



# 2023 DECARBONISATION & THE BUILT ENVIRONMENT

2 NOVEMBER 2023  
THURSDAY

03:00PM - 04:00PM SGT  
05:00PM - 06:00PM SYDT

## SUMMARY

Decarbonisation of the built environment is a critical imperative in meeting the global climate change challenges. To achieve this goal, an integrated approach that incorporates life cycle analysis and comprehensive carbon emissions reporting is essential.

This approach considers the entire life cycle of buildings and infrastructure, from concept through the construction, renewal, maintenance, and operation to the eventual end of life phase for every asset.

By quantifying the carbon emissions associated with each phase, it becomes possible to identify opportunities for reduction targets and performance optimization.

Such integrated reporting not only aids in making informed decisions for sustainable design, construction and operations but also supports stakeholder's ESG disclosure reporting.

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## SPEAKERS



**STEPHEN BALLESTY**

FOUNDER,  
IN-TOUCH ADVISORY



**COLIN KIN**

MANAGING DIRECTOR,  
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**RLB** Rider  
Levett  
Bucknall

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Singapore: 2 November 2023

## Decarbonisation and the Built Environment:

using integrated life cycle and carbon emissions reporting


**Stephen Ballesty**, FRICS, FAIQS, IFMA Fellow, ICECA, CQS, CFM  
In-Touch Advisory

*... connecting you with solutions for your Built Environment*

## Decarbonisation and the Built Environment:

using integrated life cycle and carbon emissions reporting

- 1) Carbon Context: Standards and Sustainability
- 2) Carbon Calculation: ICMS, Life Cycle and Solutions
- 3) Sustainable Development





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Singapore:  
2 November 2023

## Decarbonisation and the Built Environment: using integrated life cycle and carbon emissions reporting

CO <sub>2</sub> in 1923:	292.80 ppm		
<u>CO<sub>2</sub> in the atmosphere the year you were born?</u>	317.73 ppm		
CO <sub>2</sub> in 2023:	416.43 ppm		
	+98.70 ppm	+34%	
	123.63 ppm	+42%	








Singapore:  
2 November 2023

## Stephen Ballesty

FRICS, FAIQS, IFMA Fellow, ICECA, CQS, CFM







[Stephen.Ballesty@in-touchadvisory.com](mailto:Stephen.Ballesty@in-touchadvisory.com)

- Stephen's consulting firm **In-Touch Advisory** connects stakeholders with solutions for the Built Environment across the property–construction–facilities life cycle.
- He is a Sydney based former RLB director.
- Stephen is the current AIQS representative to Standards Australia's MB-022 Committee and in turn an Australian delegate to ISO/TC-267 for FM standards (ISO 41000 facility management since 2012), and is ISO/TC-267's global liaison to ISO/TC-251 (ISO 55000 asset management since 2014). He is also the Regional Director for Australasia and Southeast Asia for IFMA's FM Consultant Council. He is a former member of the IFMA Global Board of Directors and Past Chairman of both the IFMA Foundation and FMA Australia.

**Acknowledgements:**  
The CIB W070 paper as jointly prepared with Anil Sawhney, and presented in Norway on 11 May 2023. Some content and images are courtesy of the ISO, Standards Australia, AIQS, RICS and Autodesk; plus thanks also for the work of the ICMS Coalition, Carbon Cure, IEA, MECLA, WorldGBC and WRI .



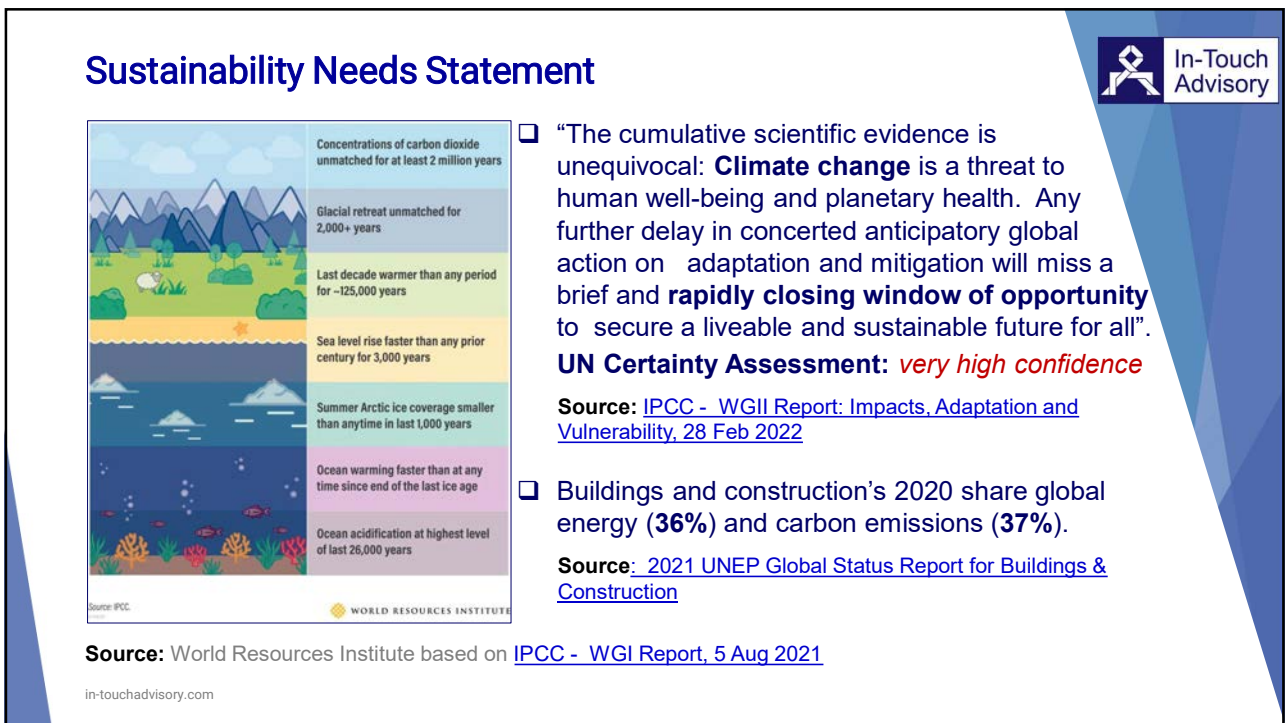
This document has been prepared for the RLB Singapore webinar event on 2 November 2023. It should be noted that this document represents a summary of the issues addressed and does not constitute advice. The author makes no representation as to its accuracy or completeness and the information should not be relied upon as such. Although care has been exercised in its preparation, the author accepts no legal responsibility for any loss or damage suffered as a result of any inadvertent inaccuracy. This document reflects the author's current and personal views only. This document should not be relied upon without seeking, professional advice and obtaining the full version of the publications and sources referred to herein.




**Standards Matter**, in the pursuit ... 








- a common language
- consistent reporting
- greater transparency
- data capture, costing, analysis and forecasts
- ability to performance benchmarking
- increased confidence through reduced risk

... of global transparency, comparability and collaboration on solutions.



