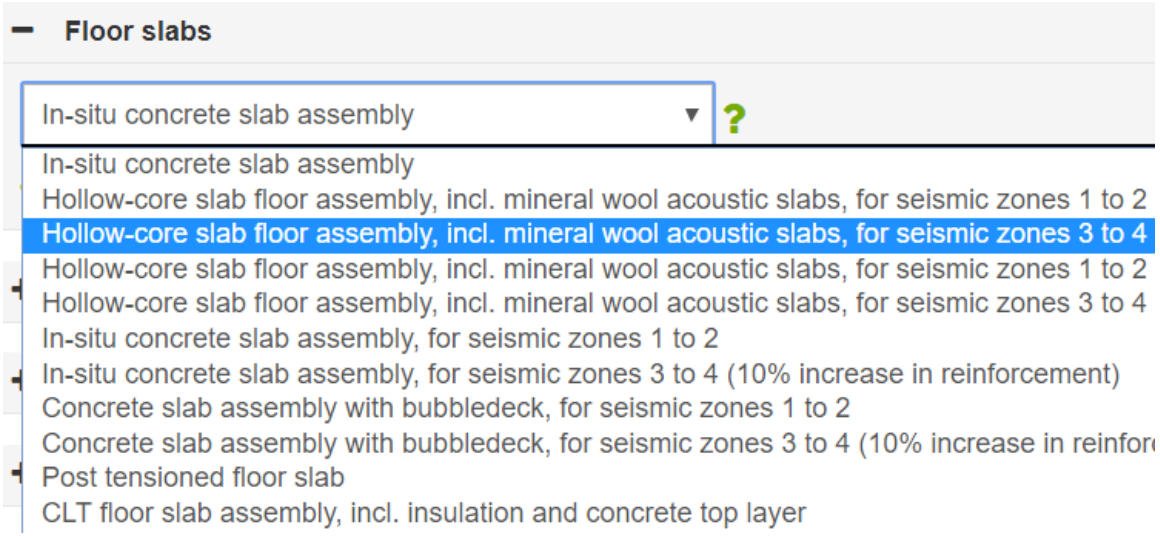
Choose types of constructions you wish to use, and adjust the materials used in them as desired. You can also save the adjusted data to a design.

+ Foundation	5000 m²	52 tn	2.9%
+ Frost Insulation	158 m	1.3 tn	0.07%
+ Cleanliness layer	1000 m²	14 tn	0.79%
+ Ground slabs	1000 m²	170 tn	9.5%
+ Floor slabs	4000 m²	410 tn	23%

Carbon Designer is based on a library of

ready to use structures which can be edited

LIBRARY OF TYPICAL SOLUTIONS…



…WHICH YOU CAN FURTHER EDIT

Hollow-core slab floor assembly, incl. mineral wool acoustic slabs, for seismic zones 3 to 4 (10% increase in reinforcement) total Co_2e [*456* tn]

Component	CO_2e	Change material to	Amount	Thickness mm
Hollow-core slab	258 tn	Hollow core concrete slabs, generic, C30/37 (4400	4167 m²	305
Accoustic insulation	37 tn	Acoustical ceiling panels (FGD gypsum), 0.31in	4167 m²	25
Leveling screed	97 tn	Sub-floor smoothing compound	130844 kg	
Reinforcement	64 tn	Reinforcement steel (rebar), generic, 90% recyclec	88549 kg	

Early design decisions Carbon Designer supports you with

WHAT IS THE CARBON IMPACT OF…

My design approach?

Varying the height of the mass?

Changing envelope materials?

Setting more demanding specs?

Reusing parts of an existing building?

LEED baseline?

Geometry changes?

Innovative products?

Detailed, yet simple to understand

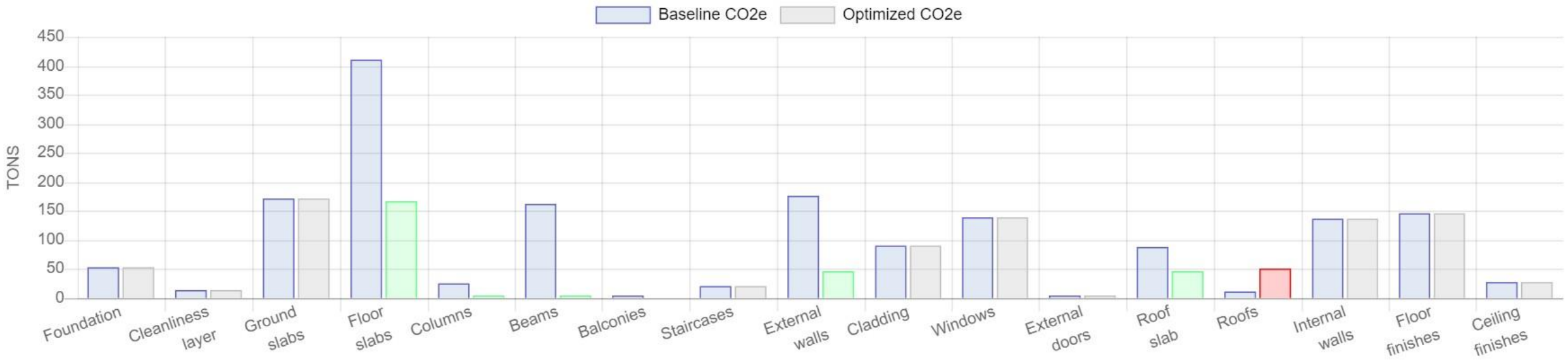
comparison of carbon impact of options

Main > 0 Net Zero Demo > Passive energy > Carbon Designer: Create baseline > Carbon Designer: Optimize design

Carbon Designer: Project carbon breakdown

Baseline CO_2e **335 kg/m²** Optimized CO_2e **224 kg/m²** Carbon change **-33.37%** / **-559.6 tons CO_2e** Assumptions

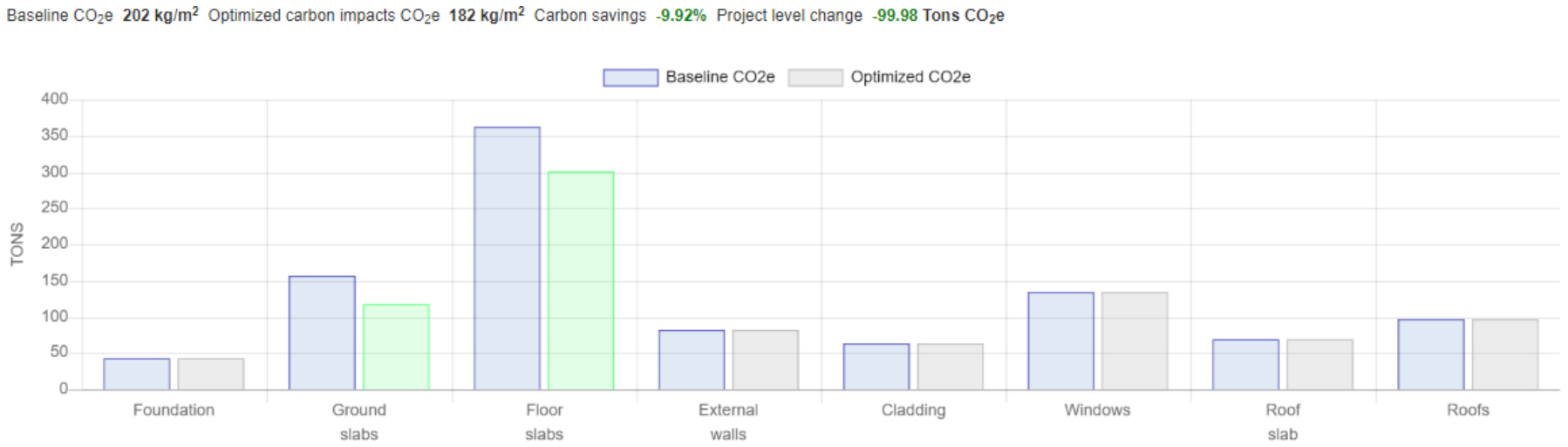
Select groupings

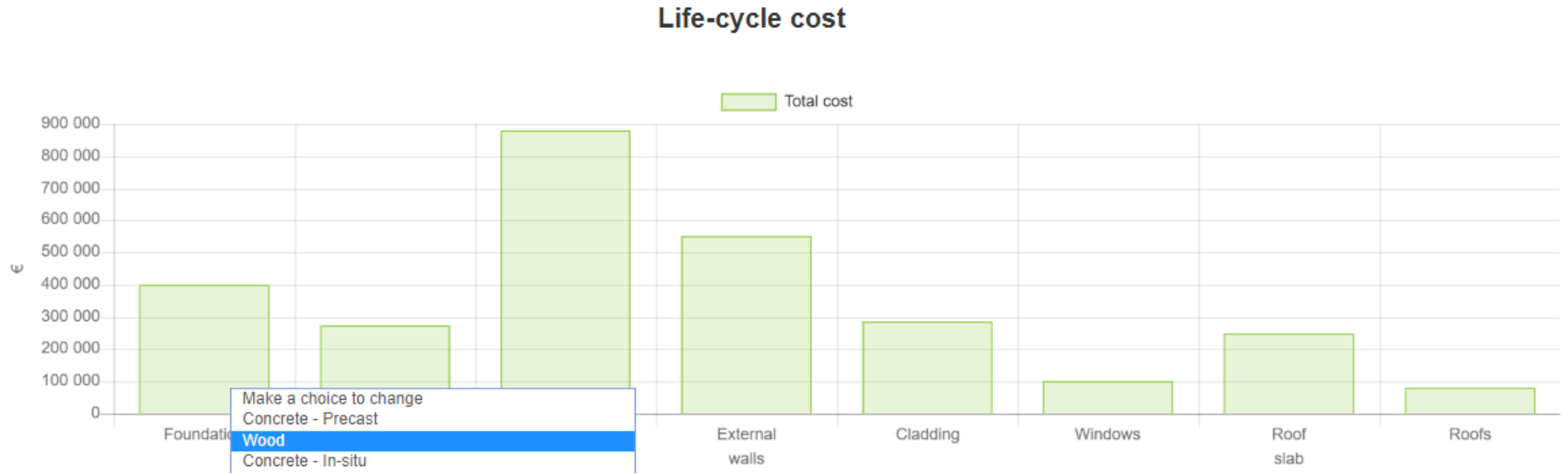


Apply scenario: Wood

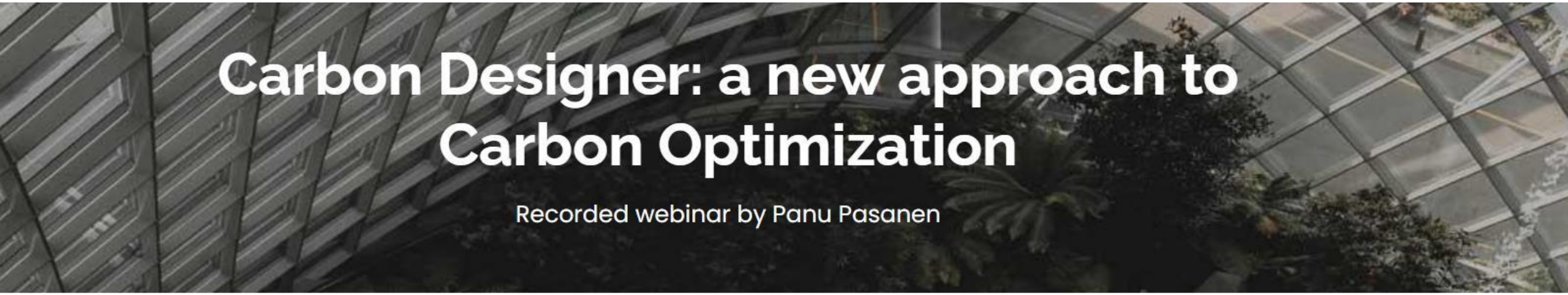
Compare options easily for carbon, and if

