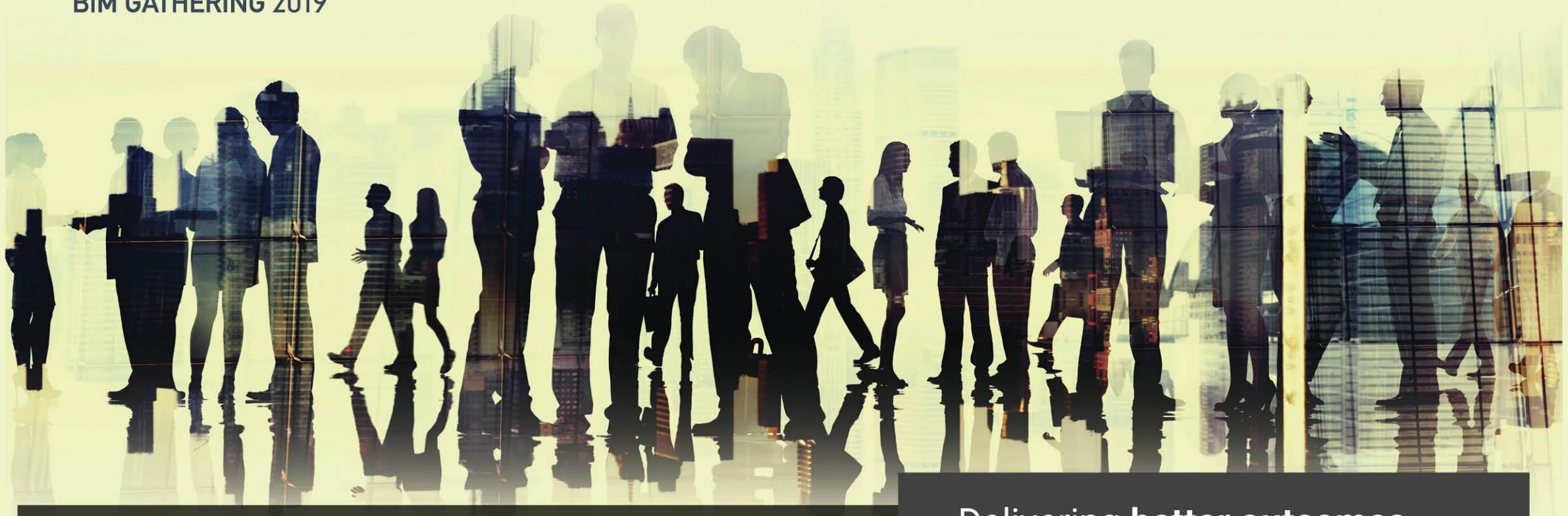


CitA

BIM GATHERING 2019



4th CitA BIM Gathering 26th September 2019, Galway, Ireland.

Delivering **better outcomes**
for Irish Construction



Exploring the role of BIM in a Circular Economy with a focus on Material Passports

Dr. Mark Kelly, Gerard Nicholson (both Department of Building and Civil Engineering, GMIT and Keith Burke (Carey Building Contractors)



What role will BIM and digitization play in supporting the sector within a circular economy?





Buildings in the EU are responsible for:

50% of all energy use

40% of all greenhouse gas emissions

50% of all raw material extraction

33% of all water use

When the full lifecycle (extraction, manufacture, transport, construction and end-of-life) is considered.

EU, 2018



The construction sector produced 923 million tonnes of waste in 2016, which in terms of volume is the largest waste stream in the EU, representing 30% of all waste generated.

(EU, 2019)

