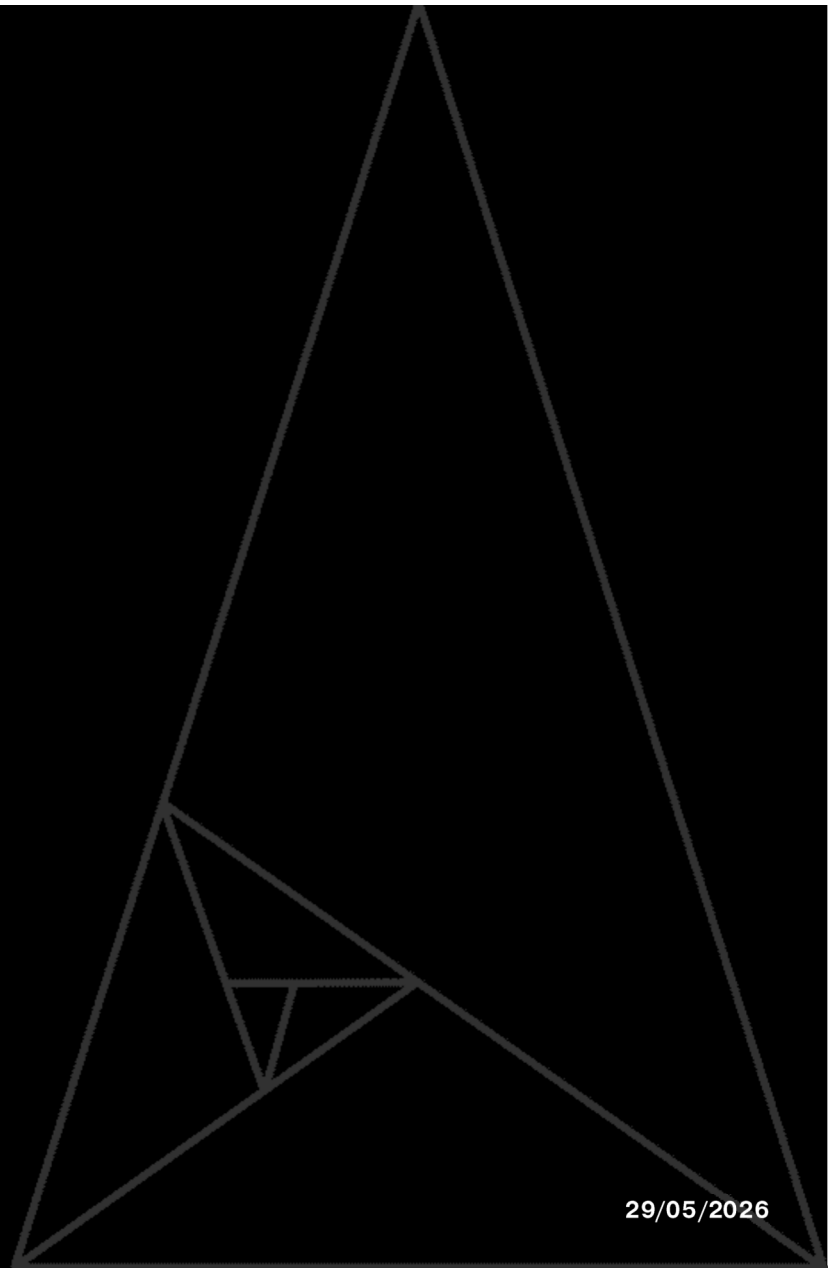
Can carbon be managed like cost?



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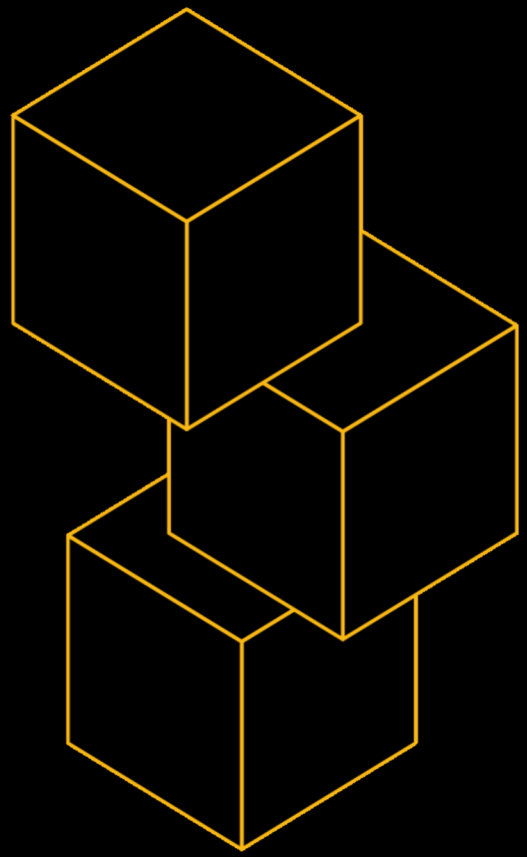
29/05/2026

