中國建築工程(香港)有限公司
CHINA STATE CONSTRUCTION ENGRG. (HONG KONG) LTD.

Innovation and Application of Low-carbon Technology for Sewage Treatment Works

China State Construction Engineering (Hong Kong) Ltd

Nov 2019

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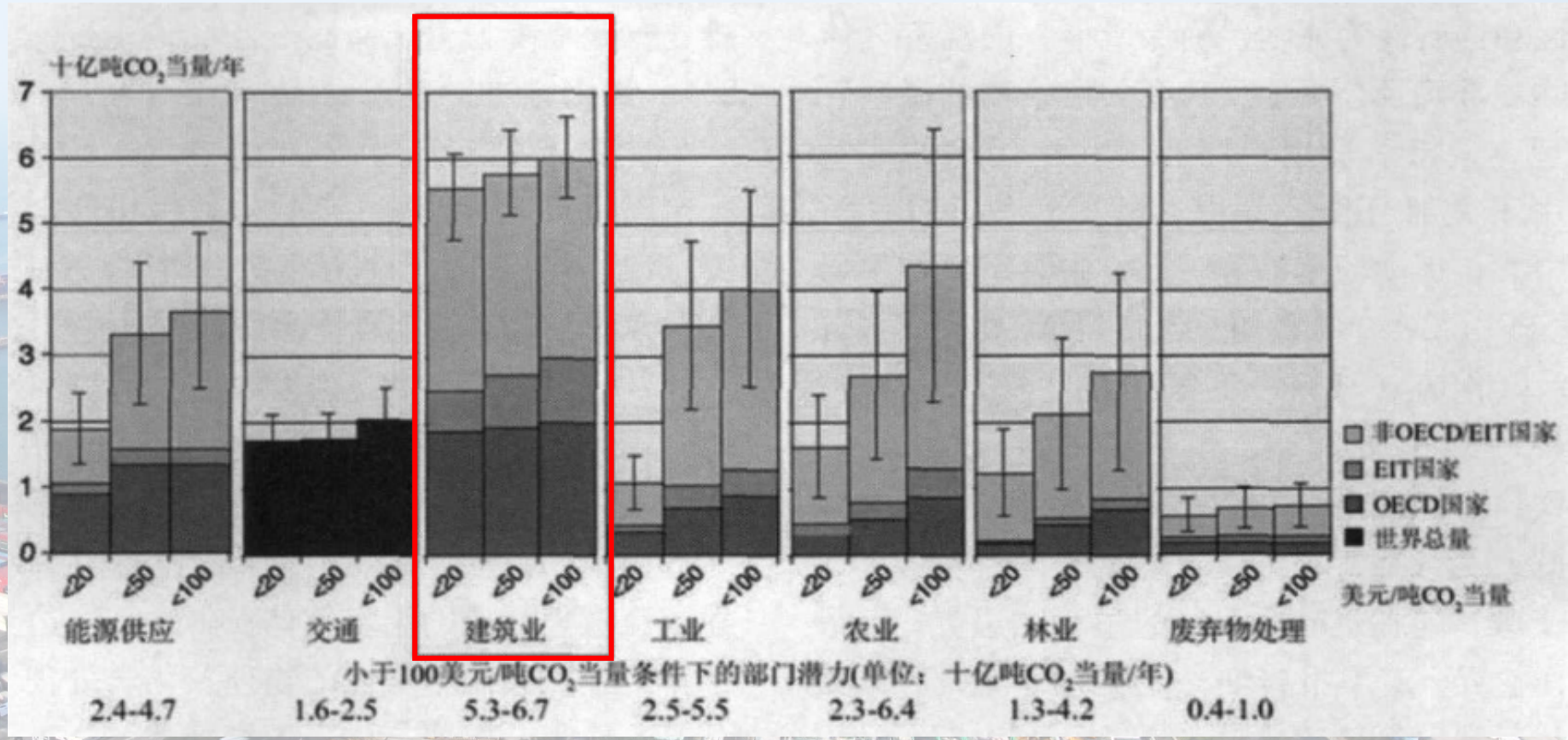
1 Introduction



Largest Potential for Emission Reduction

-- (Climate Change 2007, the **Fourth Assessment Report**) issued by World Meteorological Organization and **U**nited **N**ations **E**nvironment **P**rogramme (UNEP)

Contents

2 Low Carbon Technologies

Supply Chain	Site Construction	Site Operation
• Raw Material Selection • Material Machining • Transportation	• Construction	• Operation • Maintenance • Waste Disposal

Life-cycle Stages

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3 Application in STW — Case Sharing

Hong Kong Pillar Point Sewage Treatment Works

Client：Drainage Services Department of Hong Kong SAR

Contract: Design, Build and Operate (DBO)

Location: North of River Trade Terminal, Tuen Mun, N.T.