## Sustainability Needs Statement



	Concentrations of carbon dioxide unmatched for at least 2 million years
	Glacial retreat unmatched for 2,000+ years
	Last decade warmer than any period for ~125,000 years
	Sea level rise faster than any prior century for 3,000 years
	Summer Arctic ice coverage smaller than anytime in last 1,000 years
	Ocean warming faster than at any time since end of the last ice age
	Ocean acidification at highest level of last 26,000 years

Source: IPCC

WORLD RESOURCES INSTITUTE

- ❑ “The cumulative scientific evidence is unequivocal: **Climate change** is a threat to human well-being and planetary health. Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and **rapidly closing window of opportunity** to secure a liveable and sustainable future for all”. **UN Certainty Assessment: *very high confidence***  
**Source:** [IPCC - WGII Report: Impacts, Adaptation and Vulnerability, 28 Feb 2022](#)
- ❑ Buildings and construction’s 2020 share global energy (**36%**) and carbon emissions (**37%**).  
**Source:** [2021 UNEP Global Status Report for Buildings & Construction](#)

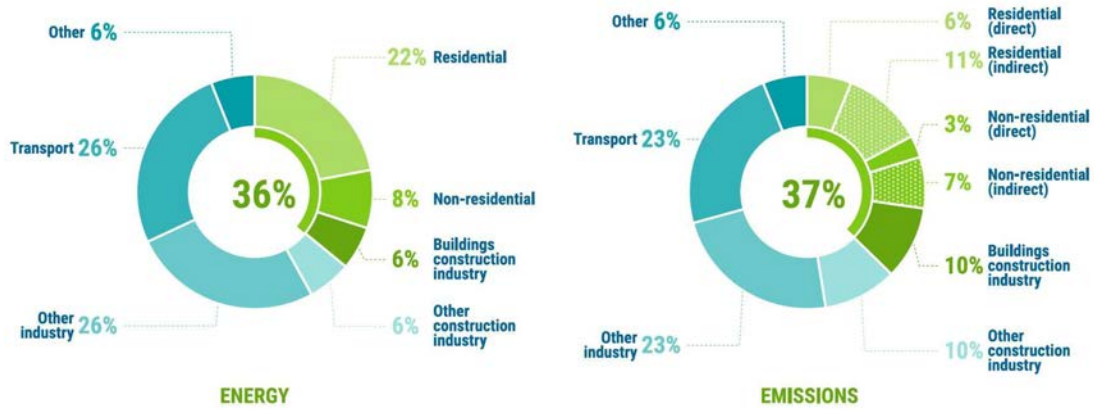
**Source:** World Resources Institute based on [IPCC - WGI Report, 5 Aug 2021](#)

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## Built Environment as a Carbon contributor

Buildings and construction's share of global final energy and energy-related CO<sub>2</sub> emissions, 2020



Note: "Buildings construction industry" is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat.

Source: IEA 2021a. All rights reserved. Adapted from "Tracking Clean Energy Progress"

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## Built Environment as a Carbon contributor

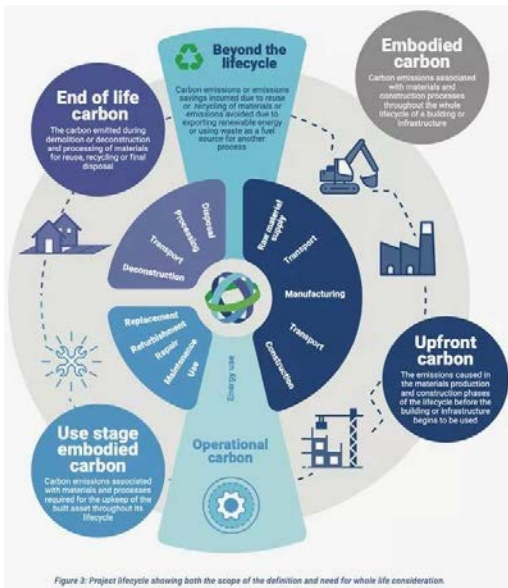


Figure 3: Project lifecycle showing both the scope of the definition and need for whole life consideration.

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"Carbon emissions released before the building or infrastructure begins to be used, sometimes called **upfront carbon**, will be responsible for half of the entire carbon footprint of new construction between now and 2050, threatening to consume a large part of our remaining carbon budget.

As **operational carbon** is reduced, **embodied carbon** will continue to grow in importance as a proportion of total emissions." **WorldGBC, 2019**

Source: [WorldGBC Bringing Embodied Carbon Upfront \(2019\).pdf](#)

## Carbon Vocabulary



### MECLA Glossary Dictionary of Embodied Carbon (2022):

Materials and Embodied Carbon Leaders' Alliance (**MECLA**) is a collaboration of organisations who have come together to drive reductions in embodied carbon in the building and construction industry. They seek to align with the Paris Agreement targets and principles of the circular economy and recognise that the building and construction sector is a complex ecosystem.

- Report released May 2022.
- Uniform vocabulary guidance.



Source: [MECLA-Glossary-Dictionary-of-Embodied-Carbon.pdf](https://www.mecla.org/MECLA-Glossary-Dictionary-of-Embodied-Carbon.pdf)

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## Embodied v's Operational Carbon



### Embodied Carbon

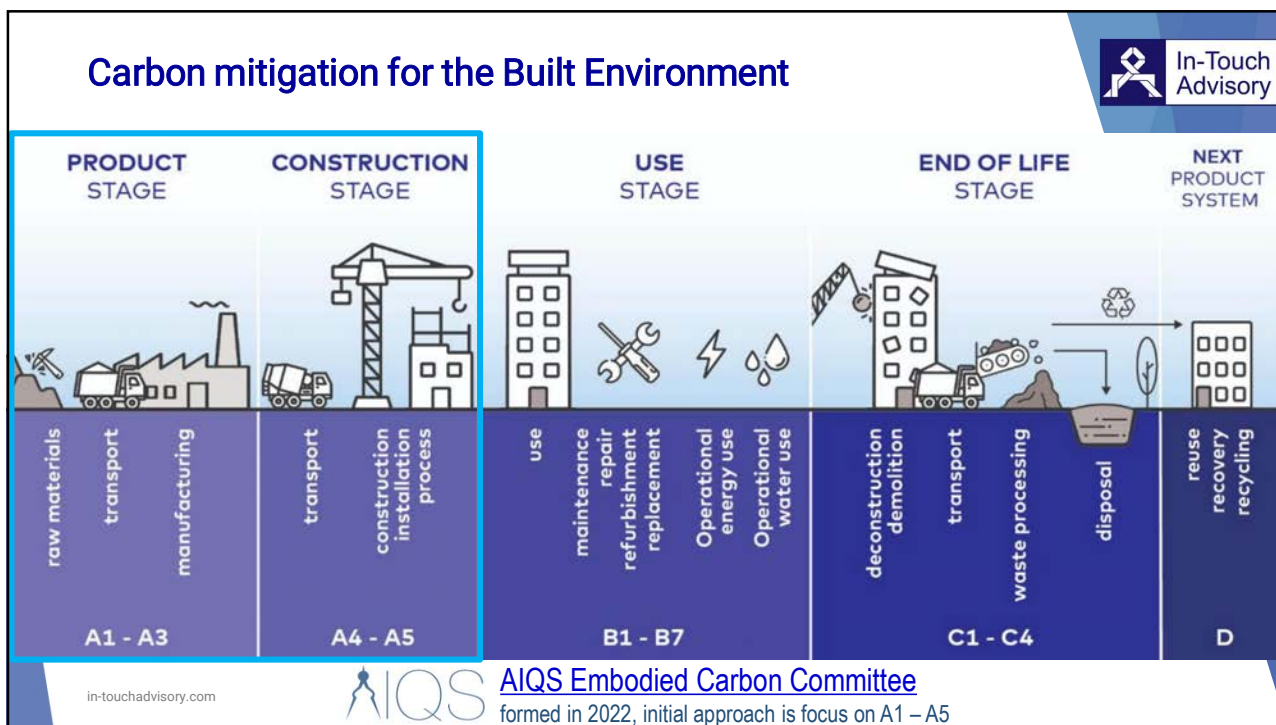
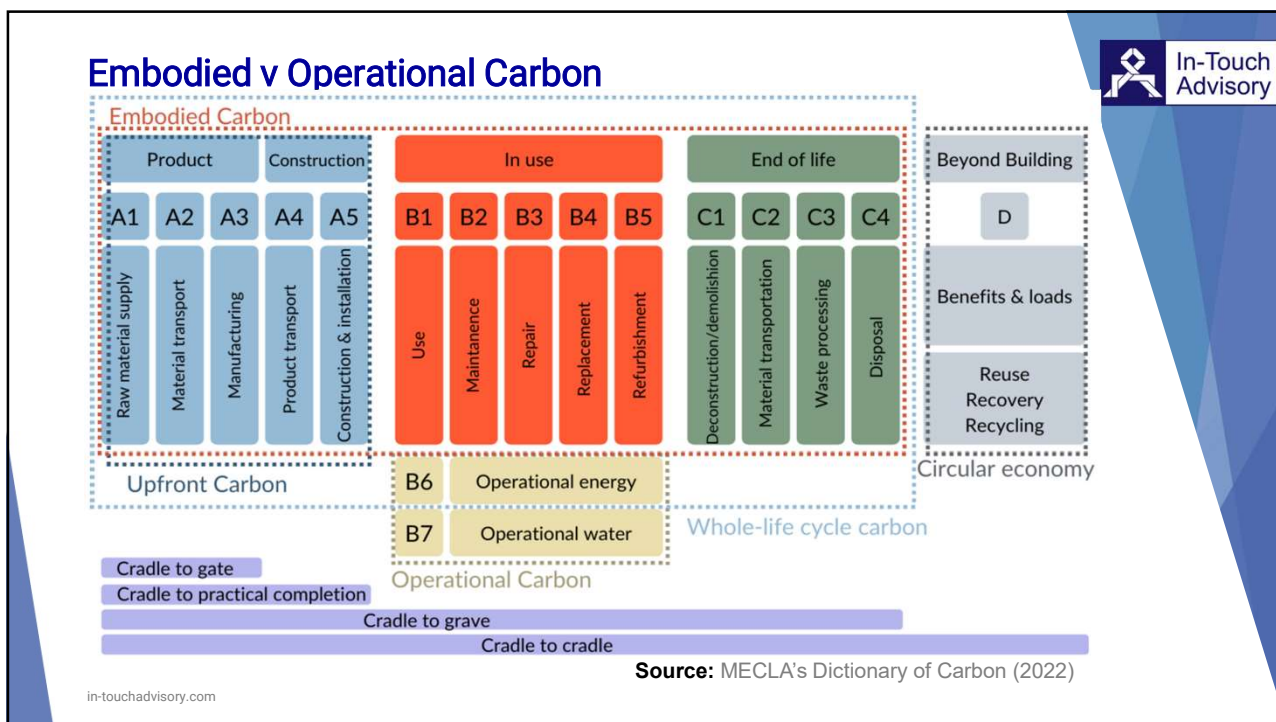
The emissions from manufacturing, transportation, and installation of building materials.