CONSTRUCTION & DEMOLITION WASTE STATISTICS FOR IRELAND



Latest 2014 EPA estimates

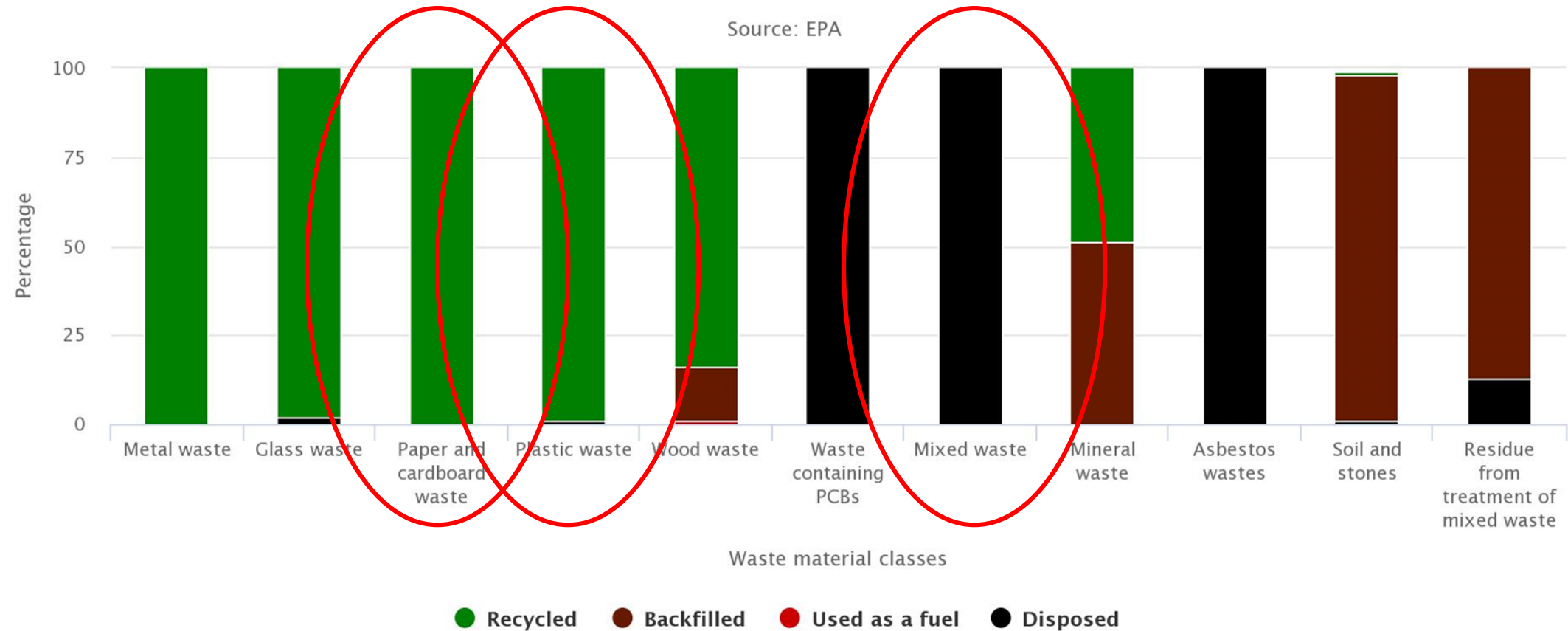
3.3 mt

2007 EPA estimates

17 mt

Data collected from licensed and managed facilities NOT construction and demolition projects.



