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Decarbonisation of the Built Environment:

using integrated life cycle and carbon emissions reporting

CIB W070 2023, session 8, paper 20
Trondheim, Norway – 11 May 2023





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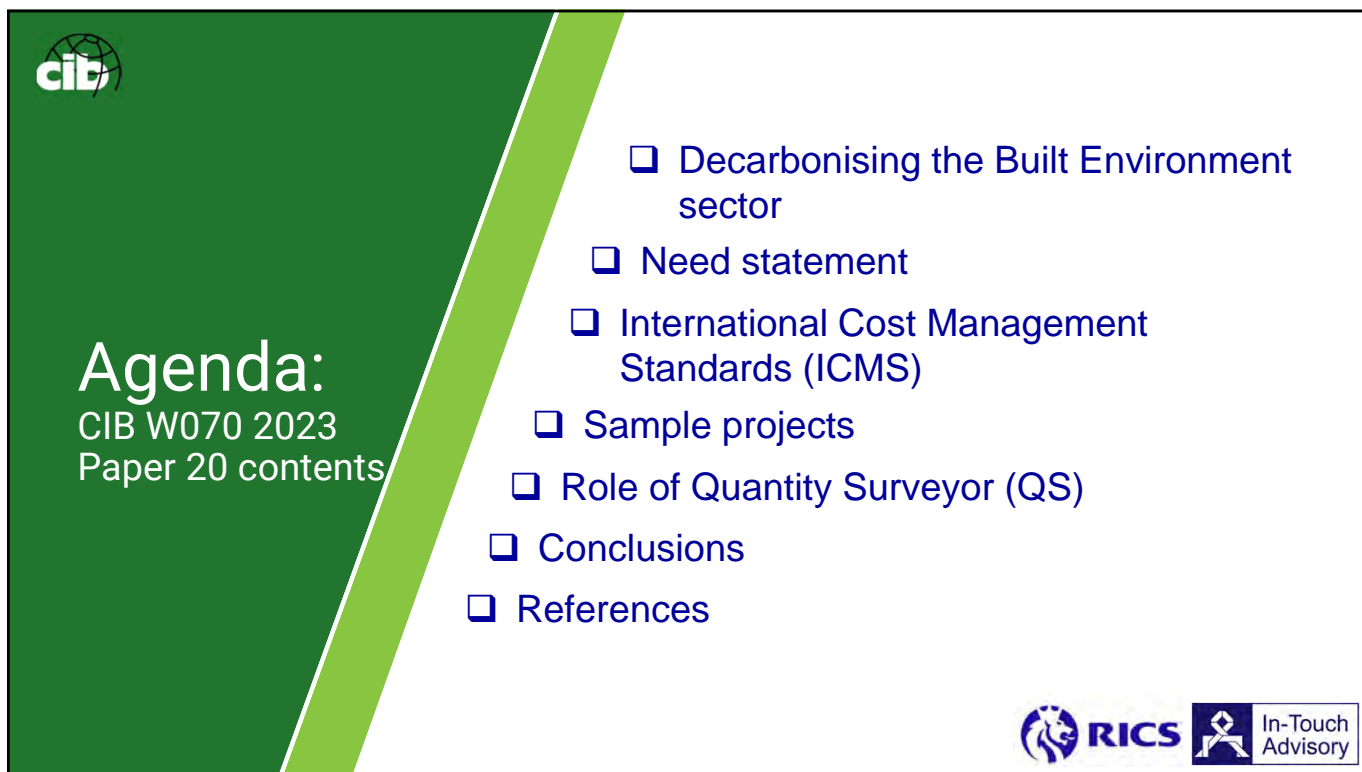



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 **Agenda:**
CIB W070 2023
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- ❑ Role of Quantity Surveyor (QS)
- ❑ Conclusions
- ❑ References




 “If you can’t measure it,
you can’t manage it”
Peter Drucker (1909-2005)