you want to, also for life-cycle cost





See Carbon Designer live in a webinar



First Name*

Type your first name

Last Name*

Type your last name

I am *

Carbon Designer – A new approach to Carbon Optimization

Highlight: Carbon Designer

What you can expect from the recorded webinar:

- What is Carbon Designer and how it can help you achieve carbon reduction
- How to leverage Carbon Designer for reference/baseline building

https://www.oneclicklca.com/recorded-webinarcarbon-designer-a-new-approach-to-carbon-optimization/

INTRODUCING ONE CLICK LCA & CARBON DESIGNER

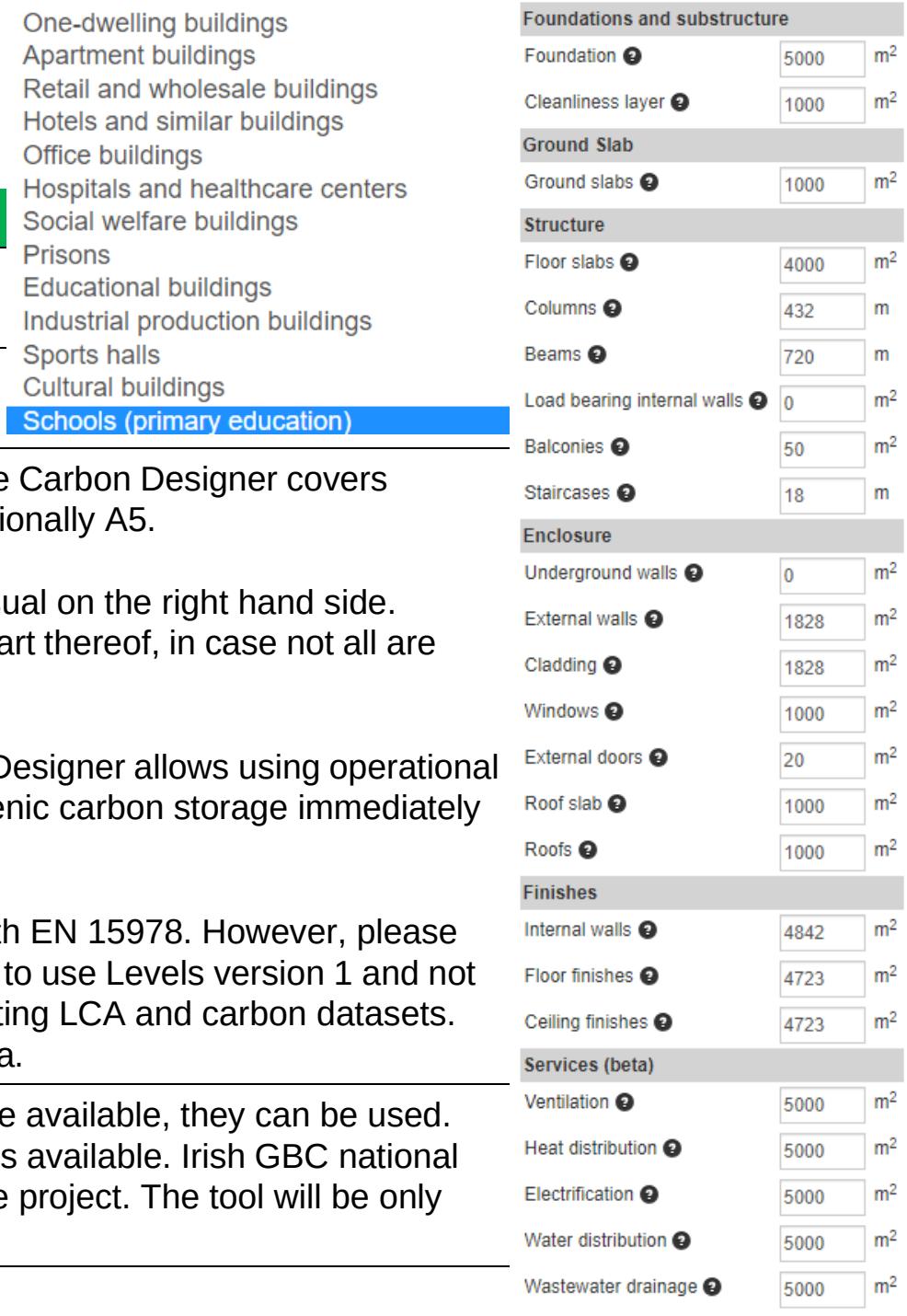
COMPLIANCE WITH THE BRIEF & ANSWERS TO BRIEF CRITERIA

COST AND COMMERCIAL TERMS

CONTACT DETAILS

Compliance with the brief

PARAMETER	ANSWER
Intent, description and use	Carbon Designer is developed for exactly this type of use. It covers all use cases listed in RFP chapter 2.1.
Interface and user experience	Carbon Designer meets requirements set out in the RFP. It has constantly received favourable feedback from users.
Technical scope	When used together with the Level(s) tool as intended here, the Carbon Designer covers modules A1-A3, A4, B4-B5, B6, C1-C4 and module D, and optionally A5. Carbon Designer covers the building elements listed on the visual on the right hand side. Carbon Designer supports the building types listed above (or part thereof, in case not all are required for Ireland or in case all can not be defined). Carbon Designer allows inputting assessment period. Carbon Designer allows using operational energy scenario using Irish defaults. It also can calculate biogenic carbon storage immediately from user given set of assemblies or default assemblies. Carbon Designer is fully aligned with Level(s) and complies with EN 15978. However, please note, that to create meaningful Carbon Designer it's necessary to use Levels version 1 and not version 2 which would prevent using most of the currently existing LCA and carbon datasets. New Level(s) would only work with EN15804+A2 compliant data.
Adaptation for Ireland	For all datasets, for which Irish datasets of qualifying quality are available, they can be used. Bionova shall determine dataset quality if no other information is available. Irish GBC national default figures can be used if they are completed in time for the project. The tool will be only provided for Ireland.



Adaptation process and timelin

PARAMETER	ANSWER
Adaptation process overview	Carbon Designer contains a range of independent regions, for which most parameters can be easily adjusted separately. Every region can contain it's own set of building types, building materials assemblies and assumptions for default structures and energy consumption scenarios, among others. Carbon Designer supports 13 building types.
Requirements for adaptation	To create Irish Carbon Designer region, Bionova requires either a list of differences compared to existing Part L 2016 UK construction libraries or the appropriate set of Irish construction libraries for each covered building part. Bionova also requires building type specific energy consumption scenarios and assumed heating method (or several alternatives in case e.g. Passive House scenario is introduced separately). GBC Ireland can also create library definitions themselves directly for Bionova to publish. Publishing and linking construction library to Carbon Designer regions is only possible by Bionova (except in case of private constructions which only same organisation sees). If IGBC has construction site default data, that data can be also incorporated. Otherwise Bionova's generic scenario can be used. Public landing page for the tool requires appropriate logos and visual elements.
Options for adaptation	Manufacturer branded construction libraries or alternatives can be created for a separate fee for any of the building elements.
Timeline	Assuming signature of contract during February 2021 and receipt of construction libraries and energy scenarios during by 15 April 2021, the solution can be released in **1,5 months**. We have created nine regional Carbon Designer models so have lot of experience in this.

Other parameters

PARAMETER	ANSWER
User experience	We suggest arranging a demonstration of the Carbon Designer either separately, or ahead of the demonstration, possibly viewing relevant portion of this recorded webinar https://www.oneclicklca.com/recorded-webinarcarbon-designer-a-new-approach-to-carbon-optimization/ Carbon Designer is very clear, and it always generates instantly visualisation. Result report can be generated very quickly once the option is defined and saved.
Technical quality	Carbon Designer is fully adaptable to Ireland for any aspect referred to in the RFP. New elements can be created very easily. Connecting them to Carbon Designer requires Bionova to review and publish them. Carbon Designer uses the One Click LCA database which shall be updated at cost of Bionova with any Irish EPDs and qualifying other LCA data. Creating these into assemblies is done separately. Calculation results are 100 % identical with full LCA calculation, the entire calculation engine is the same as used in One Click LCA, which is by far the most used building LCA software on the Irish market.
Additionality	Carbon Designer can as such be used to calculate carbon saving impact of refurbishment. This is done by unselecting elements that are retained from existing building. Carbon Designer; or parts of the assemblies created for it, could also be made available for the One Click LCA Planetary for Ireland. This requires technical review for feasibility, as Planetary covers only about 10 materials categories and others can not be added to it. Separately of this, and as an additional option, life-cycle costing could be connected to it.
Precedence	One Click LCA Carbon Designer was originally developed for the Norwegian government in 2018. It has been improved ever since and is currently in use in about 30 countries with nine local models and an international model. Carbon Designer is used in a similar manner in Finland where it’s sponsored for the marketplace by the Finnish Construction Industry. This module has circa 1000 paying users globally, and well over 200 in the UK. We have a range of users for whom this tool is instrumental in early phase decisions.