Contractor: ADC (China State) JV

Commencement：2010.07.28

Construction Completion: 2014.05.17

Operation: 10 + 5(operational) years

Contract Sum: HK$ 2.67 billion

Capacity：241,000 m^3/d

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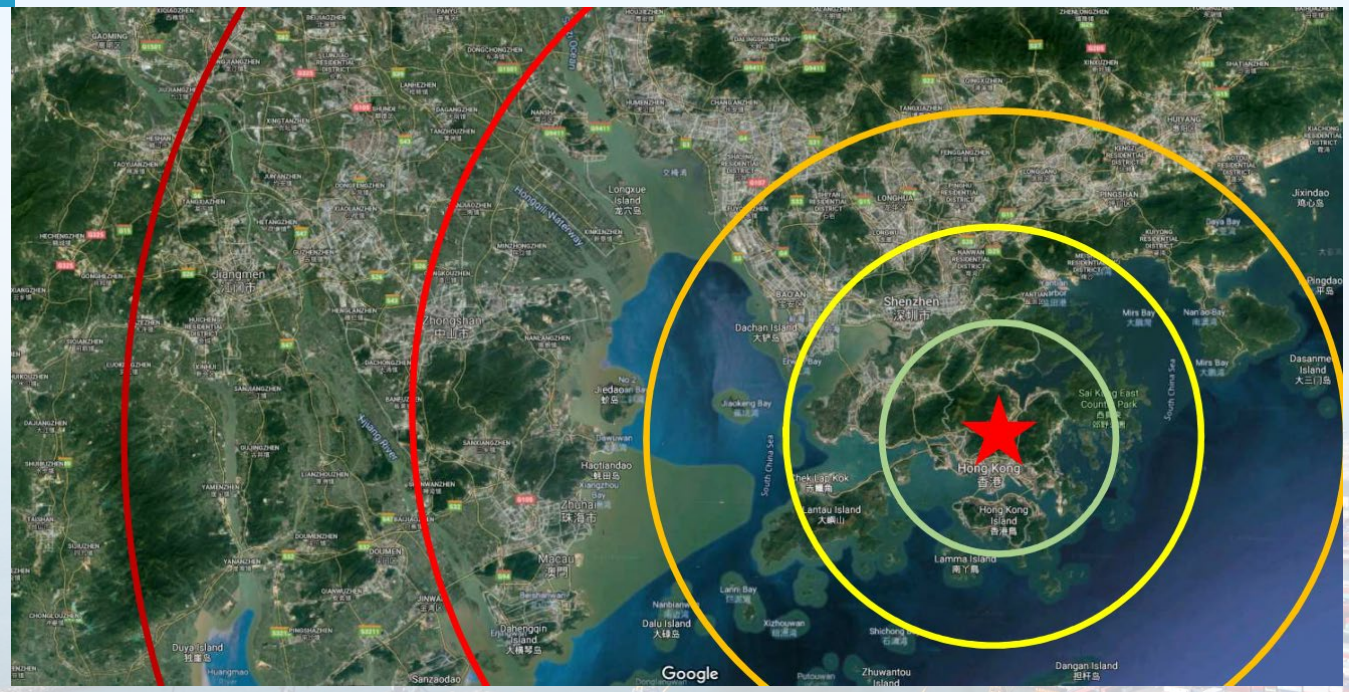

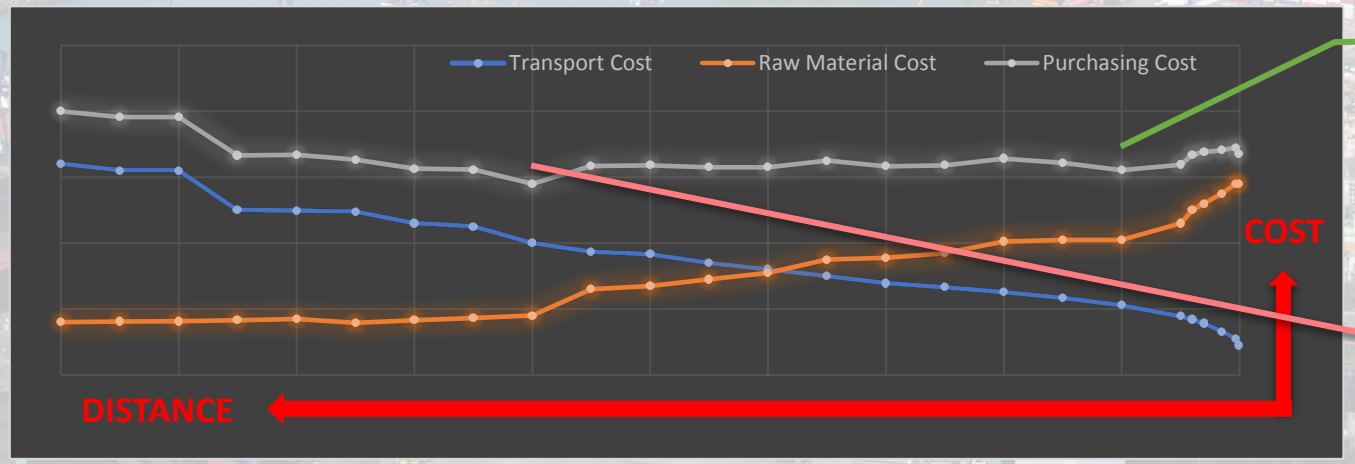

Supply Chain

- ❑ Transport Cost
- ❑ Material Cost

Cost and Carbon Footprint Balanced

Lowest Purchasing Cost

3 Application in STW — Case Sharing

Construction Machinery

- ❑ Choose machinery match the power and load

Material Usage

- ❑ Pulverized Fly Ash cement (PFA)
- ❑ Reinforced Glass Fiber
- ❑ Metal scaffolding
- ❑ Reusable formwork

