BUILDING INFORMATION MODELING (BIM) & INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARD (ICMS) :

GLOBAL CONSISTENCY IN PRESENTING CONSTRUTION COST

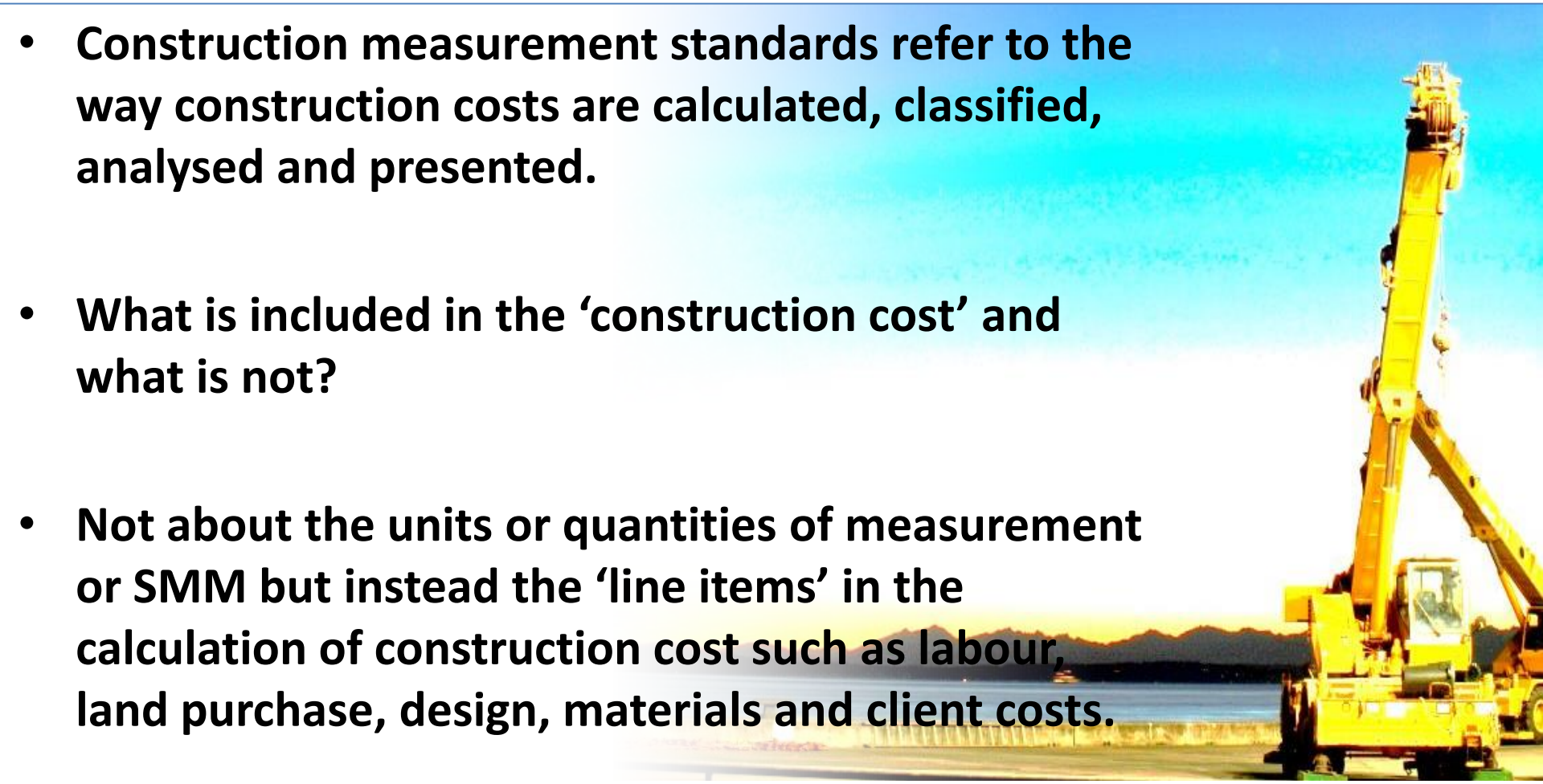
ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

What are construction measurement standards?

- **Construction measurement 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 such as labour, land purchase, design, materials and client costs.**

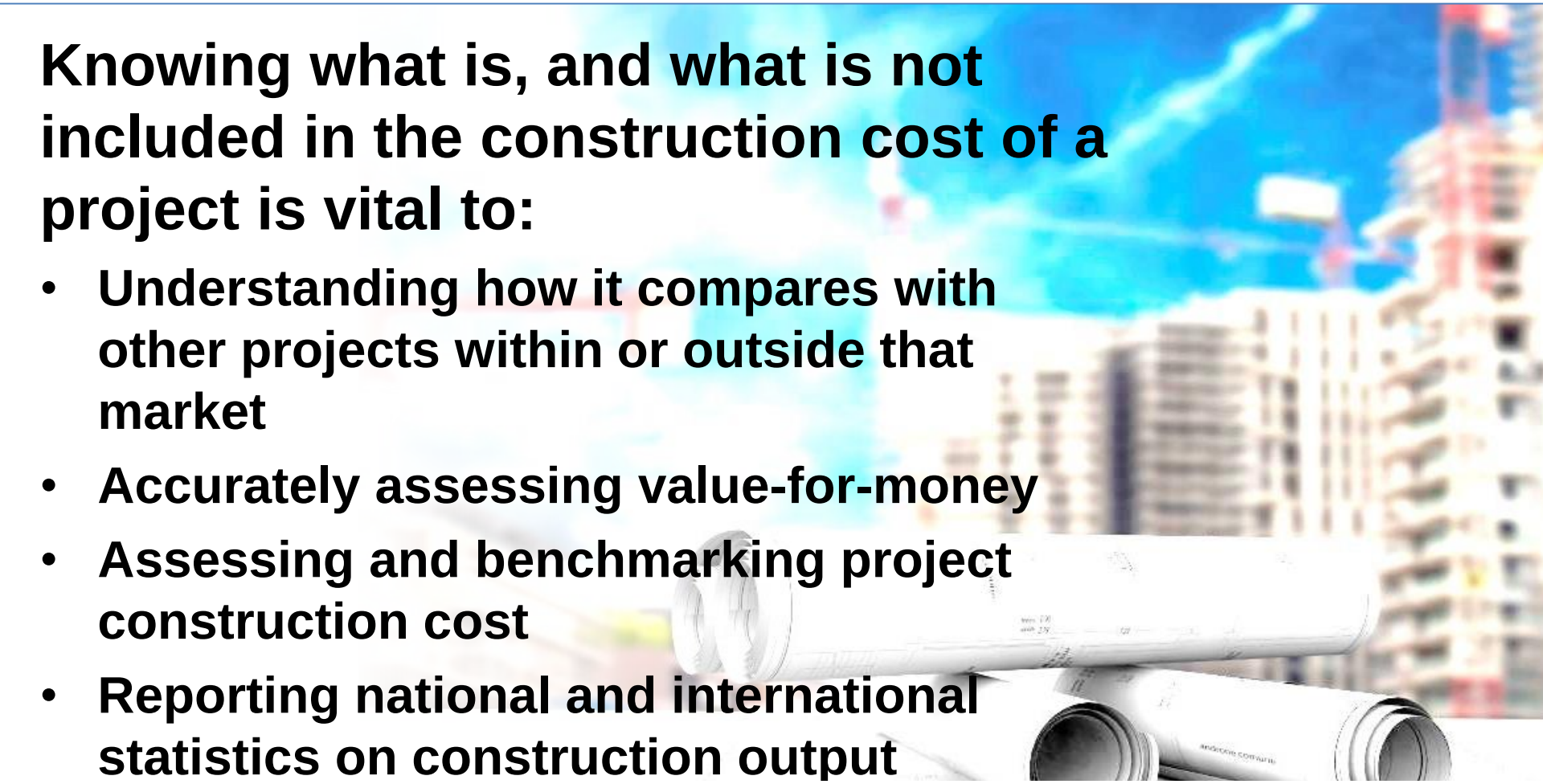


ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

Why are they important?

Knowing what is, and what is not included in the construction cost of a project is vital to:

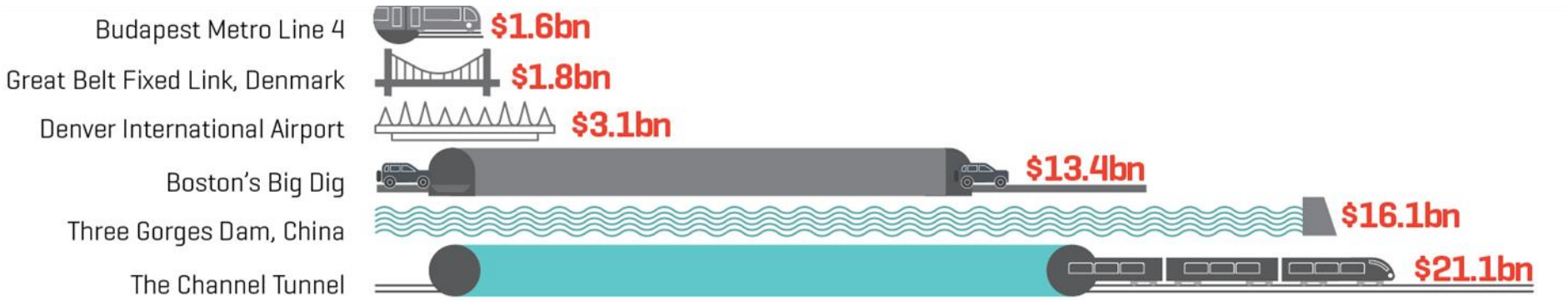
- **Understanding how it compares with other projects within or outside that market**
- **Accurately assessing value-for-money**
- **Assessing and benchmarking project construction cost**
- **Reporting national and international statistics on construction output**



Why are they important?

Budget Busters

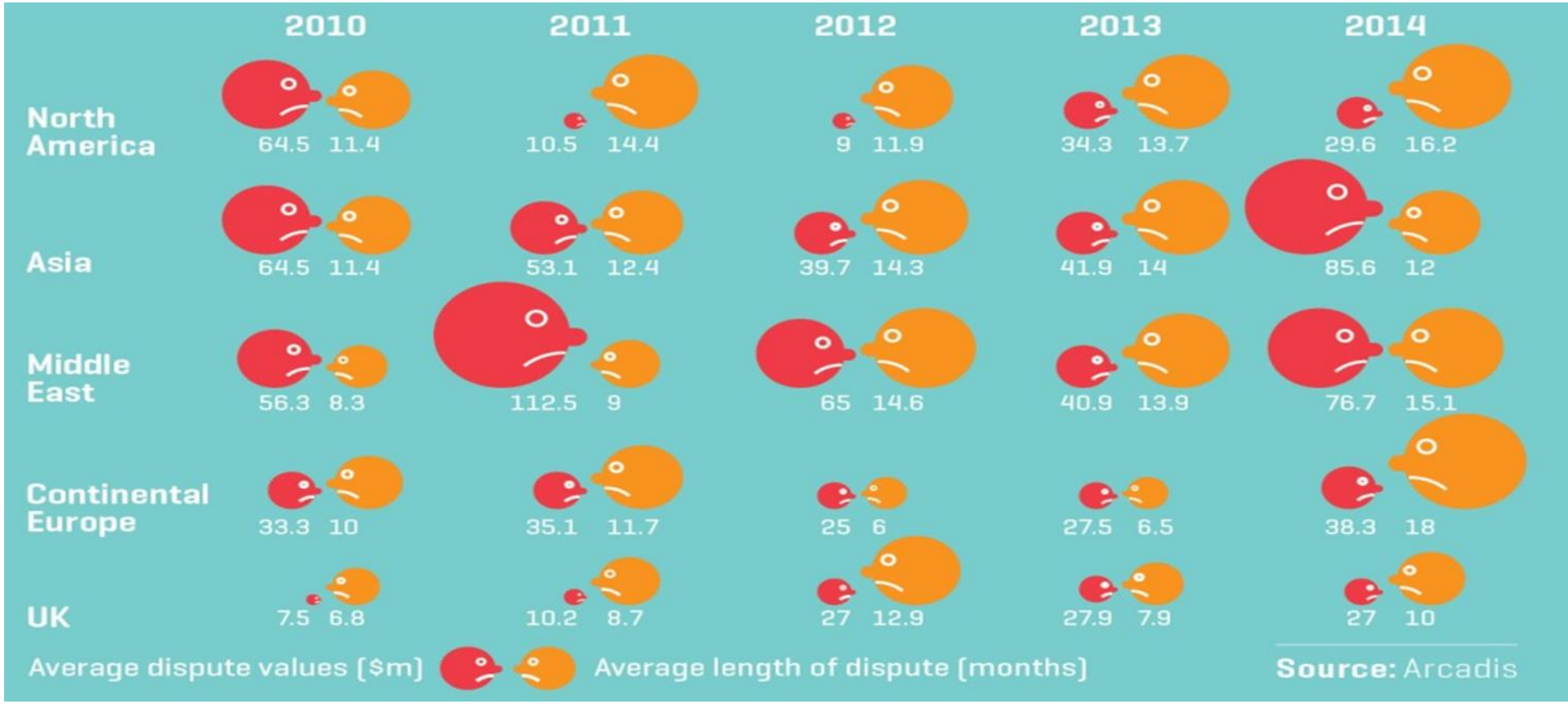
The most over-budget infrastructure construction projects in the world....



ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

Why are they important?

Average length and cost of construction projects disputes by region….