OR

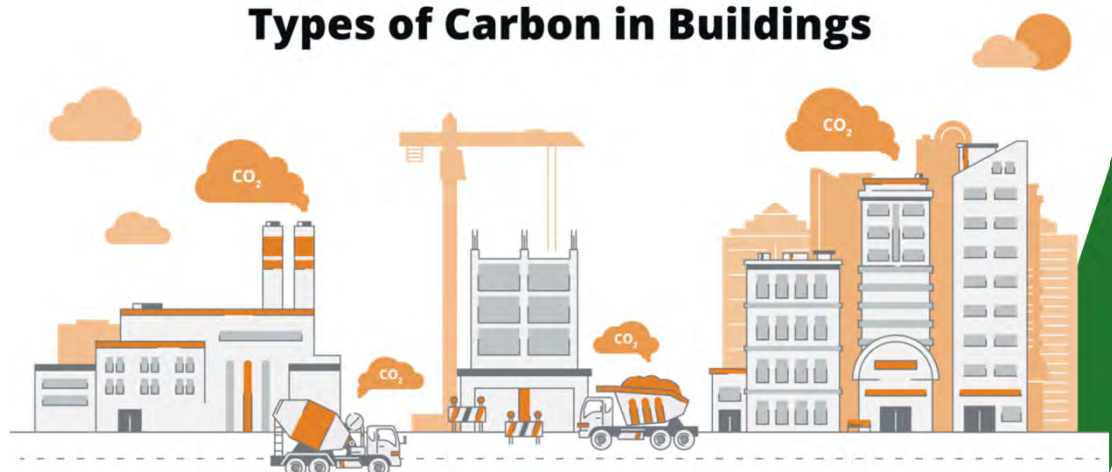
“If you can’t measure it,
you can’t improve it”
Lord Kelvin (1824–1907)



Need statement



Types of Carbon in Buildings



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

Operational Carbon
The emissions from a building's energy consumption.

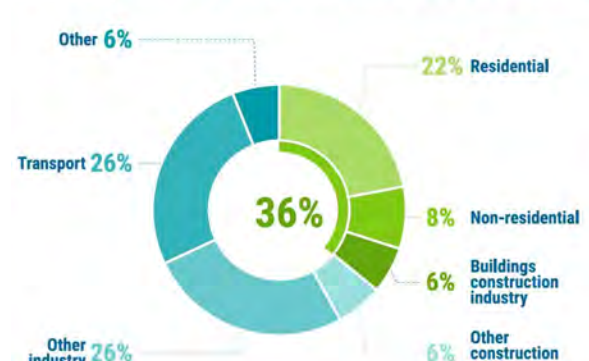
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Decarbonising the Built Environment sector

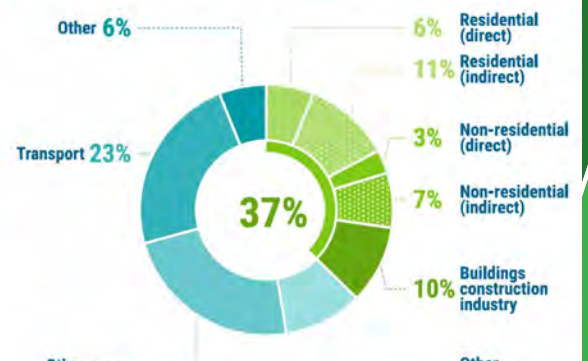
Buildings and construction's share of global final energy and energy-related CO₂ emissions, 2020

ENERGY



Category	Percentage
Transport	26%
Other	6%
Residential	22%
Non-residential	8%
Buildings construction industry	6%
Other construction industry	6%
Other industry	26%


EMISSIONS




Category	Percentage
Transport	23%
Other	6%
Residential (direct)	6%
Residential (indirect)	11%
Non-residential (direct)	3%
Non-residential (indirect)	7%
Buildings construction industry	10%
Other construction industry	10%
Other industry	23%

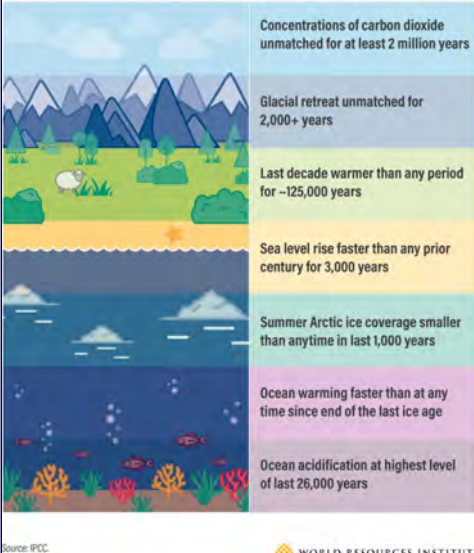
Note: "Buildings construction industry" is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat.
Source: IEA 2021a. All rights reserved. Adapted from "Tracking Clean Energy Progress"

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Need 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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International Cost Management Standards




Construction (capital) costs

Life cycle costs

Life cycle costs

Carbon emissions

+ other outcomes such as sustainability, circularity, etc.