INTRODUCING ONE CLICK LCA & CARBON DESIGNER

COMPLIANCE WITH THE BRIEF & ANSWERS TO BRIEF CRITERIA

COST AND COMMERCIAL TERMS

CONTACT DETAILS

Cost and commercial terms

PARAMETER	ANSWER
One time cost for delivery and three years use phase	Fixed cost of 25 000 EUR shall be charged for the adaptation and three years maintenance (calculated from delivery). VAT is not included in the figures, and assuming IGBC is VAT liable, would be reversed to IGBC. Otherwise prevailing rate of VAT is added to the cost. This cost includes standard maintenance including hosting the tool and planned updates for replacing expiring or outdated data and main user support for IGBC, but no additional adaptations or creating or setting up new models or libraries. This cost is to be paid in full within 30 days of the delivery and startup of the service.
Maintenance cost after three years	Annual maintenance cost after the three years period is 6500 EUR excluding VAT / year.
Rate for other work required	Other work required and outside the scope of work above is charged at 150 EUR ex VAT.
Co-branding	Branded landing page shall be created for the tool to acknowledge required sponsors. This is included in the scope of work.
Commercial terms	This offer is valid 30 days from the tender submission deadline and is subject to contract. Carbon Designer is delivered exclusively under Bionova's General Web Service Terms, https://www.360optimi.com/static/terms/Bionova_web_service_terms_and_privacy_policy_13July2020.pdf.

INTRODUCING ONE CLICK LCA & CARBON DESIGNER

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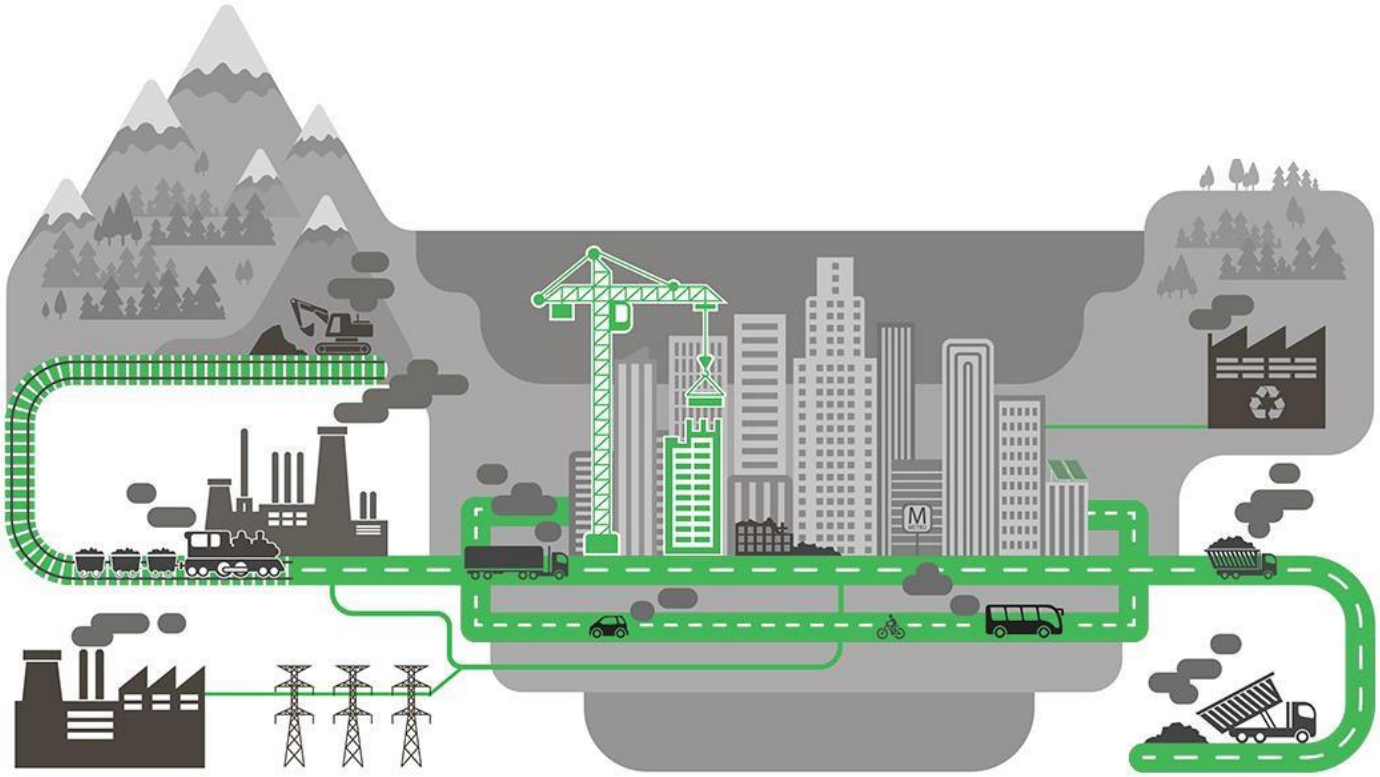
Thank you!



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IRISH GREEN BUILDING COUNCIL

Resource efficient and circular material life cycles qualitative indicator templates integrated into Home Performance Index (HPI)

WP4 HPI Circularity Integration Report

CIRCULARLife

GreenEnterprise epa

Contents

Project Summary

About the CIRCULARlife Project:

To date the discussion in Ireland on circularity in buildings has focused on downcycling of materials, waste audits already within existing buildings and finding uses for waste, such as reuse of aggregates and other recycled materials. A different approach is needed in order to design out the need for downcycling at the earliest stage of the project and to radically reduce overall resource consumption and embodied carbon.

IGBC intends to trial circularity tools with designers to help drive greater uptake and to identify the most useful approaches. The application of tools and indicators is a good way of identifying gaps and where the infrastructure is lacking in building a truly circular economy for construction, as it immediately identifies what is difficult to apply in the Irish context and why.

As part of the project IGBC will also create learning materials, deliver webinars, and carry out training workshops with members and others in the sector to assist designers and developers to incorporate circularity into their projects. This project is funded by EPA Green Enterprise.

Acknowledgements

This project is funded by the Environmental Protection Agency of Ireland's Green Enterprise Programme. The Carbon Designer Tool for Ireland is co-funded by the Land Development Agency (LDA).

1. Introduction

The Home Performance Index is Ireland's national residential sustainability certification. It was originally launched in 2016. At the start of 2023 over 16,000 homes were registered to be certified under the Home Performance Index.

In October 2019 Version 2.0 of the Home Performance Index was launched to align with the updates to TGD Part L 2019, Conservation of Fuel and Energy – Dwellings and TGD Part F 2019, Ventilation.

Home Performance Index v1 and v2 has targeted improved performance in material resource through indicators for Resource and Waste Management and Whole Life Carbon Assessments.

Version 3.0 of the Home Performance Index was launched in December 2022. This included the addition of the following indicators to further expand on resource efficiency and circular material.

- EN 8.1: Pre-Demolition Report
- EN 8.2: Design for Disassembly
- EC 3.2: Adaptability

The detail of each of the new indicators added to Home Performance Index v3.0 is in the following sections.

The Home Performance Index v3.0 also contains templates. A template is provided for Design for Disassembly and reference is made to Environmental Protection Agency (EPA) templates to be used for resource efficiency. The template for Design for Disassembly provides a qualitative indicator for disassembly and has been adapted from the Regenerate Tool.

2. EN 8.1: Pre-Demolition Report

This indicator is in the Environmental section of the Home Performance Index and references use of the EU Document *Guidelines for the waste audits before demolition and renovation works of buildings*, published in May 2018. This document states

> *A waste audit before demolition or renovation of buildings and infrastructures is a specific task within the project planning. It is necessary to understand the type and amount of elements and materials that will be deconstructed and/or demolished, and to issue recommendations on their further handling. An assessment of the viable recovery routes for materials can also be given (including reuse and the potential reuse value, recycling on- and offsite and the associated cost savings and energy recovery).*

This EU document provides templates in Sections 7–10 for use on projects.

3. EN 8.2: Design for Disassembly

This indicator is in the Environmental section of the Home Performance Index and its intention is to promote circularity within the construction industry. It involves an assessment of the decisions by the design team to incorporate Disassembly within the design strategy and detailed construction design.

The template provided references the contents of the Regenerate Tool.

4. EC 3.2: Adaptability

This indicator is in the Economic section of the Home Performance Index and its intention is to ensure resource and space efficient design that balances area efficiency with long term flexibility, and to ensure flexibility is designed in, to allow homes to be adaptable for occupants' needs throughout their lives.

The requirement to demonstrate adaptability is that at least two designs be submitted to show the future adaptability of the proposed design.

5. EU Taxonomy

The introduction of EN 8.2 Design for Disassembly and EC 3.2 Adaptability are also requirements that align with the EU Taxonomy for New Construction.

6. References

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

HPI X CIRCULAR LIFE:
Breakdown of Circularity Requirements harvested from the REGENERATE tool

Circularity Aim	Please tick the relevant box
Basic Circularity	
Partial Circularity	
Full Circularity	

Design for Disassembly / Deconstruction	How was it implemented?	Is this plausible?	Does this support circularity?
Site			
Foundation design is considered to be reversible			
Structure			
Reversible, mechanical connections are used instead of chemical alternatives			
Access to structural connections provided to allow for ease of deconstruction and a high percentage recovery of material			
The number of different types of structural connections is minimised			
A deconstruction plan has been produced			
Material passport style inventory recorded			
Skin			
Reversible, mechanical connections are used instead of chemical alternatives			
Access to façade connections provided to allow for ease of dismount and ensure high percentage recovery of material			
Number of different types of connections to façades minimised			
Façade replacement or upgrade strategy in place			
Material passport style inventory recorded			
Services			
Reversible, mechanical connections are used instead of chemical alternatives			
Access to services is provided to allow for ease of deconstruction, upgrade and a high percentage recovery of material			
Number of different types of connections to services minimised			

Material passport style inventory recorded			
Space			
Reversible, mechanical connections are used instead of chemical alternatives			
Access to internal connections / fixings provided to allow for ease of deconstruction and ensure high percentage recovery of material			
Number of different types of connections to internal spaces minimised			
Material passport style inventory recorded			

IRISH GREEN BUILDING COUNCIL

CIRCULARLife

GreenEnterprise

IMPLEMENTATION OF CIRCULARITY, WHOLE LIFE CARBON AND LIFE CYCLE COSTING

IN PUBLIC CONSTRUCTION PROJECTS

CONTENTS

INTRODUCTION

This handbook introduces you to some of the key green indicators that should be applied within public construction projects in addition to the energy efficiency requirements in Building egulations TGD Part L. These include Circularity, Whole Life Carbon assessment and Life Cycle Costing. It explains why these are important to integrate in projects, and how there is now a standardised EU approach to the application of the indicators through the EU framework for sustainable buildings: Level(s). This handbook the appropriate level of assessment and how to apply the indicators at each of the stages of the Capital Works Management Framework (CWMF), as well as who should be involved. It provides links to guidance, tools and education available in Ireland and internationally for the application of the indicators.