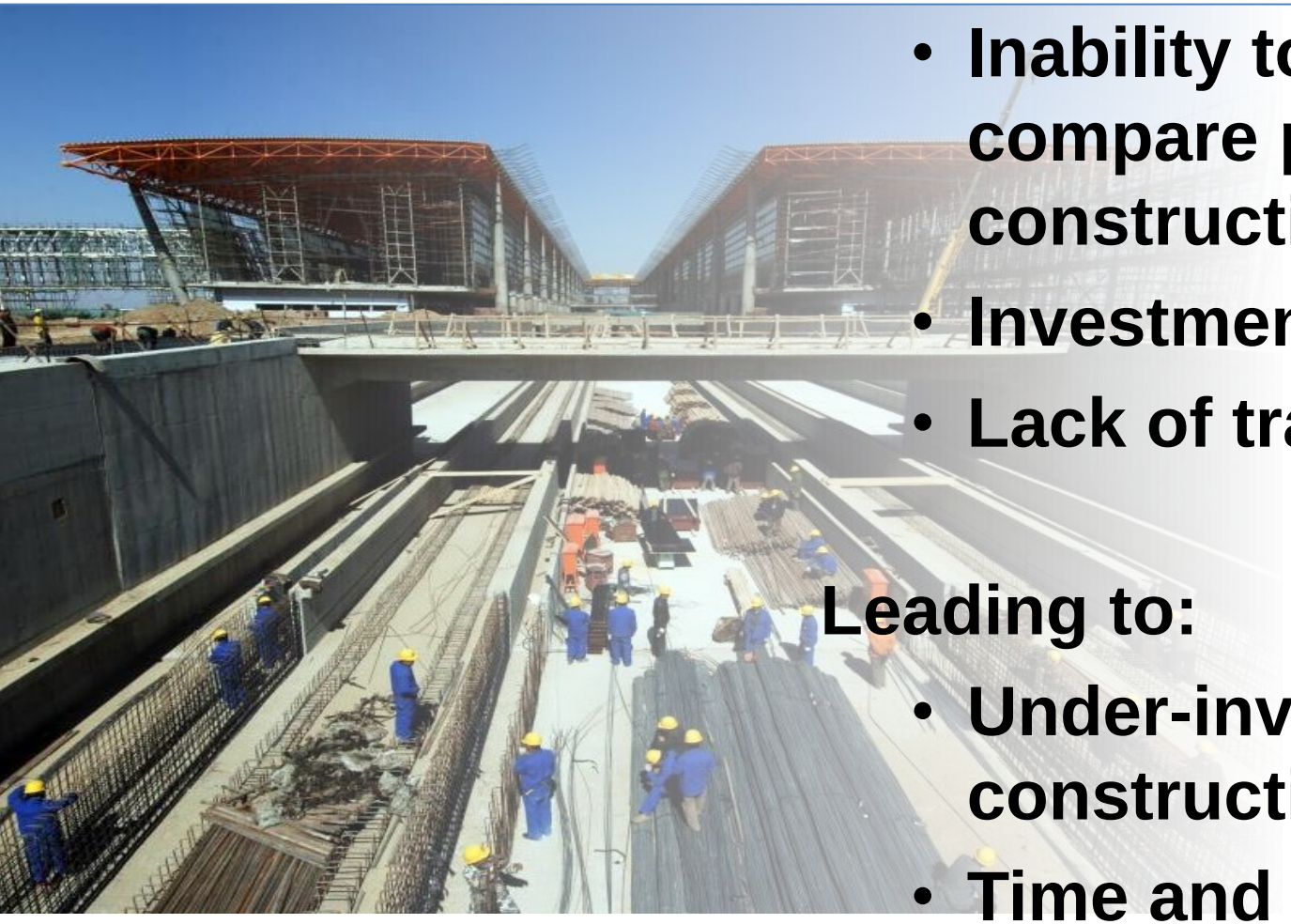


ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

How are they used today?

- **The standards used today differ within countries and from one jurisdiction to the next.**
- **Depending on where the project is located the costs might include some or all of the following elements:**
  - **Labour and materials**
  - **Land acquisition**
  - **Professional Fees**
  - **Client costs**

What are the implications of global inconsistency?



- **Inability to accurately compare project construction costs**
- **Investment risk**
- **Lack of transparency**

Leading to:

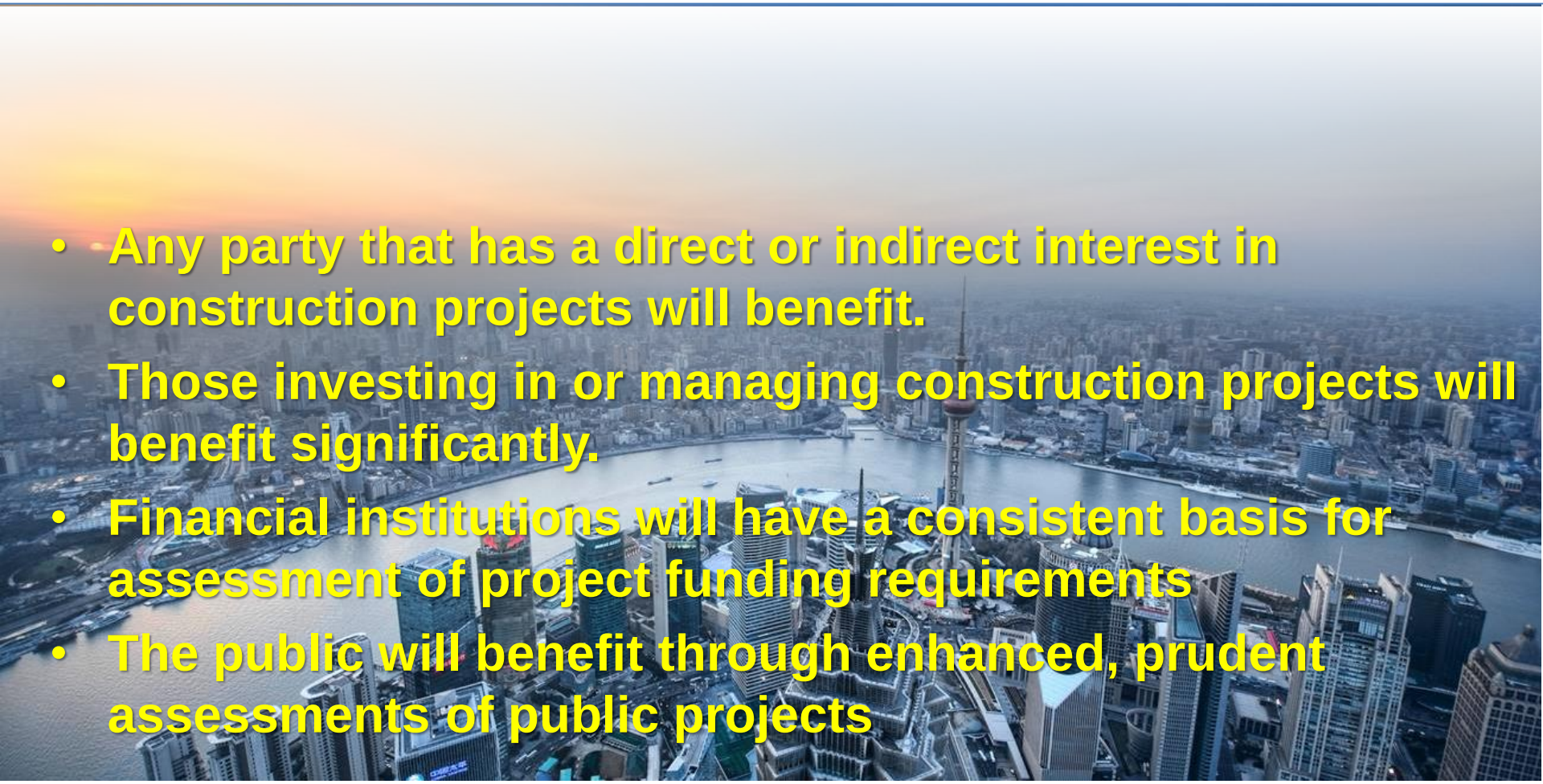
- **Under-investment in construction projects**
- **Time and cost overruns**

What are the aims of ICMS?

- **Construction cost to be consistently and transparently benchmarked;**
- **The causes of difference in costs between projects can be identified;**
- **Properly informed decisions on the design and location of construction projects to be made; and**
- **Data to be used with confidence for project financing & investment, programme and decision-making and related purposes**

ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

Who will benefit from ICMS?



- Any party that has a direct or indirect interest in construction projects will benefit.
- Those investing in or managing construction projects will benefit significantly.
- Financial institutions will have a consistent basis for assessment of project funding requirements
- The public will benefit through enhanced, prudent assessments of public projects

Who is developing ICMS?

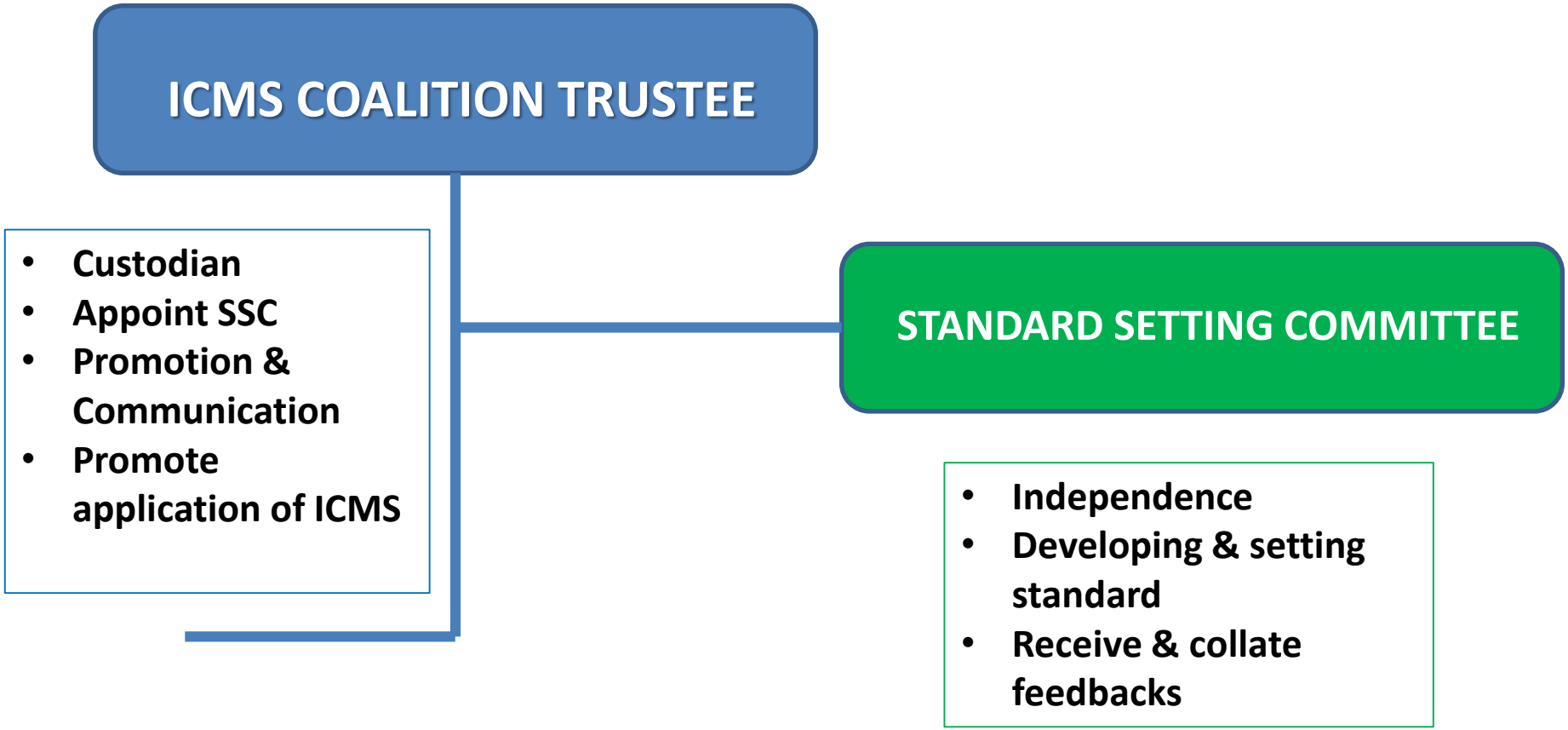
- **Developed by a coalition of professional bodies from around the world.**
- **Coalition established during a meeting at the IMF, Washington D.C. in June 2015.**
- **Currently 44 Professional organisations worldwide have signed the Declaration and committed to develop and implement the standard.**

ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

ICMS COALITION

ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

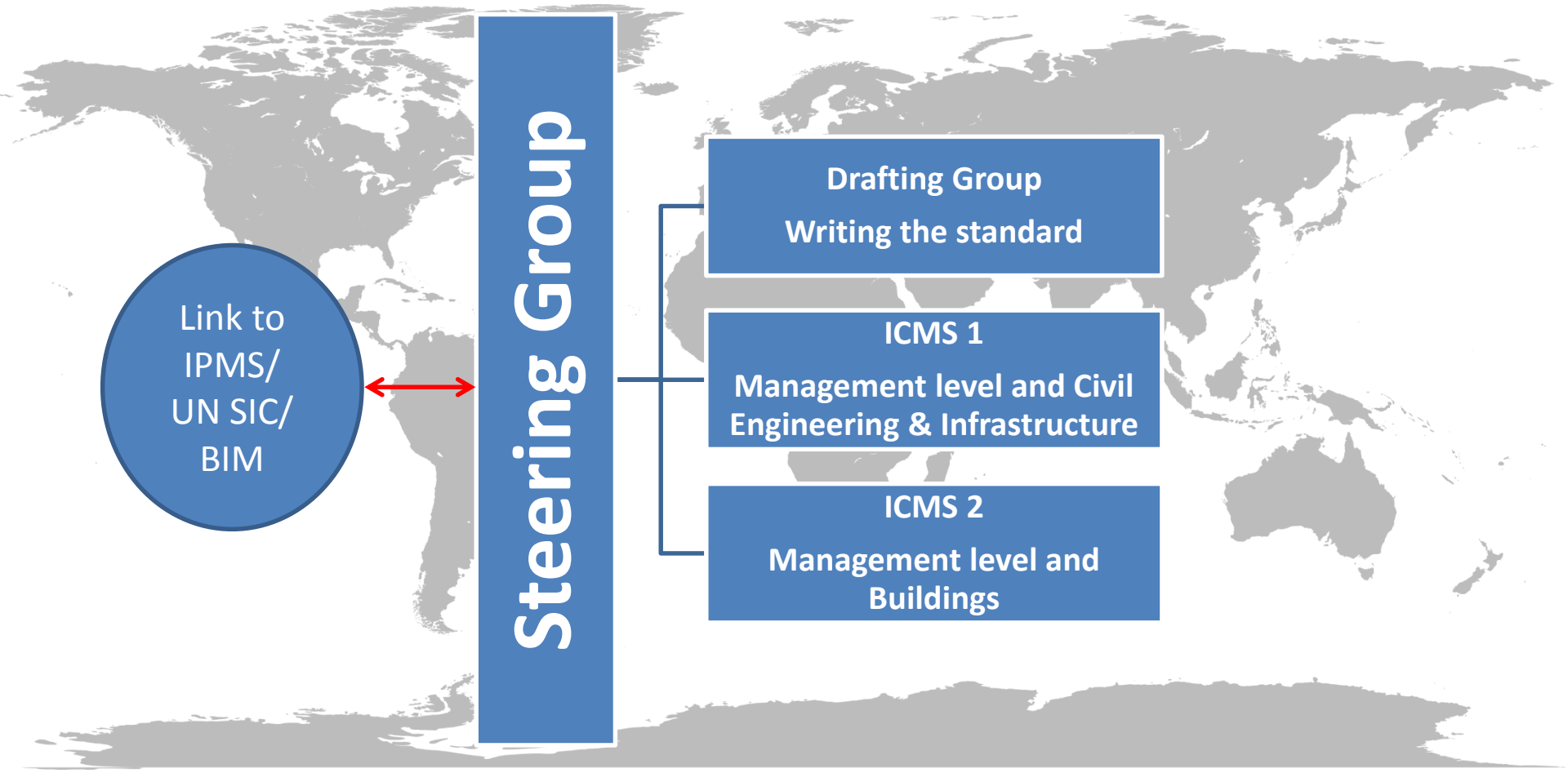
ICMS Governance Structure



The Standard Setting Committee

- An independent Standards Setting Committee (SSC) has been established to draft the ICMS.
- The SSC is comprised, in total, of 27 (23) experts from around the world.
- A public consultation on the ICMS will run before the SSC ratifies and hands over the final standard to the Coalition for publication.