CO2 / CO2e

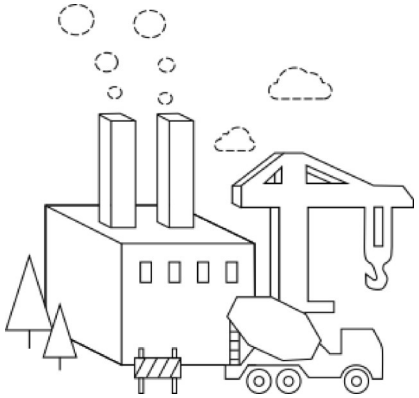


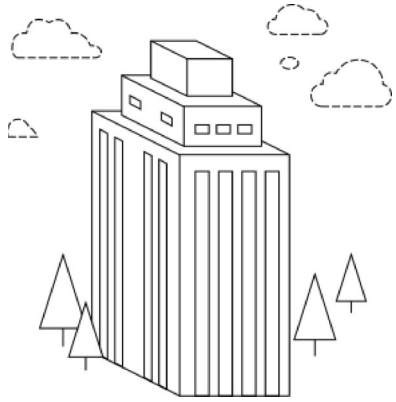
Carbon stages

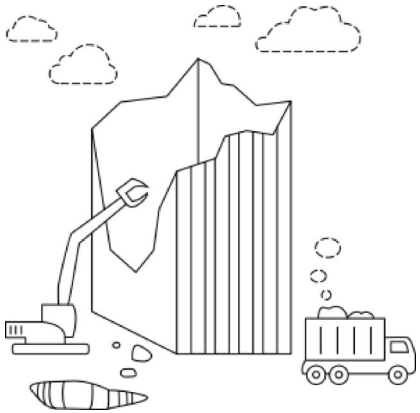
CO2 in construction primarily represents the greenhouse gas emissions generated throughout the lifecycle of a building or infrastructure project. These emissions are a key factor in evaluating the carbon footprint of construction activities, which includes both:

- **Monitoring CO2 is critical for achieving netzero carbon goals in construction.**
- **The construction industry is responsible for approximately 38% of worldwide energy related CO2 emissions and infrastructure projects play a big part on this.**

Embodied carbon → **Operational carbon** → **End-of-life carbon**





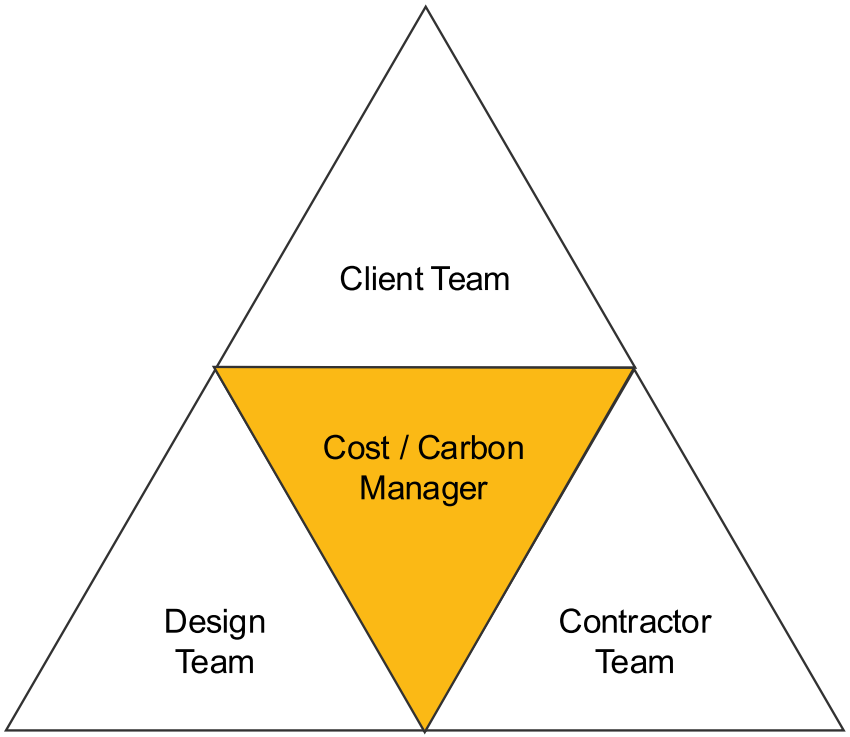


Cost & Carbon Management

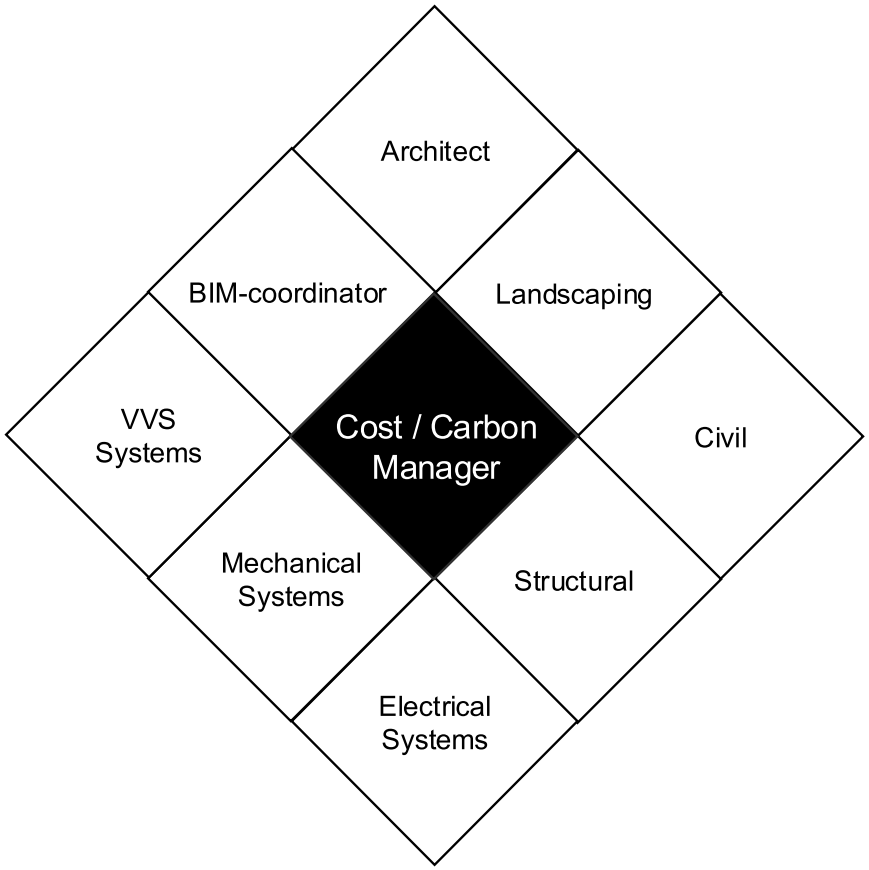
1 Process

2 Outcomes

Cross-Project Stakeholders



Cross Project Disciplines



KOSMOS Roadmap

Phase 1: Business Case/Concept

- Preparation of the project Review & finalisation of the BIM execution plan
- Initial discussions with the design team on naming conventions, standards, etc
- Initial procurement strategy discussions
- Assessment of potential Value Engineering opportunities
- Assessment of potential risk
- Delivery of Concept estimate at end of phase
- Initial Embedded Carbon assessment and strategy establishment
- Upload data to database