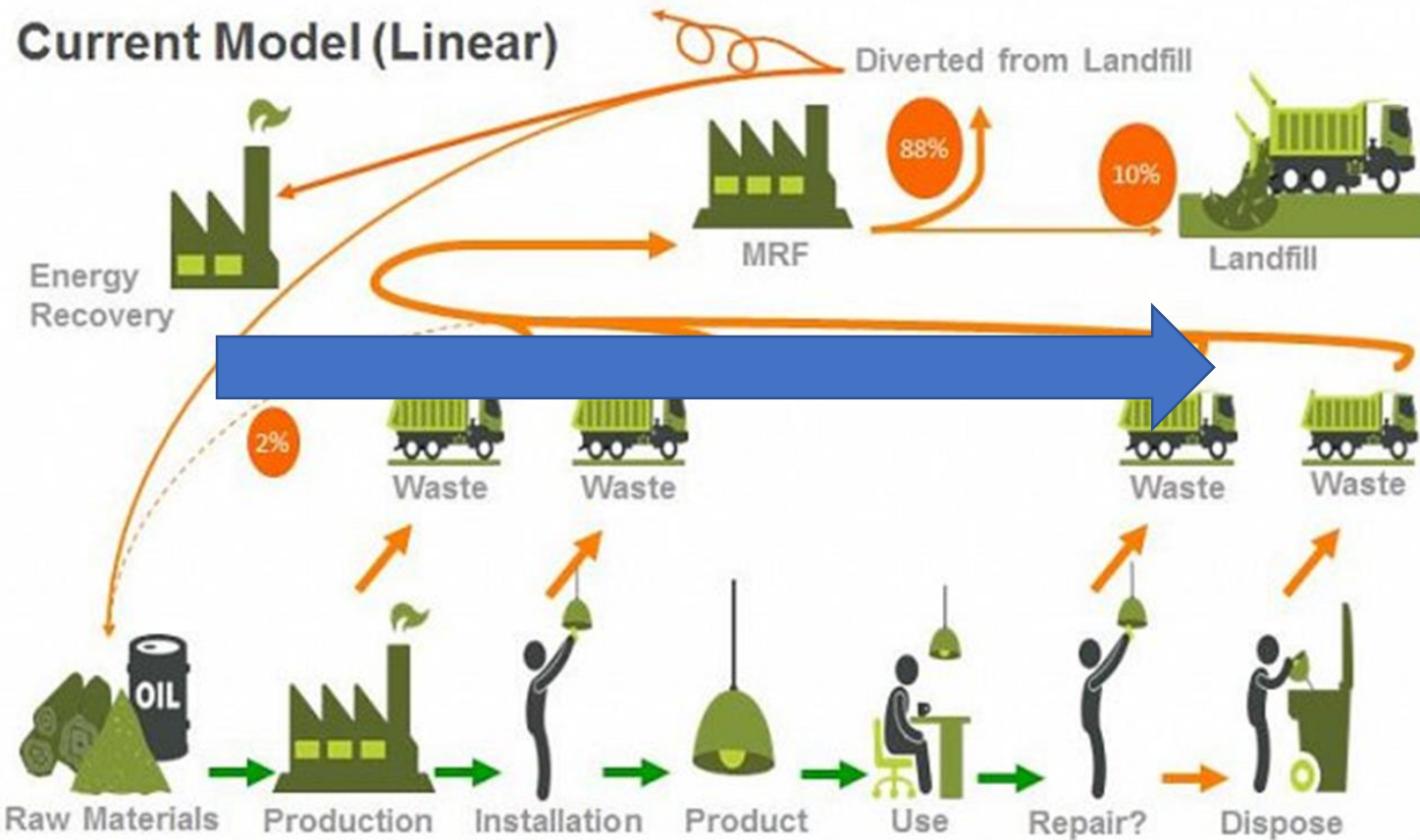


Highcharts.com

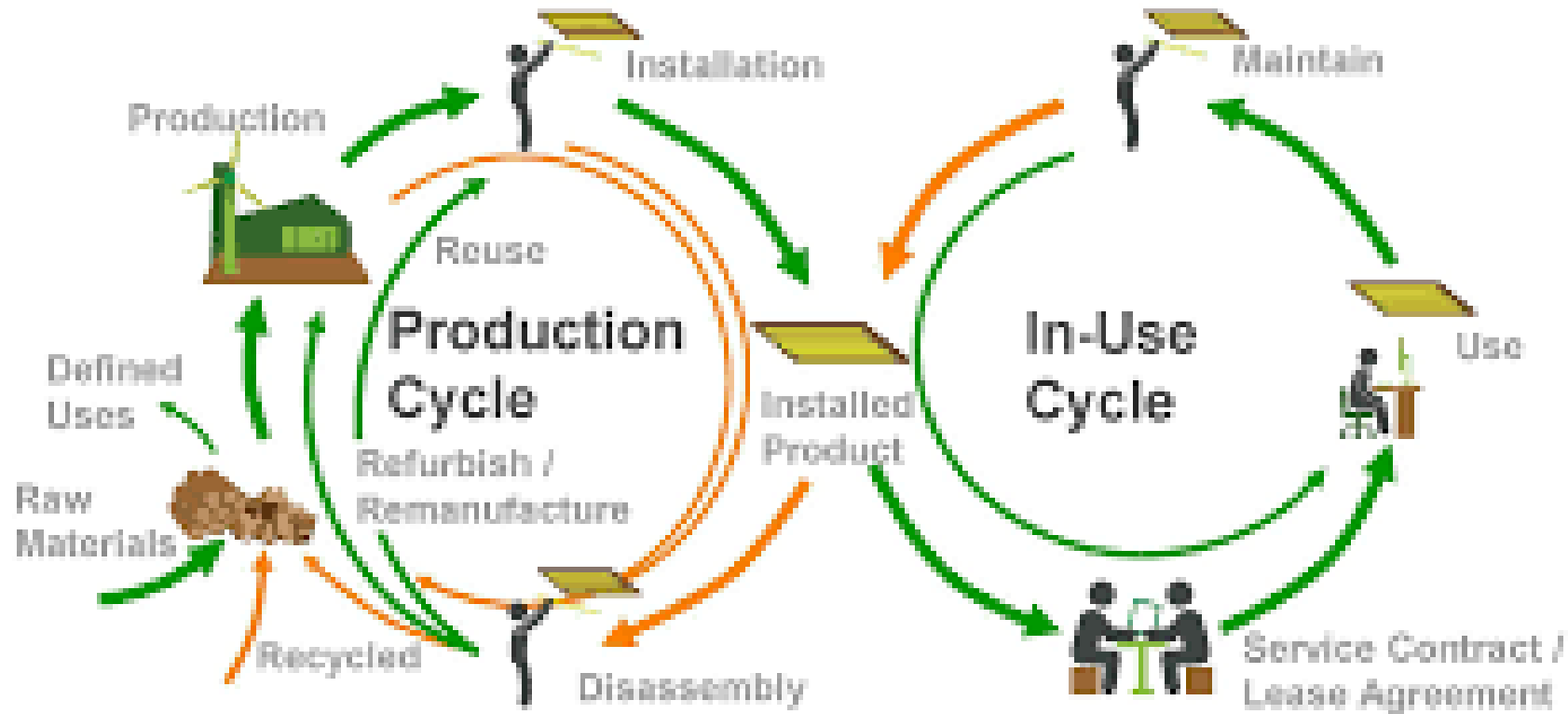


INDIRECT WASTE





<https://sustainability.bam.co.uk/insights/2014-09-18-the-circular-economy-a-new-resource-model-for-the-built-environment>



(UK Green Building Council)

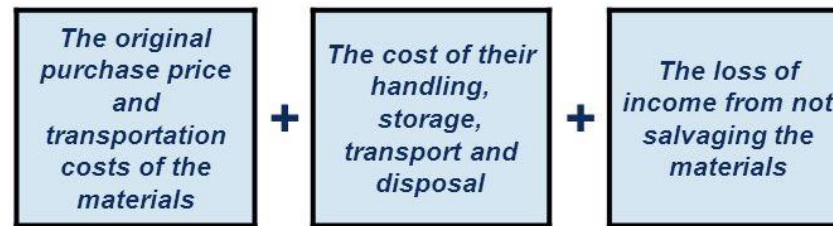


The circular economy is one that is restorative by design, and which aims to keep products, components and materials at their highest value and utility at all times.