How have we organised ourselves?



Where are we now?

- ✓ **1st Private consultation draft completed and circulated to family and friends of ICMS coalition for comment at end August 2016**
- ✓ **1st PUBLIC consultation completed and published in November 2016**
- ✓ **2nd PUBLIC consultation completed and published in March 2017**

Where are we now?

SSC meeting in London (Nov 2016)

Where are we now?

ICMS Coalition Trustee (London Nov 2016)

Where are we now?

ICMS Coalition Trustee (London Nov 2016)

Where are we now?

Launch of 1st Draft for Public Consultation (London Nov 2016)

What are the timeframes?

- **2nd Public Consultation draft out on 13/3/2017**
- **Deadline for comments on 2nd Public Consultation Draft – 1 May 2017**
- **Publication of the standard: July 2017**

BIM & COST ESTIMATES

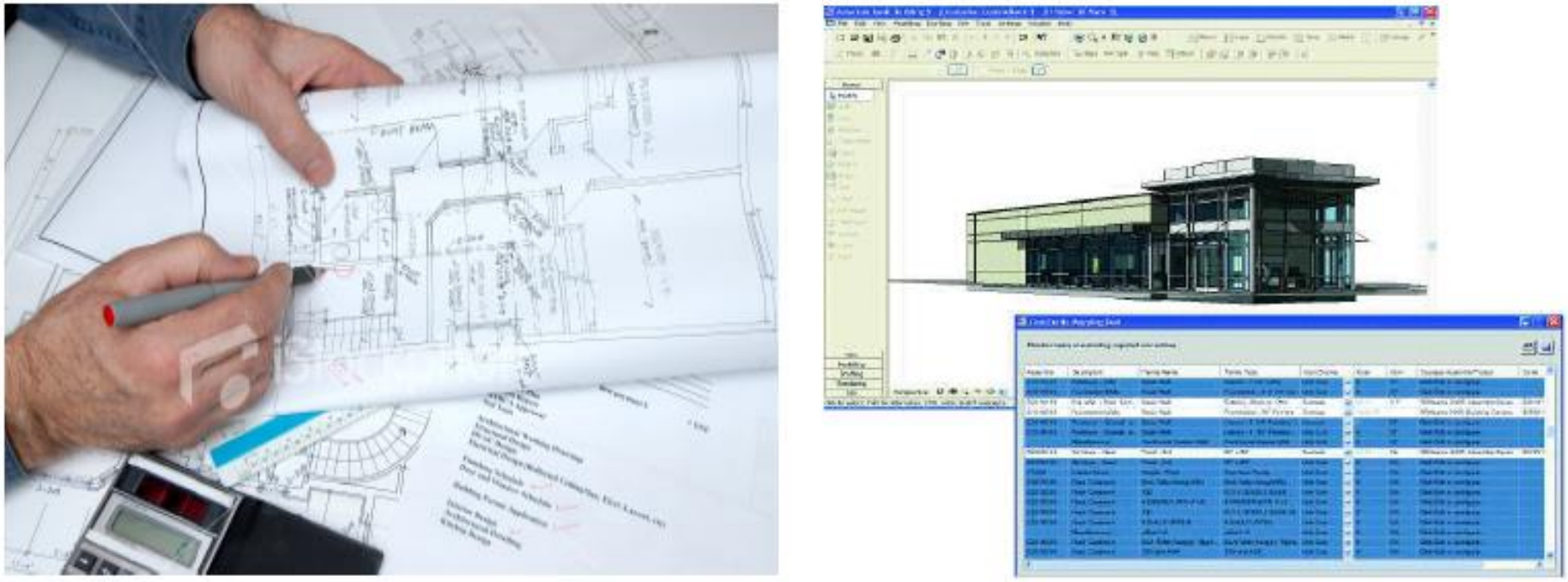


Figure 1: Traditional cost estimating take-off vs. BIM-based quantification[1]

BIM & COST ESTIMATES

- Cost estimation for building projects traditionally starts with quantification – a time-intensive process of tallying components from printed drawing sets, or more recently - CAD drawings.
- From these quantities, estimators utilize methods from spreadsheets to costing applications to produce the project cost estimate.
- This process is prone to human error and tends to propagate inaccuracies that creep into the tallies.
- Currently, quantification is also time-consuming – it can require 50% to 80% of a cost estimator's time on a project.

BIM & COST ESTIMATES

- BIM offers the capability to generate takeoffs, counts and measurements directly from a model.
- This provides a process where information stays consistent throughout the project and changes can be readily accommodated.
- BIM supports the full project lifecycle and offers the capability to integrate costing efforts throughout all project phases.
- The information in a model and type of cost estimate needed depends on the phase of the project – ranging from high level schematic models during preliminary phases, to detailed estimates as projects enter construction.

BIM & COST ESTIMATES

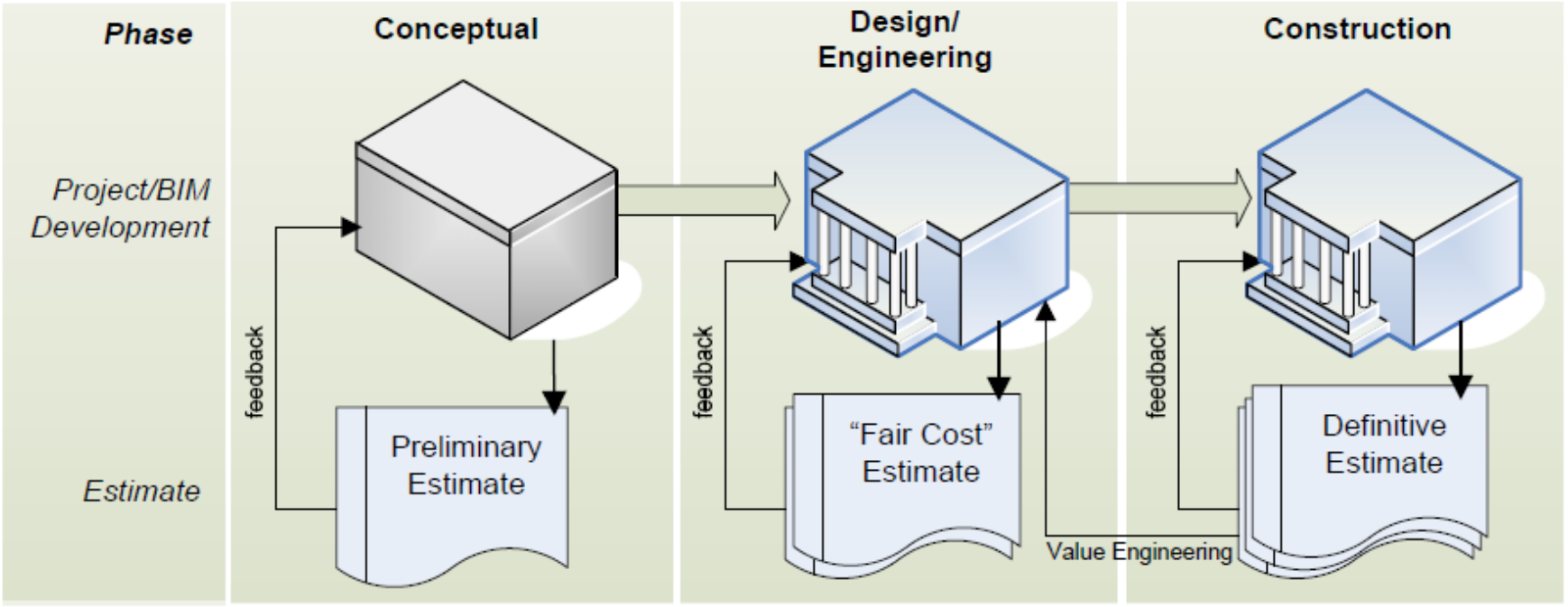


Figure 2: Project and Cost Estimating Process

BIM & COST ESTIMATES

- A prerequisite to the success of cost estimating will be consistent definitions and data formats for building objects and assemblies.
- The capability of BIM platforms to perform automated quantification of items, areas and volumes of building elements does not produce a cost estimate.
- Application of BIM in cost estimating is a broader process than mere automated measurements.

CHALLENGES OF BIM BASED ESTIMATING

- ***Substandard BIM models and inadequate information.***
- Frequently, BIM models do not exactly tally the needs of the quantity surveyors in terms of quality and information.
- This creates difficulties for the quantity surveyors in managing and searching for the required information within the model for the development of cost estimates.

CHALLENGES OF BIM BASED ESTIMATING

- ***Issues related to data exchange***
- Many BIM estimating applications currently do not accommodate bidirectional data exchange.
- Most software enables only quantities within the model to be constantly transferred and updated during design changes, but not the cost information.

CHALLENGES OF BIM BASED ESTIMATING

- ***Lack of standardisation and inappropriate pricing format.***
- BIM adopted currently is contended to be fragmented and there is no industry standard yet for the link between the model and cost estimating.
- This is where ICMS become absolutely necessary.

ICMS FRAMEWORK

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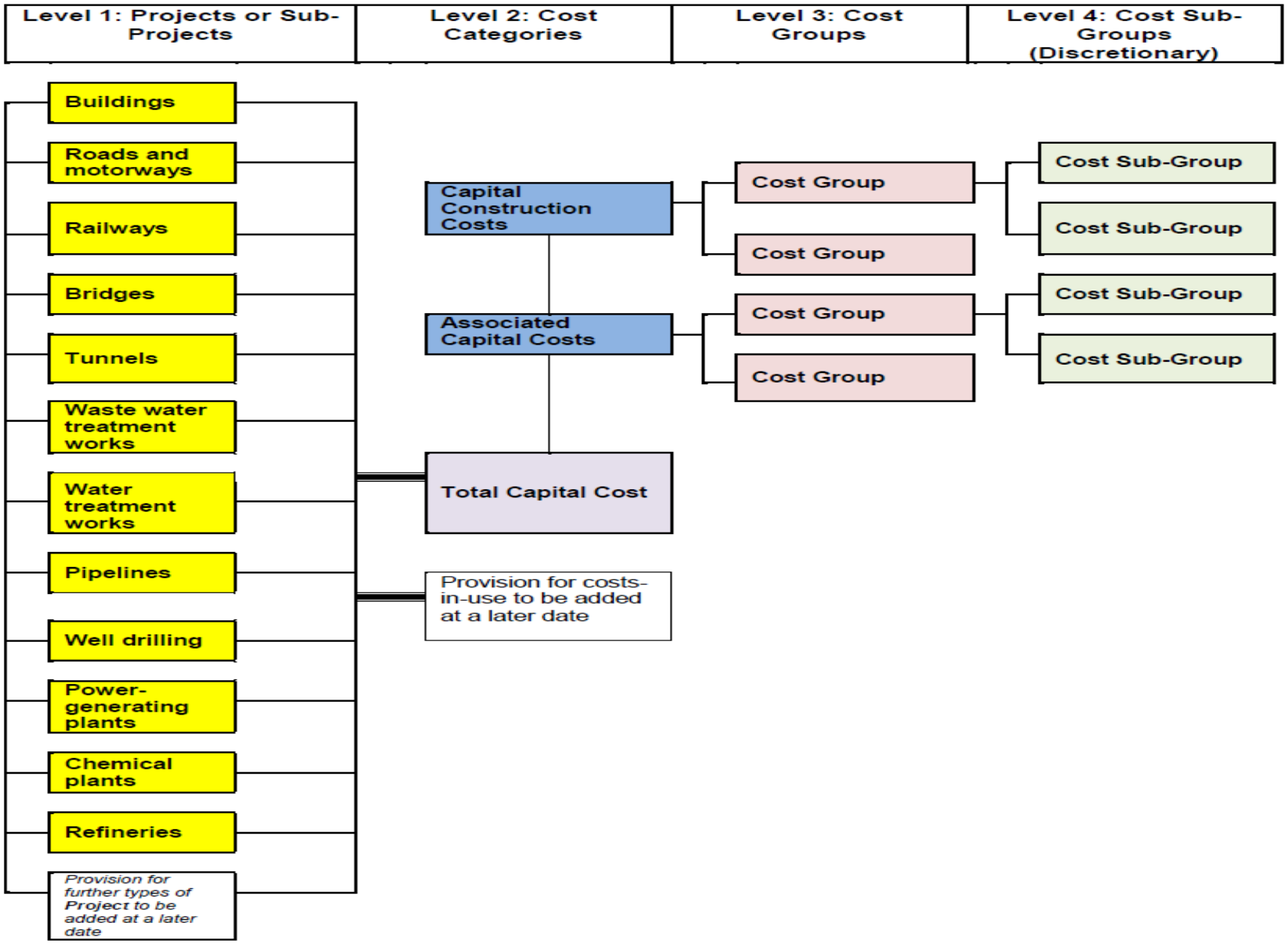
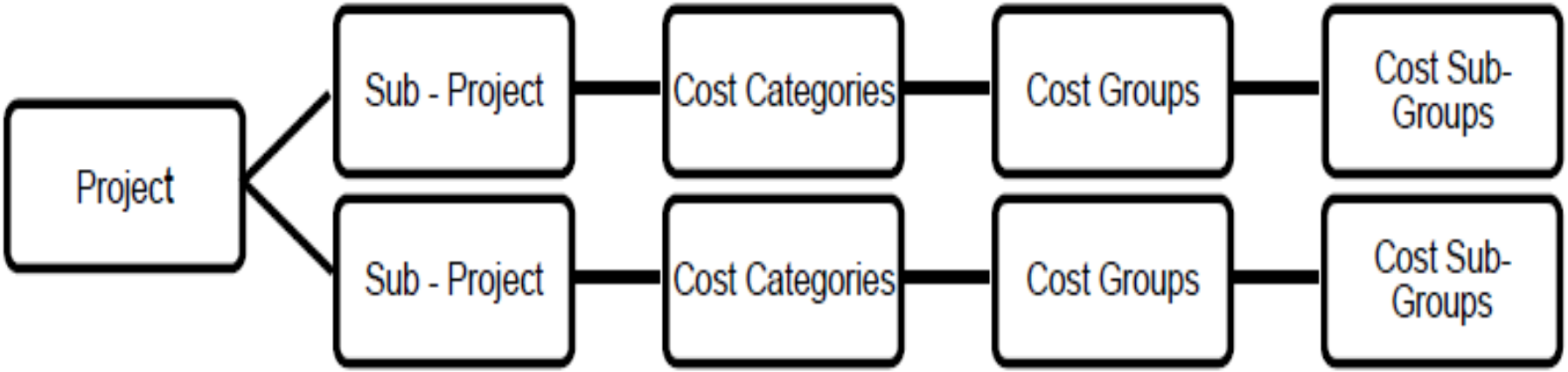