Phase 2: Schematic

- Focus on major cost drivers
- Monthly updates of cost & cost report
- Assessment of potential risk
- Close dialogue with design team on design & BIM quality
- Management and recording of change and cost impact
- Preparation of Schematic design estimate at the end of the phase
- Preparation of the Schematic design embedded carbon calculation
- Upload data to database

Phase 3: Detailed Design

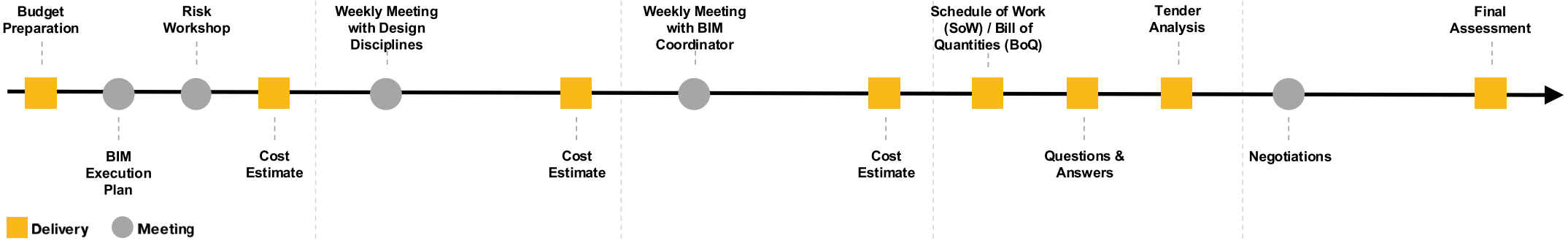
- Focus on major cost drivers
- Monthly updates of cost & cost report
- Assessment of potential risk
- Weekly meetings with BIM coordinator & discipline leads
- Management and recording of change and cost impact
- Preparation of Detailed design estimate at the end of the phase
- Preparation of the detailed design embedded carbon calculation
- Upload data to database

Phase 4: Tender Phase

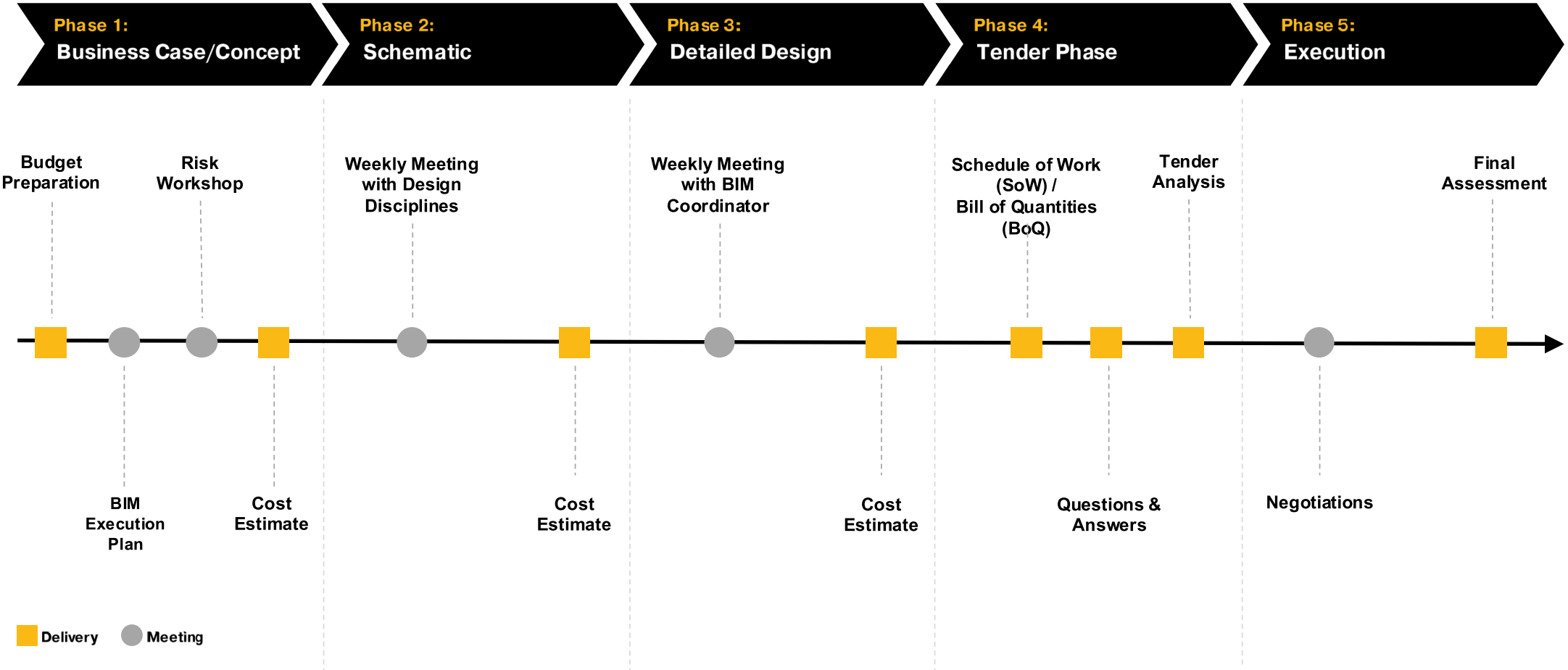
- Preparation of Schedule of Works/ Bill of Quantities
- Review of all tender material & align with design team
- Review all general & preamble material
- Assist in answering contractor queries during tender
- Assess & analyses contractor bids
- Prepare qualification & clarification for contractor
- Reconcile contractor bid so that all gaps are identified
- Upload data to database

