

ICMS

CONTEXT, FRAMEWORK & IMPLEMENTATION STRATEGY

ICMS- CONTEXT, FRAMEWORK & IMPLEMENTATION STRATEGY

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PRESENTED AT THE NIQS
WORKSHOP

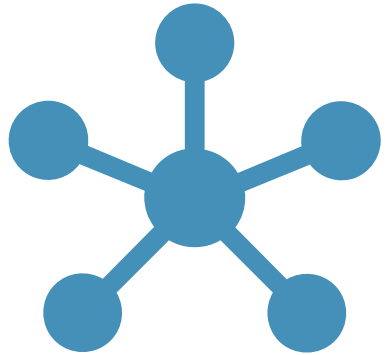
THEME:

INFRASTRUCTURE COST
MANAGEMENT

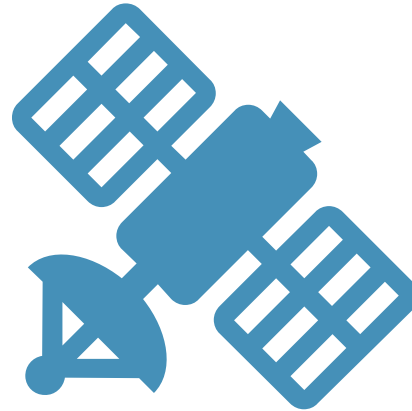
CONTEMPORARY ISSUES & EMERGING
TRENDS

NOVEMBER 23RD, 2022

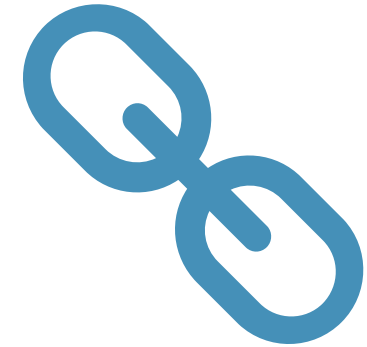




CONTEXT



FRAMEWORK



IMPLEMENTATION

LEARNING OUTCOMES



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Introduction

2

Principles and philosophy

3

Structure, framework, hierarchical levels, attributes and values

4

Life cycle cost and Carbon Emissions considerations

5

Recommendations & Conclusion



INTRODUCTION

STANDARD OF MEASUREMENT VS MEASUREMENT STANDARD

Construction measurement (management) standards refer to the way construction costs are calculated, classified, analysed and presented.

What is included in the 'construction cost' and what is not?

Not about the units or quantities of measurement or SMM but instead the 'line items' in the calculation of construction cost



INTRODUCTION

Since publication of the first edition in July 2017, the International Construction Measurement Standard (ICMS) has evolved

ICMS

1

- Global Consistency in Presenting Construction Costs
- 1st edition, July 2017

2

- Global Consistency in Presenting Construction and Other **Life Cycle Costs**
- 2nd edition, September 2019

3

- **Global Consistency in Presenting Construction Life Cycle Costs and Carbon Emissions**
- 3rd edition, November 2021

International
Construction Measurement
Standards



ICMS INTERNATIONAL
CONSTRUCTION
MEASUREMENT
STANDARDS

ICMS INTERNATIONAL
COST
MANAGEMENT
STANDARD

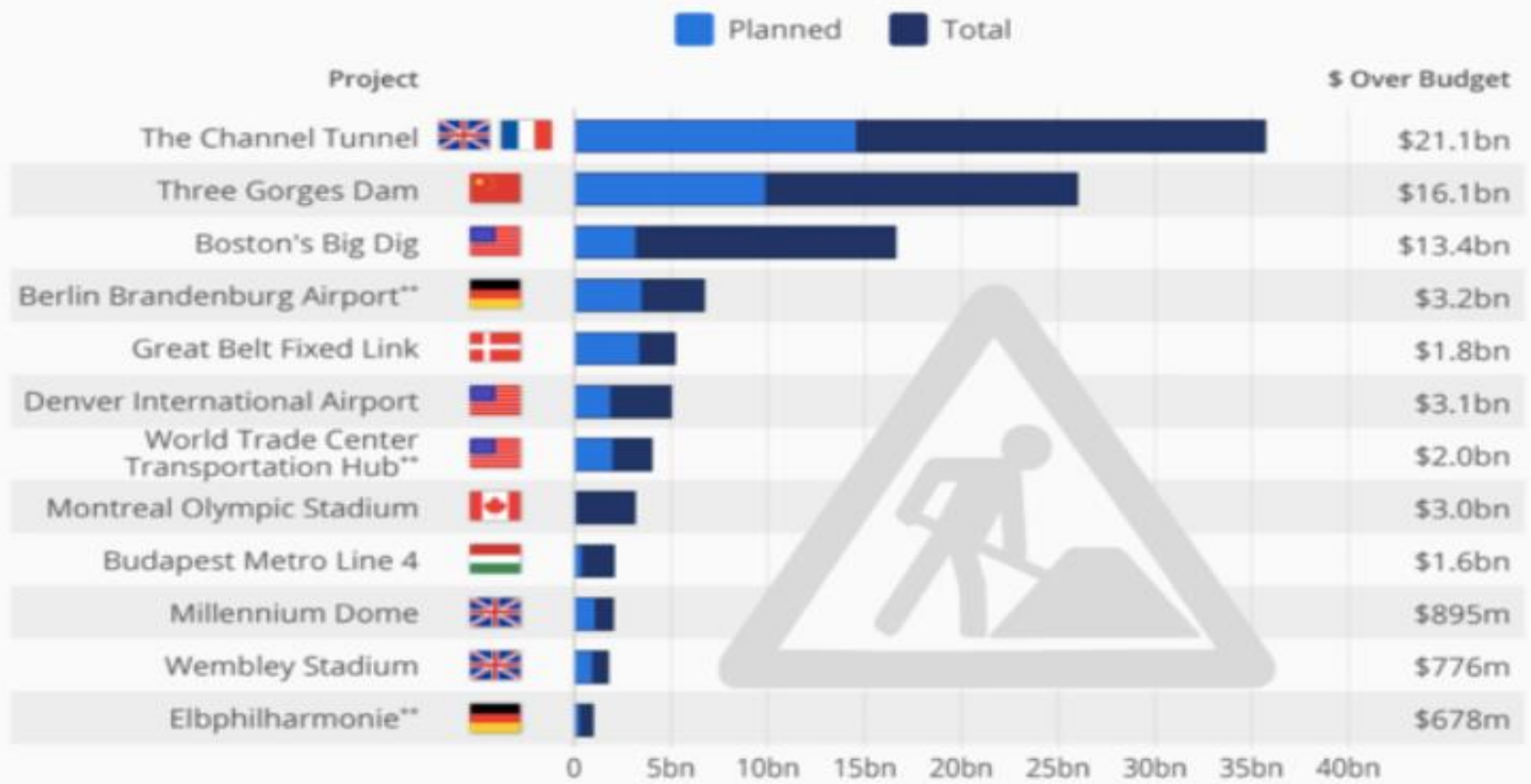


all further references to ICMS in this presentation refer to the third edition (ICMS 3).



Over-Budget Construction Projects In Comparison

Selected over-budget construction projects worldwide (in U.S. dollars)*



* Converted to US dollars and adjusted for inflation; ** Still not completed



Sources: Podio, Der Spiegel, NY Times

Forbes statista

The construction costs of **HS2** were estimated in **2010** to be between **£30.9 billion** and **£36 billion**. **Oakervee's** review in **2019** estimated the project would cost up to **£87 billion** at **2019 prices**



Challenges of multiple standards

ICMS is a **reporting system**: it **does not** purport to **describe how costs or carbon emissions should be calculated**, since methods of calculation vary from country to country, although reference is made to other publications where this information may be obtained. It does, however, require the **method of calculation to be stated**, so that at least local comparisons should be possible

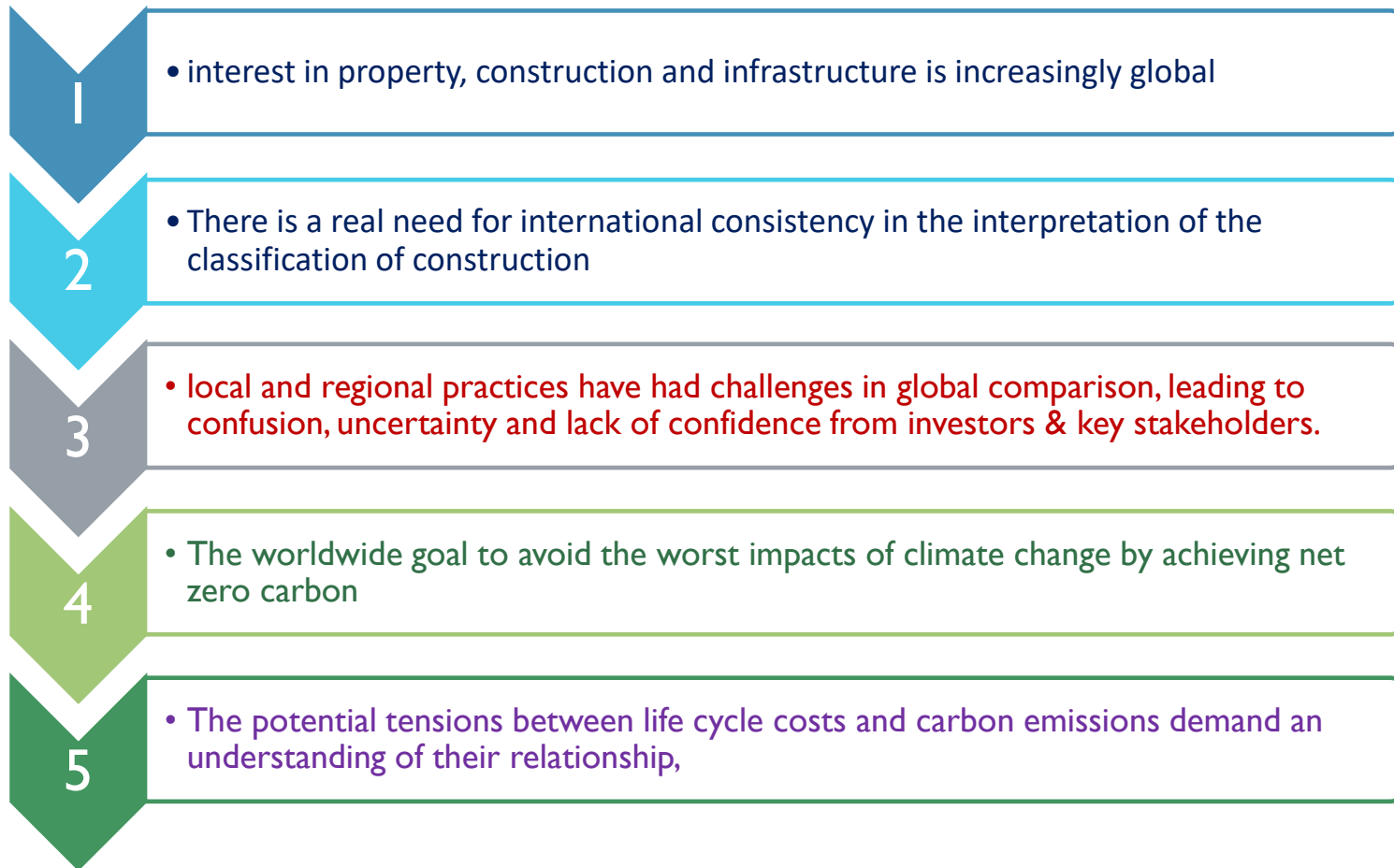
- ❑ global inconsistency-
- ❑ Lack of transparency
- ❑ Inability to accurately compare project construction costs
- ❑ Investment risk

This leads to

- Inevitable Scope creep/variables
- Over/Under-investment in construction projects
- Time and cost overruns
- What's In vs What's out



The Need



These reinforced the need for a common, consistent and integrated reporting framework.



The aims and objectives of ICMS:

:

- 1) to agree **what is included and excluded from** construction costs at both a project level and a national reporting level
- 2) to **create a framework for a standard system** of costing for building and civil engineering projects, which will allow cost comparisons to be made on a like-for-like basis between countries
- 3) construction costs can be **consistently and transparently benchmarked**
- 4) the **causes of costs differences** between projects can be identified
- 5) properly informed decisions on the design and location of construction projects can be made
- 6) **data can be used with confidence** for construction project financing and investment, programme and project decision-making and related purposes.