(Ellen McArthur Foundation, 2015)



True cost of construction waste



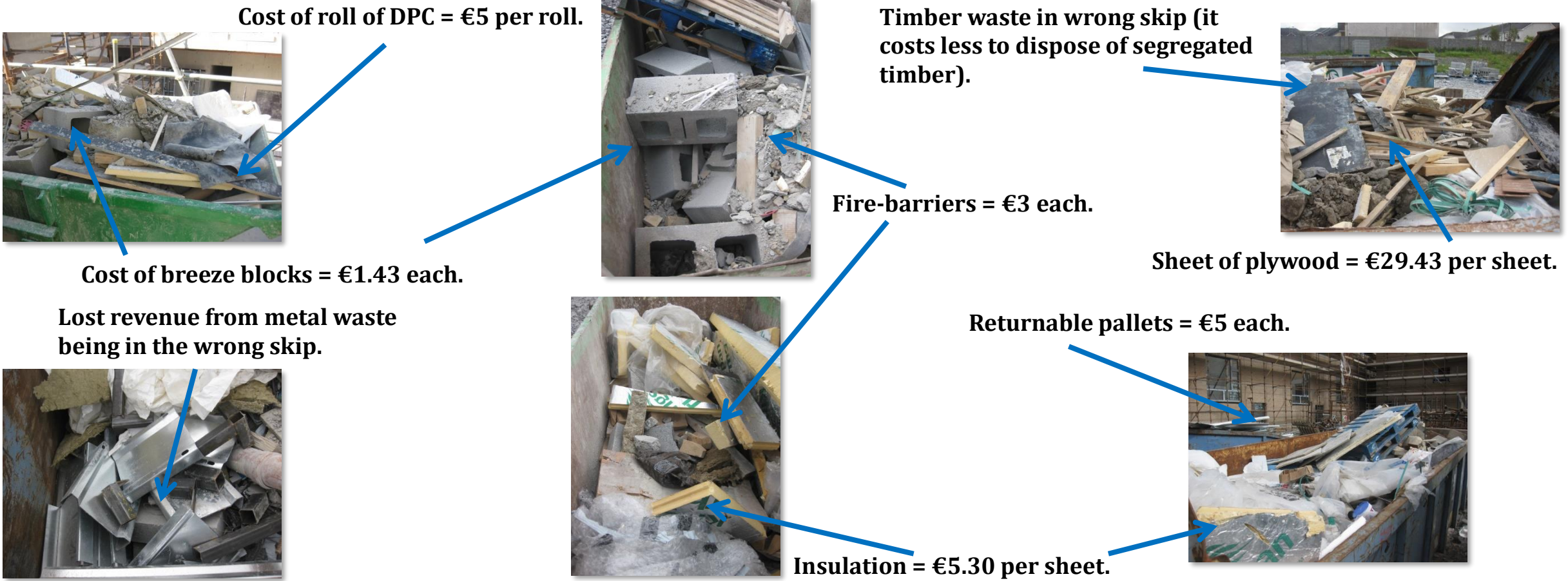
e.g. For 8 cu yd skip:

Skip hire	£85
Labour to fill skip	£163
Cost of materials put in skip	£1095

TOTAL TRUE COST **£1343**

(Source: AMEC)

We need to rethink what 'value' means and our definition of 'waste'...it is not a 'waste', it is a resource.





What is a circular building?

A building that is developed, used and reused without unnecessary resource depletion, environmental pollution and ecosystem degradation. It is constructed in an economically responsible way and contributes to the wellbeing of people and other inhabitants of this earth. Here and there, now and later. Technical elements are demountable and reusable, and biological elements can also be brought back into the biological cycle.

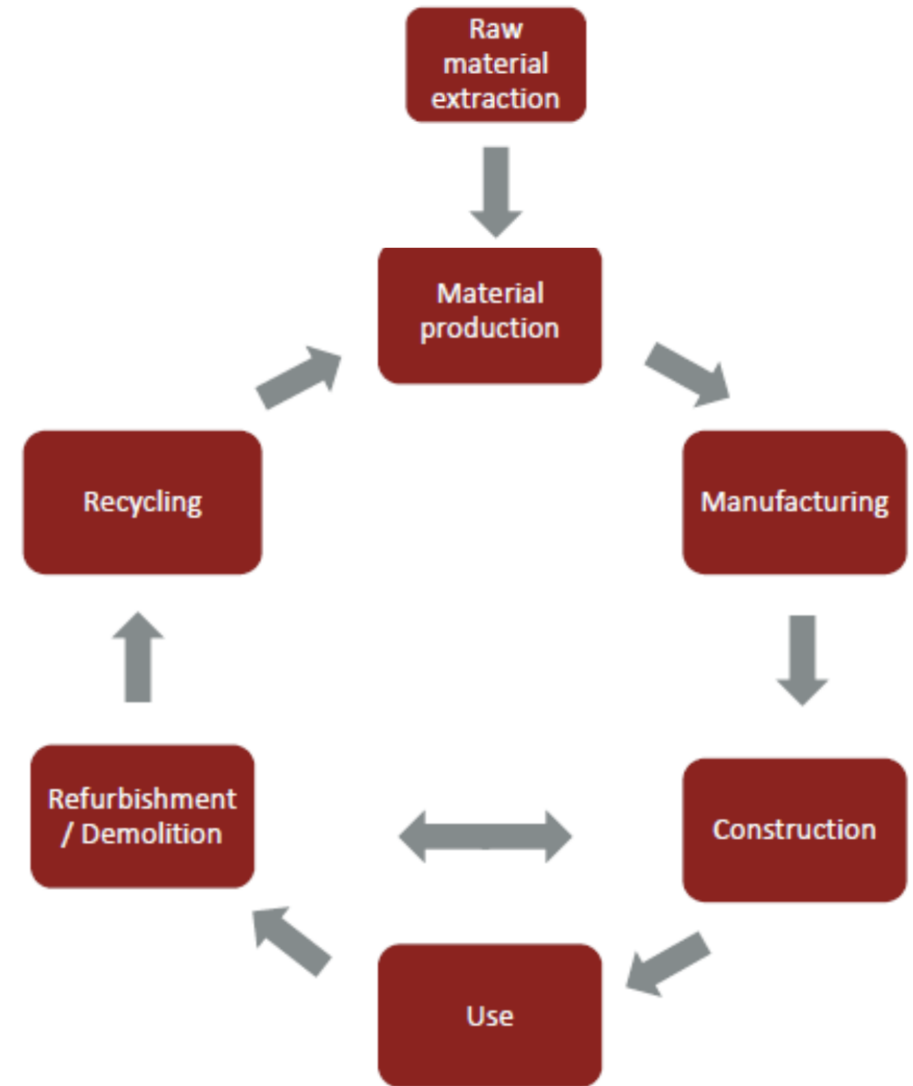
(Circle Economy, 2018)