Phase 5: Execution

- Monthly cost report
- Management of change and variations
- Management of claims
- Monthly valuations & recommendations
- Upload data to database
- Final account agreements
- Change management
- Risk management



KOSMOS Roadmap

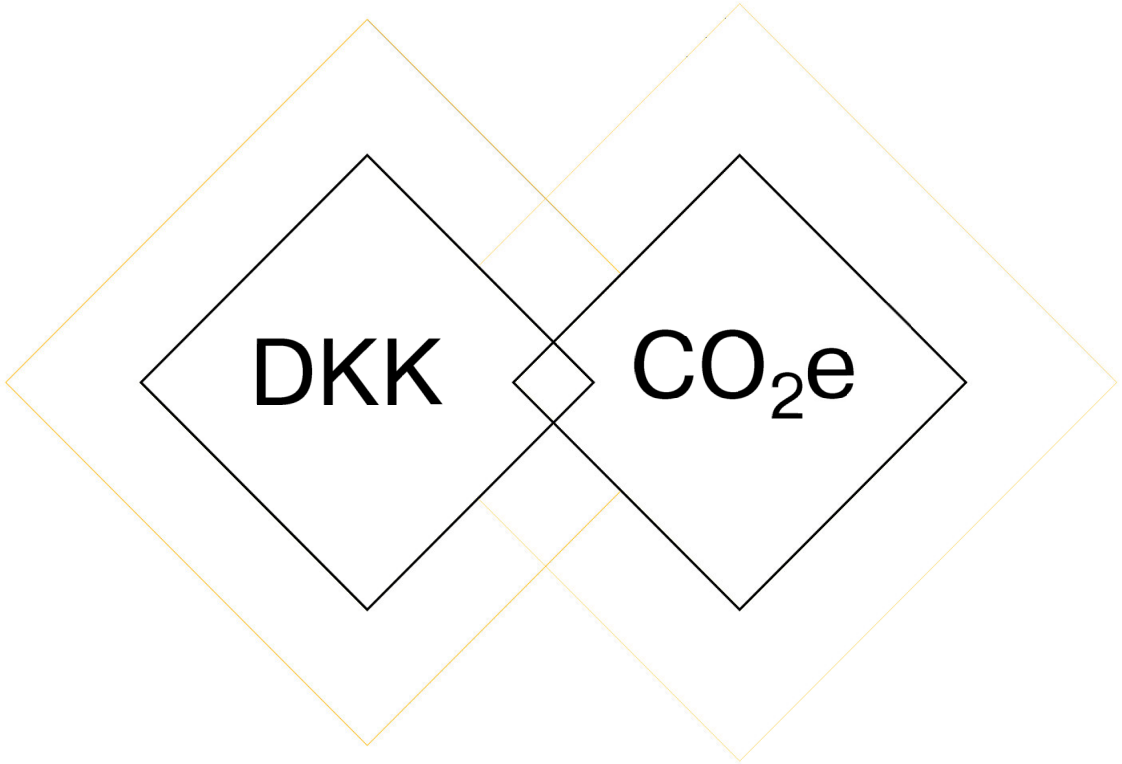


We refer to CO2e as a currency. Hence, we already have established processes to monitor and control it.

CO2e accounting at each phase

Risk Management

Common Work breakdown structure / Bill of Quantities



Monitoring during execution

Change Management

Procurement Strategy

Cost & Carbon in Parallel

Work breakdown structure

Link to BIM Quantities

Shared set of quantities in project

Carbon rate

Cost rate

Pos.	Description	Location	Variant	C_AreaNameCode	C_Product	Method	Quantity	Unit	kgCO2e / Unit	kgCO2e	SUM [kgCO2e]	DKK / Unit	DKK	SUM [DKK]
						B: 3D BIM M: Manu								
6.5.3	Structure	Bgb												2
	Secant Bored Pile wall	Bgb	BASE	Bgb	Secant Piles	M		m						
	Concrete Slabs	Bgb	BASE	Bgb	Slab	B		m3						
	Wall External	Bgb	BASE	Bgb	Wall External	B		m3						
	Wall Internal	Bgb	BASE	Bgb	Wall Internal	B		m3						
	Concrete Beams	Bgb	BASE	Bgb	Beam	B		m3						