ICMS INTERNATIONAL
COST
MANAGEMENT
STANDARD

**Classify,
Define,
Measure,
Record,
Analyse,
Present and
Compare.**



WHO WILL BENEFIT FROM ICMS?



- Everybody who is involved in construction projects, whether directly or indirectly, will gain.
- Construction project managers and investors stand to gain significantly.
- Financial institutions will have a standardized framework for assessing project financing requirements..
- The public will benefit from improved, judicious appraisals of public projects.



CONTENT

1

2

Principles and philosophy

3

4

5



CONTEXT

Research from the World Economic Forum has shown that improvements in the design and construction process can be achieved by using international standards like ICMS to gain comparable and consistent data.

ICMS INTERNATIONAL
COST
MANAGEMENT
STANDARD

- ICMS provides a high-level structure and format for **classifying, defining, measuring, recording, analysing and presenting** life cycle costs and carbon emissions associated with construction projects and constructed assets.

- It provides a common reporting framework for life cycle costs and carbon emissions, and allows their interrelationship to be explored to improve environmental sustainability

- provided a single methodology for reporting, grouping and classifying construction project costs.

- **consistent practice in presenting construction costs globally will bring significant benefits to construction cost management**

ICMS explained; *published by RICS*, is a practical resource that will equip quantity surveyors and cost consultants to deliver cost estimates and financial reports in line with ICMS 3. It also sets out the purpose, context and philosophy of ICMS.



SCOPE - WHAT'S IN & WHAT'S OUT

It is important to understand the scope of ICMS: what it covers and what it does not cover.

buildings and civil engineering works, but not, presently, the **process industries** (although factories and their production equipment can be reported as buildings).

It also covers the life cycle costs and carbon emissions arising throughout the life of a construction project, from inception to end of life,

but not Whole Life Costs and Whole Life Carbon Emissions.

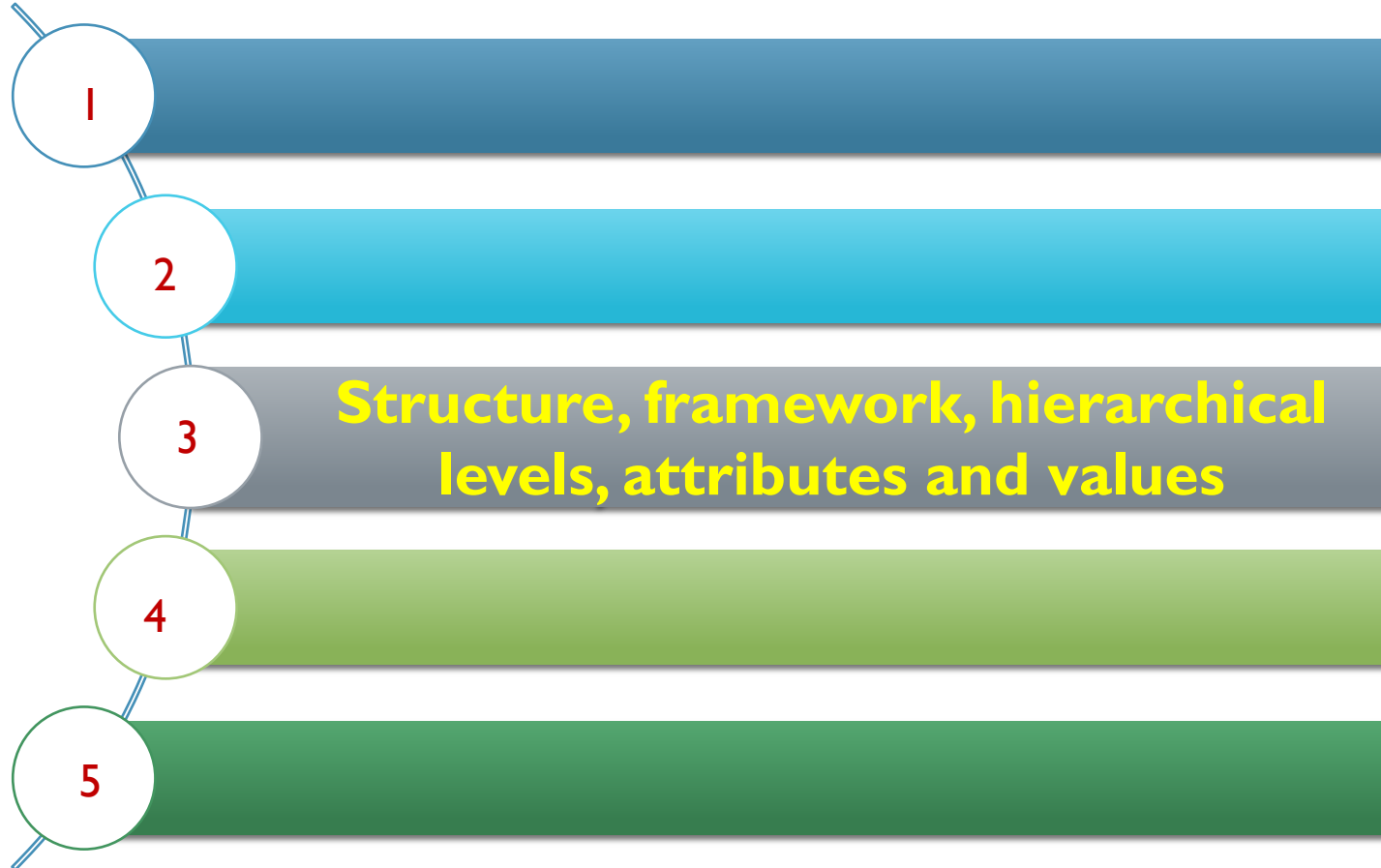
Thus it does not cover:

- the costs or carbon emissions associated with change of use prior to acquisition
- what is referred to in BS 15686-5 as 'externalities' such as sequestration or
- carbon credits such as energy exported during operation which are considered to sit outside the boundaries of the project.

ISO 15686-5:2017 Buildings and constructed assets – Service life planning – Part 5: Life-cycle costing



CONTENT



DOCUMENT STRUCTURE

67/61= 128

Part 1 Context - pgs 8-12

Part 2 ICMS Framework- pgs 13-29

Part 3 Project Attributes and Values – pg 30-64

Part 4 Definitions – pgs 65-74

Appendices- pgs 75-135

**Guidance
is given
on:**

- 1)• how ICMS is to be used
- 2)• the level of detail to include when presenting costs and carbon emissions
- 3)• the method of dealing with Projects comprising different Sub-Projects and
- 4)• the approach for ensuring that like is compared with like, especially considering different currencies, sources of carbon emissions and timeframes.

General Notes

- Appendix A – Acquisition Sub-Groups
- Appendix B – Construction | Renewal | Maintenance Sub-Groups: Buildings
- Appendix C – Construction | Renewal | Maintenance Sub-Groups: Civil Engineering Works
- Appendix D – Operation Sub-Groups
- Appendix E – End of Life Sub-Groups
- Appendix F – Process Flow Charts
- Appendix G – Cost Reporting Templates
- Appendix H – Carbon Emission Reporting Templates
- Appendix I – ICMS Coding Structure
- Appendix J – Interface with International Property Measurement Standards (IPMS)
- Appendix K – Revision Notes for ICMS, third edition
- Appendix L – Bibliography

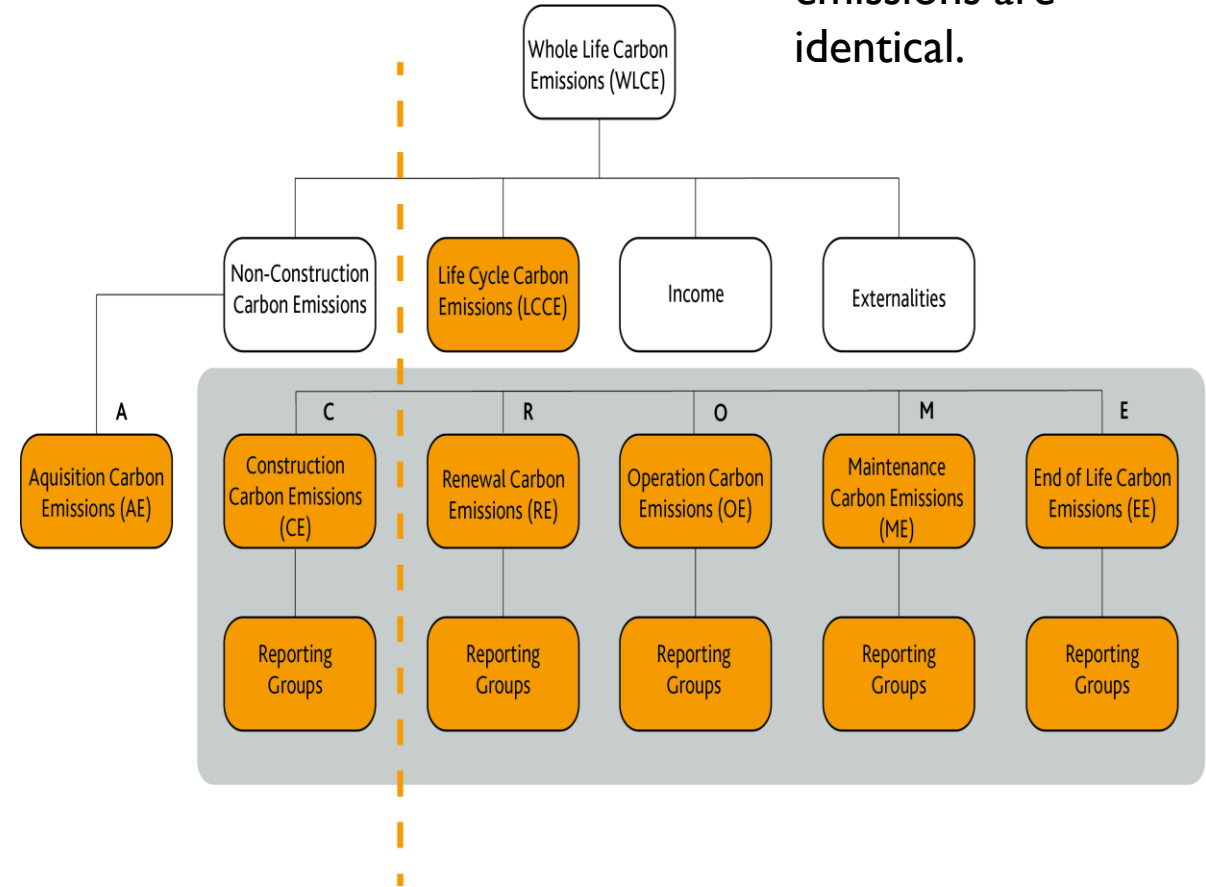
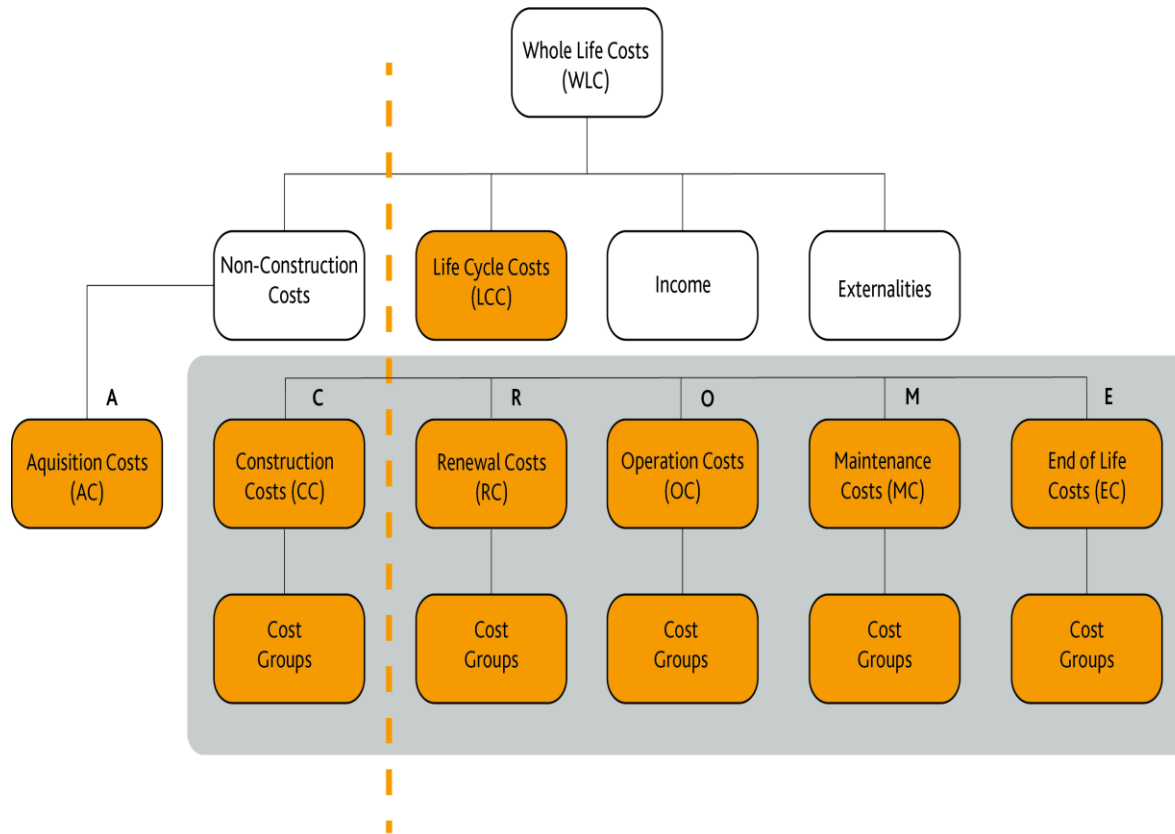


ICMS Framework

The broad context of the ICMS general framework is provided in two main sections viz;

The relationship between ICMS, Life Cycle Costs (LCC) and Whole Life Costs (WLC) – ICMS 3 scope is coloured & shaded parts ONLY

Thus, the reporting structures for costs and carbon emissions are identical.