WHAT IS GREEN PUBLIC PROCUREMENT (GPP)?

Green Public Procurement (GPP) is a process where public authorities seek to source goods, services or works with a reduced environmental impact. The Government of Ireland's annual public sector purchasing accounts for **10%** to **12%** of **Ireland's GDP**, a large part of economic activity and demand.

This provides Ireland's public sector with significant influence to stimulate the provision of more resource-efficient, less polluting goods, services and works within the marketplace.

The public sector has a responsibility to promote green procurement, in order to support Ireland's environmental and wider sustainable development objectives. This duty is highlighted in the **Climate Action Plan (CAP)** 2023 as it states that the public sector will lead by example, embedding climate actions as a central value, **relentlessly** focusing on continuous improvement that **deliver real progress**.

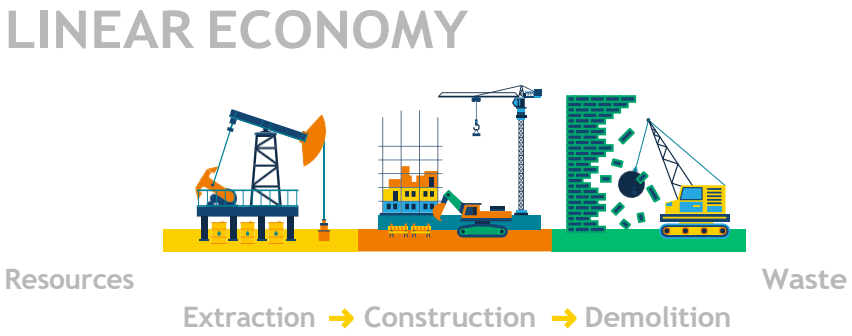
The large impact that the public sector has in relation to implementing circularity is highlighted on a national level in the **Whole of Government Circular Economy Strategy 2022–2023 Living More, Using Less** plan and in the **Waste Action Plan for a Circular Economy: Ireland's National Waste Policy 2020–2025**. At an EU level, the **European Green Deal** and the **EU Circular Economy Action Plan** (CEAP) state the importance of green public procurement in the EU's aim to achieve its climate neutrality target by 2050 and to halt biodiversity loss.

WHAT IS CIRCULARITY
AND WHY IS IT IMPORTANT?

Circularity is the process of keeping materials that have already been extracted or harvested to their highest value and reusing these materials rather than disposing of them. In this system there is no waste. Everything flows and copies the regenerative cycles of nature. This system avoids extraction from the Earth's finite resources and reduces carbon emissions.

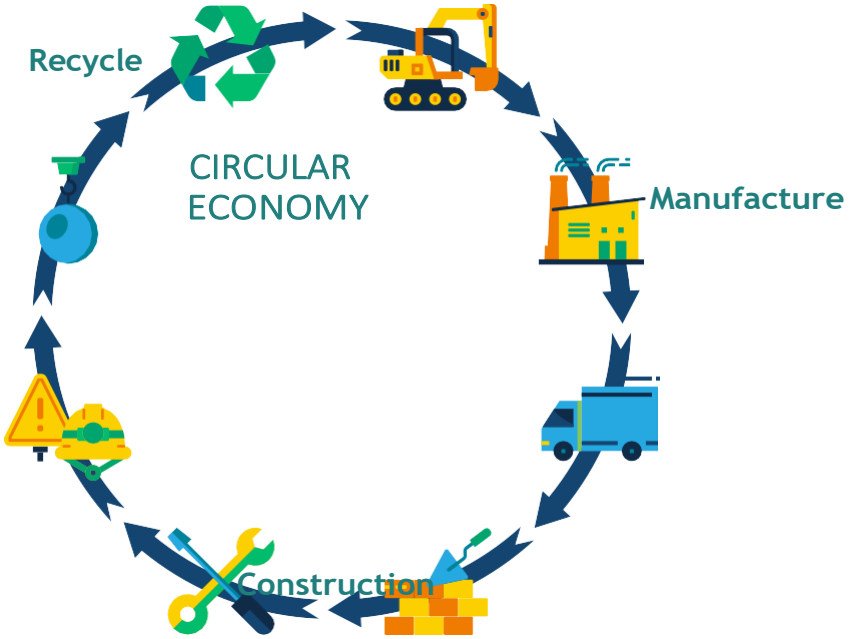
In recent years, the world at large has been focusing on the journey of switching to renewable energy. However, this only **addresses just over half of greenhouse gas emissions**.[1] The remaining greenhouse gas emissions come from the fact that we are stuck in a linear economy, and we are constantly extracting from the Earth to make goods. The Circular Economy is the opposite of the linear economy.

Construction is an activity that requires considerable extraction to create the buildings and infrastructure that surround us every day. Extraction of all materials is responsible for 90% of biodiversity loss. Construction is responsible for almost 50% of raw material consumption in Europe.



In the EU, Waste from Construction and Demolition (C&D) activity is the largest waste stream and C&D waste represents one third of all waste produced within the EU. C&D waste is Irelands largest waste stream, and this number is only going to increase due to the large amount of construction projects planned in Ireland, especially under the Ireland 2040 plan.

The circular economy gives us the tools to tackle climate change and biodiversity loss together. The circular economy transition will bring many positive attributes such as green jobs and economic benefits[2].



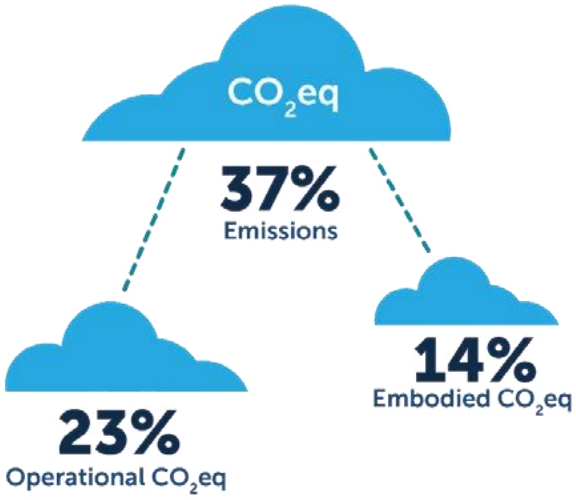
1 https://ellenmacarthurfoundation.org/completing-the-picture
2 The Circular Economy Could Unlock $4.5 trillion of Economic Growth, Finds New Book by Accenture | Accenture

WHOLE LIFE CARBON

AND WHY IS IT IMPORTANT?

The construction and built environment sectors account for 37% of Ireland's carbon emissions, equalling those of agriculture. Just under two thirds (23%) of these emissions come from operating buildings but more than a third (14%) come from quarrying, the production of construction materials, transport of materials, construction process, maintenance, repair and disposal of buildings and infrastructure. The carbon modelling work carried out by IGBC and UCD for Building a Zero Carbon Ireland roadmap[3] showed that Ireland will not be able to meet its climate goals by 2030 unless embodied carbon is tackled.

The Government Climate Action Plan 2023 requires a decrease in embodied carbon in construction materials by 10% by 2025 and a decrease by at least 30% by 2030 for materials produced in and used in Ireland. Construction of buildings and infrastructure accounts for up to 14% of Ireland's CO_2eq emissions. In older buildings the main cause of emissions is operational energy, but newer buildings with better performance require greater quantities of materials to achieve this performance. The production of materials also has a carbon cost known as embodied carbon. Cradle to grave thinking allows for building design solutions that seek the optimum balance between embodied carbon and use stage carbon emissions. In particular with embodied carbon, it is important to recognise that buildings are a significant material bank, being a repository for both carbon-intensive resources (concrete, steel, etc.) and carbon sequestering resources (wood, hemp, etc.) over many decades, and so it is important to explore designs that facilitate the future reuse and recycling at the end of the building life.



'Whole Life Carbon' (WLC)

is the total Global Warming Potential (GWP) associated with all life cycle stages of a building including both operational and embodied carbon. It is measured in kg or tonnes of CO2 equivalent (CO2eq).