ICMS FRAMEWORK

- **Level 1 – Project or Sub-Project**
- **Level 2 – Cost Category**
- **Level 3 – Cost Group**
- **Level 4 – Cost Sub-group (Discretionary)**

Levels 1, 2 and 3 are mandatory

ICMS HIERACHY



LEVEL 1 – PROJECT CATEGORIES

Project Categories	UN ISIC Code
1. Buildings	F4100
2. Roads and Motorways	F4210
3. Railways	F4210
4. Bridges	F4210
5. Tunnels	F4210
6. Waste Water Treatment Works	F4220
7. Water Treatment Works	F4220
8. Pipelines	F4220
9. Well Drilling	F4220
10. Power Generating Plants	F4290
11. Chemical Plants	F4290
12. Refineries	F4290

PROJECT ATTRIBUTES

- **Project Attributes are the principal characteristics of a project or sub-project relating to time, cost, scope of works, design, quality, quantity, procurement, location and other contextual features that might impact its cost.**

- **Project Values are the standard set of descriptors and/or measurements for each of the Project Attributes**

- **Details given in Schedule 1**

PROJECT ATTRIBUTES & VALUES

Attributes	Values
Common (for all Project Categories)	
Report	
Status of cost report	pre-construction forecast | mixture of actual and forecast during construction | actual costs after construction
Date of cost report	month | revision number
Brief description of the project	client | function | scope
Location and country	country code (e.g. CN) | address of building site(s) | start and end locations for civil engineering works
Price level	
Currency	currency code (e.g. USD)
Exchange rates	rate used to convert from actual cost | payment currencies to the reported currency at the cost base date
Cost base date	month | revision number
Programme	
Project status	concept & initiation phase | design phase | construction & commissioning phase | complete
Construction period	date of start of demolition and site preparation to completion of commissioning in months
Site	
Existing site status	• greenfield | brownfield; • urban | rural | agricultural
Site topography	principally flat | principally hilly | mixed | mountainous
Ground conditions	soft | rocky | reclaimed
Procurement	
Funding	private | public | public and private in partnership
Project delivery	conventional bills of quantities | design bid build | design and build (turnkey) | build operate and transfer | management contracting | construction management | others stated

PROJECT CATEGORIES & VALUES - Building

Buildings (A construction with a cover and enclosure to house people, equipment or goods for persistent daily use.)	
Code	
UN ISIC code	F4100
Local functional code (if relevant)	• name of local classification standard; • code number
Works	
Functional type	• residential | office | commercial | shopping centre | industrial | hotel | carpark | warehouse | educational | hospital | airport terminal | railway station | ferry terminal | mix of the foregoing; • new building | refurbishment, renovation, retrofit, revitalisation | restoration
Grade	ordinary quality | medium quality | high quality (the qualitative description must be read in conjunction with the location.)
Environmental grade	grade of environmental certification
Principal design features	• Structural (predominant)– timber | concrete | steel | loadbearing masonry | others stated; • External walls (predominant) – stone | brick/block | render/block | curtain walling | others stated; • Environmental control – non air-conditioned; air-conditioning
Complexity	• Morphology (on plan) – circular, elliptical or similar | square, rectangular, or similar | complex • Design – simple | bespoke | innovative • Method of working – sectional completion | out of hours working | confined working | others stated

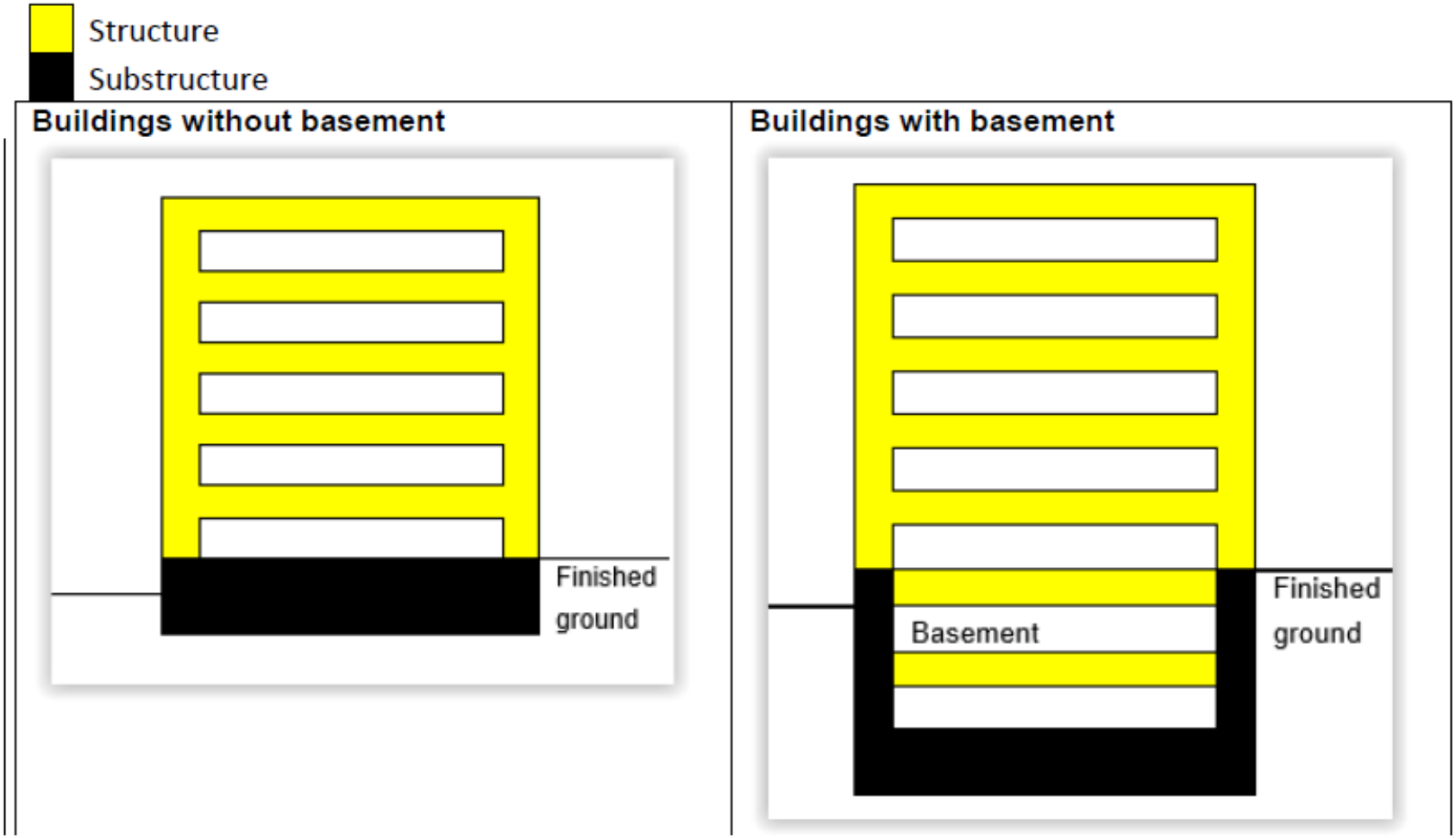
PROJECT CATEGORIES & VALUES - Building

Design life	years
Altitude	average height of site above or below sea level (m | ft)
Dimensions	overall length x width x height of each building (m | ft)
Storey above ground (qualitative)	house | low rise | medium rise | high rise (the qualitative description must be read in conjunction with the location.)
Storey above ground (quantitative)	specific number | 0 - 3 | 4 - 7 | 8 - 20 | 20 - 30 | 30 - 50 | over 50
Storey below ground	specific number
Project Quantities	
Site area	site area within lot boundary of building site, excluding temporary working areas outside the site (m^2 | ft^2)
Gross external floor area as IPMS 1	m^2 | ft^2
Gross internal floor area as IPMS 2	m^2 | ft^2
Functional units	occupancy | number of bedrooms | number of hospital beds | number of hotel rooms | number of car parking spaces | number of classrooms | number of students | number of passengers | number of boarding gates | others stated

PROJECT CATEGORIES & VALUES – Power Plant

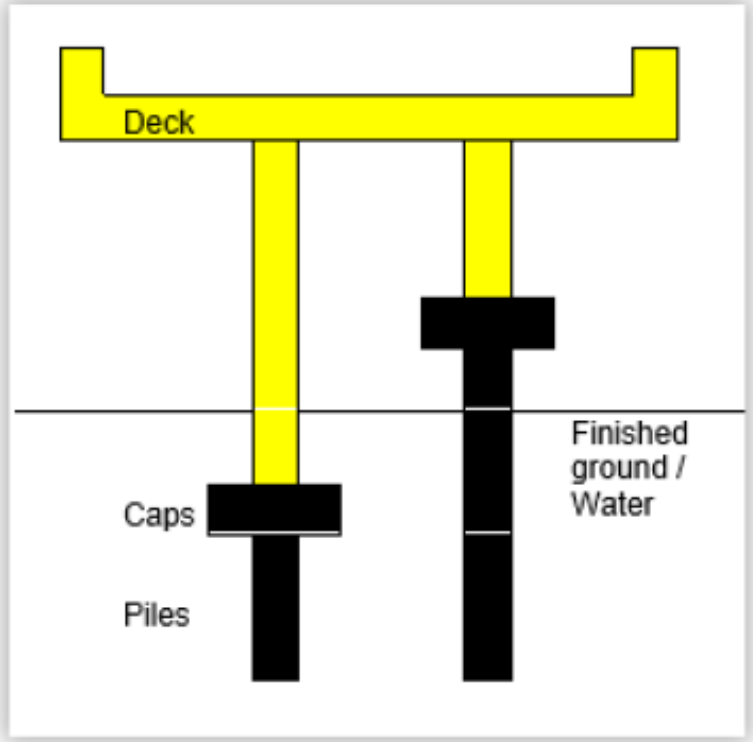
Power Generating Plants (A facility for the generation of electrical power through the process of but not limited to nuclear fission, wind-power, solar power, hydroelectric, geothermal, biomass, gas, coal, or oil).	
Code	
UN ISIC Code	F4290
Local functional code (if relevant)	• name of local classification standard; • code number
Works	
Functional type	nuclear | wind-power | solar power | hydroelectric | geothermal | biomass | gas | coal | oil | others stated
Environmental grade	grade of environmental certification
Principal design features	• generator containment material (concrete | steel | mixed | others stated); • coolant (water | gas | others stated); • heat exchanger | direct cycle; • number and size of turbines (MW)
Complexity	cooling system (wind | water | mixed)
Design life	years
Altitude	average height of site above or below sea level (m | ft)
Dimensions	overall external diameter | length x width x height of each major structure (m | ft)
Project Quantities	
Site area	area of land covered by permanent works, excluding temporary working areas outside the site (hectares | acres)
Functional units	capacity (MW)