ICMS 2nd edition (Construction and Other Life Cycle Costs)

ICMS is consistent with ISO 15686-5:2017 Buildings and constructed assets – Service life planning – Part 5: Life-cycle costing.

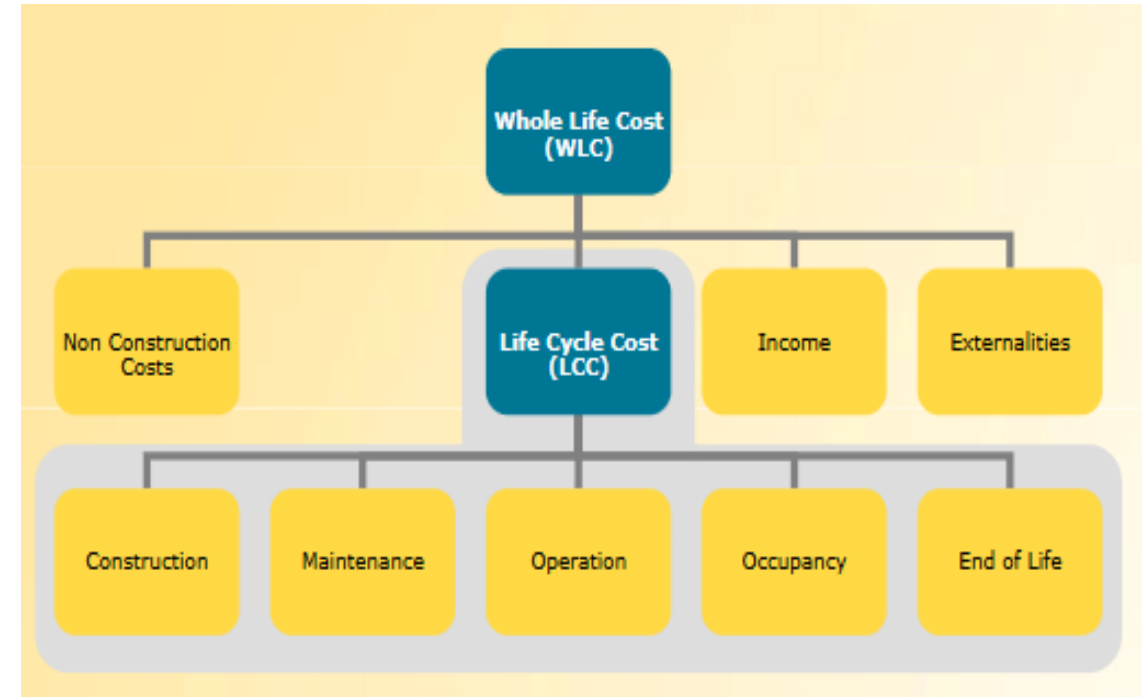
ICMS Framework

The international standard, BS/ ISO 15686-5 Buildings & Constructed Assets, set out clear definitions for the two terms

Broadly, **life cycle costs** are those associated directly with constructing and operating the building;

while **whole life costs** include other costs such as land, income from the building and support costs associated with the activity within the building.

The diagram below illustrates the difference between WLC and LCC (adapted from BS ISO 15686-5)



ICMS Framework

Hierarchical Levels

ICMS Hierarchy

It consists of **four levels** with **Level 1 through Level 3** being **mandatory** while **Level 4** is **discretionary**.

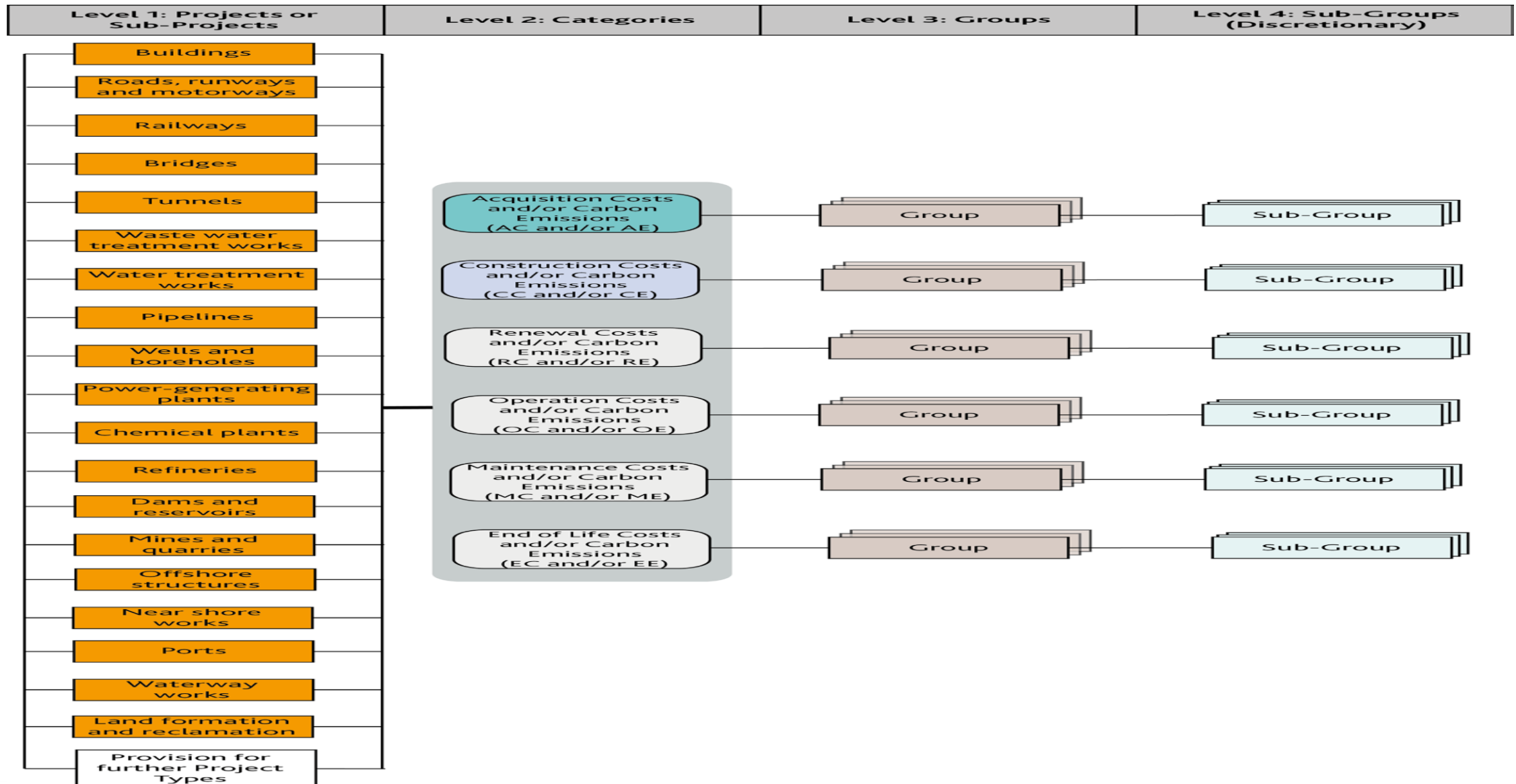
Hierarchical Levels

The hierarchical links between the four levels of the ICMS taxonomy, from the highest to the lowest level of detail.

ICMS Hierarchy



ICMS Framework The taxonomy



Hierarchical Levels- Projects and Sub-Projects (Level 1)

01 Buildings	11 Chemical plants
02 Roads and runways	12 Refineries
03 Railways	13 Dams and reservoirs
04 Bridges	14 Mines and quarries
05 Tunnels	15 Offshore structures
06 Wastewater treatment works	16 Near shore works
07 Water treatment works	17 Ports
08 Pipelines	18 Waterway works
09 Wells and boreholes	19 Land formation and reclamation
10 Power-generating plants	

ICMS classifies Projects according to their **essence and principal purpose**.

The Projects shown in the framework are not exhaustive and will be further developed in future editions of ICMS

It is also possible to use a combination of Sub-Projects within a Project to report a collection of Projects under the names of 'programme' or 'portfolio'.

Codes need be used only when considered desirable, for example, in databases

When a Project is too large or complex to be described by a single set of Project Attributes and Values, it is to be subdivided into Sub-Projects



ICMS Framework

Hierarchical Levels - Categories (Level 2)

Code	Description			
	Categories (Level 2)	AC	CC	RC, OC, MC and EC
	Groups (Level 3)			
	Life Cycle Cost (CC plus NPV of RC, OC, MC, and EC)			
1.	Acquisition Costs (AC) [Part of Non-Construction Costs]			
2.	Construction Costs (CC)			
3.	Renewal Costs (RC)			
4.	Operation Costs (OC)			
5.	Maintenance Costs (MC)			
6.	End of Life Costs (EC)			

A	C	R	O	M	E
1. Acquisition Costs (AC) and/or Carbon Emissions (AE)	2. Construction Costs (CC) and/or Carbon Emissions (CE)	3. Renewal Costs (RC) and/or Carbon Emissions (RE)	4. Operation Costs (OC) and/or Carbon Emissions (OE)	5. Maintenance Costs (MC) and/or Carbon Emissions (ME)	6. End of Life Costs (EC) and/or Carbon Emissions (EE)

They are mandatory and standardised for all Projects to enable high-level comparison between different Projects and Sub-Projects.

Accepted alternative terms are separated with a vertical slash (|).

Different levels of Codes are to be linked together with a full point (.) in between

- acquisition costs | carbon emissions (AC | AE)
- construction costs | carbon emissions (CC | CE)
- renewal costs | carbon emissions (RC | RE)
- operation costs | carbon emissions (OC | OE)
- maintenance costs | carbon emissions (MC | ME) and
- end of life costs | carbon emissions (EC | EE).

Life Cycle Cost (CC plus NPV of RC, OC, MC, and EC)
Life Cycle Emissions (CE+RE+OE+ME+EE)



ICMS Framework

Hierarchical Levels – Groups (Level 3)

Note: Costs are reported for all cells at level 3; Carbon Emissions are reported at level 3 only for the cells coloured green.