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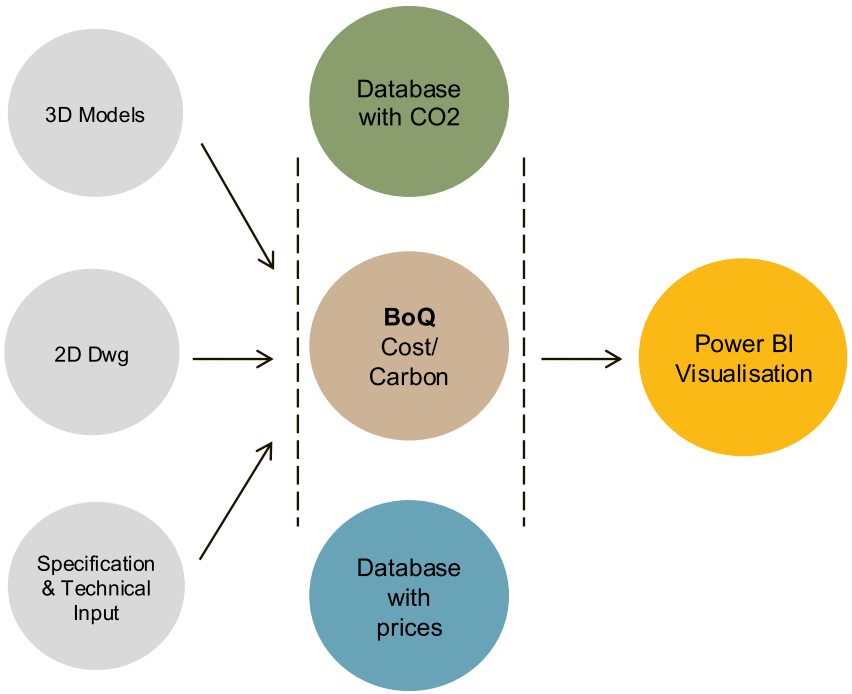
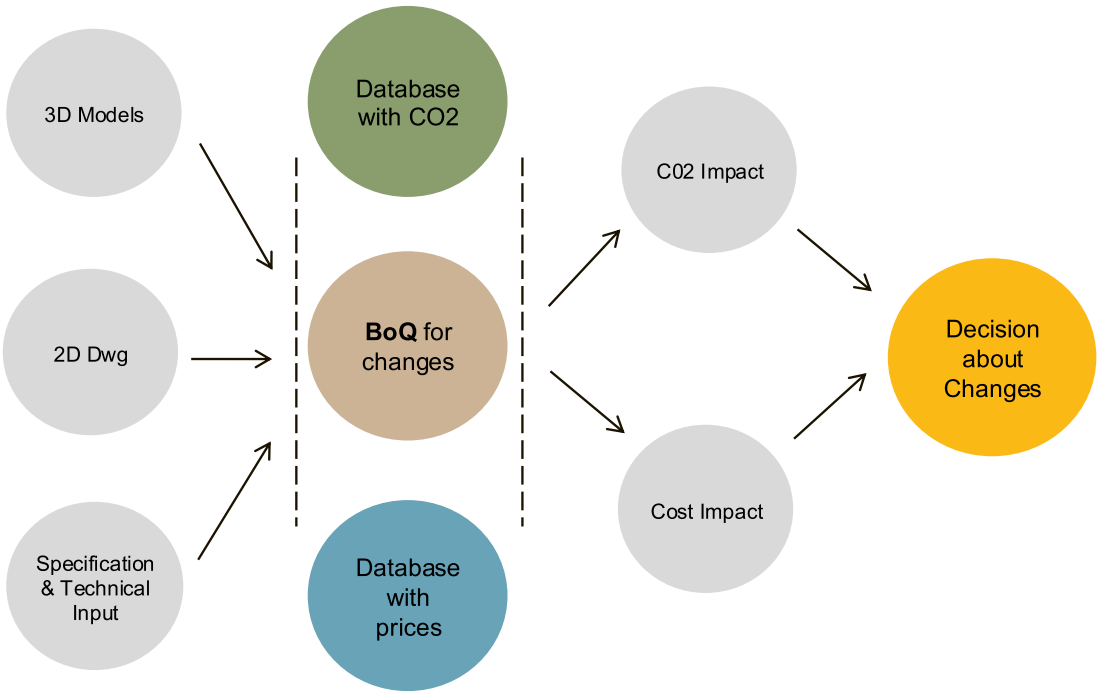
Cost management in parallel with Carbon Management

Original Calculation



Calculation of Changes



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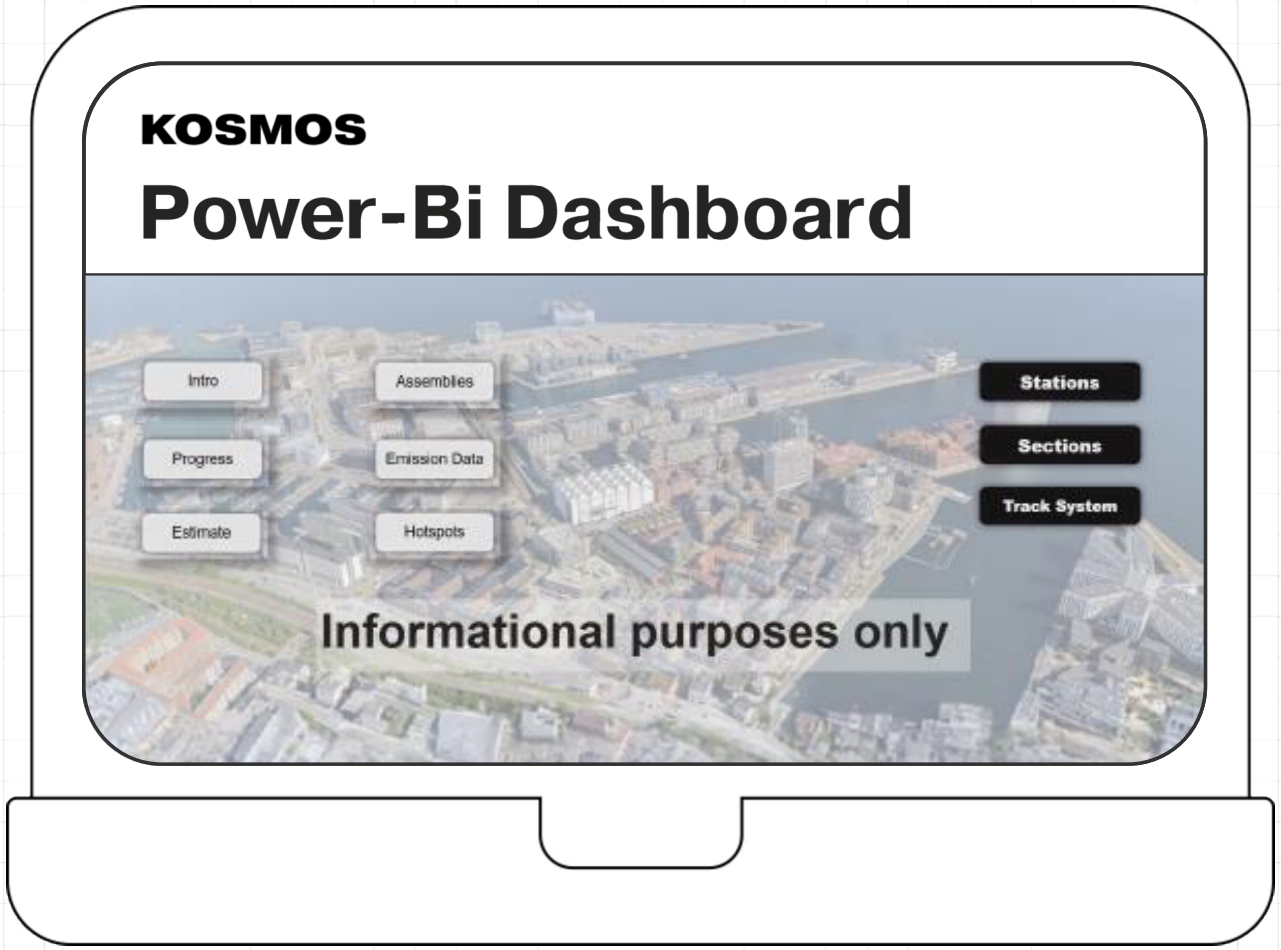
Practical Use of CO2 Management