### Operational Carbon


The emissions from a building's energy consumption.

Source: Carbon Cure, ['What is embodied carbon?'](#) (22.09.2020)

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## Carbon mitigation for the Built Environment



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# Embodied Carbon

### Resources

- Resources
- Career and Scholarships
- Building Cost Index
- Built Environment Economist
- Technical Documents
- ACIF Construction Forecasts
- Diversity, Equity and Inclusion
- Embodied Carbon

## Embodied Carbon: Resources


AIQS is committed to assisting in the development of a national embodied carbon method of measurement to assist in the reduction of carbon emissions from the construction industry.

This page features the following resources:

- [Articles & News](#)
- [Events & Webinars](#)
- [Updates from the AIQS Embodied Carbon Committee](#)
- [External Resources](#)

**Source:** [AIQS - Embodied Carbon](#) (2023)

## Carbon mitigation for the Built Environment



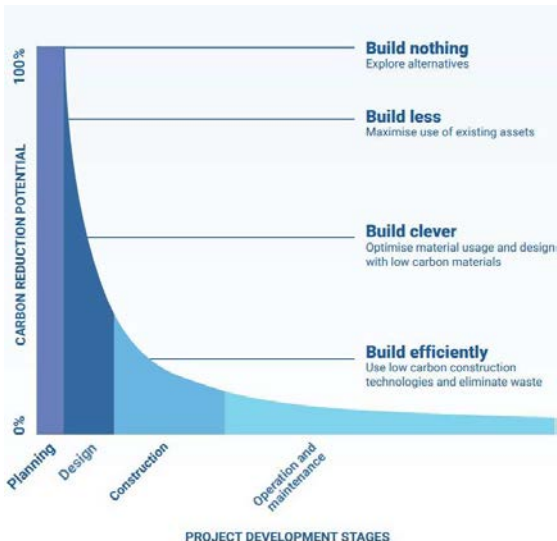


Figure 4: Opportunities to reduce embodied carbon from stage of design process.  
Source: HM Treasury: Infrastructure Carbon Review, 2013

### Carbon reduction potential principles:

1. Prevent
2. Reduce and optimise
3. Plan for the future
4. Offset

**WorldGBC, 2019**

Figure 4: Opportunities to reduce embodied carbon from stage of design process.  
Source: HM Treasury: Infrastructure Carbon Review, 2013

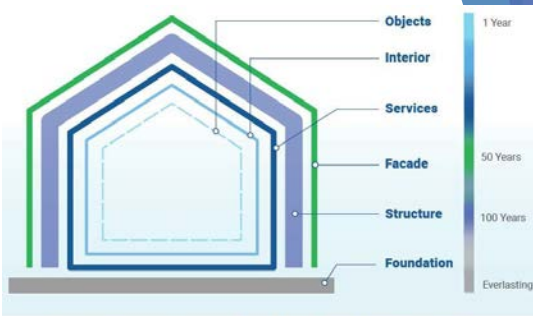
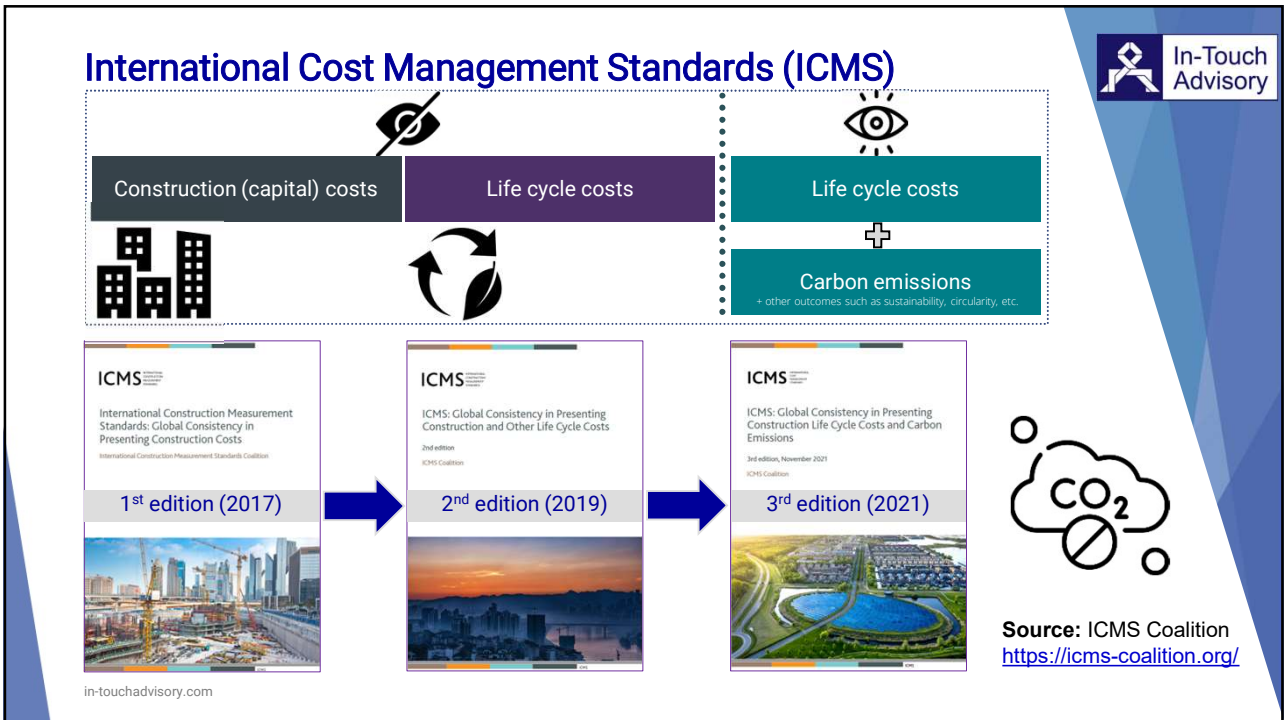


Figure 5: Elements of a building and their typical lifetime, before replacement is needed<sup>4</sup>.