01. Site acquisition	01. Demolition, site preparation and formation	01. Cleaning	01. Disposal inspection
02. Administration, finance, legal and marketing expenses	02. Substructure	02. Utilities	02. Decommissioning and decontamination
	03. Structure	03. Waste management	03. Demolition and reclamation
	04. Architectural works non-structural works	04. Security	04. Reinstatement
	05. Services and equipment	05. Information and Communication Technology	05. Constructors' site overheads general requirements
	06. Surface and underground drainage	06. Operators' site overheads general requirements	06. Risk Allowances
	07. External and ancillary works	07. Risk Allowances	07. Taxes and Levies
	08. Preliminaries Constructors' site overheads general requirements	08. Taxes and Levies	
	09. Risk Allowances		
	10. Taxes and Levies		
	11. Works and utilities off-site		
	12. Production and loose furniture, fittings and equipment		
	13. Construction-related consultants and supervision		



ICMS Framework

Hierarchical Levels - Groups (Level 3)

1	Code	Acquisition Costs (AC)
	01	Site Acquisition
	02	Administrative, financial, legal and marketing expenses

2 3 5	Code	Construction Costs (CC) , Renewal Costs (RC), Maintenance Costs (MC)
	01	Demolition, site preparation and formation
	02	Substructure
	03	Structure
	04	Architectural works non-structural works
	05	Services and equipment
	06	Surface and underground drainage
	07	External and ancillary works
	08	Preliminaries Constructor's site overheads general requirements
	09	Risk Allowances
	10	Taxes and Levies
	11	Work and utilities off-site
	12	Production and loose furniture, fittings and equipment
	13	Construction Renewal Maintenance-related consultants and supervision

Categories CC, RC and MC use the same Groups

4	Code	Operation Costs (OC)
	01	Cleaning
	02	Utilities
	03	Waste management
	04	Security
	05	Information & communication technology
	06	Operators' site overheads general requirements
	07	Risk Allowances
	08	Taxes and Levies

6	Code	End of Life Costs (EC)
	01	Disposal inspection
	02	Decommissioning and decontamination
	03	Demolition, reclamation and salvage
	04	Reinstatement
	05	Information & communication technology
	06	Constructors' site overheads general requirements
	07	Risk Allowances
	08	Taxes and Levies

At level 3, each of the six categories is broken down into groups to provide greater granularity for capturing cost and carbon

a reminder of the colour coding is provided at the top of each page: turquoise for acquisition groups, light blue for construction groups, and light grey for renewal, maintenance, operation and end of life groups



ICMS Framework

Hierarchical Levels – Subgroups (Level 4)

Sub-Groups are chosen irrespective of their design, specification, materials or construction.

The ICMS recommends classification of the Sub-Groups (Level 4) and have provided examples of what might be included for costs in the following appendices

Appendix A – Acquisition Sub-Groups: common to **all types of project** where the functional type is defined in the project attributes elsewhere.

• **Appendix B** – Construction | Renewal | Maintenance Sub-Groups: **Buildings**: where the functional type is defined in the project attributes elsewhere.

• **Appendix C** – Construction | Renewal | Maintenance Sub-Groups: **Civil Engineering Works**: the classification appears in the form of a table or matrix, where the relevant level 4 sub-group item is 'dotted' to indicate that it is relevant to that particular type of civil engineering works.

• **Appendix D** – Operation Sub-Groups: common to **both buildings and civil engineering works**.

• **Appendix E** – End of Life Sub-Groups: common to **all types of project** where the functional type is defined in the project attributes elsewhere.

APPENDIX A	Acquisition Sub-Groups	all types of project
APPENDIX B	Construction Renewal Maintenance Sub-Groups: Buildings	Buildings
APPENDIX C	Construction Renewal Maintenance Sub-Groups: Civil Engineering Works	Civil Engineering Works:
APPENDIX D	Operation Sub-Groups	
APPENDIX E	End of Life Sub-Groups	all types of project

APPENDIX A	Acquisition Sub-Groups	all types of project
APPENDIX B	Construction Renewal Maintenance Sub-Groups: Buildings	Buildings
APPENDIX C	Construction Renewal Maintenance Sub-Groups: Civil Engineering Works	Civil Engineering Works:
APPENDIX D	Operation Sub-Groups	
APPENDIX E	End of Life Sub-Groups	all types of project



Code		Description	Note
		Category (Level 2) AC AE	
		Group (Level 3)	
		Sub-Group (Level 4)	
1.		Acquisition Costs (AC) Acquisition Carbon Emissions (AE) (each Sub-Group includes Risk Allowances)	
	01.	Site acquisition	
	01.010	Costs and premium required to procure site	
	01.020	Compensation to existing occupiers	
	01.030	Demolition, removal and modification of existing properties by way of payment to existing owners instead of carrying out physical work	
	01.040	Contributions for the preservation of heritage, culture and environment	
	01.050	Related fees to agents, lawyers, and the like	
	01.060	Related taxes and statutory charges	
	02.	Administrative, finance, legal and marketing expenses	
	02.010	Client's general office overheads	
	02.020	Client's project-specific administrative expenses: <ul style="list-style-type: none"> • in-house project management and design team • supporting project staff • project office venue, furniture and equipment if not included in Constructor's preliminaries site overheads • stores and workshops • safety and insurances • staff training • accommodation and travelling expenses for in-house team and external parties 	
	02.030	Interest and finance costs	
	02.040	Legal expenses	
	02.050	Accounting expenses	
	02.060	Sales, leasing, marketing, advertising and promotional expenses	
	02.070	Taxes and statutory charges related to sales and lease	
	02.080	License and permit charges for operation and use	

Appendix B – Construction | Renewal | Maintenance Sub-Groups: Buildings

Code	Description	Note
	Category (Level 2) CC CE RC RE or MC ME	
	Group (Level 3)	
	Sub-Group (Level 4)	
2	Construction Costs (CC) Construction Carbon Emissions (CE)	
3	Renewal Costs (RC) Renewal Carbon Emissions (RE)	
5	Maintenance Costs (MC) Maintenance Carbon Emissions (ME)	
	CC CE RC RE or MC ME share the same Groups below, so far as applicable. Those separated by in [] are respective alternative terms.)	
	01 Demolition, site preparation and formation	
	1.010 Site survey and ground investigation	
	1.020 Environmental treatment	
	1.030 Sampling of hazardous or useful materials or conditions	
	1.040 Temporary fencing	
	1.050 Demolition of existing buildings and support to adjacent structures	
	1.060 Site surface clearance (clearing, grubbing, topsoil stripping, tree felling, minor earthwork, removal)	
	1.070 Tree transplant	
	1.080 Site formation and slope treatment	
	10.090 Temporary surface drainage and dewatering	
	01.100 Temporary protection, diversion and relocation of public utilities	
	01.110 Erosion control	
	02. Substructure	
	02.010 Foundation piling and underpinning:	
	<ul style="list-style-type: none"> • mobilisation and demobilisation • trial piles and caisson • permanent piles and caisson • pile and caisson testing • underpinning 	



ICMS Framework Hierarchical Levels – Subgroups (Level 4)

Code		Description	Note
		Category (Level 2)	CC CE RC RE or MC ME
		Group (Level 3)	
		Sub-Group (Level 4)	
	02.020	Foundations up to top of lowest floor slabs: <ul style="list-style-type: none"> • excavation and disposal • lateral supports • raft footings, pile caps, column bases, wall footings, strap beams, tie beams • substructure walls and columns • lowest floor slabs and beams (excluding and beyond basement bottom slabs) • lift pits • composite or prefabricated work 	
	02.030	Basement sides and bottom: <ul style="list-style-type: none"> • excavation and disposal • lateral supports • bottom slabs and blinding • sides • vertical waterproof tanking, drainage blanket, drains and skin wall • horizontal waterproof tanking, drainage blanket, drains and topping slab • insulation • lift pits, sump pits, sleeves • composite or prefabricated work 	
	03.	Structure	
	03.010	Structural removal and alterations	
	03.020	Basement suspended floors (up to top of ground floor slabs): <ul style="list-style-type: none"> • structural walls and columns • beams and slabs • staircases 	
	03.030	Frames and slabs (above top of ground floor slabs): <ul style="list-style-type: none"> • structural walls and columns • upper floor beams and slabs • roof beams and slabs • staircases • fireproofing to steel structure 	
	03.040	Tanks, pools, sundries	
	03.050	Composite or prefabricated work	
	04.	Architectural works Non-structural works	
	04.010	Non-structural removal and alterations	

Appendix C – Construction | Renewal | Maintenance Sub-Groups: Civil Engineering Works- Pg 86

Code	Description	Roads and runways	Railways	Bridges	Tunnels	Wastewater treatment works	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and reservoirs	Mines and quarries	Offshore Structures	Near Shore Works	Ports	Waterway Works	Land formation and reclamation	Note	
	Category (Level 2)																				
	Group (Level 3)																				
	Sub-Group (Level 4)																				
2.	Construction (CC CE)																				
3.	Renewal (RC RE)																				
5.	Maintenance (MC ME)																				
	(CC CE, RC RE, and MC ME share the same Groups below, so far as applicable. Those separated by ' ' in [] are alternative terms for respective Groups)																				
01.	Demolition, site preparation and formation																				
01.010	Site survey and ground investigation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
01.020	Environmental treatment	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
01.030	Sampling of hazardous or useful materials or conditions	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	



	Code	Description	
		Category (Level 2)	OC OE
		Group (Level 3)	
		Sub-Group (Level 4)	
4.		Operation Costs (OC) Operation Carbon Emissions (OE)	
	01.	Cleaning	
	01.010	External cleaning (routine and periodic)	
	01.020	Internal cleaning (routine and periodic)	
	01.030	Specialist cleaning (define type)	
	02.	Utilities	
	02.010	Fuel (state type: gas / electricity / oil and other fuel sources)	
	02.020	Water, drainage and sewerage	
	03.	Waste management	
	03.010	Waste collection and disposal	
	03.020	Recycling and salvage	
	04.	Security	
	04.010	Physical security	
	04.020	Remote monitoring	
	05.	Information and communications technology	
	05.010	Communication systems	
	05.020	Specialist technology / sensors	
	06.	Operators' site overheads general requirements	
	06.010	Administration	
	06.020	Property insurance	
	07.	Risk Allowances	
	07.010	Operation related (user definable)	
	07.020	Contractual obligations	
	08.	Taxes and Levies	
	08.010	Taxes	
	08.020	Levies	

	Code	Description	
		Category (Level 2)	EC EE
		Group (Level 3)	
		Sub-Group (Level 4)	
6.		End of Life Costs (EC) End of Life Carbon Emissions (EE)	
	01.	Disposal inspection	
	01.010	Dilapidations report	
	01.020	Contractual hand-back obligations	
	02.	Decommissioning and decontamination	
	02.010	Shutdowns and decommissioning	
	02.020	Decontamination	
	03.	Demolition, reclamation and salvage	
	03.010	Demolition	
	03.020	Reclamation	
	03.030	Salvage	
	04.	Reinstatement	
	04.010	Agreed reinstatement works	
	04.020	Contractual obligations	
	05.	Constructors' site overheads general requirements	
	05.010	Administration	
	05.020	Overheads (project specific)	
	06.	Risk Allowances	
	06.010	End of life specific (user definable)	
	06.020	Abnormal risks (user definable)	
	07.	Taxes and Levies	
	07.010	Taxes	
	07.020	Levies	
	07.030	Credit for grants	

ICMS Framework

Hierarchical Levels – Subgroups (Level 4)

Examples - coding

Level 1	Level 2	Level 3	Level 4
Projects/Sub-Projects	Category	Group	Sub-Group
Buildings	Construction Costs	Substructure	Foundation piling and underpinning:
01	2	02	010

Code 01.2.02.010

Level 1	Level 2	Level 3	Level 4
Projects/Sub-Projects	Category	Group	Sub-Group
Buildings	Construction Costs	Production and loose furniture, fittings and equipment (including related risk allowances, taxes and levies)	Fixed production, process and operating furniture, fittings and equipment installed before completion of construction
01	3	12	020

Code 01.3.12.020

Level 1	Level 2	Level 3	Level 4
Projects/Sub-Projects	Category	Group	Sub-Group
Tunnels	Construction Costs	Demolition, site preparation and formation	Habitat protection systems
05	2	01	700

Code 05.2.01.700

Level 1	Level 2	Level 3	Level 4
Projects/Sub-Projects	Category	Group	Sub-Group
Near shore works	operation costs	Waste management	Recycling and savage
16	4	03	020

Code 16.4.03.020



What is an attribute?

- Attributes are used to capture those characteristics of a construction project and the context in which it is built that might influence its performance.

Purpose/Benefit

- They enable consistent and concise evaluation and comparison between different Projects, design schemes, through a set of Project Attributes and Values describing the principal characteristics of each Project or Sub-Project.
- Attributes are used for searching, benchmarking and identifying suitable projects for comparison by surveyors.

Characteristics

- An attribute is a characteristic such as 'Ground conditions (predominant)' which may take one of the values 'soft | rocky | reclaimed | submerged | swampy or for roads for example: 'total paved area' for which the user inserts the value in m² | ft².'

Type of Information

- Each project contains information about its location, the date of report, the currency stated, and where available, projects include start and end dates along with the type of cost data collected (for example, "At tender", or "Costs on completion"). In addition, project attributes are defined on a project type basis.