Sub-Structure and Structure Delineation

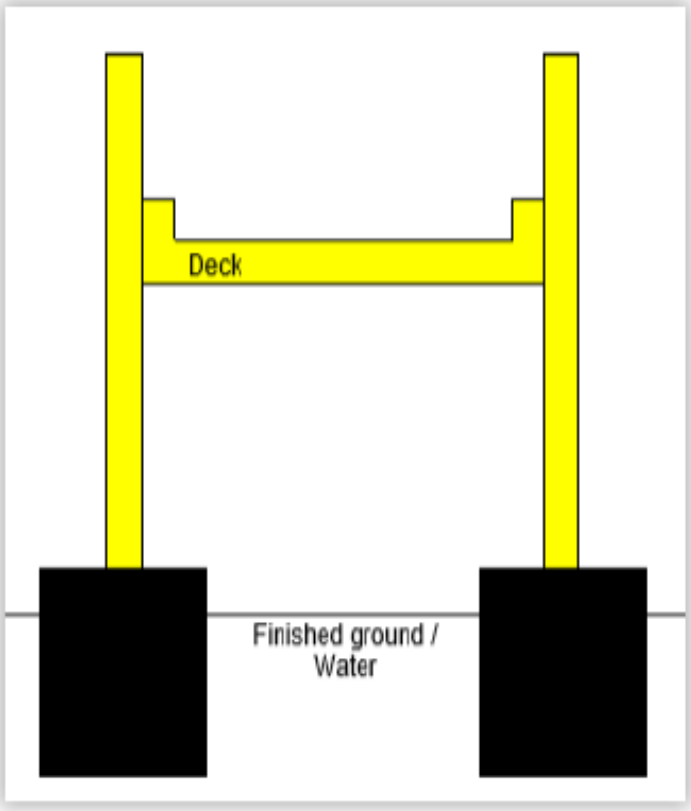


Sub-Structure and Structure Delineation

Bridges



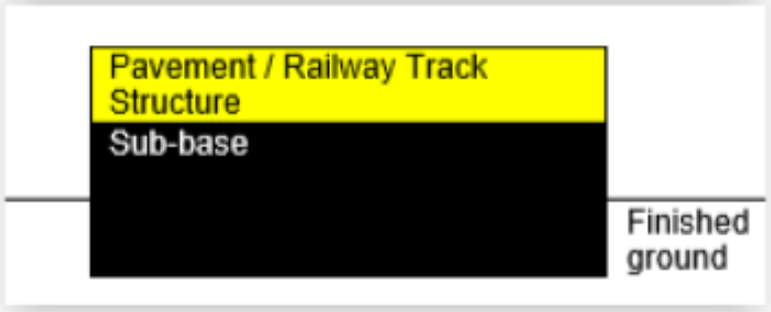
Bridges



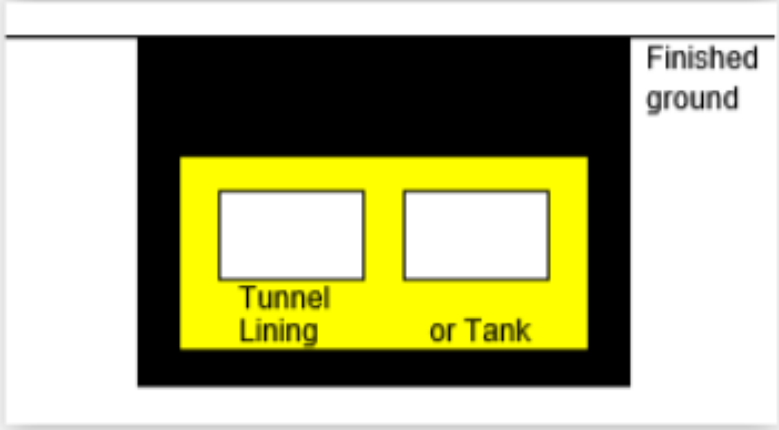
Sub-Structure and Structure Delineation

Roads, motorways and rail track structures close to surrounding ground level

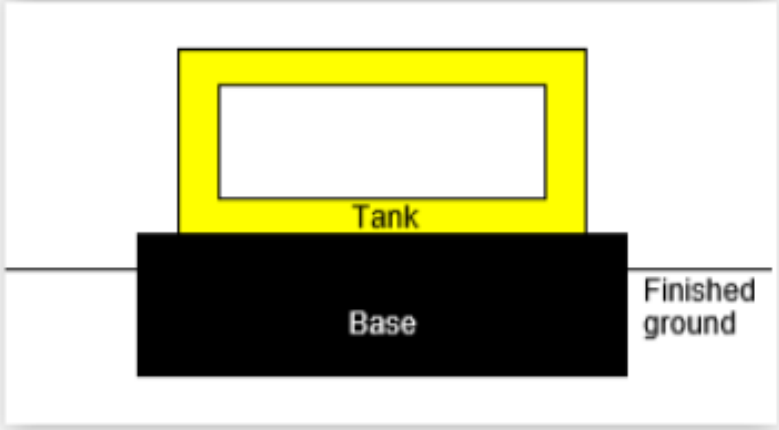
Roads, motorways and rail track structures higher than surrounding ground level



Tunnels and tanks underground

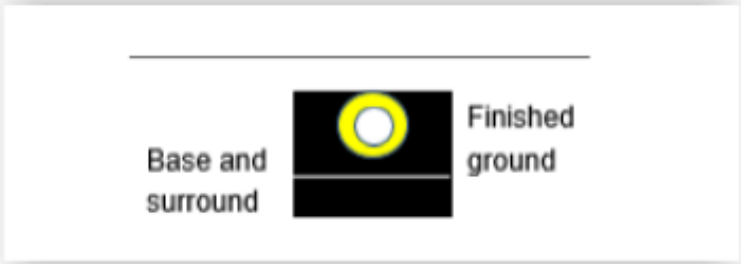


Tanks above ground

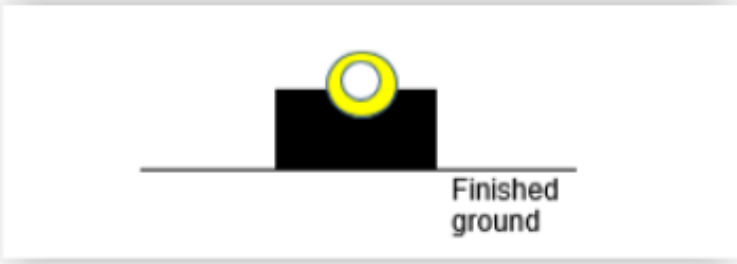


Sub-Structure and Structure Delineation

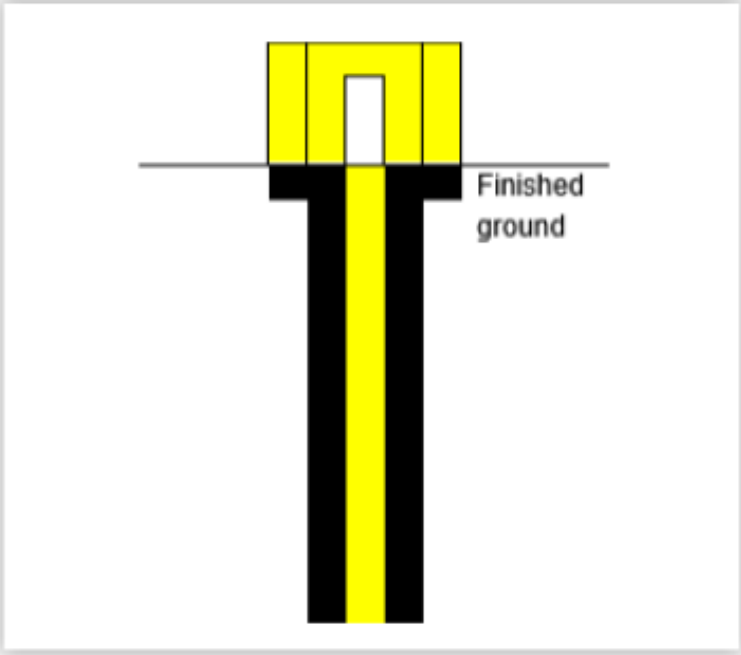
Pipelines underground



Pipelines above ground



Well drilling



Waste water treatment works, water treatment works, power-generation plants, chemical plants and refineries

Use the same principles as illustrated above.

LEVEL 2 – COST CATEGORIES

- **Two main Project Capital Cost Categories:**
  - ❑ **Capital Construction Cost**
  - ❑ **Associated Capital Cost**

- **Total Project Cost is the sum total of capital construction cost and associated capital cost**

- **Cost-in-use or life-cycle cost are not included in the current standard, but it is anticipated that this will be covered in future editions of ICMS**

LEVEL 3 - COST GROUPS

- **These are breakdown of cost according to functional elements of the construction project**

- **They are major divisions of a Cost Category into small number of groups to enable easy estimation or extraction of cost date for high-level comparison by design discipline or common purpose.**

COST CATEGORIES AND COST GROUPS – Capital Construction Cost

	Item	Description
		Cost Categories (Level 2)
		Cost Groups (Level 3)
	0	**Total Capital Cost (1 + 2)**
	1	**Capital Construction Costs**
	1.01	Demolition, site preparation and formation • Scope: All necessary advance or facilitating work to prepare, secure and form the site to enable substructure construction.
	1.02	Substructure • Scope: All the load-bearing work underground or underwater up to and including the following, including related earthwork and lateral support beyond site formation: ○ for buildings: lowest floor slabs, and basement sides and bottom including related waterproofing and insulation ○ for roads and motorways: sub-base to pavements ○ for railways: sub-base to rail track structures ○ for bridges: pile caps, footings, bases nearest ground level or water level if constructed in water ○ for tunnels: external faces of structural tunnel linings ○ for tanks and the like underground: external faces of tanks ○ for tanks and the like above ground: bases supporting tanks ○ for pipelines underground: beds and surrounds to underground pipes ○ for pipelines above ground: bases to structures supporting pipes ○ for well drilling: bases to structures supporting well heads.

COST CATEGORIES AND COST GROUPS – Capital Construction Cost

	1.03	Structure • Scope: All the load-bearing work, excluding that included in Substructure.
	1.04	Architectural works | Non-structural works • Scope: All architectural and non-load-bearing work excluding services, equipment and underground drainage.
	1.05	Services and equipment • Scope: All fixed services and equipment required to put the completed project into use, whether they are mechanical, hydraulic, plumbing, fire-fighting, transport, communication, security, electrical or electronic, excluding external underground drainage.
	1.06	Surface and underground drainage • Scope: All external surface and underground drainage systems specifically serving the **Constructed Asset.**
	1.07	External and ancillary works • Scope: All work outside the external face of buildings or beyond the construction required to fulfil the primary function of the **Project or Sub-Project**, and not included in other **Cost Groups.**

COST CATEGORIES AND COST GROUPS – Capital Construction Cost

	1.08	Preliminaries | **Constructor's** site overheads | general requirements • Scope: **Constructor's** site management, temporary site facilities, site services, and expenses, not directly related to a particular **Cost Group**, but commonly required to be shared by all **Cost Groups**.
	1.09	Capital Costs **Risk Allowances** • Scope: Those as defined but related to **Capital Construction Costs** and not included in other **Cost Groups**.
	1.11	**Taxes and Levies** Scope: As defined.

COST CATEGORIES AND COST GROUPS – Associated Capital Cost

	2	Associated Capital Costs
	2.01	Site acquisition • Scope: All payments required to acquire the site, excluding physical construction.
	2.02	Construction-related consultants and supervision • Scope: Fees and charges payable to **Service Providers** not engaged by the **Constructors.**
	2.03	Work and utilities outside site • Scope: All payments to government authorities or public utility companies to connect public work and utilities to the site, or services diversions, to enable the **Project** or **Sub-Project.**
	2.04	Loose furniture, fittings and equipment • Scope: Provided for the **Constructed Asset** to perform its function close to or after completion.

LEVEL 4 - COST SUB-GROUPS (Discretionary)

- **They are sub-division of cost under a Cost Group according to their functions or common purposes irrespective of their design, specification, materials or construction to enable the costs of alternatives serving the same function or common purpose to be compared, evaluated and selected.**
- **Level 4 data are not mandatory and discretion is allowed in the contents at this level.**
- **However some guidance is given in the Appendices to the Standard.**

EXAMPLES OF COST SUB-GROUPS – Buildings 1/13

Item	Description	Note
	Cost Category (Level 2)	
	Cost Group (Level 3)	
	Cost Sub-Group (Level 4)	
1	**Capital Construction Costs**	
1.01	Demolition, site preparation and formation	
1.01.010	Site survey and investigation	
1.01.020	Environmental treatment	
1.01.030	Sampling for construction, geophysical, geological or similar purposes	
1.01.040	Temporary fencing	
1.01.050	Demolition of existing buildings and support to adjacent structures	
1.01.060	Site surface clearance (clearing, grubbing, topsoil stripping, tree felling, minor earthwork, removal)	
1.01.070	Tree transplant	
1.01.080	Site formation and slope treatment	
1.01.090	Temporary surface drainage and dewatering	
1.01.100	Temporary protection, diversion and relocation of public utilities	

EXAMPLES OF COST SUB-GROUPS – Buildings 2/13

1.02	Substructure	
1.02.010	Foundation piling and underpinning: 010 - mobilisation and demobilisation 020 - trial piles and caisson 030 - permanent piles and caisson 040 - pile and caisson testing 050 - underpinning	
1.02.020	Foundations up to top of lowest floor slabs: 010 - excavation and disposal 020 - lateral supports 030 - raft footings, pile caps, column bases, wall footings, strap beams, tie beams 040 - substructure walls and columns 050 - lowest floor slabs and beams (excluding basement bottom slabs) 060 - lift pits	
1.02.030	Basement sides and bottom: 010 - excavation and disposal 020 - lateral supports 030 - bottom slabs and blinding 040 - sides 050 - vertical waterproof tanking, drainage blanket, drains and skin wall 060 - horizontal waterproof tanking, drainage blanket, drains and topping slab 070 - insulation 080 - lift pits, sump pits, sleeves	

EXAMPLES OF COST SUB-GROUPS – Buildings 3/13

1.03	Structure	
1.03.010	Structural removal and alterations	
1.03.020	Basement suspended floors (up to top of ground floor slabs): 010 - walls and columns 020 - beams and slabs 030 - staircases	
1.03.030	Frames and slabs (above top of ground floor slabs): 010 - structural walls and columns 020 - upper floor beams and slabs 030 - roof beams and slabs 040 - staircases 050 - fireproofing to steel structure	
1.03.040	Tanks, pools, sundries	
1.04	Architectural works | Non-structural works	
1.04.010	Non-structural removal and alterations	
1.04.020	External elevations: 010 - non-structural external walls and features 020 - external wall finishes except cladding 030 - facade cladding and curtain walls 040 - external windows 050 - external doors 060 - external shop fronts 070 - roller shutters and fire shutters	