**Source:** [WorldGBC Bringing Embodied Carbon Upfront \(2019\).pdf](#)

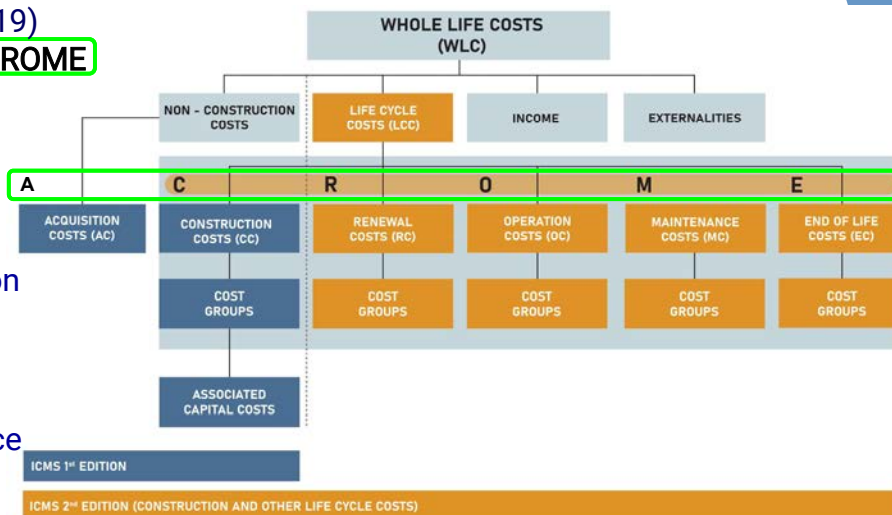




### ICMS 1<sup>st</sup> ed. versus 2<sup>nd</sup> ed. footprint



ICMS,2 (2019) defines **A.CROME** as the new framework:



Construction  
Renewal  
Operational  
Maintenance  
End of Life

Source: ICMS,1 (2017); ICMS,2 (2021); and AIQS-LCC Analysis (2022)

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### C.R.O.M.E. explained



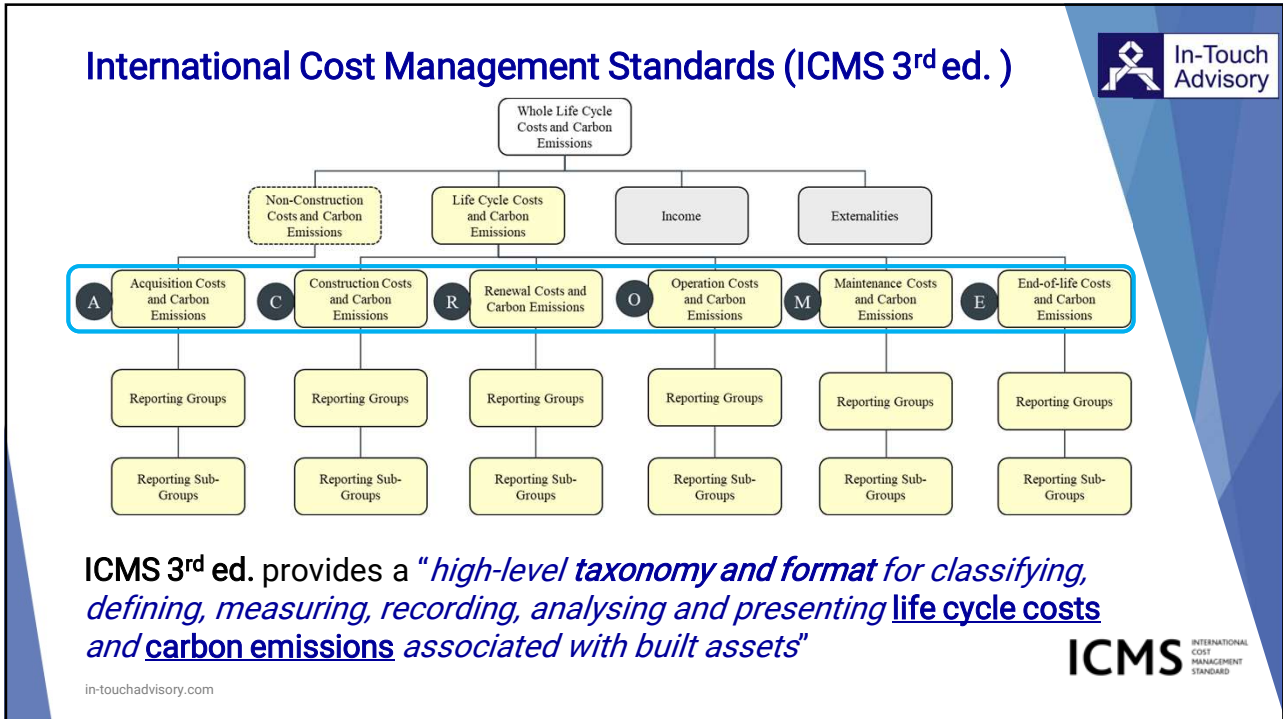
ICMS,2 (2019) **CROME** approach as a relationship framework of the significant contributors to the asset / facility life cycle.

**COST** is a powerful communications tool across the influencers.



Source: ICMS,1 (2017); ICMS,2 (2021); and AIQS-LCC Analysis (2022)

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## Measurement of Costs & Carbon Emissions

CAPITAL COST ESTIMATING

Description	Quantity	Unit	Unit Rate	Total
32 MPa concrete to suspended slab and beams	8	m <sup>3</sup>	\$550.00 /m <sup>3</sup>	\$ 4,400.00