Building attributes

- **Building attributes**
- Function
- IPMS 1 Area GIFA [m2]
- IPMS 2 Area GEFA [m2]
- Covered Area On Plan [m2]
- Site area [m2]
- Number of storeys above ground (qualitative)
- Number of storeys above ground (quantitative) [storeys]
- Number of storeys below ground (quantitative) [storeys]
- Wall design [Wall type]
- Air-conditioning
- Prefabrication degree
- Building structure
- Nature
- Grade
- Functional units [unit]
- Environmental - grade and name of certification
- Environmental - grade status

Railway attributes & Road attributes

- **Railway attributes**
- Function
- Nature
- Design speed [kph]
- Maximum axle load [tonnes]
- Track gauge [metres]
- Weight of traffic [million tonnes/year]
- Passenger journeys [millions/year]
- Route length [km]
- Equated length (track-km) [km]
- Length - elevated [km]
- Length - at grade [km]
- Length - below ground [km]
- **Road attributes**
- Footway width [metres]
- Design speed [kph]
- Total paved area [m2]
- Function
- Surfacing
- Length [km]
- Equated length (lane-km) [km]
- Vehicle capacity [vehicles/hour]
- Nature

Bridge attributes & Dam/reservoir attributes

- **Bridge attributes**
- Function
- Support
- Deck length [km]
- Surface area of deck [m2]
- Nature
- State of use
- **Dam/reservoir attributes**
- Function (type)
- Function (purpose)
- Nature
- Structure
- Core
- Location (above / below ground)
- Principal material
- Geotechnical
- Site area [m2]
- Reservoir capacity [million cubic metres]
- Capacity (hydroelectric only) [MW]
- Principal dam wall height [m]
- Principal dam crest length [m]

Tunnel attributes & Offshore structures attributes

- **Tunnel attributes**
- Function
- Tunnelling method
- End to end length [km]
- Volume of excavation [cubed metres]
- Equated length (lane-km / track-km) [km]
- Nature
- **Offshore structures attributes**
- Function
- Nature
- Construction
- Foundations
- Positions
- Surface area of platform [m2]
- Mass of prefabricated offshore structure [tonnes]



Note 1:

- All Values should be given so long as the attributes are relevant.

Note 2:

- Alternative Values are separated with a vertical slash (|). More than one alternative Value may be chosen. Some Attributes are multi-valued requiring the entry of sets of sub-Attributes and Values, e.g., more than one set of dimensions or quantities are to be stated when more than one size is involved.

Note 3:

- All quantities should be rounded to the nearest whole number unless considered inappropriate in special circumstances.

Note 4:

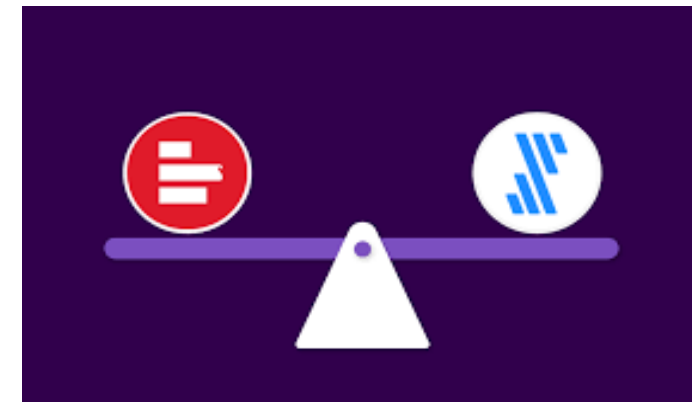
- These Project Attributes and Values capture the minimum principal characteristics of a Project or Sub-Project that might have a significant influence on cost and/or carbon emissions. Users may add more Project Attributes and Values to suit their needs.

Note 5:

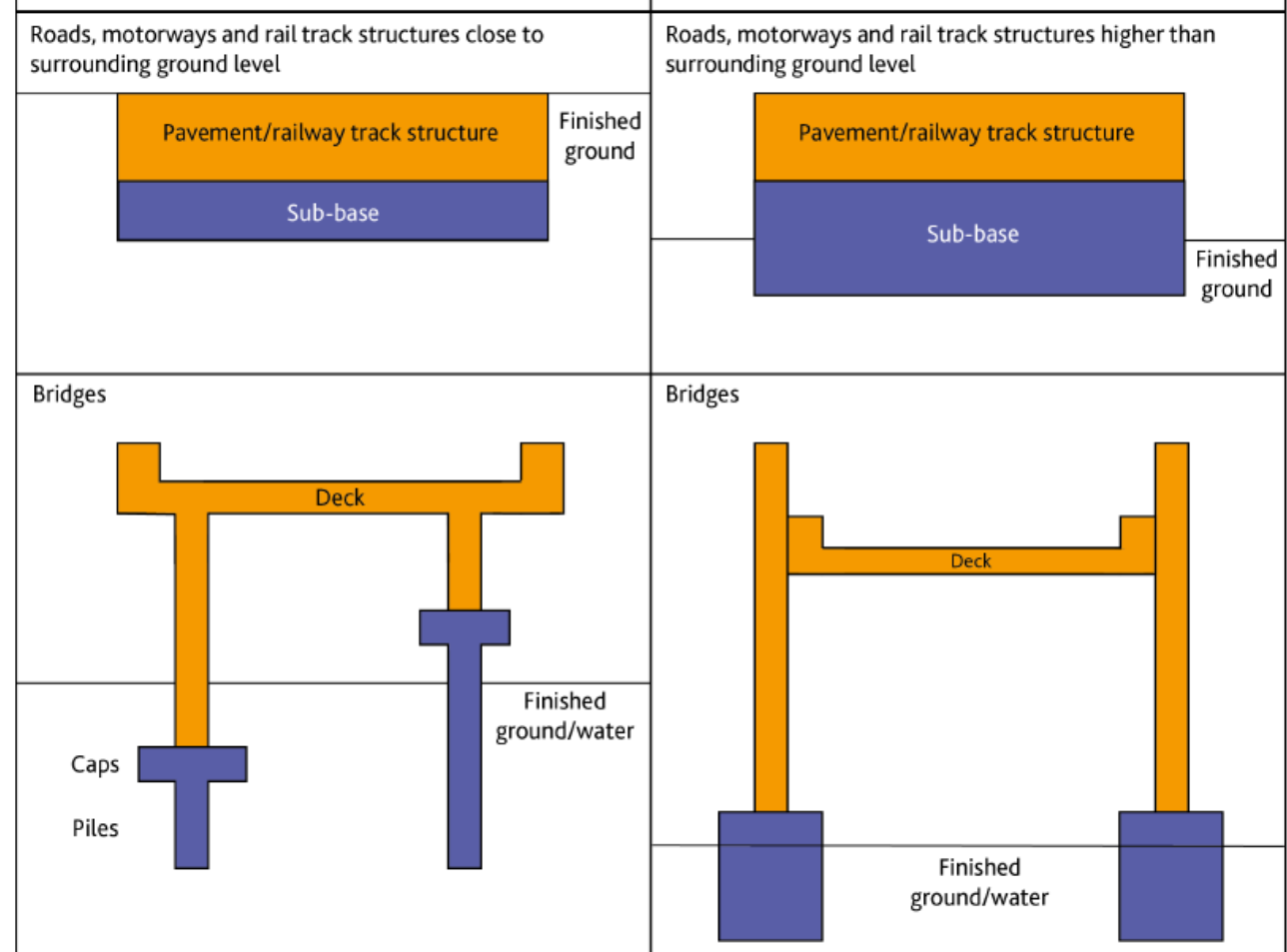
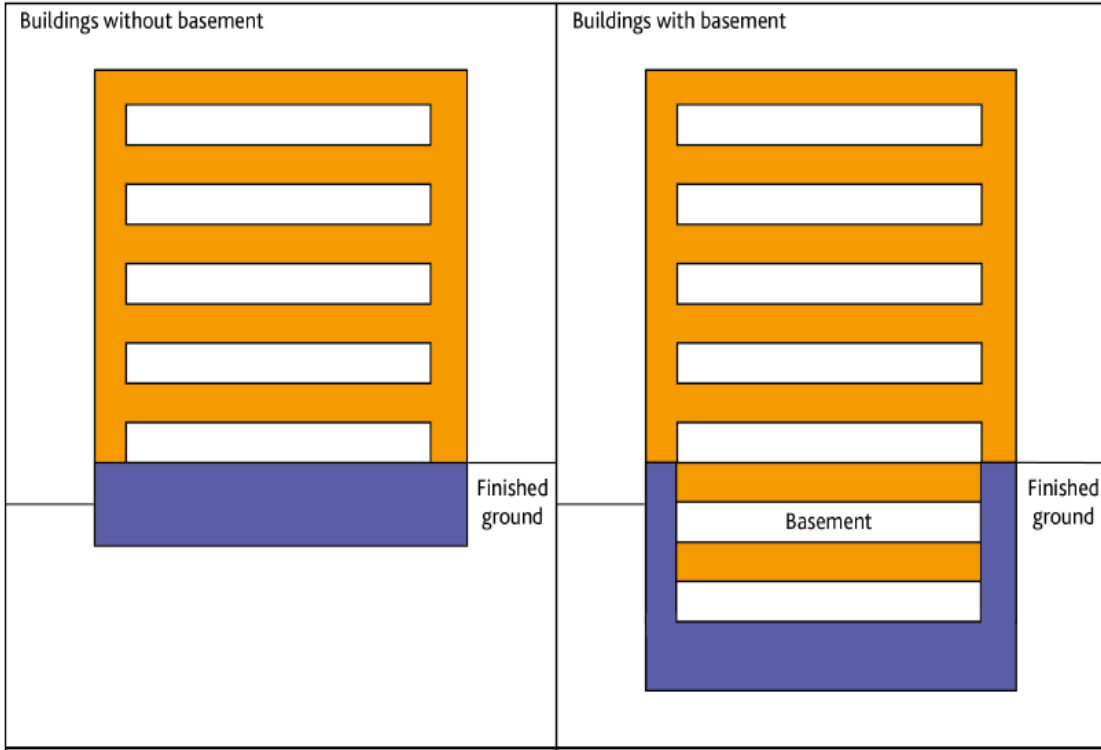
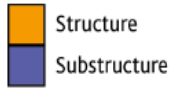
- The values of functional units refer to the designed values.

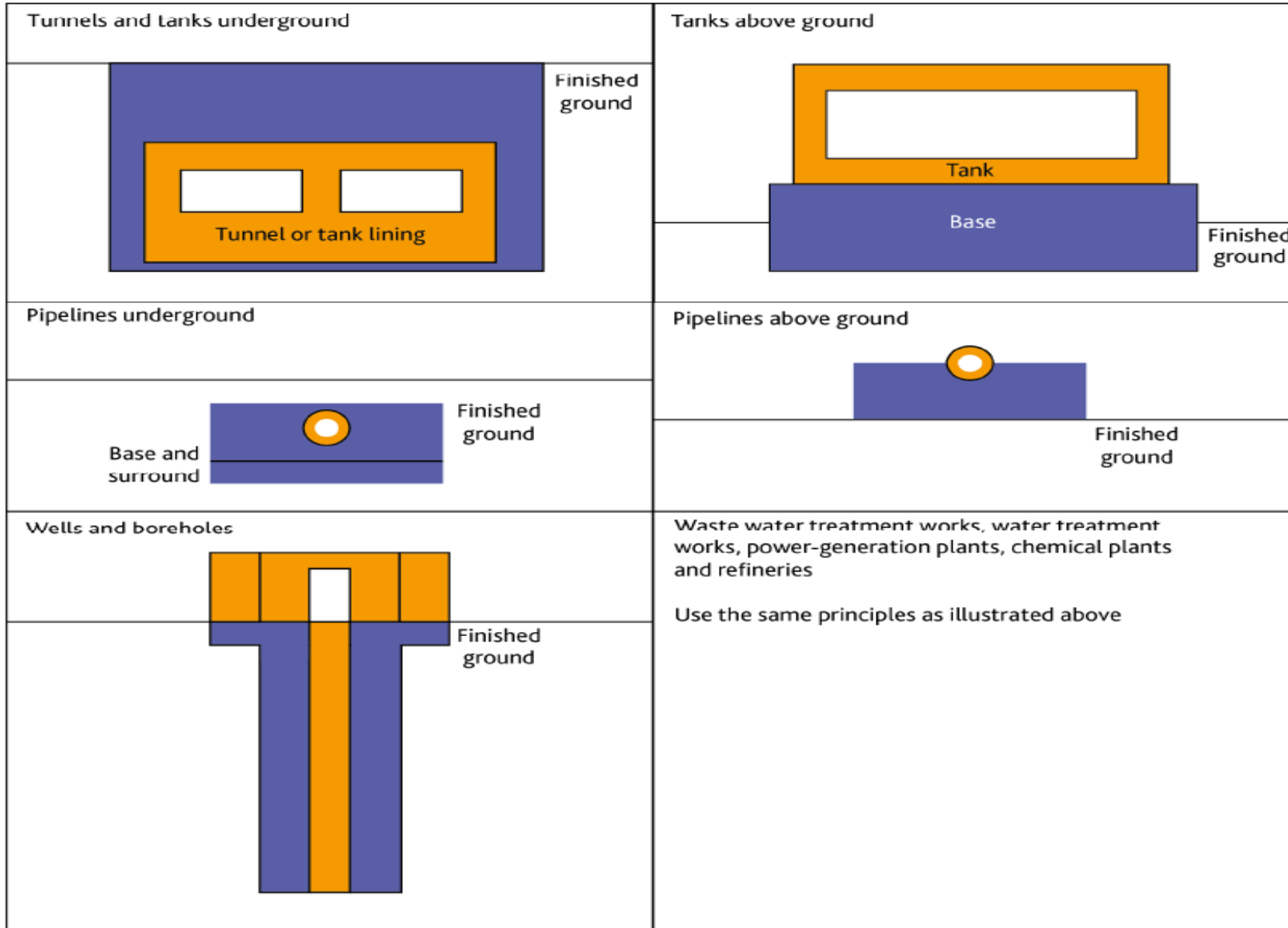
Common for all Projects and Sub-Project Types (Project level only)