Can carbon be managed like cost?



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Carbon Dashboard

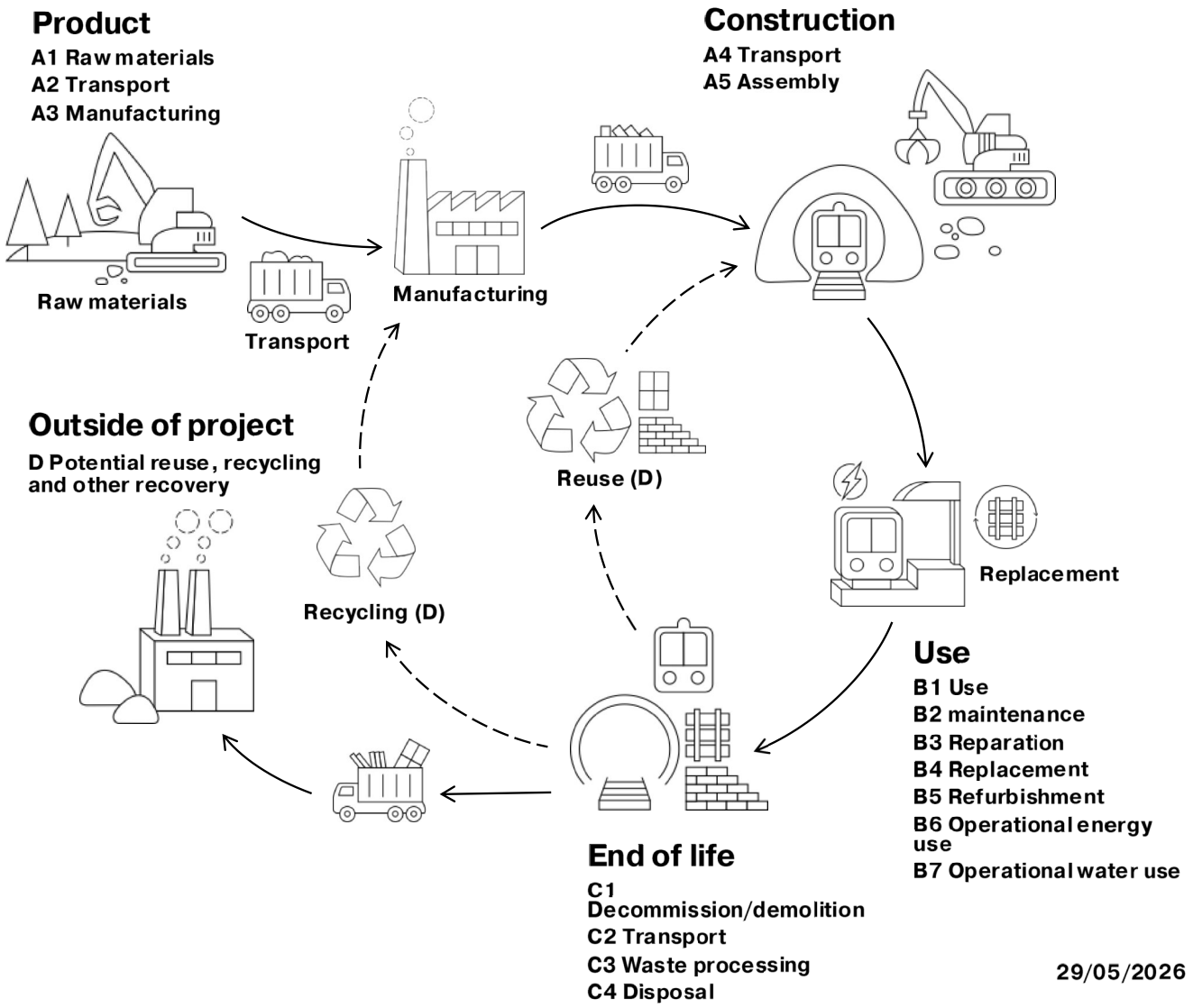
The Carbon Dashboard is a tool to integrate carbon into the project.