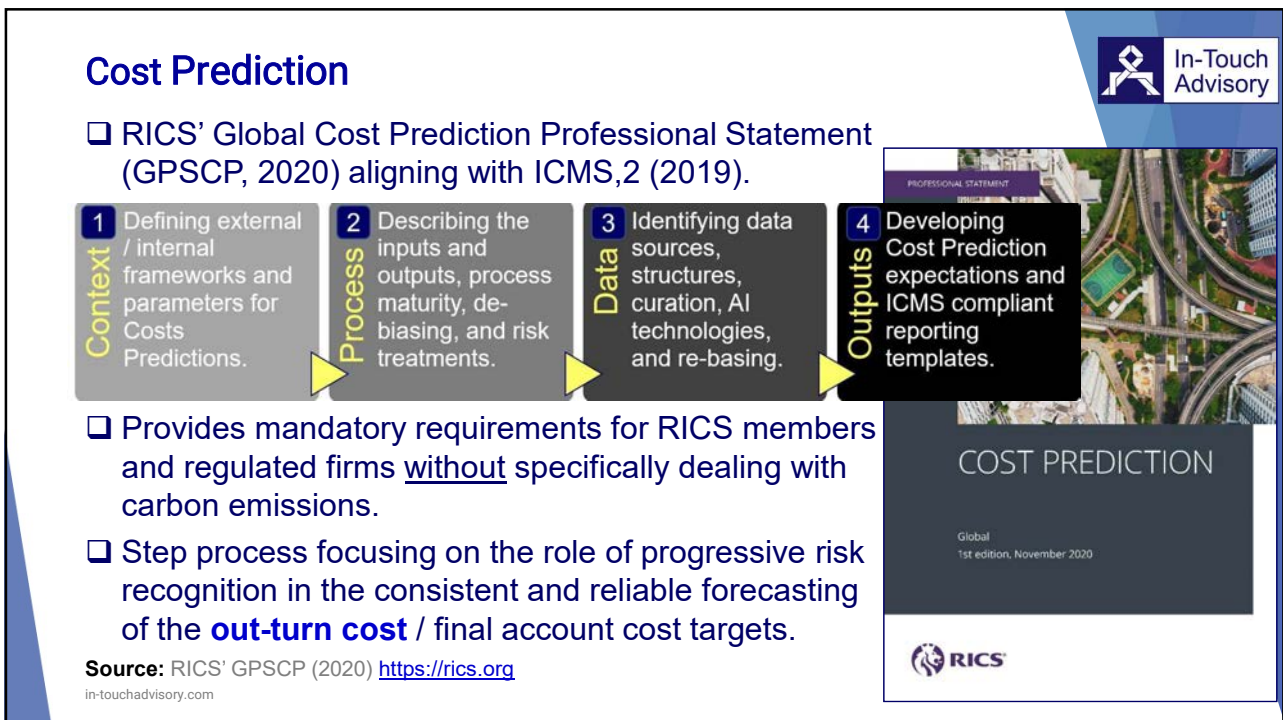
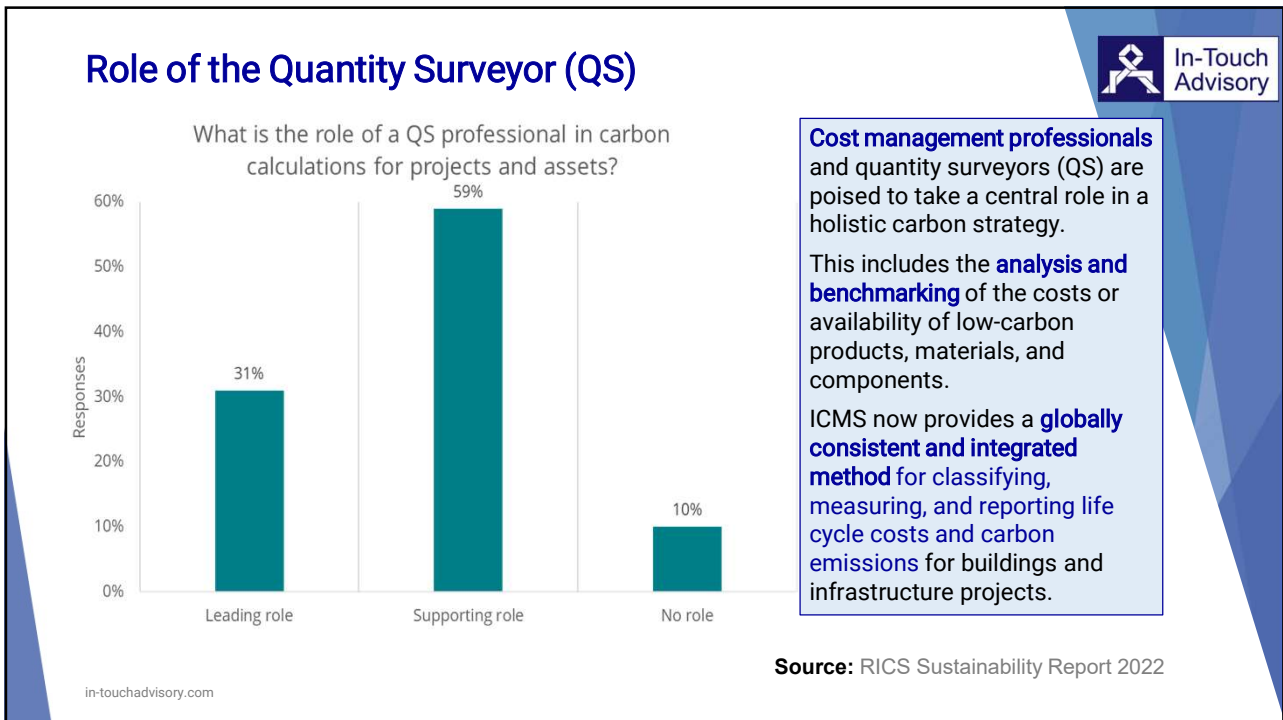
Key substitution: Unit \$ rate, with CO<sub>2</sub>e factor

CARBON EMISSIONS

Description	Quantity	Unit	CO <sub>2</sub> e	Total
32 MPa concrete to suspended slab and beams	8	m <sup>3</sup>	0.22 t CO <sub>2</sub> e /m <sup>3</sup>	1.76 t CO <sub>2</sub> e /m <sup>3</sup>

**Source:** AIQS Embodied Carbon Committee (2023)

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## Life Cycle Costing

- ❑ AIQS' Information Paper Life Cycle Cost Analysis
- ❑ Released in February 2022 taking account of:
  - ISO 15686-5: 2017 Buildings and constructed assets, Service Life Planning - Part 5: Life-cycle costing.
  - ICMS 2<sup>nd</sup> edition (2019) and ICMS 3<sup>rd</sup> edition (2021).
  - AIQS' Australian Cost Management Manual: Vol.1, (4<sup>th</sup> ed).
  - ISO 41000 series of Facility Management standards and ISO 55000 series of Asset Management standards.
  - and other leading publications and relevant guidelines.

DEFINE

MEASURE

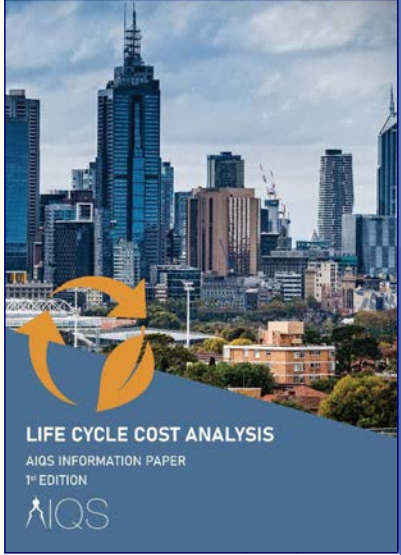
ANALYSE

IMPROVE

CONTROL

- ❑ New, concise and practical guidance for the design, construction and operational life cycle.

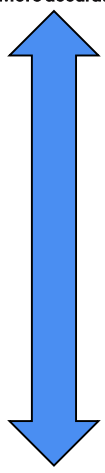
**Source:** AIQS' Information Paper LCC Analysis (2022) <https://aiqs.com.au>  
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LIFE CYCLE COST ANALYSIS  
AIQS INFORMATION PAPER  
1<sup>st</sup> EDITION  
AIQS

## How to calculate Embodied Carbon – good data and lots of it


More accurate



Less accurate

- ❑ **PRODUCT SPECIFIC EMISSION FACTORS**  
Life Cycle Assessment (LCA) per ISO 14025 based for specific products used in the construction (producer and region-specific). Example: Product specific Environmental Product Declarations (EPD).
- ❑ **INDUSTRY AVERAGE VALUES**  
Apply to a group of producers for the correct material type and region of manufacture. Example: Industry average - Environmental Product Declarations (EPD).
- ❑ **GENERIC VALUES FROM DATABASES**  
Generic materials from a life cycle assessment tool specific to a region. Example: Australian National Life Cycle Inventory Database (AusLCI) is a major initiative currently being delivered by the Australian Life Cycle Assessment Society (ALCAS)
- ❑ **GENERIC VALUES FROM GLOBAL LITERATURE**  
These generic emissions factors are not producer or regional-specific and may not have been verified. Example: Published LCA reports / articles.

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**Source:** AIQS Embodied Carbon Committee (2023)

## How to calculate Embodied Carbon – example A



- ❑ An Environmental Product Declaration (EPD) is a third party verified using Life Cycle Assessment (LCA) per ISO 14025.
- ❑ Published by manufacturers on specific products.
- ❑ Global Warming Potential: expressed as “kg/CO2-eq.”