Level I Specific

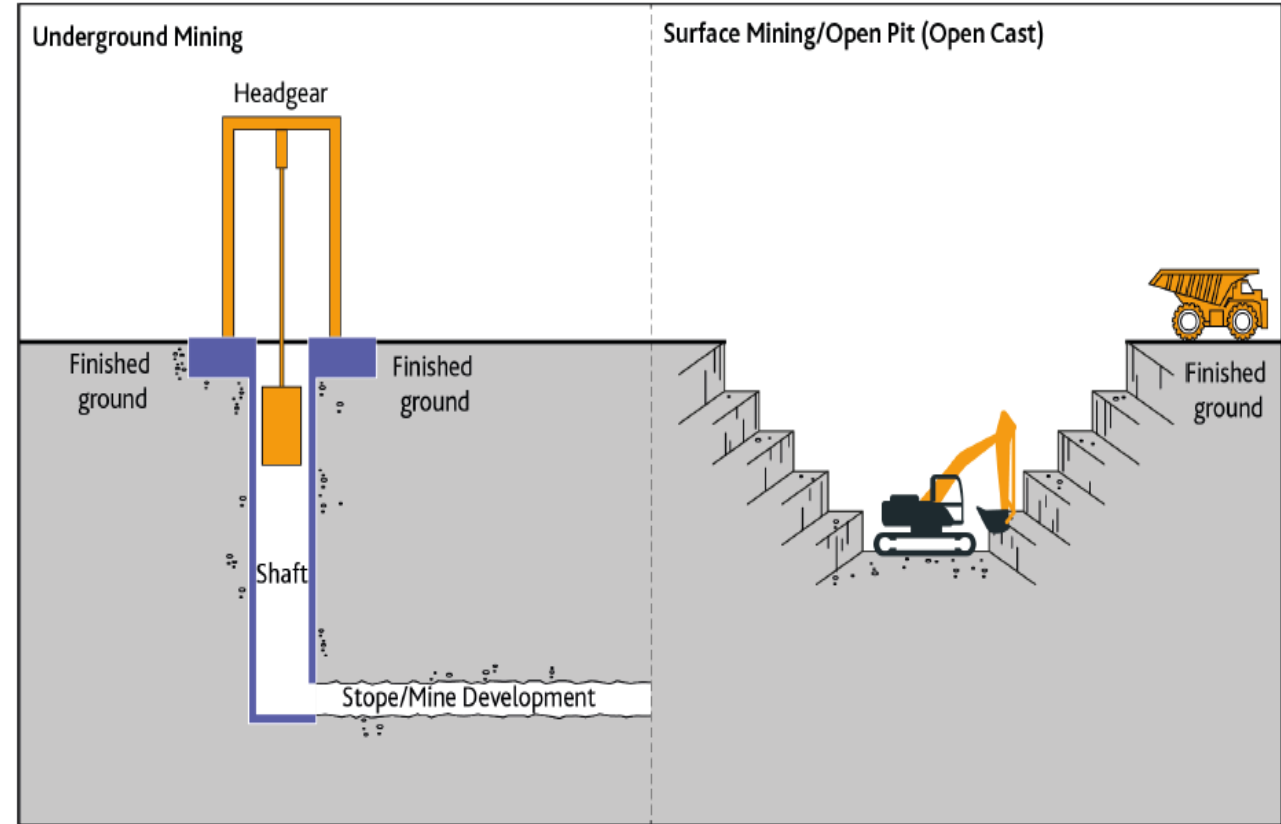
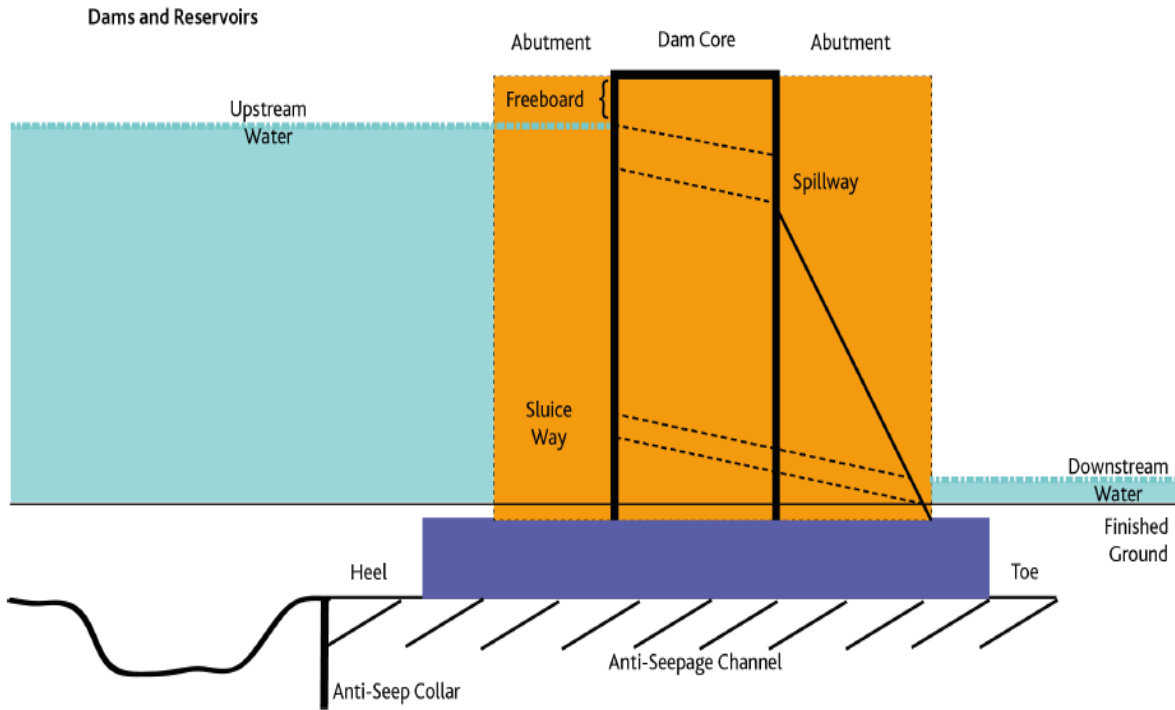