This enables the project to have a shared place for the carbon count of the project broken down and visualize for everybody to identify carbon hotspots and potential innovative ideas for saving Carbon on the project.

Life cycle stages

Carbon footprint calculation will focus on the following highlighted Life Cycle Assessment (LCA) phases: A1-A3, B4, and B6.

- Product stage (A1-A3)
- Construction stage (A4+A5)
- Replacement of materials (B4):

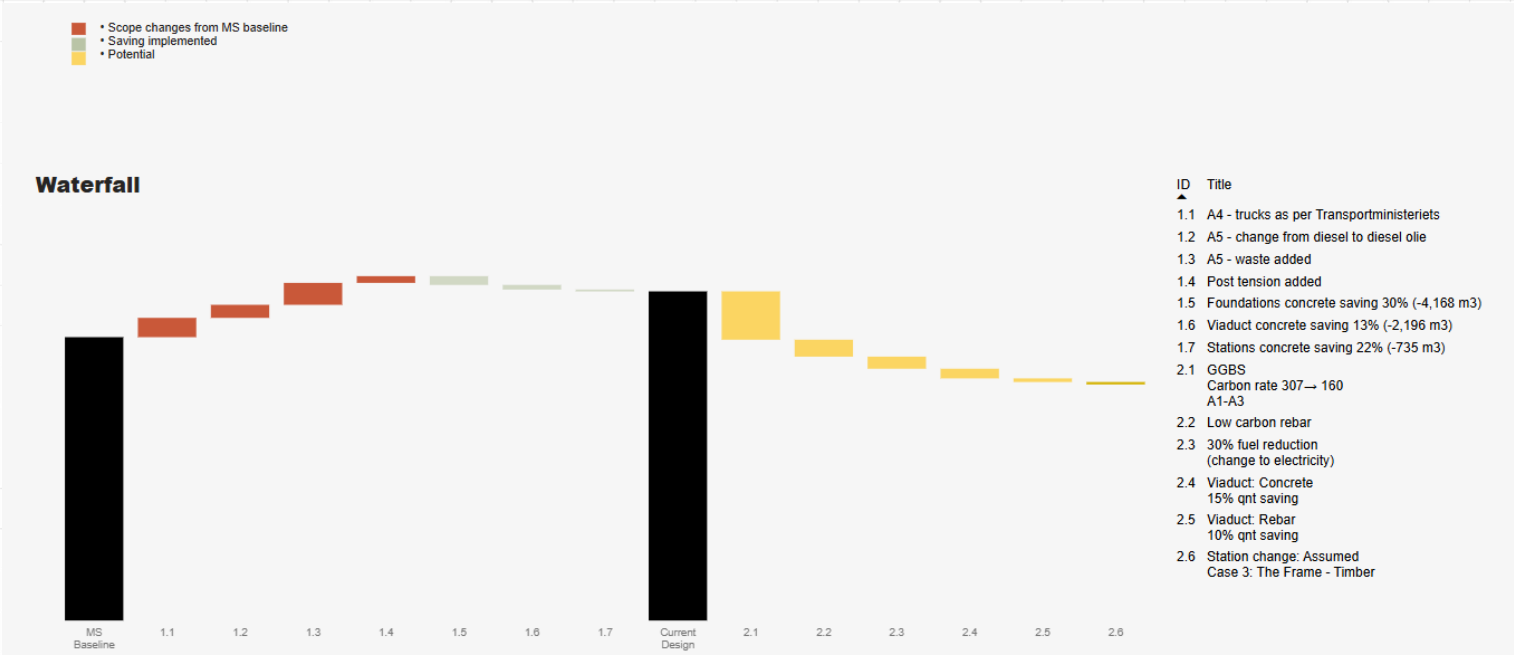


Progress

Scope: Baseline Scope

The waterfall illustrates how carbon management, design collaboration across disciplines, and innovation initiatives are continuously driving progress in carbon reduction.

A1-A3 analysis:



ID	Title
1.1	A4 - trucks as per Transportministeriets
1.2	A5 - change from diesel to diesel olie
1.3	A5 - waste added
1.4	Post tension added
1.5	Foundations concrete saving 30% (-4,168 m3)
1.6	Viaduct concrete saving 13% (-2,196 m3)
1.7	Stations concrete saving 22% (-735 m3)
2.1	GGBS Carbon rate 307→ 160 A1-A3
2.2	Low carbon rebar
2.3	30% fuel reduction (change to electricity)
2.4	Viaduct: Concrete 15% qnt saving
2.5	Viaduct: Rebar 10% qnt saving
2.6	Station change: Assumed Case 3: The Frame - Timber

Estimate

Total (kgCO2e) A1-A5

27.23M

Phases (kgCO2e)