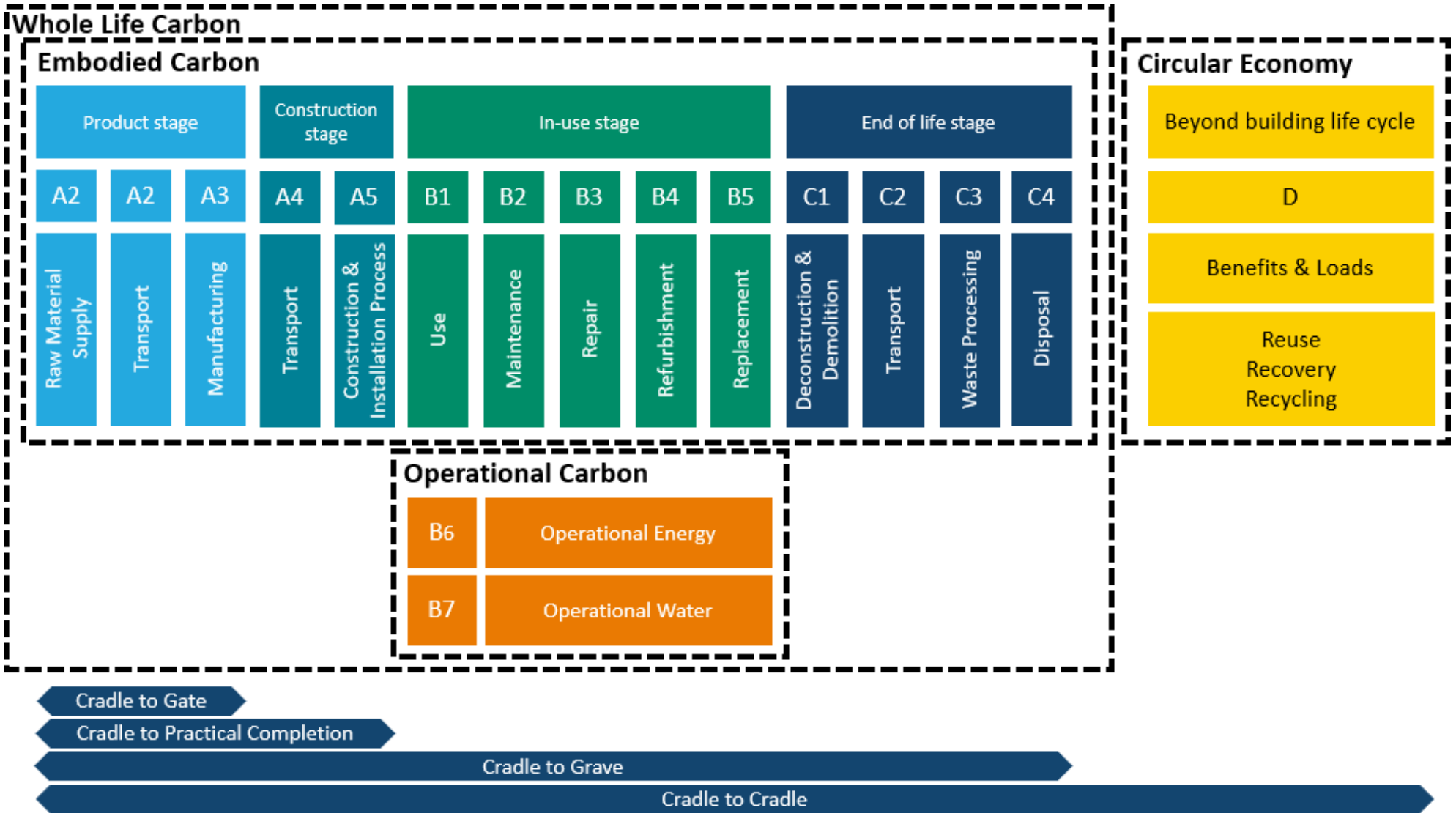
'Operational Carbon'

is the GWP associated with operational energy and water use (modules B6 and B7) during the use stage of a building's life cycle.

'Embodied Carbon'

is the GWP associated with the manufacturing and use of all construction materials and products over a building's whole life cycle (50-60 years), cradle to grave (modules A1-A5, B1-B5 and C1-C4).

3 https://www.igbc.ie/building-a-zero-carbon-ireland/

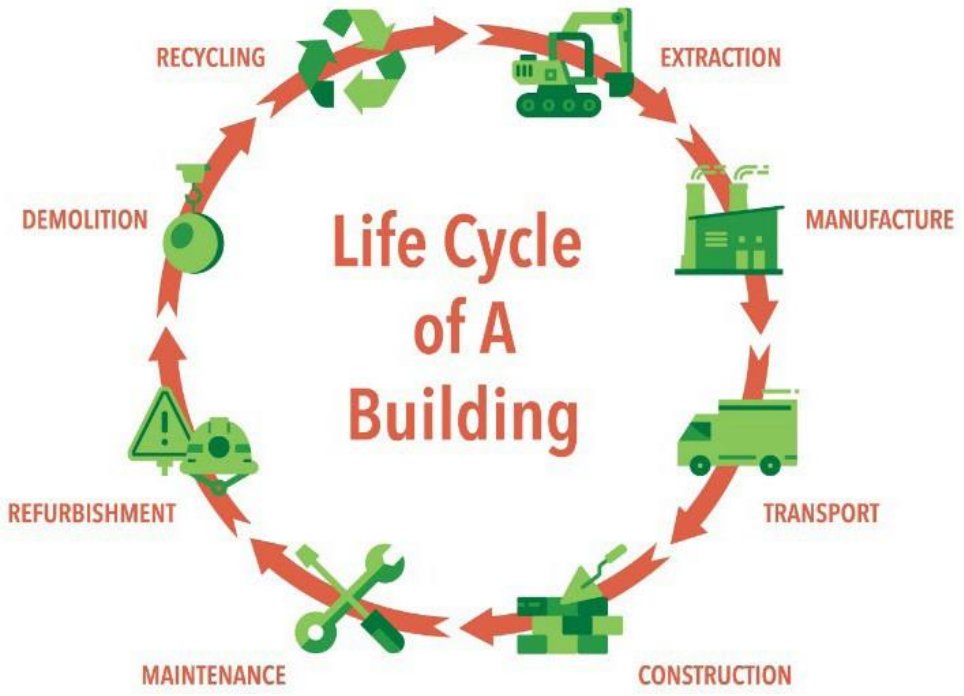


Building Life Cycle stages are defined by EN15978:2011

Measuring of WLC of a building gives a clear understanding of the carbon impact of constructing and operating the building. It allows an understanding of long-term post-completion considerations such as durability and lifespan.

By making WLC assessment an important consideration in the design of a building, design teams will;

- Reduce the material needs wherever possible
- Optimise the energy performance
- Consider how a building will be deconstructed
- Possibly most importantly, send a signal up supply chains to material manufacturers that lower carbon products will be preferred. This will assure manufacturers that there is a market for lower carbon solutions and therefore encourage investment in cleaner production processes.



LIFE CYCLE COSTING
AND WHY IS IT IMPORTANT?

Life cycle cost (LCC) analysis is a methodology for comparing the total cost of a product, structure or system over its entire life cycle. LCC gives a measurement of long-term economic performance of a building taking into account all its life stages. It includes various kinds of cost: the upfront capital costs, maintenance, repair and operation costs, renovation and adaptation costs, and finally demolition and disposal costs. It can also include environmental externalities. By estimating life cycle costs, important information can be provided to investors, asset managers and occupiers.

A life cycle cost perspective encourages clients and designers to consider the relationship between upfront capital costs and use stage costs. They can also provide a more informed basis for understanding future performance, value and liabilities associated with a building.

Savings associated with energy- and water-efficient buildings can be cash-flowed in order to capitalise the value of the savings and reflect this in property valuations and investment decisions.

This may be in comparison with benchmarks of performance in a local market, across a portfolio or the asset performance prior to a major renovation. The development of a medium- to long-term maintenance and replacement plan can support more cost-effective management of assets. This can include decisions relating to the service life and durability of key elements and components, as well as predictions of potential future costs and liabilities that may be associated with the early failure of components.

WHAT IS LEVEL(S)

AND WHY IS IT IMPORTANT?

Level(s) is an EU initiative that joins up sustainable building thinking across the EU by offering guidance on the key areas of sustainability in the built environment and how to measure them during design and after completion. Level(s) is the first-ever European Commission framework for improving the sustainability of buildings, living by the values of flexibility, resource efficiency and circularity.

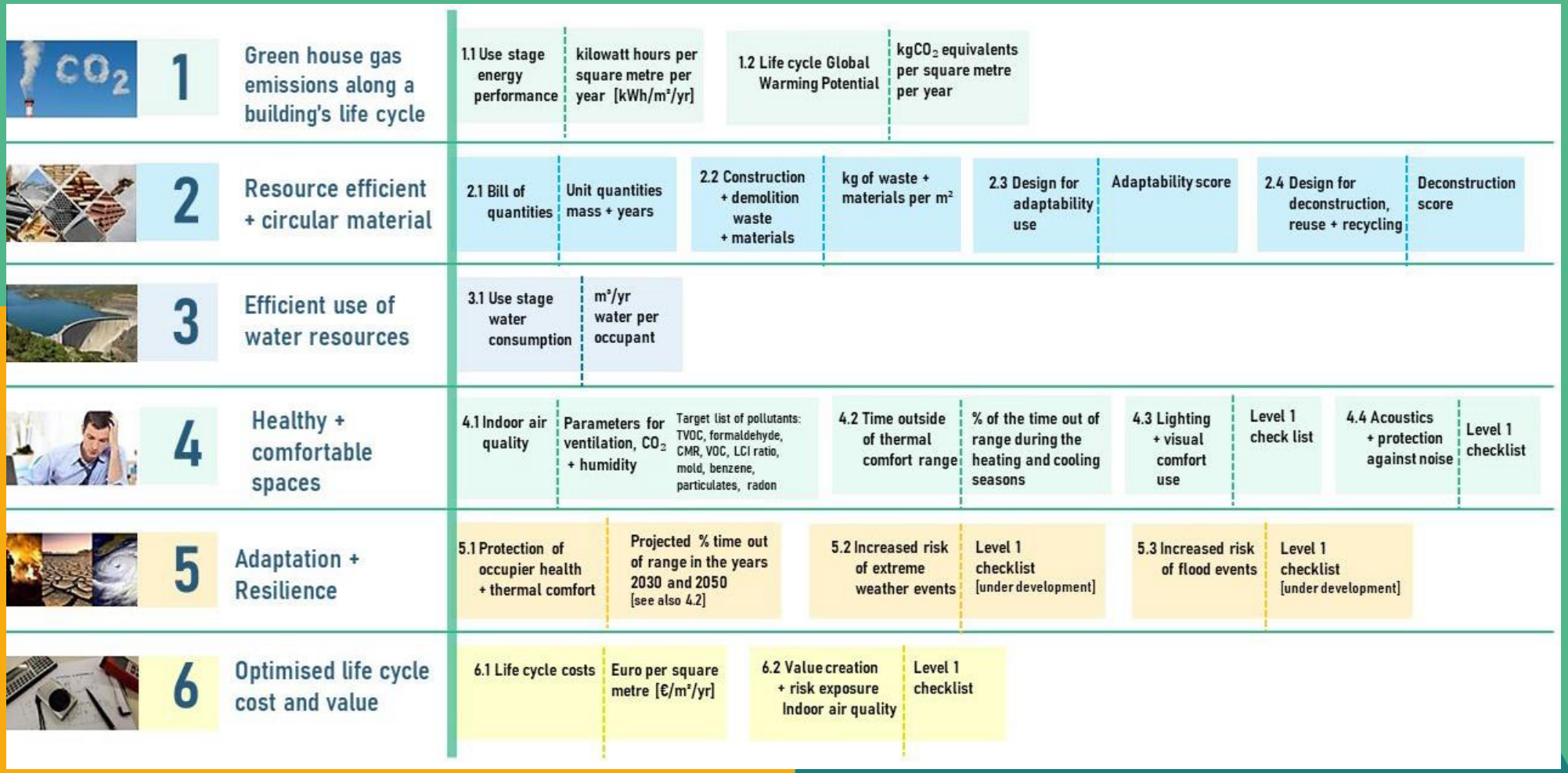
Level(s) is mentioned in key EU policy related to the built environment including the **Renovation Wave, the Circular Economy Action Plan,** the **New European Bauhaus** and the **EU Energy Efficiency Directive**, as a framework for construction and buildings to increase sustainability, and for use in Green Public Procurement. The draft **Energy Performance of Buildings Directive (EPBD)** will require disclosure of whole life carbon in accordance with the Level(s) framework for large new buildings by 2027 and all new buildings by 2030.