EXAMPLES OF COST SUB-GROUPS – Buildings 4/13

1.04.030	Roof finishes, skylights and landscaping (including waterproofing and insulation): 010 - roof finishes 020 - skylights 030 - other roof features 040 - roof landscaping (hard and soft)	
1.04.040	Internal divisions: 010 - non-structural internal walls and partitions 020 - shop fronts 030 - toilet cubicles 040 - moveable partitions 050 - cold rooms 060 - internal doors 070 - internal windows 080 - roller shutters and fire shutters 090 - sundry concrete work	
1.04.050	Fittings and sundries: 010 - balustrades, railings and handrails 020 - staircases and catwalk not forming part of the structure, cat ladders 030 - cabinets, cupboards, shelves, counters, benches, notice boards, blackboards 040 - exit signs, directory signs 050 - window and door dressings 060 - decorative features 070 - interior landscaping 080 - access panels, fire service cabinets 090 - sundries	

EXAMPLES OF COST SUB-GROUPS – Buildings 5/13

1.04.060	Finishes under cover: 010 - floor finishes (internal and external) 020 - internal wall finishes and cladding 030 - ceiling finishes and false ceilings (internal or external)	
1.04.070	Builder's work in connection with services: 010 - plinth, bases 020 - fire-proofing enclosure 030 - hoisting beams, lift pit separation screens 040 - suspended manholes 050 - cable trenches, trench covers 060 - sleeves, openings and the like not allowed for in "Fittings and sundries"	
1.05	Services and equipment	
1.05.010	Heating, ventilating and air-conditioning systems/air conditioners: 010 - seawater system 020 - cooling water system 030 - chilled water system 040 - heating water system 050 - steam and condensate system 060 - fuel oil system 070 - water treatment 080 - air handling and distribution system 090 - condensate drain system 100 - unitary air-conditioning system 110 - mechanical ventilation system	

EXAMPLES OF COST SUB-GROUPS – Buildings 6/13

	120 - kitchen ventilation system 130 - fume-extraction system 140 - anaesthetic gas-extraction system 150 - window and split-type air conditioners 160 - air-curtains 170 - fans 180 - related electrical and control systems 190 - submissions, testing and commissioning	
1.05.020	Electrical services: 010 - high-voltage transformers and switchboards 020 - incoming mains, low-voltage transformers and switchboards 030 - mains and submains 040 - standby system 050 - lighting and power 060 - uninterrupted power supply 070 - electric underfloor heating 080 - local electrical heating units 090 - earthing/lightning protection and bonding 100 - submissions, testing and commissioning	
1.05.030	Fitting out lighting fittings	

EXAMPLES OF COST SUB-GROUPS – Buildings 7/13

1.05.040	Extra low voltage electrical services: 010 - communications 020 - staff paging/location 030 - public address system 040 - building automation 050 - security and alarm 060 - close circuit television 070 - communal aerial broadcast distribution and the like 080 - submissions, testing and commissioning	
1.05.050	Water supply and above ground drainage: 010 - cold water supply 020 - hot water supply 030 - flushing water supply 040 - grey water supply 050 - cleansing water supply 060 - irrigation water supply 070 - rainwater disposal 080 - soil and waste disposal 090 - planter drainage disposal 100 - kitchen drainage disposal 110 - related electrical and control systems 120 - submissions, testing and commissioning	

EXAMPLES OF COST SUB-GROUPS – Buildings 8/13

1.05.060	Supply of sanitary fittings	
1.05.070	Disposal systems: 010 - refuse 020 - laboratory waste 030 - industrial waste 040 - incinerator 050 - submissions, testing and commissioning	
1.05.080	Fire services: 010 - fire hydrant and hose reel system 020 - wet risers 030 - sprinkler system 040 - deluge system 050 - gaseous extinguishing system 060 - foam extinguishing system 070 - audio/visual advisory system 080 - automatic fire alarm and detection system 090 - portable hand-operated appliances	
	100 - related electrical and control systems 110 - submissions, testing and commissioning	

EXAMPLES OF COST SUB-GROUPS – Buildings 9/13

1.05.090	Gas services: 010 - coal gas 020 - natural gas 030 - liquid petroleum gas 040 - medical gas/laboratory gas 050 - industrial gas/compressed air/instrument air 060 - vacuum 070 - steam 080 - submissions, testing and commissioning	
1.05.100	Movement systems: 010 – lifts | elevators 020 – platform lifts 030 – escalators 040 – travellators | moving walkways 050 – conveyors 060 - submissions, testing and commissioning	

EXAMPLES OF COST SUB-GROUPS – Buildings 10/13

1.05.110	Gondolas	
1.05.120	Turntables	
1.05.130	Generators and uninterruptible power supply	
1.05.140	Energy-saving features	
1.05.150	Sewage treatment	
1.05.160	Fountains, pools and filtration plant	
1.05.170	Powered building signage	
1.05.180	Kitchen equipment	
1.05.190	Cold room equipment	
1.05.200	Laboratory equipment	
1.05.210	Medical equipment	
1.05.220	Hotel equipment	
1.05.230	Car park or entrances access control	
1.05.240	Domestic appliances	
1.05.250	Other specialist services	
1.05.260	Builder's profit and attendance on services	
1.06	Surface and underground drainage	
1.06.010	Surface water drainage	
1.06.020	Storm water drainage	
1.06.030	Foul water drainage	
1.06.040	Drainage disconnections and connections	
1.06.050	CCTV inspection of existing or new drains	

EXAMPLES OF COST SUB-GROUPS – Buildings 11/13

1.07	External and ancillary works	
1.07.010	Permanent retaining structures	
1.07.020	Site enclosures and divisions	
1.07.030	Ancillary structures	
1.07.040	Roads and paving	
1.07.050	Landscaping (hard and soft)	
1.07.060	Fittings and equipment	
1.07.070	External services: 010 - water supply 020 - gas supply 030 - power supply 040 - communications supply 050 - external lighting 060 - utility disconnections and connections	

EXAMPLES OF COST SUB-GROUPS – Buildings 12/13

1.08	**Preliminaries | Constructor's site overheads | general requirements**	(j)
1.08.010	Construction management including site management staff and support labour	
1.08.020	Insurances and bonds	
1.08.030	Common construction plant	
1.08.040	Temporary access roads and storage areas	
1.08.050	Temporary facilities and services	
1.08.060	Submissions and reports	
1.08.070	Building information modelling (BIM)	
1.08.080	Traffic management and diversion	
1.08.090	Safety, health and environmental management	
1.08.100	Monitoring and recording	
1.08.110	Testing and commissioning	
1.08.120	As-built documentation	

EXAMPLES OF COST SUB-GROUPS – Buildings 13/13

1.09	**Capital Costs Risk Allowances**	(j), (k)
1.09.010	Design development allowance	(l)
1.09.020	Construction contingencies	(m)
1.09.030	Price level adjustments: 010 - until tendering 020 - during construction	(n)
1.09.040	Exchange rate fluctuation adjustments	
1.10	**Taxes and Levies**	(j)
1.10.010	Paid by the Constructor	
1.10.020	Paid by the Client in relation to the construction contract payments	

EXAMPLES OF COST SUB-GROUPS – Civil Works

EXAMPLES OF COST SUB-GROUPS – Civil 2/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
	Cost Category (Level 2)												
	Cost Group (Level 3)												
	Cost Sub-Group (Level 4)												
1	**Capital Construction Costs**												
1.01	Demolition, site preparation and formation												
1.01.010	Site survey and investigation	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.020	Environmental treatment	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.030	Sampling for construction, geophysical, geological or similar purposes	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.040	Temporary fencing	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.01.050	Demolition of existing structures and support to adjacent structures	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.060	Site surface clearance (clearing, grubbing, topsoil stripping, tree felling, minor earthwork, removal)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.070	Tree transplant	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.080	General site formation and slope treatment	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.090	Temporary surface drainage and dewatering	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.01.100	Temporary access roads and storage areas (provided under an advance contract)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.01.110	Temporary protection, diversion and relocation of public utilities	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.02	Substructure												
1.02.010	Embankments/cuttings	◙	◙	◙	◙								
1.02.020	Excavation, disposal and lateral supports (specifically to receive any substructure construction but excluding general site formation and slope treatment)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.02.030	Trenching	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.02.040	Drilling/boring				◙			◙	◙				

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.02.050	Piling/anchoring	◙	◙	◙		◙	◙			◙	◙	◙	
1.02.060	Structural backfill/ground remediation	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.02.070	Earth-retaining structures	◙	◙	◙	◙								
1.02.080	Abutments/wing walls	◙	◙	◙									
1.02.090	Pile caps/footings/bases (nearest to the ground level or water level if constructed in water)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.02.100	Sub-base to pavements and rail track structures	◙	◙										
1.02.110	Bases to supports for tanks, pipes, well heads and the like					◙	◙	◙	◙	◙	◙	◙	
1.02.120	Beds and surrounds to underground pipes					◙	◙	◙	◙	◙	◙	◙	
1.02.130	Bearings			◙									

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.03	Structure												
1.03.010	Piers and towers			◙									
1.03.020	Suspension system			◙									
1.03.030	Decks			◙									
1.03.040	Tunnel lining				◙								
1.03.050	Road/track base	◙	◙	◙	◙								
1.03.060	Pavement	◙	◙	◙	◙								
1.03.070	Service roads and approaches	◙	◙	◙	◙								
1.03.080	Parapets/edge treatment	◙	◙	◙	◙								

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.03.090	Main structures					◙	◙	◙	◙	◙	◙	◙	
1.03.100	Tanks, rigs, storage containers and the like					◙	◙	◙	◙	◙	◙	◙	
1.03.110	Supports for tanks, pipes and the like					◙	◙	◙	◙	◙	◙	◙	
1.03.120	Civil pipework					◙	◙	◙	◙		◙	◙	
1.03.130	Valves and fittings					◙	◙	◙	◙		◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.04	Non-structural works												
1.04.010	Non-structural removal and alterations	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.04.020	Non-structural construction					◙	◙	◙	◙	◙	◙	◙	
1.04.030	Running surface	◙	◙	◙	◙								
1.04.040	Signage, markings and the like	◙	◙	◙	◙								
1.04.050	Gantries and the like	◙	◙	◙	◙								
1.04.060	Safety facilities	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.04.070	Barriers/rails and means of access	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.04.080	Special equipment and fittings	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.04.090	Interior landscaping	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.04.100	Builder's work in connection with services	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05	Services and equipment												
1.05.010	Mechanical systems	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.020	Lighting systems	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.030	Illuminations	◙	◙	◙	◙								

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.05.040	Low-voltage power supply	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.050	High-voltage power supply	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.060	Cables/cable trays	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.070	Other electrical services	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.080	Control systems and instrumentation	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.090	Pipe racks/supports	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.05.100	Water supply and above ground drainage	◙	◙	◙	◙	◙	◙			◙	◙	◙	
1.05.110	Fire services	◙	◙	◙	◙	◙	◙			◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.05.120	Movement systems: lifts/elevators/conveyors	◙	◙	◙	◙	◙	◙			◙	◙	◙	
1.06	Surface and underground drainage												
1.06.010	Surface water drainage	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.06.020	Storm water drainage	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.06.030	Foul water drainage	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.06.040	Pumping systems	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.06.050	Drainage connections	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.07	External and ancillary works												
1.07.010	Site enclosures and divisions	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.07.020	Ancillary structures	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.07.030	Roads and paving (not amounting to a Sub-Project)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.07.040	Landscaping (hard and soft)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.07.050	Fittings and equipment	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.08	Preliminaries | Constructor's site overheads | general requirements												(j)
1.08.010	Construction management including site management staff and support labour	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.020	Insurances and bonds	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.030	Common construction plant	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.08.040	Temporary access roads and storage areas (at the Constructors' discretion)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.050	Temporary facilities and services	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.060	Submissions and reports	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.070	Building information modelling (BIM)	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.080	Traffic management and diversion	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.090	Safety, health and environmental management	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.100	Monitoring and recording	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.08.110	Testing and commissioning	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.08.120	As-built documentation	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.09	**Risk Allowances**												(j), (k)
1.09.010	Design development allowance	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	(l)
1.09.020	Construction contingencies	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	(m)
1.09.030	Price level adjustments 010 - until tendering 020 - during construction	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	(n)
1.09.040	Exchange rate fluctuation adjustments	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

EXAMPLES OF COST SUB-GROUPS – Civil 3/5

Item	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment works	Water treatment works	Pipelines	Well drilling	Power generating plants	Chemical plants	Refineries	Note
1.10	**Taxes and Levies**												(j)
1.10.010	Paid by the Constructors	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	
1.10.020	Paid by the Client in relation to the construction contract payments	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙	

COST SUB-GROUPS – ASSOCIATED COST

COST SUB-GROUPS – ASSOCIATED COST

Item	Description
	Cost Category (Level 2)
	Cost Group (Level 3)
	Cost Sub-Group (Level 4)
2	**Associated Capital Costs**
2.01	Site acquisition
2.01.010	Costs and premium required to procure site including additional cost and premium to be paid by foreign investors
2.01.020	Compensation to existing occupiers
2.01.030	Contributions to pay for the protection of heritage sites or to encourage development
2.01.040	Demolition, removal and modification of existing properties by way of payment to existing owners instead of carrying out physical work
2.01.050	Related fees to agents, lawyers, and the like
2.01.060	Related taxes and statutory charges

COST SUB-GROUPS – ASSOCIATED COST

2.02	Construction-related consultants and supervision
2.02.010	Consultants' fees and reimbursable: 010 - architects (architectural, landscape, interior design, technical, etc.) 020 - engineers (geotechnical, civil, structural, mechanical, electrical and plumbing, technical, etc.) 030 - project managers 040 - surveyors (quantity surveying, land surveying, building surveying, cost engineering, etc.) 050 - specialist consultants (environmental, traffic, acoustic, facade, BIM, etc.) 060 - value management studies
2.02.020	Charges and levies payable to statutory bodies or their appointed agencies (in connection with planning, design, tender and contract approvals, supervision and acceptance inspections)
2.02.030	Site supervision charges (including their accommodation and travels)
2.02.040	Payments to testing authorities or laboratories
2.03	Work and utilities outside site
2.03.010	Connections to, diversion of and capacity enhancement of public utility mains or sources outside site up to mains connections on site: 010 - electricity 020 - transformers 030 - water 040 - sewer 050 - gas 060 - telecommunications
2.03.020	Public access roads and footpaths