ICMS International Construction Measurement Standards: Global Consistency in Presenting Construction Costs

1st edition (2017)


ICMS Global Consistency in Presenting Construction and Other Life Cycle Costs

2nd edition (2019)

ICMS Global Consistency in Presenting Construction Life Cycle Costs and Carbon Emissions

3rd edition (2021)

Source: ICMS Coalition <https://icms-coalition.org/>
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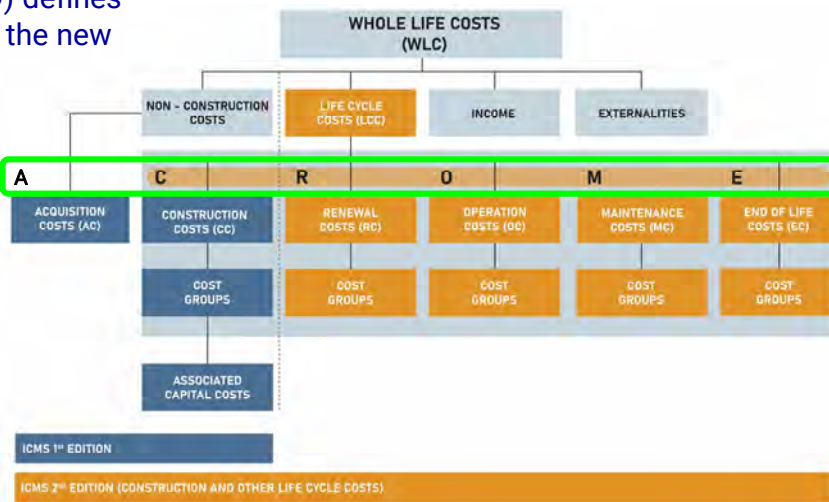




ICMS 1st ed. versus 2nd ed. footprint

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, 2022
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A.CROME 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, 2022
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International Cost Management Standards (ICMS,3)

The diagram shows a hierarchical structure for 'Whole Life Cycle Costs and Carbon Emissions'. It branches into four main categories: 'Non-Construction Costs and Carbon Emissions', 'Life Cycle Costs and Carbon Emissions', 'Income', and 'Externalities'. The 'Life Cycle Costs and Carbon Emissions' category is further divided into six sub-categories: Acquisition (A), Construction (C), Renewal (R), Operation (O), Maintenance (M), and End-of-life (E). Each sub-category is supported by 'Reporting Groups' and 'Reporting Sub-Groups'.

ICMS,3 provides a *“high-level taxonomy and format for classifying, defining, measuring, recording, analysing and presenting life cycle costs and carbon emissions associated with built assets”* ICMS

INTERNATIONAL COST MANAGEMENT STANDARDS

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Sample projects

Our paper provides two (2) case studies in the ICMS format:

- i. Life cycle costing of alternatives.
- ii. Carbon footprint calculations

Level 1

Project

Sub-project(s) — Optional

Level 2

Categories (cost and carbon)

Level 3

Groups (cost and carbon)

Level 4

Sub-Groups (cost and carbon) — Discretionary


International


Local

Project Attributes and Values

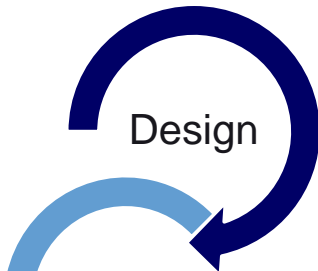
- General
- Entity/project specific
- Life cycle
- Carbon emissions

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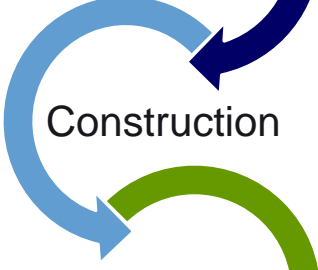




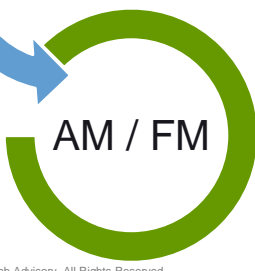
Cost Management Life Cycle



Design



Construction



AM / FM



1. Brief
2. Outline Proposals
3. Sketch Design
4. Documentation
5. Tender
6. Construction
7. Renewal
8. Operation
9. Maintenance
10. End-of-Life