Level(s) is included in national policy documents such as Ireland's new **National Policy on Architecture** published in 2022 as **'essential in order to make comparable assessments, identify key performance indicators and understand the quality of development and its impact on natural and culturally significant sites'**. The **EPA Green Public Procurement Guidance** for the public sector also references the use of the EU Level(s) framework.

Level(s) is based on six overarching macro-objectives:

1. Greenhouse gas emissions along a building's life cycle
2. Resource efficient and circular material lifecycles
3. Efficient use of water resources
4. Healthy and comfortable spaces
5. Adaptation and resilience
6. Optimised life cycle cost and value

LEVEL(S) KEY INDICATORS



The common Level(s) **framework is organised into three levels**. The **levels provide a choice as to how advanced the reporting on sustainability for the project will be.** The three levels represent the following stages (meaning – levels of detail of design) in the execution of a building project:

Level 1:

The conceptual design for the building project

– the simplest level as it entails early-stage qualitative assessments of the basis for the conceptual design and reporting on the concepts that have been or are intended to be applied. This roughly aligns with Stage 1 and part of Stage 2 of the CWMF.

Level 2:

The detailed design and construction performance of the building

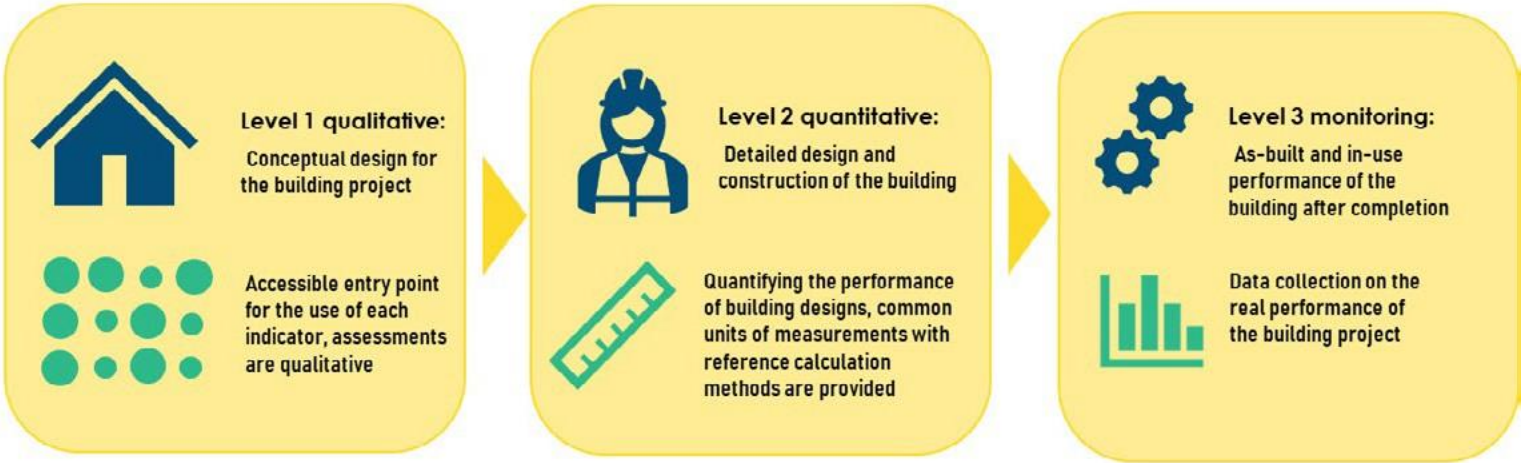
– an intermediate level as it entails the quantitative assessment of the designed performance and monitoring of the construction according to standardised units and methods. This roughly aligns with stages 2-3 of the CWMF.

Level 3:

The as-built and in-use performance of how the building performs after completion and handover to the client

– the most advanced level as it entails the monitoring and surveying of activity both on the construction site and of the completed building and its first occupants as well as the post-occupancy evaluations, with the aim of assessing the performance of the completed building and bringing awareness of the performance gap which could be addressed in repairs and any future developments. This aligns with need for post-occupancy evaluation.

Level(s) Structure



Journey from initial concept design, construction and the reality of the completed building

USING THE LEVEL(S) FRAMEWORK

In order to support the use of the Level(s) framework, the **EU Commission has published manuals for each indicator**, which **follow the life cycle of a project from feasibility or early concept design stage through to reporting on the operation of the building**. The first step for the practitioner is to **'Read the manual' for each indicator/criterion**. It provides checklists or reporting frameworks that can be used at each stage of the project. For example, the Level 1 checklists can be used for reporting on an evaluation of the building even prior to acquisition and at early feasibility and concept stage, i.e. Stage 1 of the CWMF.

A summary of each indicator is included in the following pages.
The summary contains:

- What it measures.
- When measurement needs to begin? i.e., whether needs to be considered before acquisition of land or building.
- What target is proposed?
- When it needs to be applied during the CWMF.
- Who needs to be involved and at what stage?
- How it can be applied. A direct link to the relevant Level(s) manual is provided plus additional guidance. There are also supporting links to other guidance on meeting the targets.
- What tools are available in Ireland or elsewhere to apply the indicator?

The Level(s) Indicators covered in this handbook

The handbook is focusing on the following Level(s) indicators relating to **Whole Life Carbon**, **Circularity** and **Life Cycle Costing**:

1.1 Life cycle global warming potential

2.1 Bill of quantities, materials and lifespans

2.2 Construction and Demolition waste and materials

2.3 Design for adaptability and renovation

2.4 Design for deconstruction

6.1 Life cycle costs

Life Cycle Global Warming Potential – Level(s) Indicator 1.2

When to begin:
Ideally assessment should begin prior to land/ building acquisition

What it measures?
$KgCO_2eq/m^2$

This indicator measures the greenhouse gas (GHG) emissions associated with the building at different stages along its lifecycle. The unit of measurement is kg CO2 equivalents per m2 useful internal floor area for a reference study period of 50 years. The results are to be reported for each life cycle stage, of which there are four – building production (A), use (B), end of life (C) and additional benefits and impacts beyond the life cycle (D). The system boundary is 'cradle to grave' as defined by EN 15978, i.e. from the production of building materials to the end of the building's useful life and the subsequent demolition and recovery of the building materials. It measures the building's entire contribution to emissions that contribute towards global warming. This is sometimes referred to as a carbon footprint assessment or whole life carbon measurement.

Key to who should be involved at each stage:
SP = Sponsoring Agency, **AP** = Approving Authority, **PTT** = Procurement Technical Team, **A** = Architect, **M&E** = Mechanical and Electrical Consultant, **SE** = Structural Engineer, **QS** = Quantity Surveyor, **LA** = Landscape Architect, **Ecl** = Ecologist, **C** = Contractor, **FM** = Facility, **V** = Valuer

Indicative Targets: New build offices <750kg/CO_2e/m^2, Schools <540kg/CO_2e/m^2, Residential <625kg/CO_2e/m^2
(Based on RIAI Modules A1-A5, B1-B5, C1-C4 climate targets)

When to apply? CWMF	Which Level(s) level?	Who is involved?	Action	Deliverable
Before site acquisition	1	SP, AP, PTT, V	Assess ground conditions, requirements for parking or other major ground works likely to impact CO2e emissions.	Implications for CO2e should be included in the site assessment report.
Stage 1: **Feasibility**	1	PTT, A, SE, M&E, QS	Integrated Design meeting - • Define target $KgCO_2eq/m2$ based on building type and brief. • Use early-stage optioneering design tools appropriate for level.	Initial report setting out various design and structural options • with early stage LCA calculations for each • at least one innovative low carbon option.
Stage 2: **Design i+ii**	1-2	A, SE, M&E, QS	• Integrated design team working to develop low carbon design options • Create more detailed inventory of materials using generic data.	Interim stage LCA calculation based on generic data aligns with target.
Stage 2iii: **Tender**	2	A, SE, M&E, QS	• Create detailed inventory using ICMS 3 compliant BOQ • Have identified low carbon materials options with product specific data.	Accurate LCA of building using EPD + BOQ for specified materials for inclusion in tender documentation aligns with target.
Stage 3: **Construction**	3	A, SE, M&E, QS, C	Contractor provides accurate quantities and EPD data on any product substitutions and evidence of final use on site.	Final calculation based on actual quantities, transport of materials, on site energy use and other information relevant for full assessment aligns or improves on target.
Stage 4: **Review**	3	FM	• Ongoing gathering of data on replacement cycles and repair.	• Report submitted on final calculated results and lessons learnt. • share data with central database to allow development of improved databases and benchmarks.

Additional information and guidance

- **The Level(s) Manual for indicator 1.2** provides guidance on applying it at the different stages of a project **https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/2021-01/UM3_Indicator_1.2_v1.1_37pp.pdf**
  IGBC is working with University of Galway to develop a National Methodology for measurement of whole life carbon compliant with Level(s) expected to be available in 3rd–4th quarter 2023 which will allow greater comparability for calculations in Ireland.
- **LETI carbon alignment document** sets out guidance on benchmarks for embodied carbon, however IGBC and Construct Innovate are developing more accurate benchmarks for different building types in Ireland. This work should be available in 2024.
- **Whole Life Carbon Hub** provides links to all generic and product specific data available for Ireland and in Europe, information on LCA tools, information videos etc. It will be updated in 2023 with the National methodology and further guidance.
- National GWP data for common building materials such as concrete, brick and steel to understand the carbon emissions involved in the production processes. **Generic Data – Irish Green Building Council (igbc.ie)**

What tools can I use?

Tools for calculation

Level 1 tool – Carbon designer for Ireland sponsored by LDA and EPA and developed by One Click LCA is a free early-stage level(s) compliant LCA and optioneering tool allows procurers to set targets at predesign stage and design teams to do early design optioneering and generate reports. It provides typical Irish construction build ups for floors, wall, and roof. **Carbon Designer for Ireland - Irish Green Building Council (igbc.ie)**

Level 1–2 Tool for structural engineers to optimise structural grid – **The Structural Carbon Tool Version 2 - The Institution of Structural Engineers (istructe.org)**

Level 2 + 3 – Tools – One Click LCA,E – Tool, are commercial Level(s) compliant tools which can be linked to BIM tools and allow full LCA to be carried out with full set of EPD datasets for Ireland. Hawkins Brown Revit Plugin allows easy visualisation of carbon hot spots in design.