ICMS Framework Substructure and Structure Delineation

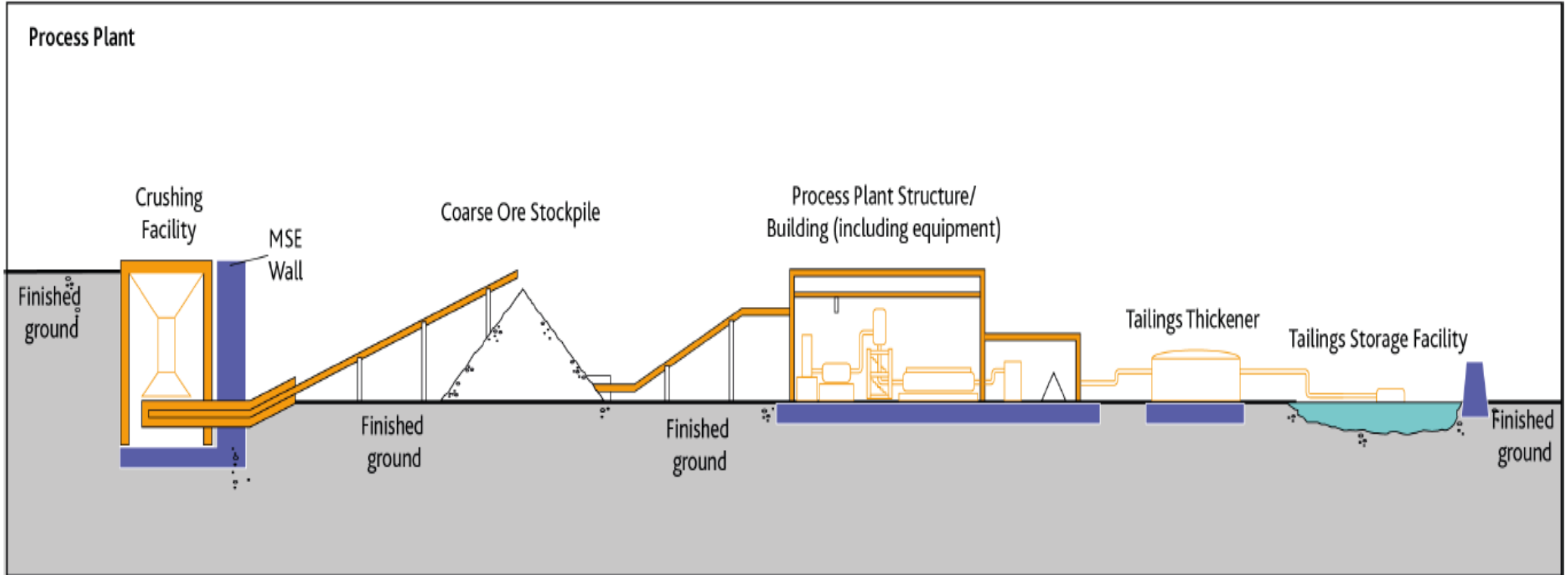


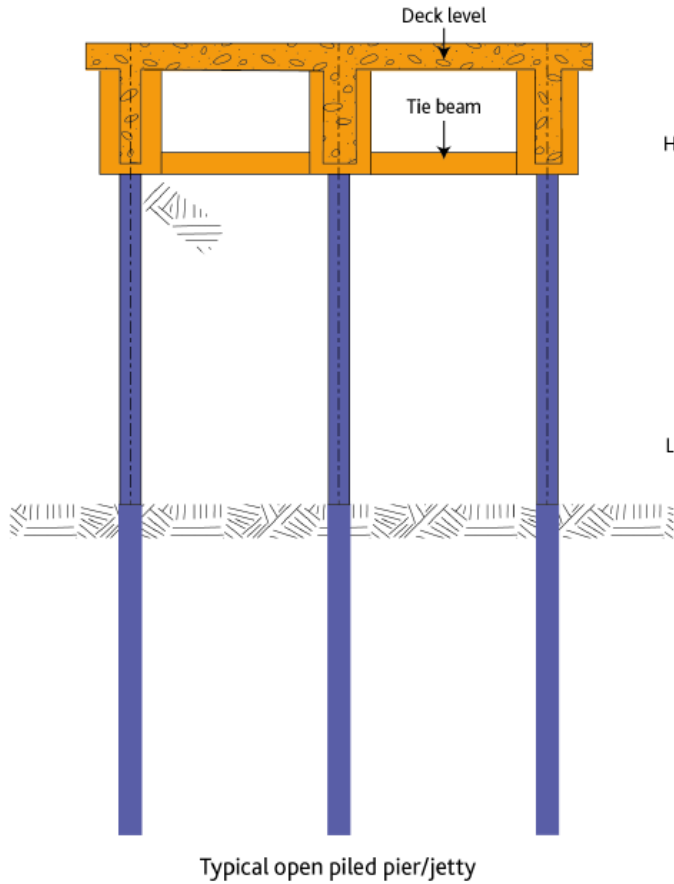


ICMS Framework Substructure and Structure Delineation



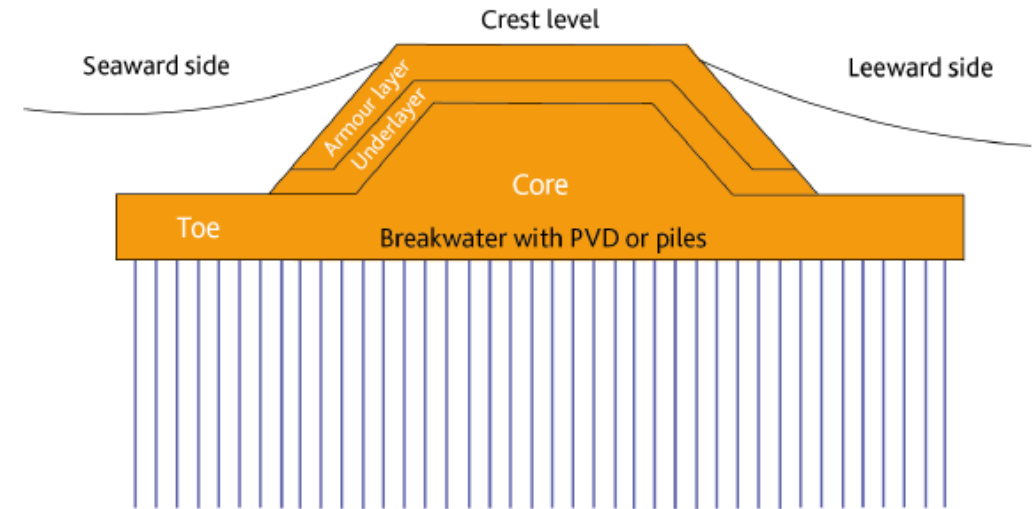
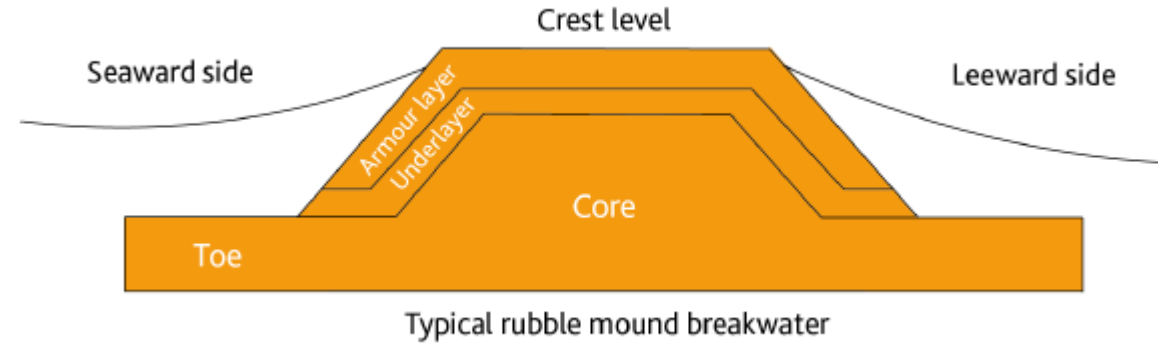
Process Plant





H.A.T. approx
 M.H.W.S
 M.H.W.N
 M.L.W.N
 M.L.W.S
 L.A.T. approx

H.A.T. – Highest Astronomical Tide
 M.H.W.S – Mean High Water Springs
 M.H.W.N – Mean High Water Neaps
 M.L.W.N – Mean Low Water Neaps
 M.L.W.S – Mean Low Water Springs
 L.A.T – Lowest Astronomical Tide



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- 1
- 2
- 3
- 4 Life cycle cost and Carbon Emissions considerations
- 5



Life cycle cost considerations

The focus is on Life cycle carbon emissions as opposed to whole life carbon emissions

Section 2.4 in ICMS is dedicated to life cycle cost considerations, including the time value of money.

It provides a brief overview of how to calculate Net Present Value, emphasizing the importance of the two major variables: **discount rate and expected asset life**.

Where constructed assets or major components have different lives, the NPV of each must be calculated separately
More information on the calculation of NPV can be found in ISO 15686-5:2017

Choosing an appropriate rate

Choosing an appropriate discount rate requires considerable expertise and professional judgement.

- It may be the cost to the client of borrowing money, it may be the loss of the rate of return on an alternative investment, it may be specified by government, it may be simply an estimate of the future cost of borrowing or it may be specified by the client.
- The rationale for the value selected should always be described in any life cycle cost report.
- The nominal discount rate takes into account the general rate of inflation, whilst the real discount rate does not.
- ICMS distinguishes between inflation and escalation based on the definition provided by ISO 15686-5.
- Inflation/deflation is defined as 'the sustained increase/decrease in the general price level of resources'
- Escalation is defined as 'a positive or negative factor or rate reflecting an estimate of differential increase/decrease in the general price level for a particular commodity, or group of commodities, or resources'
- They will need to be considered separately in any calculation of life cycle costs.

The expected life

The expected life of an asset may be its **design life, its physical or operational life** when major failures are so frequent that its reliability is compromised, its **economic life** (based on the time when it becomes no longer economical to continue operating the asset), or its **obsolescence life** when its use is overtaken by more modern approaches.

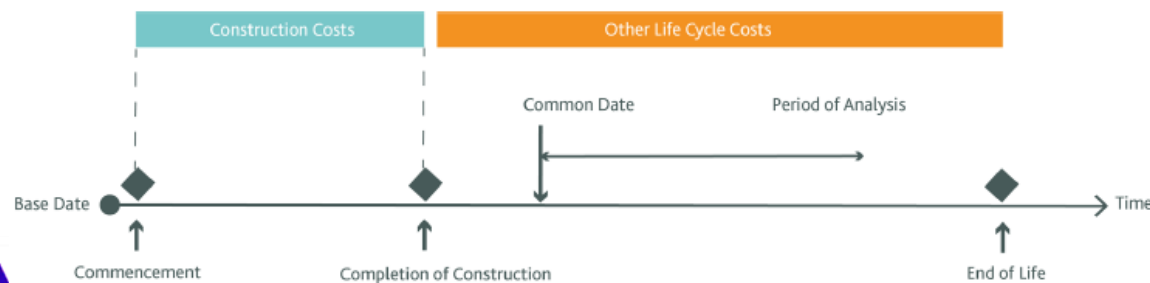
Because of the uncertainty surrounding the estimates of the major variables, it is recommended that a sensitivity analysis of the results of life cycle costing should be conducted to test the impact of changes in discount rates and asset lives.

Time value of money

Templates for reporting life cycle costing are provided in Appendix G

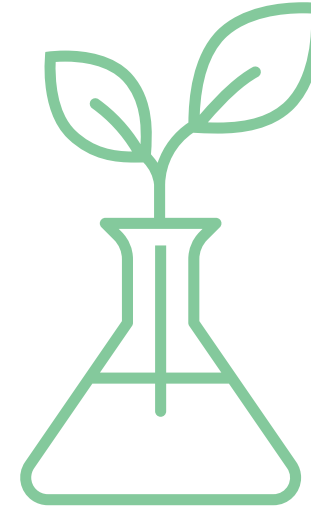
Appendix G

- G1 - Grand Summary for a Mixed Project
- G2 - Construction Costs only for a Project
- G3 - Construction Costs only for a Building Project
- G4 - Total Capital Cost for a Project
- G5 - Total Capital Cost for a Building Project
- G6 - Life Cycle Costs for a Project
- G7 - Comparison Between Two Design Schemes for a Project
- G8 - Comparison Between Two Design Schemes for a Building Project
- G9 - Project Consisting of Various Parts
- G10 - Handling Two Currencies
- G11 - Handling Many Currencies



ICMS 3 does not cover:

- Carbon emissions associated with the change of use prior to acquisition.
- 'Externalities' such as sequestration.
- Carbon credits such as energy exported during operation which is considered to sit outside the boundaries of the project.



The templates in Appendix H cover:

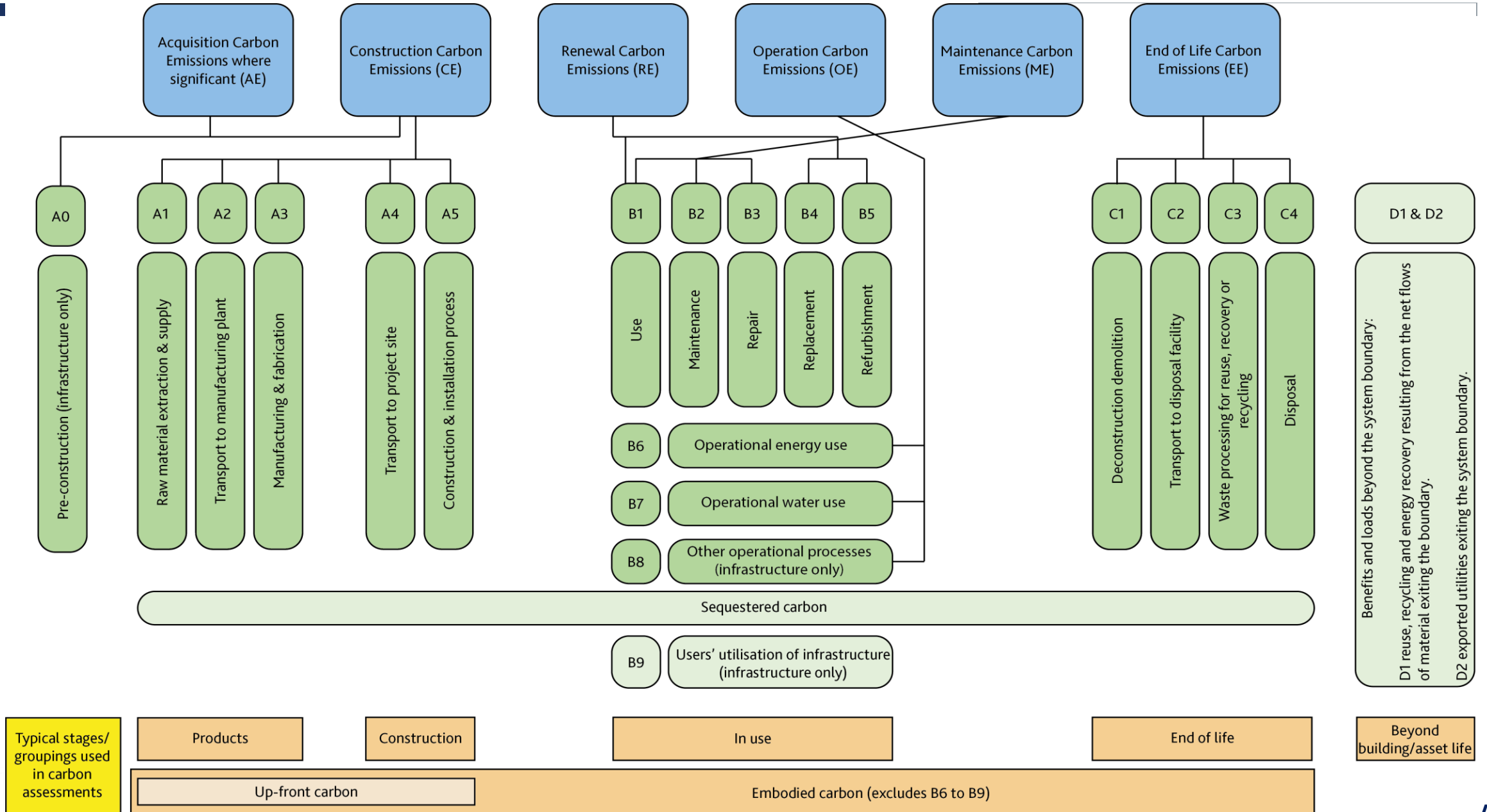
- H1 - Carbon Emissions by Category. This helpfully includes a diagram showing how ICMS reporting maps to the stages associated with whole life carbon assessment
- H2 - Carbon Emissions by Groups

project management and cost management professional's work closely with other professionals on a multidisciplinary

ICMS Framework

How ICMS reporting maps to the stages associated with whole life carbon assessment (adapted from EN 15978: 2011 & PAS 2080:2016)