Table 2. Life Cycle Impact Assessment Indicators

Base Metal (Steel) Thickness (BMT)	Declared Unit	COLORBOND® steel AM100							
		0.42mm				0.48mm			
		1m <sup>2</sup>				1m <sup>2</sup>			
EN 15804 INDICATORS	units	A1-A3	C3	C4	D	A1-A3	C3	C4	D
Global warming potential	kg CO <sub>2</sub> -eq.	12.8	0.0793	0.0189	-4.07	14.1	0.0795	0.0189	-4.08
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	8.13E-09	0	6.93E-13	0	8.16E-09	0	6.95E-13	0
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	0.0502	2.58E-04	5.39E-05	-0.00968	0.0550	2.59E-04	5.40E-05	-0.00970
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> -eq.	0.00511	2.00E-05	6.58E-06	-0.000267	0.00562	2.00E-05	6.60E-06	-0.000268
Formation potential of tropospheric ozone photochemical oxidants	kg ethene-eq.	0.00704	2.41E-05	6.02E-06	-0.00216	0.00779	2.42E-05	6.03E-06	-0.00217
Abiotic depletion potential for non fossil resources	kg Sb-eq.	2.13E-04	1.23E-08	3.63E-09	1.49E-04	2.13E-04	1.23E-08	3.64E-09	1.49E-04
Abiotic depletion potential for fossil resources	MJ	146	1.07	0.270	-42.7	160	1.08	0.271	-42.8

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Source: AIQS Embodied Carbon Committee (2023)



## How to calculate Embodied Carbon – example B

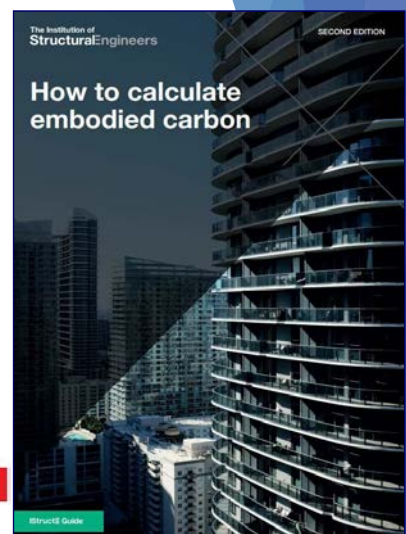


- ❑ The Institution of Structural Engineers (UK)’s “How to calculate embodied carbon” 2<sup>nd</sup> edition (2022).
- ❑ This document supports legislation by UK Parliament to achieve net zero carbon emissions by 2050.
- ❑ Focus on structures as a prime contributor and the need to move towards net zero carbon designs urgently.



Source: IStructE (UK)’s HTCEC (2022) [HTCEC-2nd-edition.pdf.aspx](https://www.istructe.org.uk/htcec-2nd-edition.pdf.aspx)

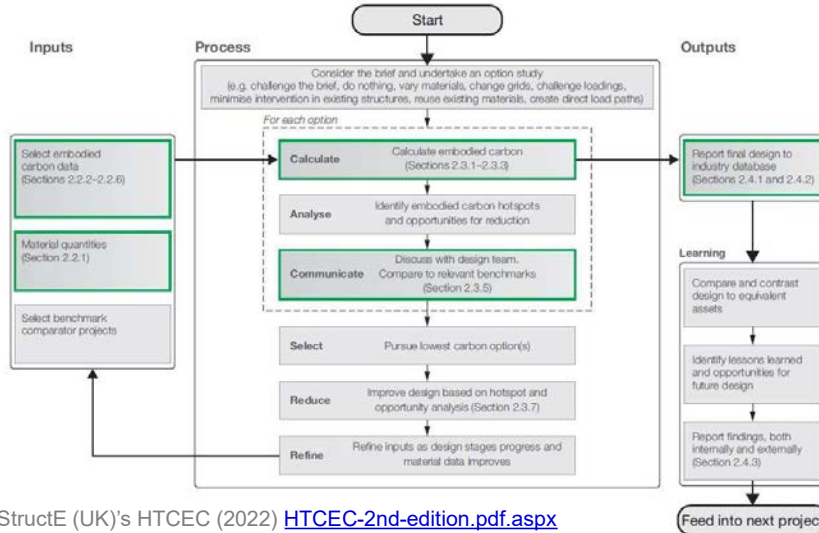
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## How to calculate Embodied Carbon – example B

Calculating embodied carbon process per IStructE's 2022 guide Figure 2.2:



Source: IStructE (UK)'s HTCEC (2022) [HTCEC-2nd-edition.pdf.aspx](https://www.in-touchadvisory.com/HTCEC-2nd-edition.pdf.aspx)  
in-touchadvisory.com



## How to calculate Embodied Carbon – example B

Suggested embodied carbon factors per IStructE's 2022 guide Table 2.3:

Material	Type	Specification/details	Recommended default value	Typical lower bound	Typical upper bound	References			
						Default	Lower bound	Upper bound	
Concrete	In situ concrete (unreinforced) <sup>a</sup>	UK C16/20	0.087 25% GGBS <sup>b</sup>	0.050 (70% GGBS)	0.113 (0% SCM <sup>c</sup> )	Ref. 19	Ref. 19	Ref. 19	
		UK C20/25	0.093 25% GGBS <sup>b</sup>	0.053 (70% GGBS)	0.112 (0% SCM <sup>c</sup> )	Ref. 19	Ref. 19	Ref. 19	
		UK C25/30	0.100 25% GGBS <sup>b</sup>	0.055 (70% GGBS)	0.119 (0% SCM <sup>c</sup> )	Ref. 19	Ref. 19	Ref. 19	
		UK C32/40	0.120 25% GGBS <sup>b</sup>	0.063 (70% GGBS)	0.149 (0% SCM <sup>c</sup> )	Ref. 19	Ref. 19	Ref. 19	
		UK C40/50	0.138 25% GGBS <sup>b</sup>	0.072 (70% GGBS)	0.159 (0% SCM <sup>c</sup> )	Ref. 19	Ref. 19	Ref. 19	
		Global Average (excludes China) C32/40 <sup>d</sup>	0.175 <sup>e</sup> (near)	0.139 <sup>f</sup> (20th percentile)	0.210 <sup>g</sup> (80th percentile)	Ref. 20	Ref. 20	Ref. 20	
		Mortar/screed	1:4 cement:sand mix <sup>h</sup> with average UK cement mix <sup>i</sup>	0.149	–	–	Ref. 19	–	–
		Precast concrete <sup>a</sup>	UK C40/50, unreinforced <sup>a</sup>	0.178 (Average UK cement mix)	0.090 (70% GGBS)	0.191 (0% SCM)	Ref. 19	Ref. 19	Ref. 19
			UK 150mm reinforced hollow core slabs: British Precast Flooring Federation average	50.2 kgCO <sub>2</sub> e/m <sup>2</sup>	–	–	Ref. 21	–	–
		Steel	Reinforcement bars	UK CARES sector average (EAF production)	0.760	–	–	Ref. 22	–
Global	1.900			0.395 (EAF production)	3.970 (BOF production)	Ref. 23	Ref. 24	Ref. 25	
PT strand	Assume the same as reinforcement bars		–	–	–	–	–	–	
Structural sections and plate	UK Rolled open sections (consumption average)		1.740	0.567 (EAF production)	2.450 (BOF production)	Ref. 26	Ref. 27	Ref. 28	
	Global Rolled open sections	1.580	–	–	Ref. 23	–	–		

- The table covers common construction materials:
- ❖ Concrete
  - ❖ Steel
  - ❖ Blockwork
  - ❖ Brick
  - ❖ Stone
  - ❖ Timber
  - ❖ Aluminium
  - ❖ Glass
  - ❖ Plasterboard
  - ❖ Intumescent coatings
  - ❖ Cementitious coatings