Circular construction: minimum use, maximum reuse

Circular construction involves the entire construction supply chain. In other words, it is not only working out how the materials can best be reused when a building is demolished. In circular construction, architects, engineers and contractors take minimising the use and maximizing the reuse of entire buildings and/or building materials into account at the very start of the construction process.

(Van Sante, 2018)

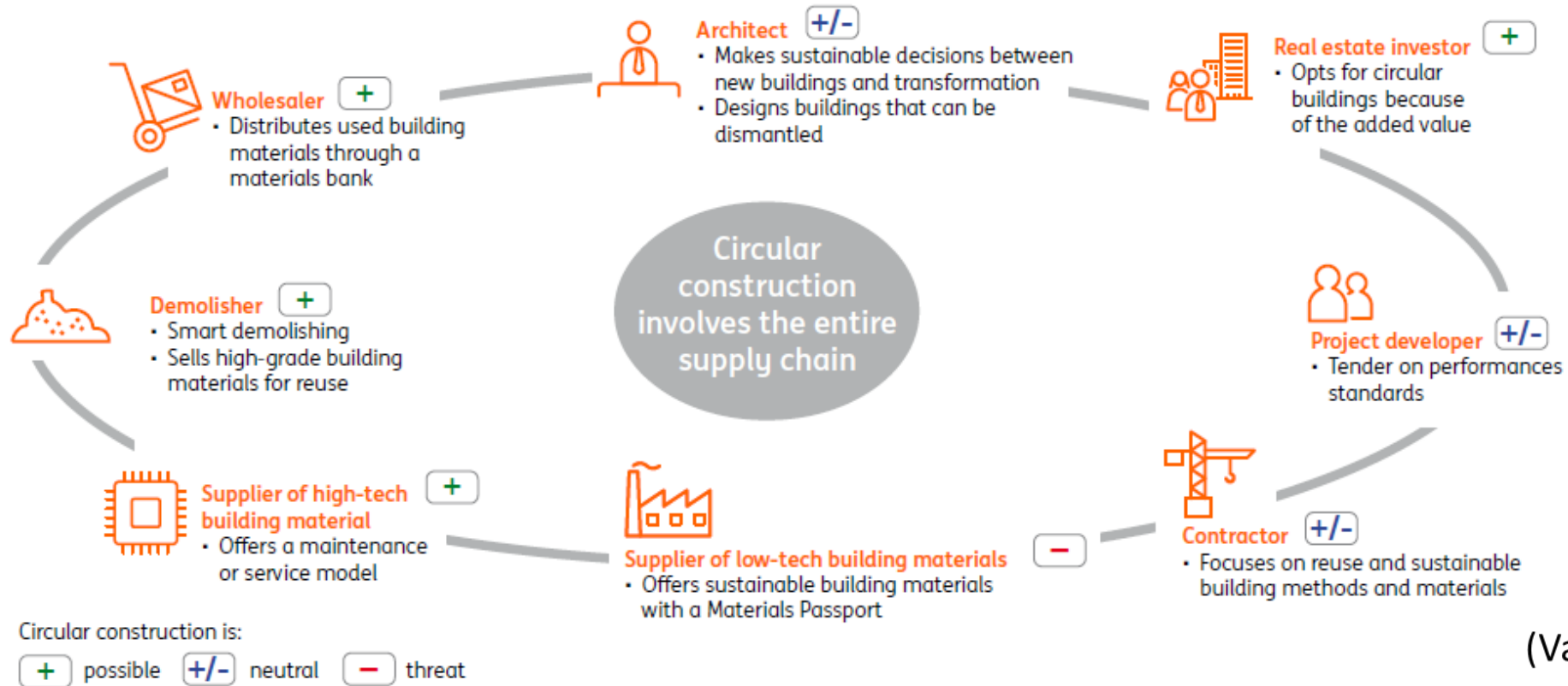
- ✓ Minimise raw material extraction
- ✓ More resource efficient material production phase utilising secondary materials
- ✓ More resource efficient manufacturing phase utilising by-products
- ✓ Macro-scale preventative design i.e. existing building use, brownfield sites etc.
- ✓ Project-scale preventative design i.e. cut and fill, reuse of excavation materials, materials optimisation, off-site construction, material durability, reusability or recyclability etc.
- ✓ Recurring resource use during building's lifecycle i.e. adaptability/flexibility, refurbishment waste etc.
- ✓ Demolition V reuse of building(s) and site decisions
- ✓ Pre-demolition auditing and deconstruction
- ✓ Waste management processing resource use and by-products influenced by market conditions
- ✓ Quality standards





Activities of supply chain partners in circular construction

Circular construction has consequences for all supply chain partners



(Van Sante, 2018)



Buildings as Material Banks

- ✓ Policy and Standards
- ✓ Business Models
- ✓ Circular Building Assessment
- ✓ Reversible Building Design
- ✓ Materials Passports



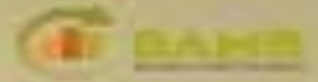
<https://www.bamb2020.eu/>



Information Management

‘...reliable and standardised information on material flows and material composition of building products and buildings is needed.’