Appendix H – Carbon Emission Reporting Templates

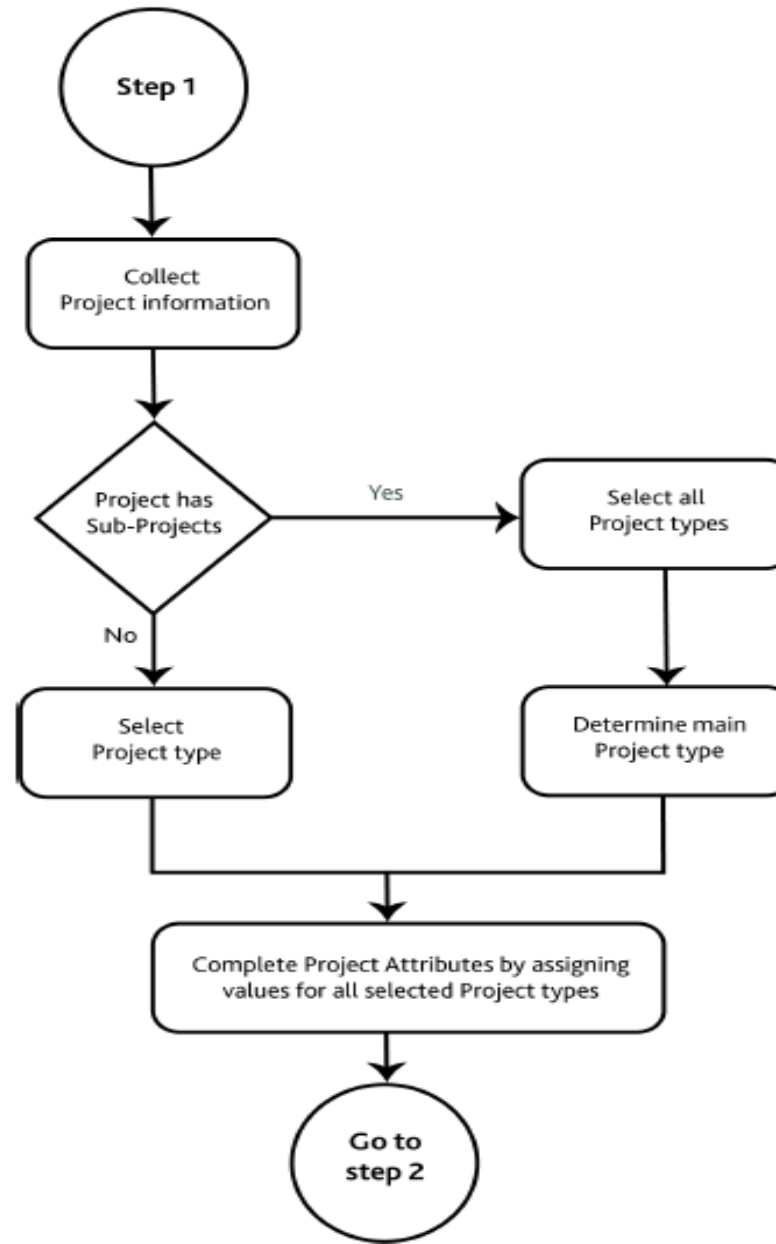


IMPLEMENTATION

Corporate vs Institutional

Process Flow Charts

The process flow charts provides the steps needed to present Life Cycle Costs and/or Carbon Emissions for a Project, programme or portfolio

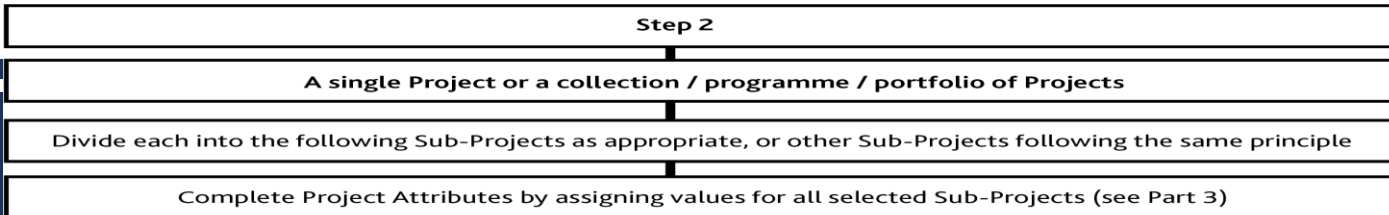


STEP 1

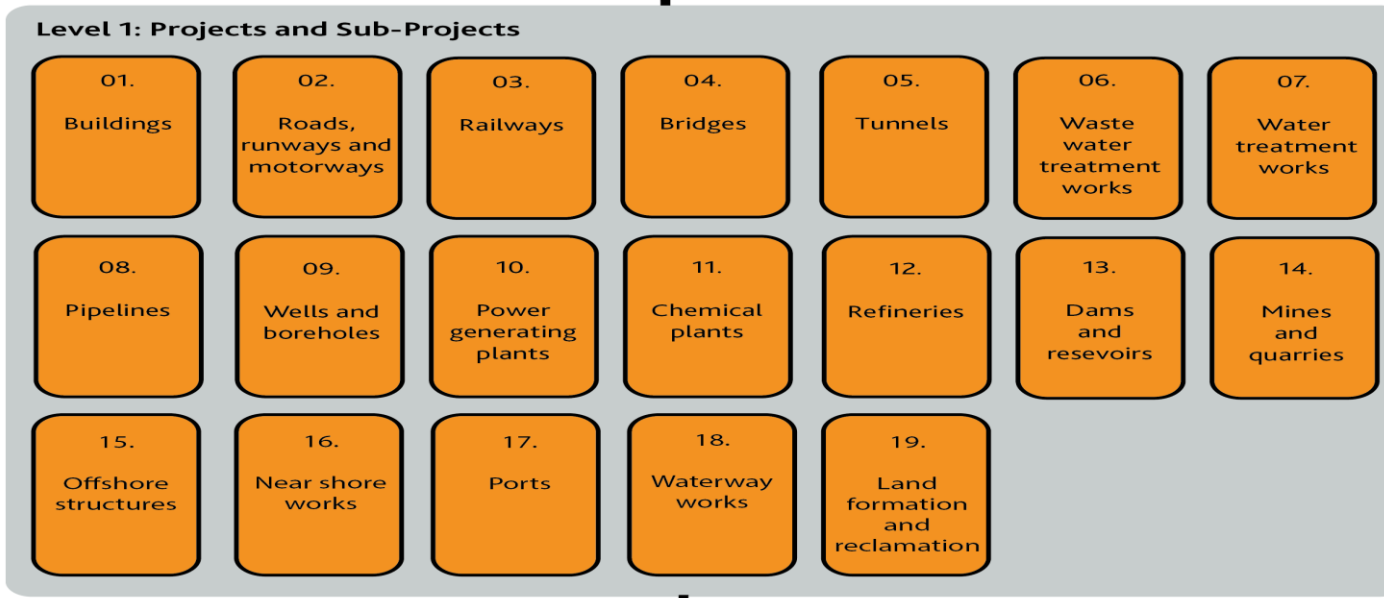
a structured approach to producing a cost classification model or report for a project



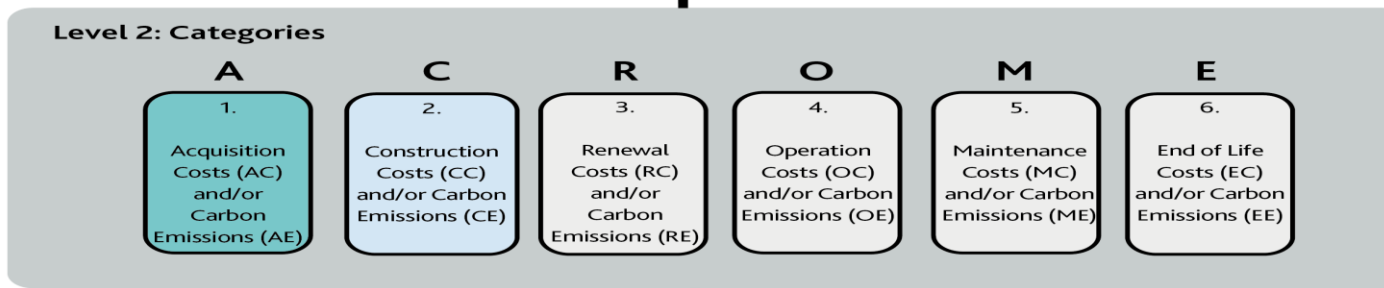
IMPLEMENTATION



STEP 2



Divide each into the following Categories

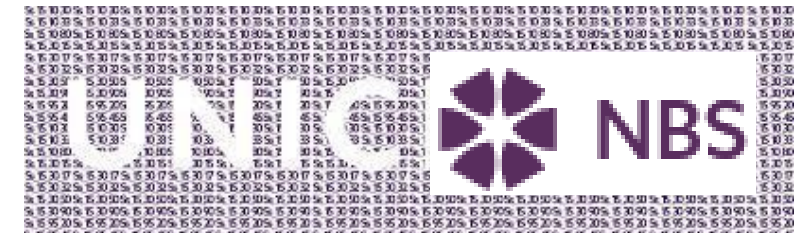


Build up each from the Groups on the next page

IMPLEMENTATION - Institutional construction information and cost classification systems



The Association of South African Quantity Surveyors



Crosswalk® for Microsoft Word®

MasterFormat®, UniFormat®, and OmniClass®



The ICMS seeks to achieve the following: Use of the Standard

1. Global investment decisions
2. international, national, regional or state cost and carbon emission comparisons
3. feasibility studies and development appraisals
4. project work including cost and carbon emission planning and control, setting carbon budgets or reduction targets, cost and carbon emission analysis, cost and carbon emission modelling, and the procurement and analysis of tenders
5. dispute resolution work
6. reinstatement costs for insurance and
7. valuation of assets and liabilities.

Markets that do have established local standards should adopt ICMS to compare cost and carbon emissions data prepared using different standards from different markets on a consistent, like-for-like basis

The third edition of ICMS can be used to present the **Acquisition, Construction, Renewal, Operation, Maintenance, and End of Life** costs [**ACROME**] using the templates provided

can be applied throughout the various stages of construction and/or after completion of construction through to the end of life or a shorter period of analysis

Wherever a report has been prepared in compliance with ICMS, this should be stated in the report.



The ICMS - LIMITATIONS:

ICMS, like any other standard, is imperfect. Nevertheless, it is the only publication that provides a single work breakdown structure for buildings and civil engineering works, lifecycle costs and carbon emissions.

ICMS has been successfully mapped on to the RICS New Rules of Measurement¹, Bills of Quantities for Highway Works² (part of the Manual of Contract Documents for Highway Works), and Rail Method of Measurement 1³. It has also been mapped on to Uniclass and UniFormat.

However, it has been shown not to map successfully on to the Civil Engineering Standard Method of Measurement⁴ or Rail Method of Measurement 2⁵.

It has Four major limitations

- a) It provides no advice on how costs and carbon emissions are to be calculated.
- b) It does not mandate a breakdown structure below the relatively coarse level 3. This may not provide sufficient granularity to identify the causes of differences in cost or carbon emissions between two apparently similar projects.
- c) It is elemental rather than activity-based and does not reflect any national standard method of measurement. As a result, its use may be unfamiliar to many cost or carbon management professionals,
- d) This lack of granularity and the absence of material quantities are especially relevant for civil engineering cost and carbon emissions planning professionals who may use activity-based estimating based on the resources, particularly plant, labour and materials consumed by a project.



CONTENTS

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Recommendations & Conclusion



Recommendations & Conclusion:

- a) The NIQS should continue the path of international collaboration
- b) A special committee should be constituted to study and see the alignment of the **BESMM4®** to the ICMS 3;
- c) To be relevant, NIQS should sponsor or partner with NBS,OCDS for national and/or regional data dominance.
- d) Sensitization of Members on the importance of the ICMS should be upscaled with strategic implementation plan; and
- e) Data mining for building a database of cost should be pursued vigorously in order to have a say in the future of cost management.



The **National Bureau of Statistics (NBS)** came into being with the merger of the Federal Office of Statistics (FOS) and the **National Data Bank (NDB)**.

RICS Data Standard (RDS)





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THANK YOU

FOR YOUR ATTENTION

REFERENCES

- 1) [ICMS ICMS: Global Consistency in Presenting Construction Life Cycle Costs and Carbon Emissions 3rd edition, November 2021](#)
- 2) [ICMS explained: A user guide for the International Cost Management Standard \(ICMS\), third edition](#)
- 3) [Building Information Modeling \(Bim\) & International Construction Measurement Standard \(ICMS\) :- Sr \(Dr\) Ong See Lian](#)
- 4) <https://icms-coalition.org/supporting-documents/>
- 5) <https://www.propelleraero.com/blog/10-construction-project-cost-overrun-statistics-you-need-to-hear/>
- 6) <https://icms-coalition.org/the-standard/>
- 7) [Whole life carbon assessment for the built environment, RICS professional statement \(2017\)](#)