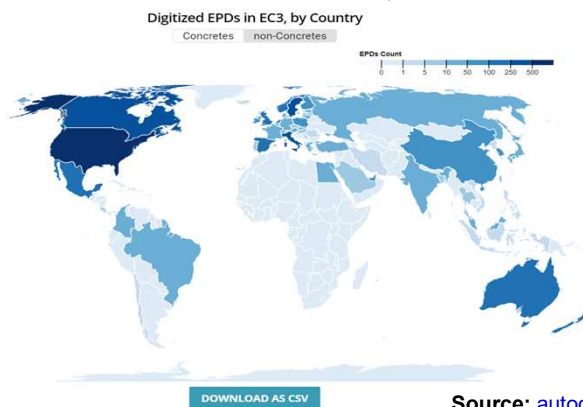
Source: IStructE (UK)'s HTCEC (2022) [HTCEC-2nd-edition.pdf.aspx](https://www.in-touchadvisory.com/HTCEC-2nd-edition.pdf.aspx)  
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## How to calculate Embodied Carbon – example C



- Find & Compare Materials
    - Concrete
    - Masonry
    - Steel
    - Aluminium
    - Wood
    - Sheathing
    - Thermal/Moisture Prot.
    - Cladding
    - Openings
    - Finishes
    - Network Infrastructure
    - Asphalt
    - Manufacturing Inputs
  - Plan & Compare Buildings
  - Level Bids
  - Manage Data
  - User Groups
  - Organizations
  - How to get an EPD
  - Methodology
  - Our partners
- AUTODESK**
- in-touchadvisory.com

AIQS' webinar of 27 September 2023: Autodesk's Docs and Takeoff combined with Building Transparency's Embodied Carbon in Construction Calculator (**EC3**). EC3 provides a **free database** of Environmental Product Declaration (EPD) for construction materials and climate impact calculator for use in design and material procurement. EC3 is currently at the Public Beta Test stage.



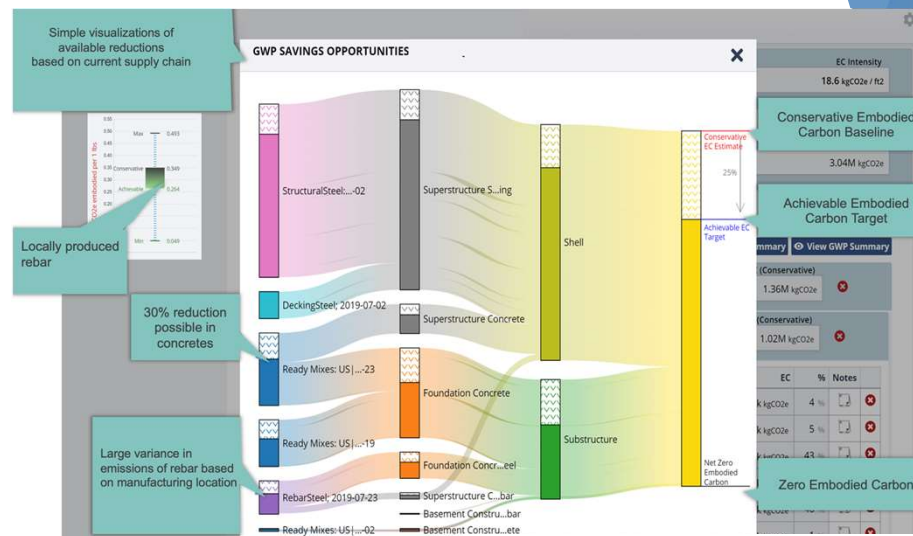
**EC3 + Autodesk Construction Cloud integration video:**  
<https://youtu.be/6XFnEPSQGo4>

Source: [autodesk.com.au](https://autodesk.com.au) & [building-transparency.org](https://building-transparency.org)

## How to calculate Embodied Carbon – example C



- Find & Compare Materials
    - Concrete
    - Masonry
    - Steel
    - Aluminium
    - Wood
    - Sheathing
    - Thermal/Moisture Prot.
    - Cladding
    - Openings
    - Finishes
    - Network Infrastructure
    - Asphalt
    - Manufacturing Inputs
  - Plan & Compare Buildings
  - Level Bids
  - Manage Data
  - User Groups
  - Organizations
  - How to get an EPD
  - Methodology
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Source: [autodesk.com.au](https://autodesk.com.au) & [building-transparency.org](https://building-transparency.org)

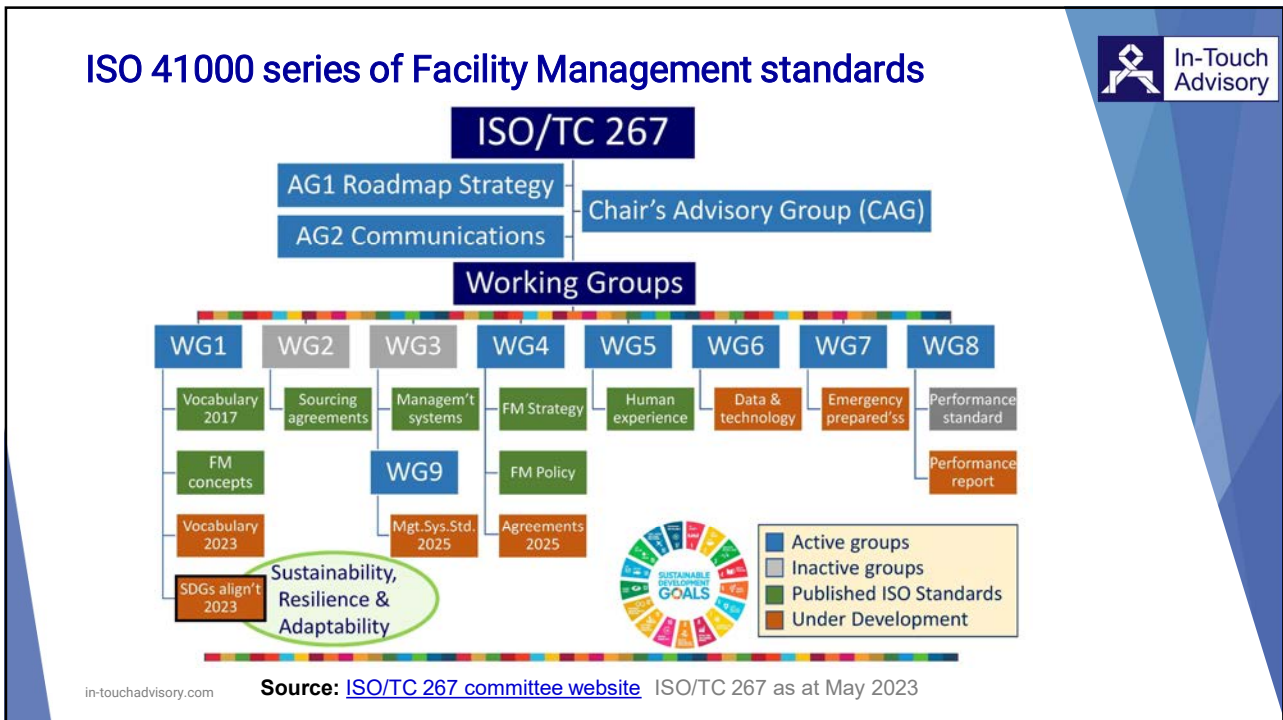




### Sustainable Development Goals (SDGs)

<b>1</b> NO POVERTY	<b>2</b> ZERO HUNGER	<b>3</b> GOOD HEALTH AND WELL-BEING	<b>4</b> QUALITY EDUCATION	<b>5</b> GENDER EQUALITY	<b>6</b> CLEAN WATER AND SANITATION
<b>7</b> AFFORDABLE AND CLEAN ENERGY	<b>8</b> DECENT WORK AND ECONOMIC GROWTH	<b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE	<b>10</b> REDUCED INEQUALITIES	<b>11</b> SUSTAINABLE CITIES AND COMMUNITIES	<b>12</b> RESPONSIBLE CONSUMPTION AND PRODUCTION
<b>13</b> CLIMATE ACTION	<b>14</b> LIFE BELOW WATER	<b>15</b> LIFE ON LAND	<b>16</b> PEACE, JUSTICE AND STRONG INSTITUTIONS	<b>17</b> PARTNERSHIPS FOR THE GOALS	

Source: United Nations <https://sdgs.un.org/goals>  
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## ISO 41000 series: towards Sustainable FM



- ❑ ISO/TC 267 January 2020: formed a 14 member **SDG Task Group** from 8 countries in to determine the ISO 41000 series alignments to the UN's SDGs and prepare a plan to enhance FM standards.
- ❑ ISO/TC 267 committed in 2021 to developing **ISO/TR 41019** "FM's role in sustainability, resilience and adaptability" based on the alignment of the ISO 41000 series with the **UN's SDGs**.