COST SUB-GROUPS – ASSOCIATED COST

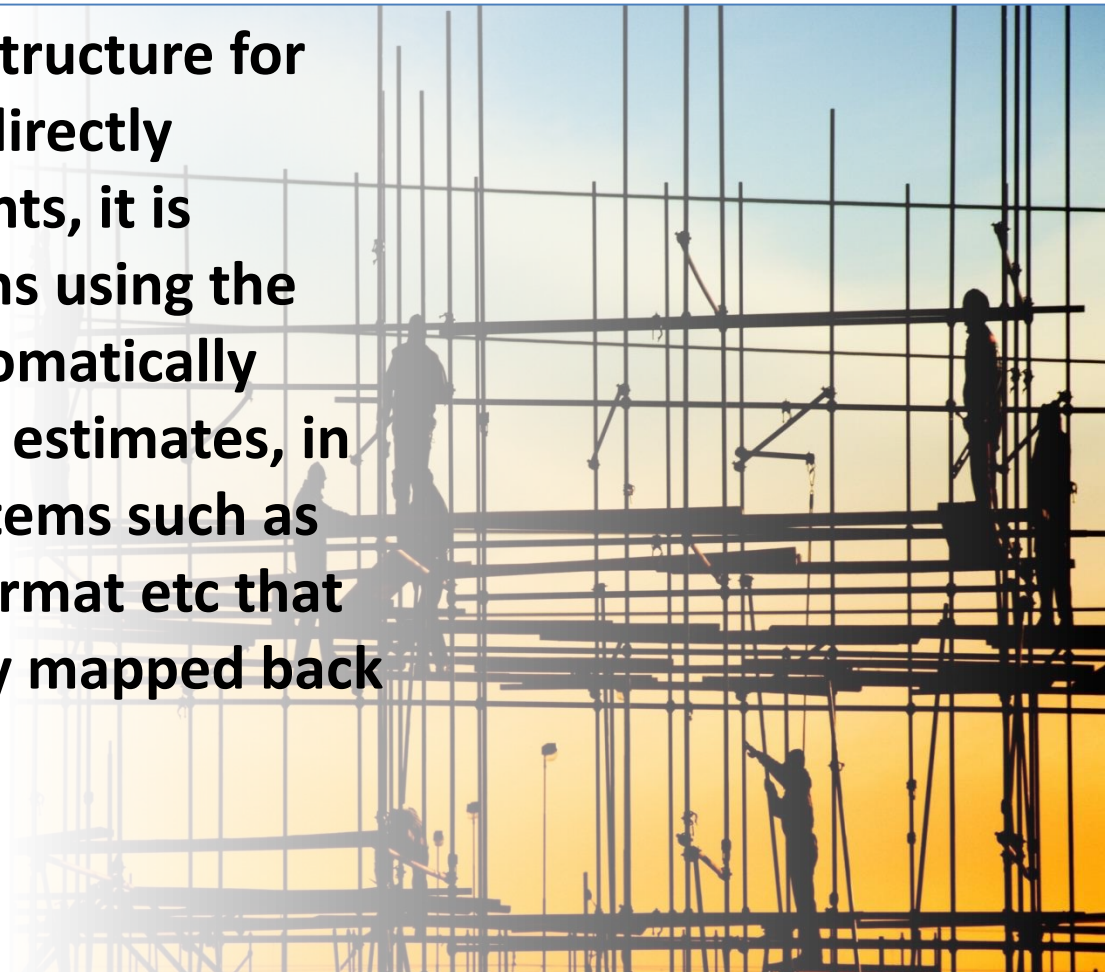
2.04	Loose furniture, fittings and equipment
2.04.010	Production, process, operating and loose furniture, furnishing and equipment not normally provided before completion of construction
2.05	Administrative, finance, legal and marketing expenses
2.05.010	Client's general office overheads
2.05.020	Client's project-specific administrative expenses: 010 - in-house project management and design team 020 - supporting project staff 030 - project office venue, furniture and equipment if not included in Constructor's preliminaries | site overheads 040 - stores and workshops 050 - safety and insurances 060 - staff training 070 - accommodation and travelling expenses for in-house team and external parties
2.05.030	Interest and finance costs
2.05.040	Legal expenses
2.05.050	Accounting expenses
2.05.060	Sales, leasing, marketing, advertising and promotional expenses

COST SUB-GROUPS – ASSOCIATED COST

2.05.070	Taxes and statutory charges related to sales and lease
2.05.080	Licence and permit charges for operation and use
2.06	**Risk Allowances**

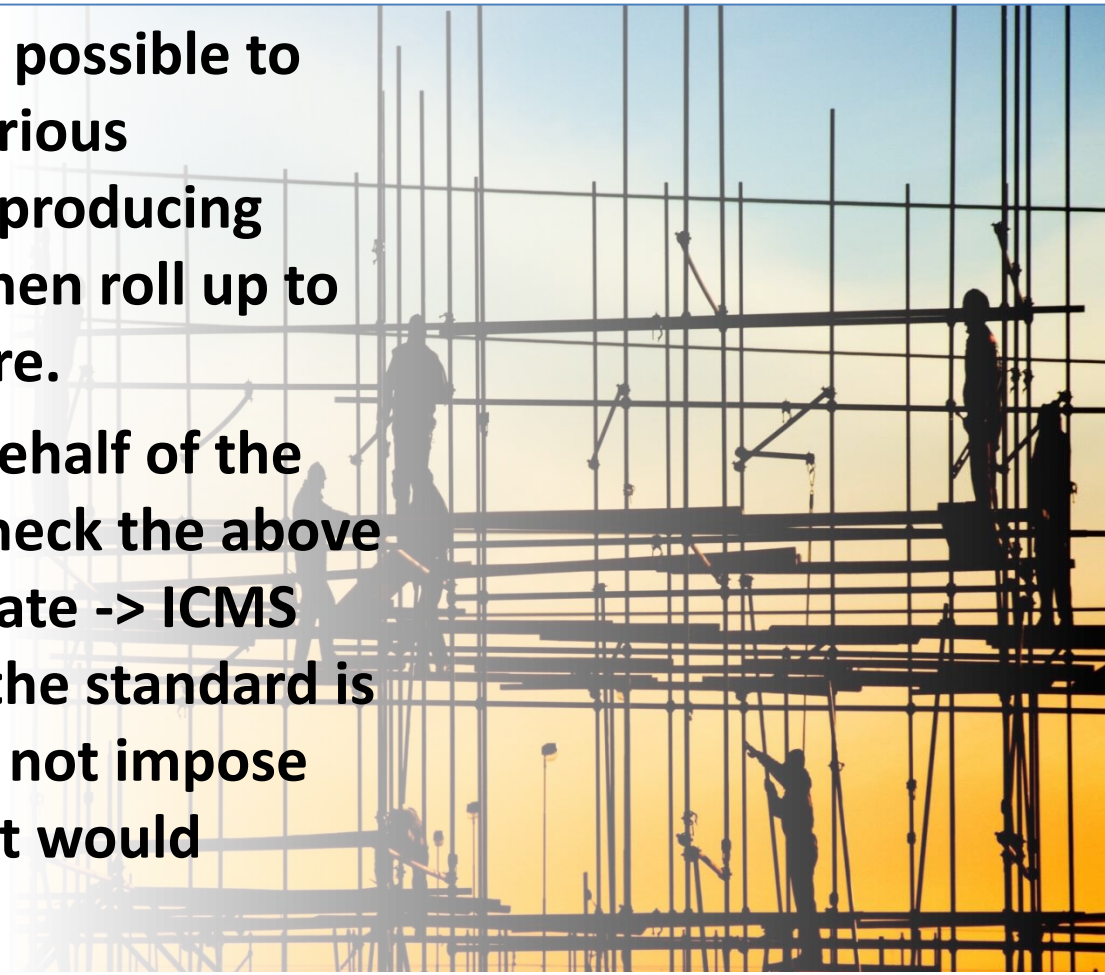
BIM & ICMS

- **Although the ICMS coding structure for reporting costs can not be directly associated with BIM elements, it is possible to define algorithms using the BIM metadata that can automatically produce BOQs and detailed estimates, in several global and local systems such as NRM2, POMI, CSI master format etc that in turn can be automatically mapped back to ICMS**



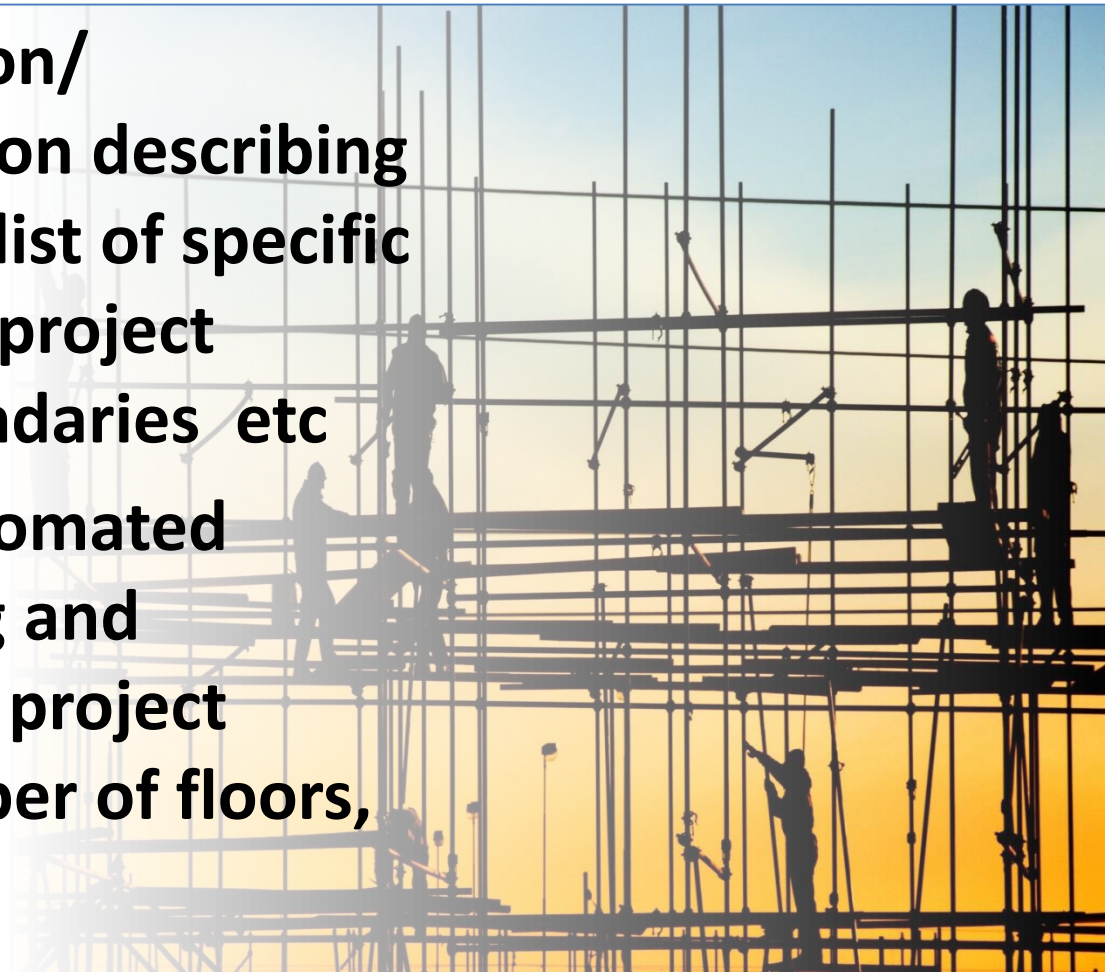
BIM & ICMS

- **With the above approach is possible to benchmark models from various locations, by automatically producing localised estimates which then roll up to the same ICMS cost structure.**
- **There was some effort on behalf of the committee to enable and check the above process (BIM -> BOQ/Estimate -> ICMS Reporting) by making sure the standard is high level enough and does not impose geometrical restrictions that would restrict the flow.**