(Henrich and Lang, 2019)

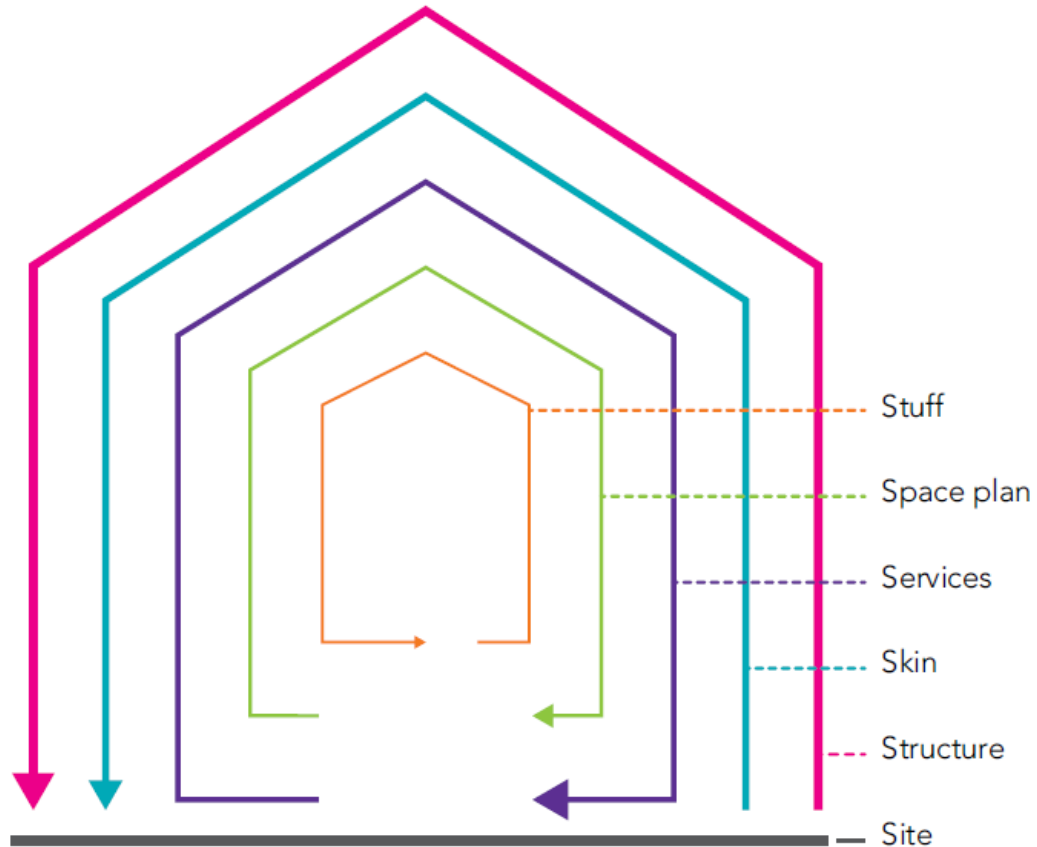


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 844284.



Material passports are...
'electronic and interoperable data sets
that collect characteristics of materials
and assemblies, enabling suppliers,
designers and users to give them the
richest possible value *and utility*.'

© BAMB



Buildings as
Material Banks



Building Layers

(Brand, 1994)



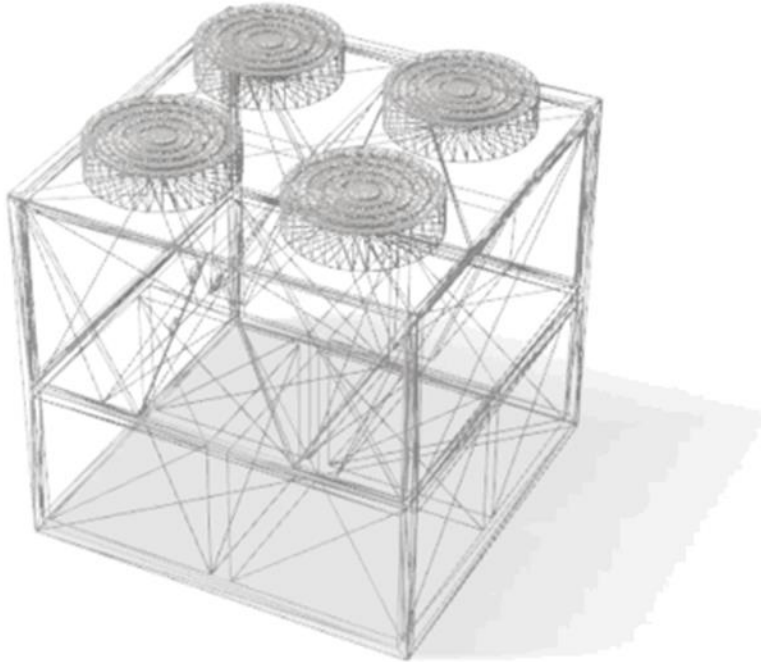
What information and data requirements does a material passport need to make it useful for circular construction?