ISO/TC 267's ISO 41000 series FM standards

**SUSTAINABLE DEVELOPMENT GOALS**

This committee contributes with 10 standards to the following

3
4
5
6
7
8
9
10
11
12
13
14
15
16

Source: [ISO/TC 267 - Facility Management](#)

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## ISO/TR 41019 sustainability, resilience & adaptability




- ❑ **Deliverable:** an ISO Technical Report, FM standards and SDGs.
- ❑ **Status:** under ISO/TC 267 review and ballot, with publication **due soon**.
- ❑ **Scope:** FM's role in sustainability, resilience, adaptability, etc.
  - ❖ Introduction, scope, terms and definitions.
  - ❖ Concepts, context and challenges (history, business and finance, climate change, net-zero emissions, and the circular economy, etc).
  - ❖ UN's Sustainable Development Goals (SDGs).
  - ❖ Role of ISO standards in supporting the SDGs.
  - ❖ FM and SDGs for sustainability, resilience and adaptability.
  - ❖ Role of the current ISO 41000 series standards.
  - ❖ Transformation and towards Sustainable FM.
  - ❖ Annexures: A) ISO 41000 series SDG alignment matrix.  
B) Towards Sustainable FM via the ISO 41000 series.  
C) Related ISO resources.
  - ❖ Bibliography.
- ❑ **Style:** concise and practical guidance for FM professionals.

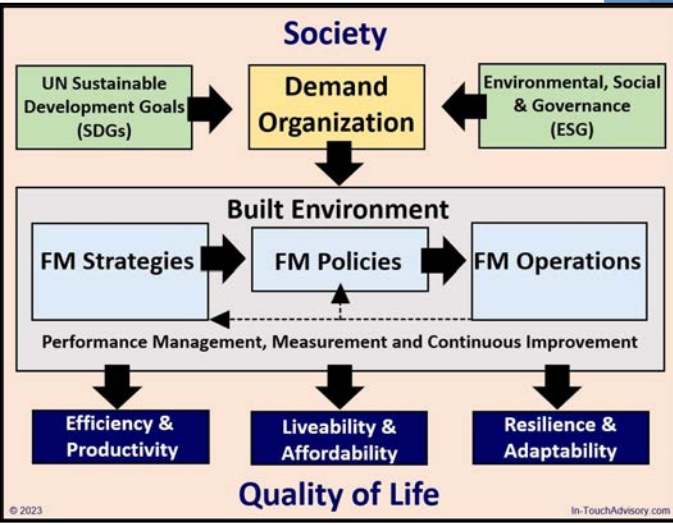


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## ISO/TR 41019 sustainability, resilience & adaptability



- ❑ **Demand Organizations** live within a societal context.
- ❑ **ISO/TR 41019** demonstrates the wide-ranging and positive contribution that FM can make through its managing the **Built Environment**.
- ❑ The need to embrace the SDGs and ESG framework to deliver outputs that support society, and enhances dimensions of our **Quality of Life**.



The diagram illustrates the flow from societal context to quality of life. At the top, 'Society' contains 'UN Sustainable Development Goals (SDGs)' and 'Environmental, Social & Governance (ESG)', both pointing to a central 'Demand Organization'. Below this is the 'Built Environment', which includes 'FM Strategies', 'FM Policies', and 'FM Operations'. 'Performance Management, Measurement and Continuous Improvement' is shown as a feedback loop between 'FM Policies' and 'FM Operations'. Finally, three boxes at the bottom represent the outcomes: 'Efficiency & Productivity', 'Liveability & Affordability', and 'Resilience & Adaptability', all contributing to 'Quality of Life'.

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## ISO/TR 41019 and Performance Reporting



**Climate risks** will be increasingly relevant to capital projects and FM budgets, requiring broader **performance measurement and reporting**, including for:

- ❖ Sustainability reporting.
- ❖ Alignment of activities with SDGs.
- ❖ Third party assurance and integrated reporting.
- ❖ Greenhouse gas (GHG) emissions and reduction goals.
- ❖ Risks with respect to climate change, and loss of biodiversity.
- ❖ IEQ and working environments (lighting, acoustics, air quality, etc.).
- ❖ Emergency preparedness and business continuity planning.
- ❖ Resilience assessment of internal systems and external supply chains.

This will be part of the bold and transformative steps required to shift the world onto a more **sustainable, resilient and adaptive path**.

The **ISO 41000 series** of FM standards provides a useful performance framework.

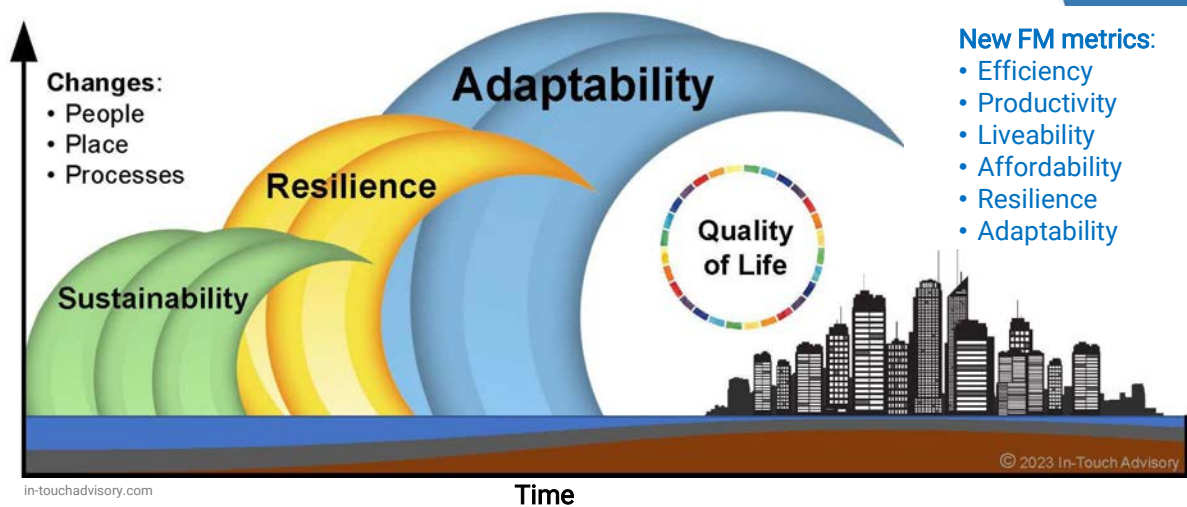


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## Sustainability, Resilience and Adaptability



Are we ready for the Third Wave? ..... now for **Sustainable FM**



## Standards for Sustainable FM



- ❑ **Transformation...** for sustainability, resilience and adaptability.
- ❑ Management Systems Standards, such as:
  - ISO 9001: 2015 Quality Management
  - ISO 14001: 2015 Environmental Management
  - ISO 22301: 2019 Security & Resilience / Business Continuity Mgt.
  - ISO 27001: 2013 Information Security Management
  - **ISO 41001: 2018 Facility Management**
  - ISO 44001: 2017 Collaborative Business Relationship Management
  - ISO 45001: 2018 Occupational Health & Safety Management
  - ISO 46001: 2019 Water Efficiency Management
  - ISO 50001: 2011 Energy Management
  - **ISO 55001: 2014 Asset Management**



**Plus new:** ISO/TC 323 for Circular Economy standards

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# Thank you, and questions

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