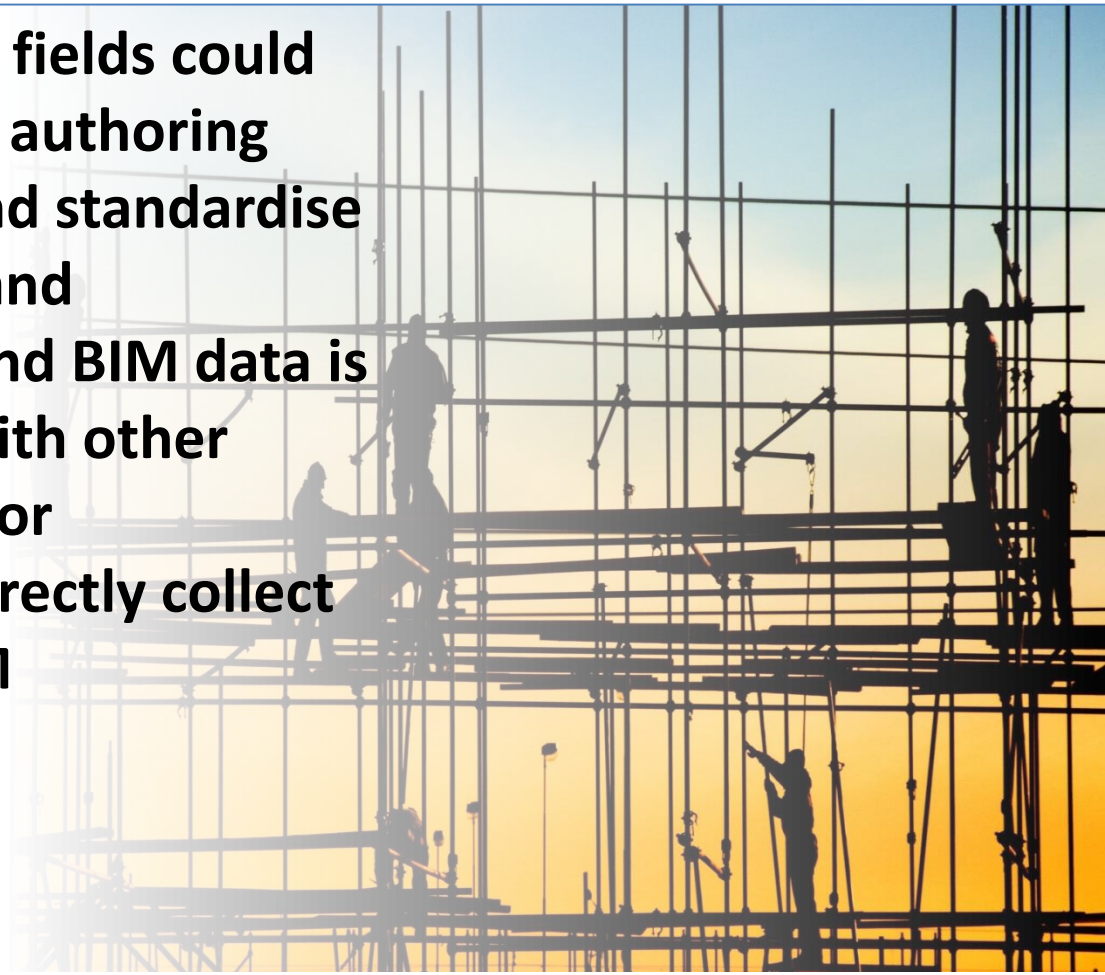
BIM & ICMS

- **ICMS provides a common/ standardised approach on describing projects by providing a list of specific attributes in regards to project function, location, boundaries etc**
- **BIM can provide an automated approach on calculating and populating a few of the project attributes such as number of floors, GIFA, GEFA**



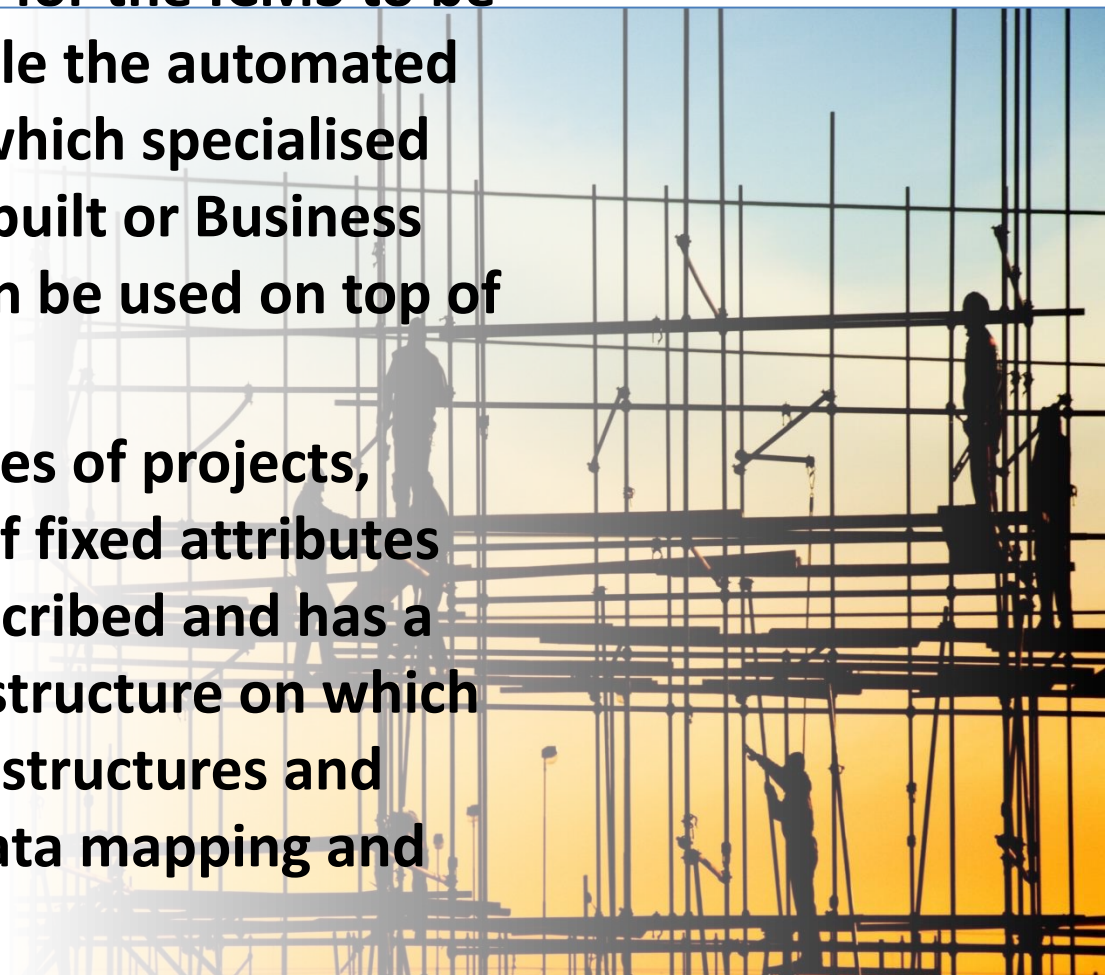
BIM & ICMS

- **The ICMS project attributes fields could also be enabled within BIM authoring systems to communicate and standardise the way project attributes and descriptions are reported and BIM data is produced and exchanged with other systems and systems used for benchmarking that could directly collect these information from BIM**



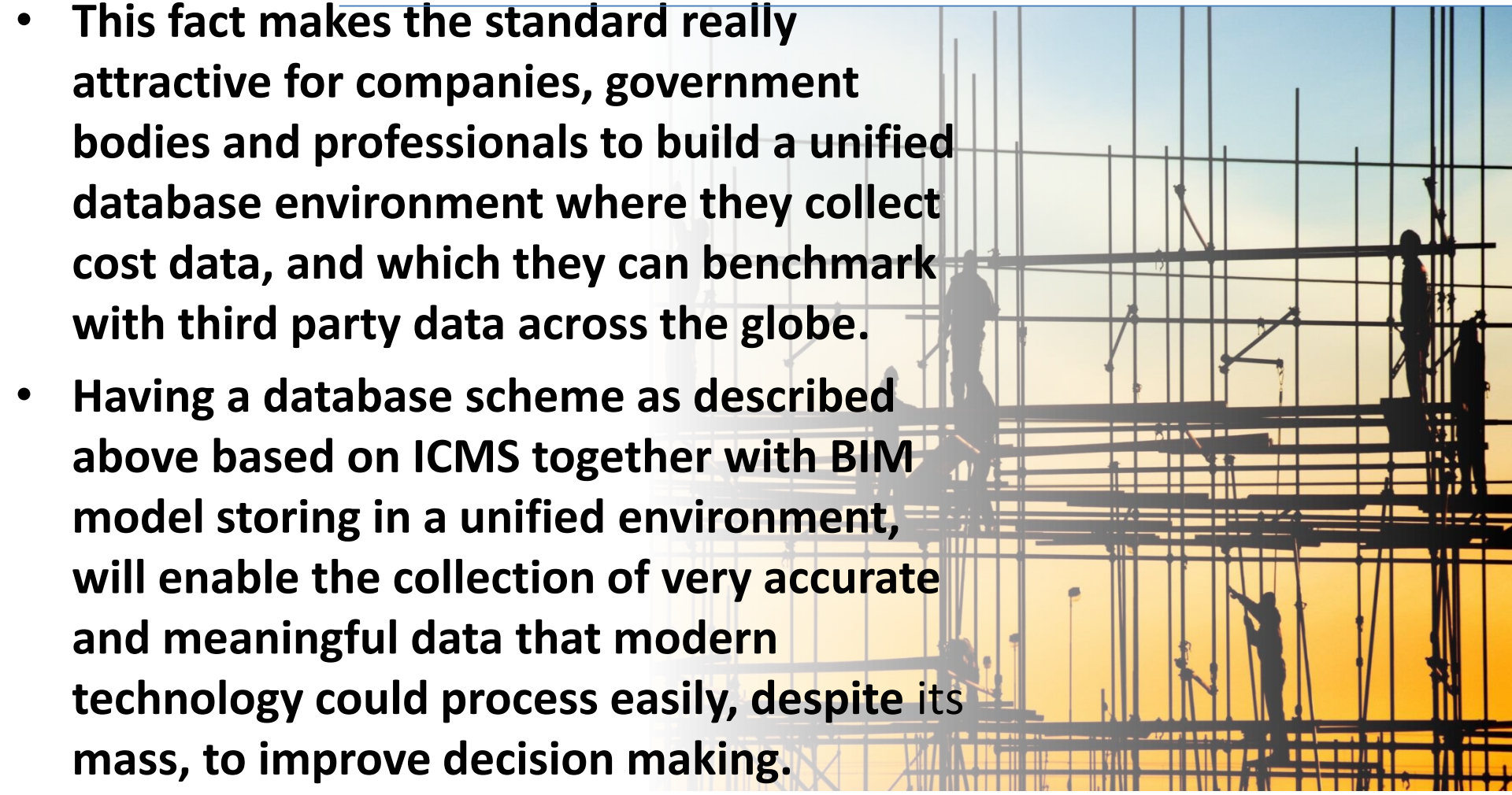
BIM & ICMS

- **Special attention was given for the ICMS to be database friendly and enable the automated processing of big data, on which specialised software platforms can be built or Business Intelligence (BI) systems can be used on top of the data.**
- **ICMS supports multiple types of projects, provides a predefined set of fixed attributes how projects should be described and has a common high level coding structure on which multiple global cost coding structures and MMs can roll up through data mapping and queries.**



BIM & ICMS

- **This fact makes the standard really attractive for companies, government bodies and professionals to build a unified database environment where they collect cost data, and which they can benchmark with third party data across the globe.**
- **Having a database scheme as described above based on ICMS together with BIM model storing in a unified environment, will enable the collection of very accurate and meaningful data that modern technology could process easily, despite** its **mass, to improve decision making.**



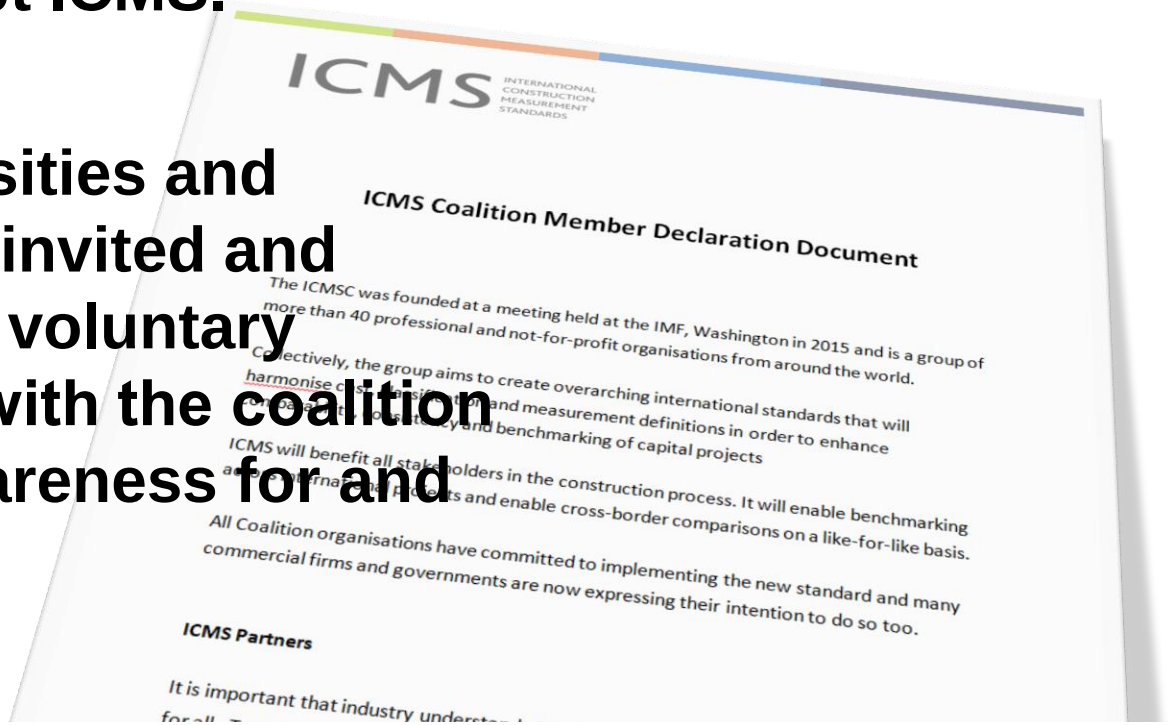
How will ICMS be adopted?

- **The coalition members have signed the Declaration and committed to implement the ICMS once it is published.**
- **Many organisations will incorporate ICMS within existing standards and guidance. Some adjustments to existing local standards may be necessary.**
- **Governments and businesses will lead adoption of ICMS in the marketplace**
- **Funding agencies and institutions will require all future requirements to be assessed based on ICMS**

How can I get involved?

- **Professional and standards-setting bodies are encouraged to join the coalition and to adopt ICMS.**

- **Private firms, universities and governments will be invited and encouraged become voluntary 'partners' and work with the coalition to develop, raise awareness for and implement ICMS.**


ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

ICMS Coalition Member Declaration Document

The ICMSC was founded at a meeting held at the IMF, Washington in 2015 and is a group of more than 40 professional and not-for-profit organisations from around the world.

Collectively, the group aims to create overarching international standards that will harmonise cost definitions and measurement definitions in order to enhance transparency and benchmarking of capital projects

ICMS will benefit all stakeholders in the construction process. It will enable benchmarking and performance reports and enable cross-border comparisons on a like-for-like basis.

All Coalition organisations have committed to implementing the new standard and many commercial firms and governments are now expressing their intention to do so too.

ICMS Partners

It is important that industry

International Construction Measurement Standards (ICMS) – Get Involved!

www.icms-coalition.org