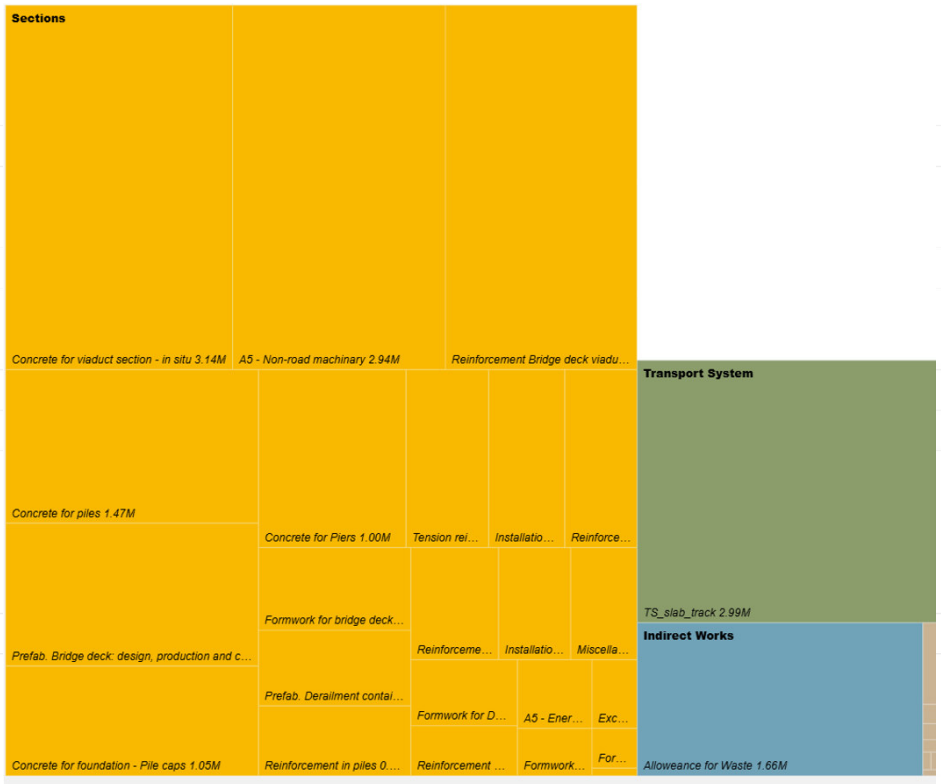
A1-A3	A4	A5	B4
18.04M	2.89M	6.30M	8.88M

Category	A1-A5 [kgCO₂e]	Quantity	Unit	TakeOff Method
Enabling Works	**0**	**1.00**	**sum**	**M**
Sections	**18,454,641**	**5,339,095.43**		**M**
[redacted]	**18,454,641**	**5,339,095.43**		**M**
Architectural works | Non-structural works	0	6,944.05	lbm	M
Demolition, site preparation and formation	3,442,292	5,133,242.47		M
Services and equipment	295,574	30,710.00		M
Substructure	5,616,905	82,625.32		M
Superstructure	9,099,869	85,573.60		M
Stations	**4,046,113**	**1,095,451.38**		**M**
[redacted]	**1,591,540**	**1,087,869.82**		**M**
Architectural works | Non-structural works	246,276	8,550.45		M
Demolition, site preparation and formation	581,624	1,068,999.13		M
Services and equipment	150,113	3,423.00		M
Substructure	146,643	4,607.18		M
Superstructure	466,885	2,290.07		M
[redacted]	**1,591,540**	**1.00**	**sum**	**M**
General	1,591,540	1.00	sum	M
[redacted]	**431,517**	**7,579.57**		**M**
Architectural works | Non-structural works		2,386.00		
Demolition, site preparation and formation		457.00		
Services and equipment	138,073	333.00		M
[redacted]	184,392	3,316.00		M
Total	**27,234,889**	**32,052,166.56**		**M**

Materials

ComponentCategory	Quantity	Unit	A1-A5 kgCO2e	A1-A5&B4 kgCO2e	A1-A3	A4	A5	B4
Concrete	27,226	m3	8,925,639	8,925,639	8,346,021	579,619	0	0
Reinforcement	5,999	t	4,863,488	4,863,488	3,867,435	996,053	0	0
Fuels	6,195,004		3,594,246	3,594,246			3,594,246	
Track	3,296	m	2,990,375	4,949,587	2,474,793	103,116	412,466	1,959,212
Waste - Construction	3,199	t	1,657,856	1,657,856	0	0	1,657,856	
Formwork	45,238	m2	989,472	989,472	904,750	84,722	0	
Aggregates	16,036	m3	937,759	937,759	117,638	820,121	0	0
MEP	8,022		506,496	1,178,428	474,066	32,430	0	671,932
Steel	62	t	209,714	628,688	199,470	10,244	0	418,974
Metals	75	t	183,454	183,454	171,000	12,454	0	0
Soil works	52,929	m3	153,605	153,605	0	0	153,605	0
Glass	13	t	109,425	218,850	107,289	2,136	0	109,425
Other metals	9	t	34,912	100,484	33,447	1,465	0	65,572
Aluminium	2	t	18,189	59,218	17,791	399	0	41,029
Grout/Cement	40	t	13,308	26,615	6,612	6,695	0	13,308
Elevator	2	pcs	12,040	48,158	11,486	554	0	36,119
Natural stone	26	t	6,367	12,733	2,021	4,346	0	6,367
Mineral wool	2	t	3,665	7,329	3,305	359	0	3,665
Other materials	1	t	1,658	3,316	1,449	209	0	1,658
Plast	0	t	166	665	154	12	0	499
Total	**6,357,179**		**25,211,833**	**[redacted]**	**16,738,726**	**2,654,934**	**5,818,172**	**3,327,757**

Hotspot



Materials (kgCO2e)

Component Category	Component in Assembly	Total A1-A5 kgCO2e
Concrete	Concrete (C40/50, EA)	7,554,649.24
Reinforcement	Reinforcement - Rebar	4,305,648.08
Fuels	Diesel oil	3,357,034.20
Track	Tracks	2,990,375.47
Concrete	Concrete (C40/50, EA) - prefab	1,370,198.56
Waste - Construction	Flammable waste	1,066,818.07
Formwork	Formwork - (foundations, slabs, beams, walls and others)	989,471.92
Aggregates	Gravel	937,758.95
Reinforcement	Steel - Post tensioned steel	557,839.61
Waste - Construction	Concrete waste	363,500.80
MEP	Steel - hot rolled coil GLO	282,518.78
Fuels	Electricity	237,211.58
Metals	Structural Steel - MS baseline	183,453.75
Soil works	A5 - Excavation	153,604.70
Waste - Construction	Plastic waste	141,489.59
MEP	MEP - st_above	138,073.23
Steel	MEP - Steel	104,629.79
Waste - Construction	Wooden waste	56,218.32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