Material Passports aim to:

- ✓ Keep or increase the value of materials, products and components over time.
- ✓ Create incentives for suppliers to produce healthy, sustainable and circular materials and building components.
- ✓ Enable circular product design, material recovery and chain of possession partnerships.
- ✓ Support material choices in reversible building design projects.
- ✓ Reduce the eco-footprint.
- ✓ Make it easier to choose and specify healthy, sustainable and circular building materials.
- ✓ Facilitate reverse logistics to reclaim products, materials and components.
- ✓ Assess future material flows.
- ✓ Eliminate waste and reduce the use of virgin resources.
- ✓ Reduce the costs by managing resources rather than managing waste.





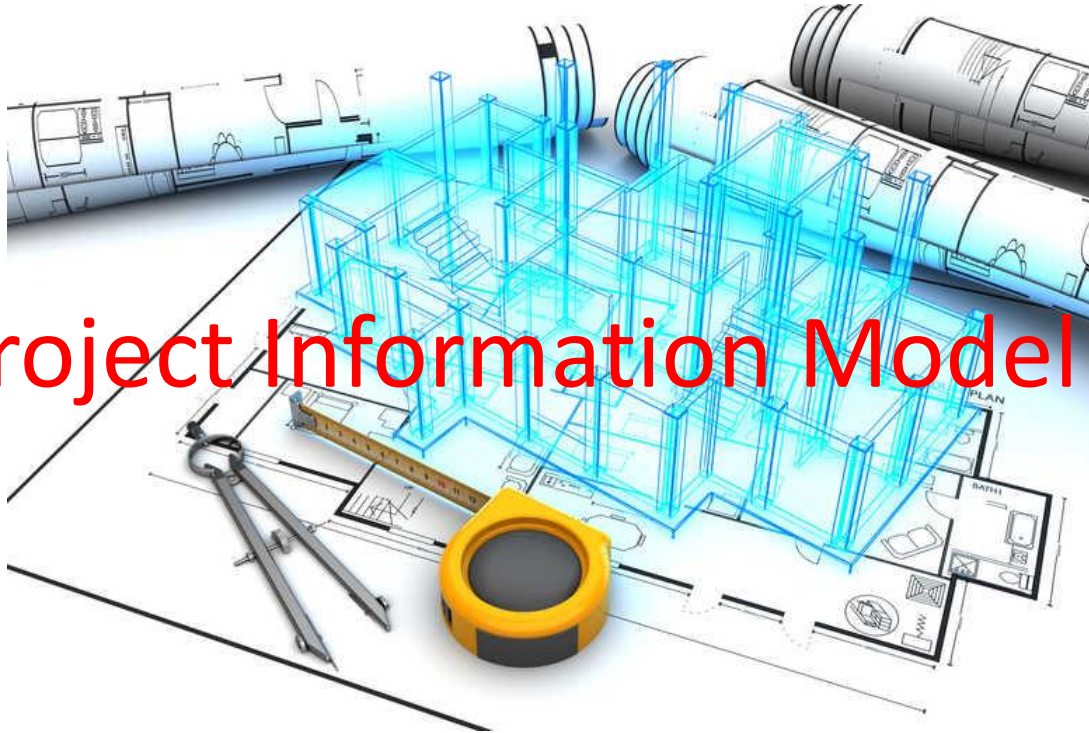
BIM Object Data



EPD Data



Project Information Model



<https://www.constructionglobal.com/facilities-management/how-bim-continually-transforming-construction>

Asset Information Model



<http://scan2bim.info/bim4rail-crossrail-stations/>



EPD Data

Environmental Product Declarations (EPD) are a standardised way of providing data about the environmental impacts of a product through the product lifecycle (EN 15804).

Global Warming Potential (GWP)
Eutrophication Potential
Petrochemical Ozone Creation Potential
Stratospheric Ozone Depletion Potential
Acidification Potential
Abiotic Depletion



HOME EPD IRELAND PROGRAMME WHAT IS AN EPD? EPD CAMPAIGN EPD SEARCH EPD UPLOAD

EPD Search

Product name	Manufacturer	Product Type
EPD compliance		EPD Language
<input type="checkbox"/> ECO Platform EPD <input type="checkbox"/> EN 15804 <input type="checkbox"/> ISO 14025		<input checked="" type="radio"/> All <input type="radio"/> English
EPD Campaign		
Quinn Lite Pac EPS insulation	Quinn Building Products	> Thermal insulation p
Quinn Therm Insulation Boards	Quinn Building Products	Building products > TI products
Ecocem Products	Ecocem	Basic Materials and P Cement, building lime hydraulic binders
Kore Insulation	Airpacks Ltd t/a KORE	Building products > TI products
Daemstatt Cellulose fibre insulation	Ecological Building Systems	Building products > Thermal insulation

Ecocem Products

Ecocem is a (latent) hydraulic binder produced by grinding granulated blast furnace slag (GBS). After grinding it becomes GGBS that conforms with the EN 15167 standard. This product is called "Ecocem". Ecocem is an "intermediate" product, i.e. a constituent for the production of concrete, as well as mortar, masonry mortar, and other cementitious-bound materials. Concrete producers determine the proportions of binders used (ordinary cement and Ecocem), so they are able to apply the optimal mix. This means that the use of Ecocem will vary with the intended application and requirements of the final concrete product.