Tools for Comparing materials

- Materials Pyramid allows easy comparison of relative impact of different materials. **https://www.materialepyramiden.dk/**
- EC3 tool is a free tool that can be used for comparing digitised EPD data including from Ireland and is hosted by **https://buildingtransparency.org/**
- Materials 2050 centralises information on sustainability onto one platform **https://2050-materials.com/**

Resource-efficient + circular material life cycles – Level(s) Ind. 2.1 – 2.4

What does it measure?

The four indicators are:

- **2.1**: Bill of quantities, materials, and lifespans - Unit quantities, mass, and years
- **2.2**: kg of waste and materials per m2 total useful floor area
- **2.3**: Adaptability score
- **2.4**: Deconstruction score

When should it begin?
Application of indicators should begin prior to acquiring site.

Key to who should be involved at each stage:
SP = Sponsoring Agency, AP = Approving Authority, PTT = Procurement Technical Team, A = Architect, M&E = Mechanical and Electrical Consultant, SE = Structural Engineer, QS = Quantity Surveyor, LA = Landscape Architect, Ecl = Ecologist, C = Contractor, FM = Facility, V = Valuer

Indicative Targets: 70% diversion of waste from landfill

When to apply? CWMF	Which Level(s) level	Who is involved?	Action	Deliverable
Before site acquisition	NA	SP, AP, V	Assess potential to adapt or reuse any existing structures as part of the acquisition and valuation linked to the intended use.	Include recommendations on site assessment report: • on reuse potential of buildings in site assessment report. • potential waste arising from particular site and potential reuse of resources from site.
Stage 1: **Feasibility**	1	PTT, A, SE, M&E, QS	• Initial design team meeting to develop a strategy using early-stage tools and checklists. • Designate a circularity champion and a waste auditor on your team.	A circularity statement setting out strategy for the building against all the key measurables. • Alternative sketches showing how building could be adapted to another future use. • Targets for waste reduction. • Strategy of design for disassembly.
Stage 2: **Design i+ii**	1-2	A, SE, M&E, QS	Iterate concept design to take into account the key measurable items using the level(s) checklists.	• Design integrates circularity principles on adaptability, deconstruction, and waste reduction. • Circularity statement is updated with additional detail. • Developed waste management plan. • Pre demolition audit on any buildings to be demolished.
Stage 2iii: **Tender**	2	A, QS, SE, M&E	• Create detailed waste management plan. • Prepare a pre-demolition audit where demolition involved. • Implement circularity strategy through technical design and specification.	• Checklist score for adaptability including architectural plans showing alternative change of use. • Score for deconstruction. • detailed ICMS compliant BOQ comparing resource use. • Detailed waste reduction plan included in tender documents.
Stage 3: **Construction**	3	A, C	Implement • circularity strategy • waste management on site, including segregation measurement.	Reports on: • different waste streams generated during construction indicator 2.3 in kg/m2 per useful area using reporting template. • Information on as built design of disassembly integrated into user manual. • Information on as built design for adaptability integrated into user manuals including e.g. spurs for future services etc.
Stage 4: **Review**	3	FM	Continue to gather evidence on the operation of the building and levels of resource use.	• Review of project achievements on implementation of circularity reporting against each of the measurable requirements.

Additional information and guidance

- Manuals for Indicator 2.1-2.4 can be downloaded here which provide a detail checklist of what should be considered at each stage. **https://susproc.jrc.ec.europa.eu/product-bureau/product-groups/412/documents**
- Preparation of BOQ in alignment with ICMS 3 – **https://icms-coalition.org/**
- EPA Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects, which includes a template for reporting on waste. **CDWasteGuidelines.pdf (epa.ie)**
- How to create circularity statements: **Greater London Authority (GLA) – Circular Economy Statement Guidance | London City Hall** May use the **Regenerate tool** to aid you in the development of these statements.
- **Guidelines for the waste audits before demolition and renovation works of buildings.** EU Commission.
- **Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects** – **Irish Green Building Council (igbc.ie)**
- Get inspired by existing buildings with circularity principles integrated! **Circular Buildings Toolkit (arup.com)**
- **The Southern Waste Region has created circularity checklists for designers, Quantity Surveyors, Clients, Contractors and Product Manufacturers - Publications | Southern Waste Region**

What tools can I use?

- The **Regenerate tool** is a free cloud-based tool that allows design teams to collaborate at early design stage measuring and scoring the circularity of the building under criteria: design for adaptability; design for deconstruction; circular materials; and resource efficiency. See case study below **https://urbanflows.ac.uk/regenerate/**
- The **Circular Buildings Toolkit (arup.com)** allows design teams to create a circular toolkit for projects focusing on topics such as build nothing, build for long term value, design for longevity, design for adaptability, design for disassembly, refuse unnecessary components, increase material efficiency, reduce the use of virgin materials, reduce the use of carbon intensive materials and design out hazardous/ polluting materials.
- Level(s) also provides a more detailed waste tracking Excel sheet which can be carried out as an alternative to the simpler EPA waste template. **https://susproc.jrc.ec.europa.eu/product-bureau/product-groups/412/documents**
- **Re-use platform Construction Materials Exchange | Irish Green Building Council (igbc.ie)** CMEx is a construction material marketplace set up to allow the reuse of construction materials that would otherwise enter the waste stream.
- **Construction Waste portal** tool allows design teams to forecast waste, enables efficient procurement and drives best practice within your supply chain. **https://www.constructionwasteportal.com/**
- BRE SMARTWaste is a flexible online-reporting tool that can help manage and reduce waste outputs, impacts and costs. It can be used to prepare, implement and monitor site waste management plans (SWMPs). Commercial subscription. **Insights and Case Studies | SmartSite (bresmartsite.com)**

Life Cycle Costs – Level(s) Indicator 6.1

When should it begin?:
Assessment begins prior to land/ building acquisition as site specific issues will impact life cycle costs.

What does it measure?:
€/m2 /year

The indicator measures all building element costs incurred at each life cycle stage of a project for the reference study period and, if defined by the client, the intended service life. The life cycle stages are presented and explained in the first part of Briefing 1.4 (see Figure 4 in the User Manual 1 document) and the minimum scope of building elements to address is originally provided in Briefings 2.2 and 2.3 (see Table 11 in the User Manual 2 document) as part of the building description. The life cycle stages reflect those used as the basis for the reference standards EN 16627 and ISO 15686-5.

These costs will be strongly influenced by the decisions and calculated performance of the following indicators in the Level(s) framework: Use stage primary energy use (1.1), bill of quantities, materials, and lifespans (2.1), efficient use of water resources (3.1).

Key to who should be involved at each stage: SP = Sponsoring Agency, AP = Approving Authority, PTT = Procurement Technical Team, A = Architect, M&E = Mechanical and Electrical Consultant, SE = Structural Engineer, QS = Quantity Surveyor, LA = Landscape Architect, Ecl = Ecologist, C = Contractor, FM = Facility, V = Valuer

Indicative Targets:
No target set yet - to be developed with increase in measurement for Ireland.

When to apply? CWMF	Which Level(s) level	Who is involved?	Action	Deliverable
Before site acquisition	1	AP, SP, PTT, V	Evaluate specific site or building conditions that would impact costs for construction and operation.	Site specific issues leading to increased cost over the lifetime should be reported on and quantified.
Stage 1: **Feasibility**	1	A, QS, SE	Lead early optioneering on different strategies with design team.	Life Cycle Costing concept design statement.
Stage 2: **Design i+ii**	1–2	A, M&E, QS	Develop more detailed BOQ and life cycle cost plan.	More developed Life Cycle Costing design statement.
Stage 2iii: **Tender**	2	AP, SP, PTT, A, M&E, QS	• Carry out full BOQ. • Detailed costings for energy and water. • Detailed information on replacement cycles.	Developed full LCC model accounting for energy water and replacement cycles.
Stage 3: **Construction**	3	C, PTT, QS	Update as built costs on completion.	Report on final total as-built costs.
Stage 4: **Review**	3	A, QS, PTT, FM	Gather data and update cost model including real in use costs, energy, water and maintenance.	• Report on total actual costs of maintenance, energy, and water. • Share data with central government agency such as OGP to allow development of national LCC cost databases.

Additional information and guidance

Level(s) manual 6.2 **https://susproc.jrc.ec.europa.eu/product-bureau/product-groups/412/documents**

SCSI Guide to Life Cycle Costing **SCSI Guide to Life Cycle Costing – Society of Chartered Surveyors Ireland**

IGBC offer regular training in LCC in conjunction with **SCSI. https://www.igbc.ie/events/**

Watch TU Dublin lecturer Dermot Kehilly's YouTube videos on LCC **Dermot Kehily - YouTube**

What tools can I use?

Levels 1–2: CRAVEzero provides a full set of free tools, including LCC calculators, LCC case studies to help in the design of high performing buildings at optimised cost **Life Cycle Cost Web Tool Info (cravezero.eu)**

Level 2: One Click LCA - Software used to carry out LCA can also be used to complete LCC at the same time using a ICMS compliant BOQ

CASE STUDY 1:

Using circularity tools in the design team process

Generating Circularity Statements for Projects using the Regenerate Tool

Clients:	**Various public and private clients**
Workshop host:	**Irish Green Building Council**
Participants:	**Clients, Architects, Structural engineers, M & E engineers**
Projects:	**Public sector, residential and industrial**
Date of workshops:	**October-December 2021**

Goal

To pilot the use of circularity statements with six design teams working on a range of public and private projects and to explore how collaboration to integrate circularity from early concept stage could work. Circularity statements set out how circularity has been integrated into a project and these are now a requirement for planning approval process in London for buildings over a certain size.

Description

In order to facilitate the process, a free cloud-based circularity tool called Regenerate developed by University of Sheffield was used. In all workshops the key design team members participated, including structural engineer, architect, mechanical and electrical engineer and in some cases the client. This proved essential as each was able to respond to a specific aspect of circularity.