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FACILITY LIFE PHASES #	PROJECT STAGES PER ACMA & ICMS COMBINED	BASIS & DOCUMENTS REQUIRED	COST MANAGEMENT ACTIVITIES	LCC INTERFACE & DELIVERABLES
DESIGN	1. Brief	Study Brief, sketches or relevant information.	Brief Stage Cost/Indicative Cost.	Business Case or Feasibility Study inputs based on facility policy and functional objectives.
	2. Outline Proposals	Scope of works (site, type, location, plan, building shape, etc.) and functional areas.	Outline Proposal Cost/ Preliminary Estimate.	Life Cost Budgets related to project planning horizons and life expectancy targets.
	3. Sketch Design	Dimensioned sketch plans, elevations and sections, structural sketches and specifications.	Sketch Design/Level of Cost Estimated Cost Plan.	Life Cost Planning with comparative analysis and option selection.
	4. Documentation	Final working drawings and specifications prior to tender.	Tender Cost Plan (Tender Estimate).	Life Cost Plan per design.
Project planning: reflective of business policies, standards, strategic objectives and understanding of risks and target LCC requirements.				
CONSTRUCTION	5. Tender	Final Bill or Schedule of Prices.	Tender Report/Contract administration and analysis.	Life Cost Plan per tender.
	6. Construction	For construction documents.	Final Account/contract administration and evaluation.	Project Monitoring (managers review and option refinement).
Performance Evaluation: reflective of facility plan, standards, monitoring, benchmarking and meeting target LCC requirements.				
ASSET / FACILITIES MANAGEMENT	7. Renewal	Costs of replacing a Facility, Constructed Asset and/or major components once they reach the end of their life, and which the client decides are to be included in the capital rather than the revenue budget.		CAPEX budget to support the service delivery plan.
	8. Operation	Costs of owning and managing a Facility, Constructed Asset, including administrative support services, rent, insurance, energy and other environmental/regulatory inspection costs, taxes and charges.		OPEX budget to support the service delivery plan.
	9. Maintenance	Costs of detection, response and preventative maintenance on a Facility, Constructed Asset or its parts and all associated management, cleaning, services, repairing, replacing or replacing of parts.		Maintenance Plan to support the service delivery plan.
	10. End of Life	Net costs or fees for disposing of an asset at the end of its service life after deducting the salvage value and other income due to disposal, including costs resulting from disposal inspection, decommissioning and decontamination, demolition and reconstruction, reinstatement, asset transfer obligations, recycling, recovery, disposal of components and materials, and transport and regulatory costs.		Business Case or Feasibility Study inputs based on facility policy, functional objectives, performance status and applicable regulatory and statutory requirements and statutory requirements and disposal and regulatory costs.

* Facility Life Cycle Phases cover both an internal and external perspective and are defined by activities, inputs, outputs and goals. Further management should be used, verified & adapted.
 ** RICS Asset Life Management Manual (Version 1.0) (October 2022)
 *** International Construction Management Association (ICMA) - 2019/2020 (2019)

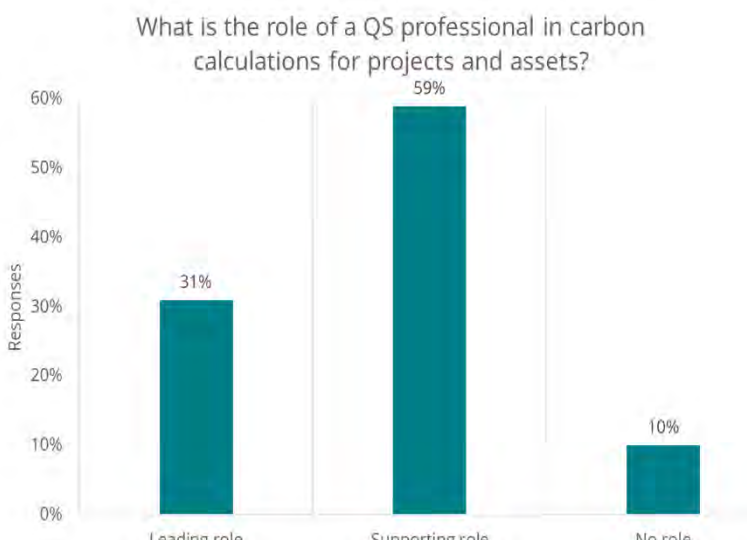
Source: AIQS' Information Paper Life Cycle Cost Analysis (2022)



Role of the Quantity Surveyor (QS)

What is the role of a QS professional in carbon calculations for projects and assets?





Source: RICS Sustainability Report 2022
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Cost management professionals and quantity surveyors (QS) are poised to take a central role in a holistic carbon strategy.

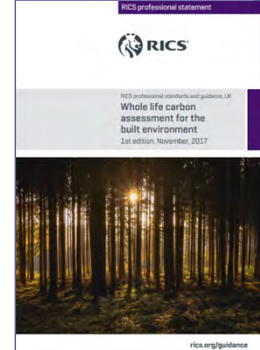
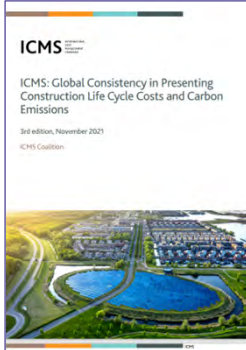
This includes the **analysis and benchmarking** of the costs or availability of low-carbon products, materials, and components.

ICMS now provides a **globally consistent and integrated method** for classifying, measuring, and reporting life cycle costs and carbon emissions for buildings and infrastructure projects.



References & Resources



Also refer: [RICS Profession & Standards \(rics.org\)](https://www.rics.org) & [Resources – In-Touch Advisory \(in-touchadvisory.com\)](https://www.in-touchadvisory.com)

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THANKS!

Any questions?

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