Besides producing Ecocem (GGBS), Ecocem Ireland also produces two different mixes of Ecocem and Portland cement. Ecocem CEM III/A contains up to 65% GGBS. Ecocem CEM III/C contains up to 95% GGBS.

EPD Type:
Product specific EPD

Registration date:
31 January 2019

Valid until:
31 January 2024

EPD Publisher:
EPD Ireland

EPD Verifier:
Chris Foster



Download

Company Information

Name	Ecocem
Contact Name	Susan McGarry
Other	

Additional Files

Responsible Procurement  Healthy Materials 

No files included

No files included

Exit full screen	F11
Back	Alt+Left Arrow
Forward	Alt+Right Arrow
Reload	Ctrl+R
Save as...	Ctrl+S
Print...	Ctrl+P
Cast...	
Translate to English	
View page source	Ctrl+U
Inspect	Ctrl+Shift+I



BUILDING ASSESSMENT INFORMATION																
BUILDING LIFE CYCLE INFORMATION																SUPPLEMENTARY INFORMATION BEYOND THE BUILDING LIFE CYCLE
PRODUCT STAGE			CONSTRUCTION ON PROCESS STAGE		USE STAGE							END OF LIFE STAGE				
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational water use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D



Other information requirements for circularity may include:

- ✓ Installation and connection requirements
- ✓ Embodied impacts
- ✓ Embedded recycled content
- ✓ Flexibility and adaptability potential
- ✓ Deconstruction and disassembly potential
- ✓ Durability and lifespan
- ✓ Embedded toxicity
- ✓ Reuse potential
- ✓ Recycling potential
- ✓ Prevention rating





Materials Passport Platform **Prototype**

Products

Buildings

Instances

?

Logout



+ Add Product

Products

Search



Name ↓	Brand Name	Manufacturer	GTIN/EAN
Accoya® Wood	Accsys Technologies	Accsys Technologies	Unknown
Acrovyn® 4000	Acrovyn® 4000	Construction Specialties Inc.	Unknown
Ahrend Balance Desk	Ahrend	Ahrend	Unknown
AirMaster®	Desso	Tarkett	Unknown
Aluminium Door Furniture	AMI BV	AMI bv	Unknown
Armstrong Ultima+	Armstrong	Armstrong World Industries Limited	0888264102735
Axia 2.0 Office Chair	BMA Ergonomics	Flokk	





Why is this important?

New London Plan Circular Planning Statement

Waste Prevention
Net Zero Waste
Circular Economy

MAYOR OF LONDON

**THE
LONDON
PLAN**

THE SPATIAL DEVELOPMENT
STRATEGY FOR GREATER LONDON
DRAFT FOR PUBLIC CONSULTATION
DECEMBER 2017

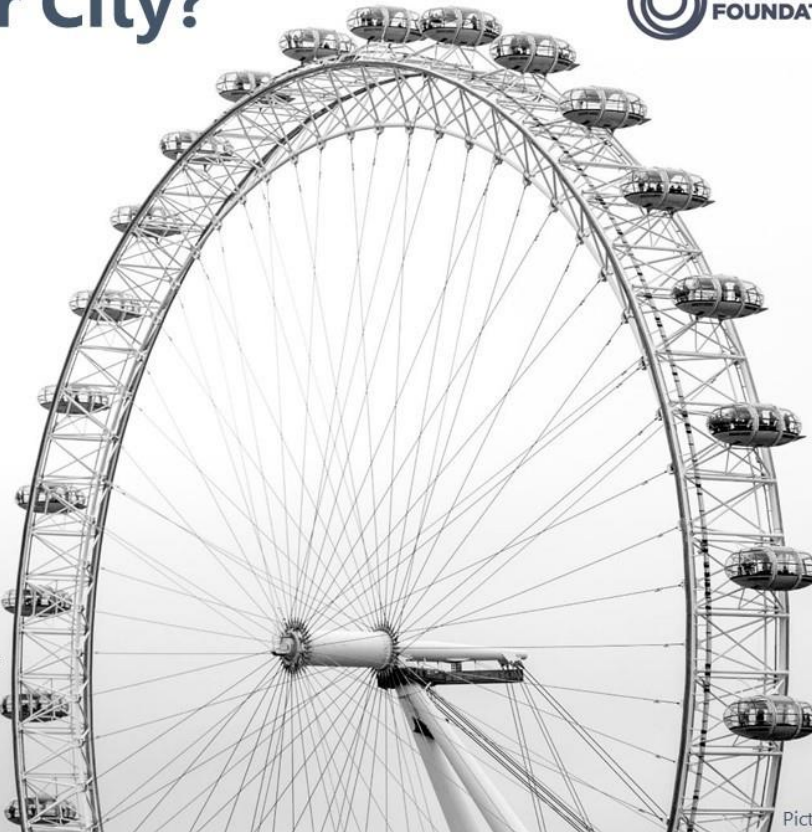




What is a Circular City?

Vision Statement

A circular city embeds the principles of a circular economy across all its functions, establishing an urban system that is **regenerative, accessible and abundant by design**. These cities aim to eliminate the **concept of waste, keep assets at their highest value at all times, and are enabled by digital technology**. A circular city seeks to generate prosperity, increase livability, and improve resilience for the city and its citizens while aiming to decouple the creation of value from the consumption of finite resources.



Picture: Bruno Abatti





Thank you

Mark.Kelly@gmit.ie