The Regenerate Tool proved useful to structure, prompt, challenge and record the approach of the design team in integrating circularity. The tool focused on the site itself, including foundations, the structure, building skin, the services, and the space, looking at design for adaptability, design for deconstruction, circular material selection and resource efficiency. It challenged each discipline of the design team members to respond on everything from drainage to façade design. This proved important as many of the aspects of circularity had not been considered by the design team before, and this prompted ideas and solutions throughout the workshop.

For example, one design team looked at integrating standardised window opening sizes to ensure future adaptability, and increasing fire proofing of partitions to facilitate a greater degree of adaptability in the future; another proposed reusing bricks, from a façade demolished on the site for the interior atrium of the new build; others decided to pilot material passports and to avoid secondary finishes in the building; and yet another team decided that building will be prefabricated off site to avoid waste. Many of these strategies would not have been considered otherwise. Responses were inputted by the design team directly into the tool, generating a formatted report which can then be provided to the client.

Conclusion

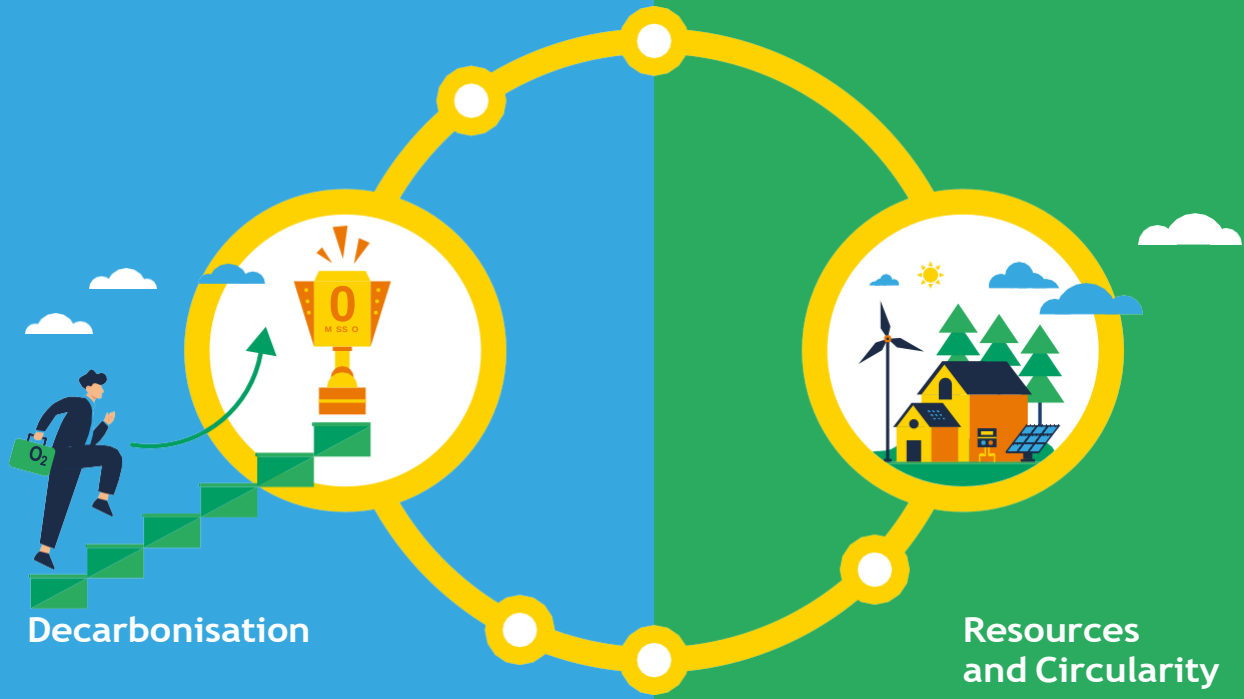
The tool allowed the team to self-assess and score the degree of circularity integrated into the project, however the pilots showed that it was really important to have an experienced team member facilitating and guiding to ensure that these responses are ambitious and substantive, as there was a tendency for some design team members to fall back to describing unambitious and business-as-usual responses as sufficient to address some questions. The workshops need the members of the design team to bring a positive, open mindset and collaborate in an open non defensive way.

While it is essential to start the process at early design stage to ensure opportunities are not missed , it is also essential to revisit the exercise at each subsequent stage of the design process with the full design team, so that the strategies are tracked and iterated with detail as the design develops.

The Design teams found the process very useful. Here are some of the comments post the workshop:

'The Regenerate tool is very useful to introduce circularity at early design stage.'

'The Regenerate tool is a great tool to use to record the project's circular process.'



Decarbonisation

New developments, infrastructure, and renovations will have Net Zero embodied carbon, and all buildings, including existing buildings, must be Net Zero operational carbon

Resources and Circularity

A built environment that supports restoration of resources and natural systems within a thriving circular economy

CASE STUDY 2:

Integrating Whole life carbon measurement into the procurement process

Clients:
Grangegorman Development Agency (GDA) / TU Dublin

Architectural Lead:
Carr Cotter Naessens Architects

Project:
FOCAS Research Institute

Completion Date:
2020-2021

Goal:

In order to develop an enduring, adaptable and environmentally responsible building, the Grangegorman Development Agency (GDA) included the requirement that the winning design must demonstrate how the building would meet an embodied carbon target of 600kgCO2e/m2 within the two-stage open Architectural Design Competition.

The carbon requirement was formulated as described in IS-EN-15978. It includes a reduction of embodied carbon by 40% from a baseline set out in the RIAI target. To help make a decision, the jury was advised by technical experts in LCA, Circularity and CLT construction.

Description

Catherine Opdebeeck, Project Coordinator - Grangegorman Development Agency

The project uses the IS EN-15978 standard and level(s) indicator 1.2 to provide the framework of its LCA. The iterative approach to LCA means decisions can be guided by the latest knowledge on the carbon impact of the design as it evolves.

In order to meet strategic objectives of a net carbon zero horizon for both the Grangegorman site and nationally, performance targets are set for this project. Targets are set for both embodied and operational carbon as elements of whole life carbon. These are complementary to regulatory compliance and are fundamental to the project. The carrying out of Life Cycle Assessments and integrating this into the design process forms part of the complete Design Team's scope. A Life Cycle Assessor has been appointed as part of the Design Team. The procurement of the LCA role was linked to the Life Cycle Cost and Quantity Surveying Role during procurement. Qualitative assessment around LCA formed a large portion of the award criteria for this linked role and as a result influenced the procurement process emphasizing a whole life approach. The Design Team are currently reviewing a number of options around the structural frame which will be reviewed according to a matrix of risks and opportunities including embodied carbon.
The Life Cycle Assessment is being considered as an iterative process used to influence early decision making.

Step 1 Goals definition:
develop an enduring, adaptable and environmentally responsible building

Step 2 Choice of indicator:
Whole life carbon as defined by IS-EN-15978 and Level(s) indicator 1.2

Step 3 1st stage:
selection of 5 teams which will provide a more detailed design

Step 4 Submission of designs

Step 5 2nd stage:
selection of the best project by a jury

Conclusion

FOCAS Research Institute project is a leading project regarding the use of LCA in public competition in Ireland. It has introduced carbon indicators in its tender, with the goal of making an enduring, adaptable and environmentally responsible building.

LCA: TECHNOLOGICAL UNIVERSITY DUBLIN, FOCAS RESEARCH INSTITUTE

GENERAL INFO

Country: Ireland
Client: Grangegorman Development Agency (GDA) / TU Dublin
Architectural Lead: Carr Cotter Naessens Architects
Project: FOCAS Research Institute
Competition Date: 2020-2021
Standard used : EN-15978

Goal:

Introduction of LCA into Irish public procurement

In order to develop an enduring, adaptable and environmentally responsible building, the Grangegorman Development Agency (GDA) included the requirement that the winning design must demonstrate how the building would meet an embodied carbon target of 600kgCO2e/m2 within the two-stage open Architectural Design Competition.

Steps

- Goals definition : develop an enduring, adaptable and environmentally responsible building
- Choice of indicator : Whole life carbon as defined by BS-EN-15978
- 1st stage : selection of 5 teams which will provide a more detailed design
- Submission of designs
- 2nd stage : selection of the best project by a jury

Methodology and tools

The carbon requirement was formulated as described in BS-EN-15978. It includes a reduction of embodied carbon by 40% from a baseline of 1000kgCO2e/m². To help make a decision, the jury was advised by technical experts in LCA, circularity and CLT construction.

https://www.epa.ie/publications/circular-economy/resources/GPP-Guidance-for-the-Irish-Public-Sector.pdf

CONCLUSION

FOCAS Research Institute project is a leading project regarding the use of LCA in public competition in Ireland. It has introduce carbon indicators in its tender, with the goal of making an enduring, adaptable and environmentally responsible building.

WHY IS IT WORKING ?

The project use the BS-EN-15978 standard to provide the framework of its LCA. The iterative approach to LCA means decisions can be guided by the latest knowledge on the carbon impact of the design as it evolves.

Catherine Opdebeeck, Project Coordinator - Grangegorman Development Agency

In order to meet strategic objectives of a net carbon zero horizon for both the Grangegorman site and nationally, performance targets are set for this project. Targets are set for both embodied and operational carbon as elements of whole life carbon. These are complementary to regulatory compliance and are fundamental to the project.

The carrying out of Life Cycle Assessments and integrating this into the design process forms part of the complete Design Teams' scope. A Life Cycle Assessor has been appointed as part of the Design Team.

The procurement of the LCA role was linked to the Life Cycle Cost and Quantity Surveying Role during procurement. Qualitative assessment around LCA formed a large portion of the award criteria for this linked role and as a result influenced the procurement process emphasizing a whole life approach.

The Design Team are currently reviewing a number of options around the structural frame which will be reviewed according to a matrix of risks and opportunities including embodied carbon. The Life Cycle Assessment is being considered as an iterative process used to influence early decision making.

IGBC

WHAT PRACTICAL STEPS CAN YOU TAKE NOW?

A good way to start your journey right now is to:

- If you are not already a member join the IGBC to learn and contribute! **Join IGBC Now! - Irish Green Building Council**
- Sign up to the IGBC Mail Courses - **Circular Economy in the Built Environment | Course Mail - Irish Green Building Council (igbc.ie)**
- Sign up to the IGBC Level(s) Procurement Commitment - **Sign Level(s) Procurement Commitment: A first step into a more sustainable built environment - Irish Green Building Council (igbc.ie)**
- Follow the IGBC roadmap to building a zero carbon Ireland - **BUILDING A ZERO CARBON IRELAND - Irish Green Building Council (igbc.ie)**