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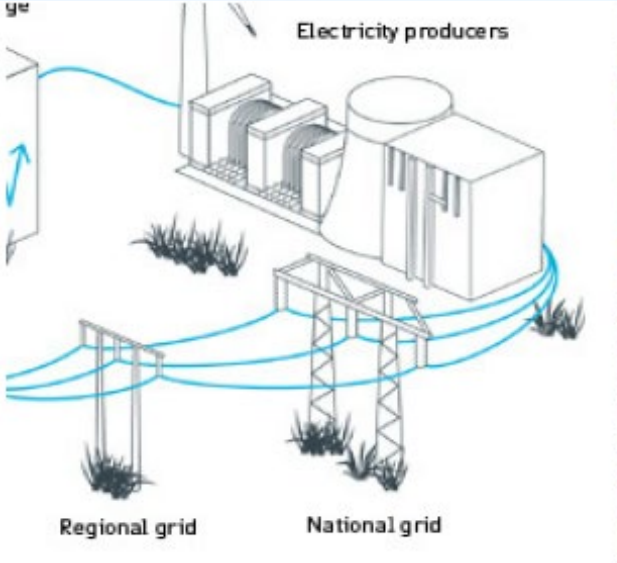

Energy Use

- ❑ Connect to grid at early stage, avoid using temporary generators
- ❑Use solar system to gain renewable energy

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Transportation

- ❑ Hybrid Car
- ❑ Shuttle bus

Material Reuse

- ❑ Recycle metal and reusable construction waste

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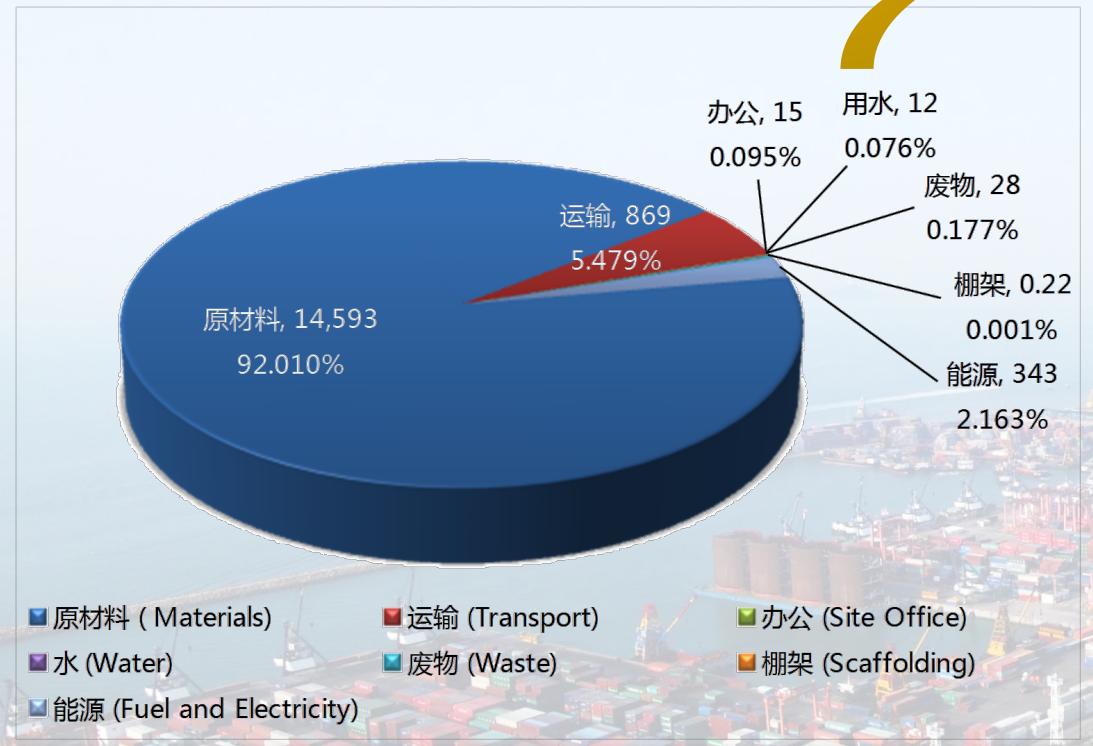
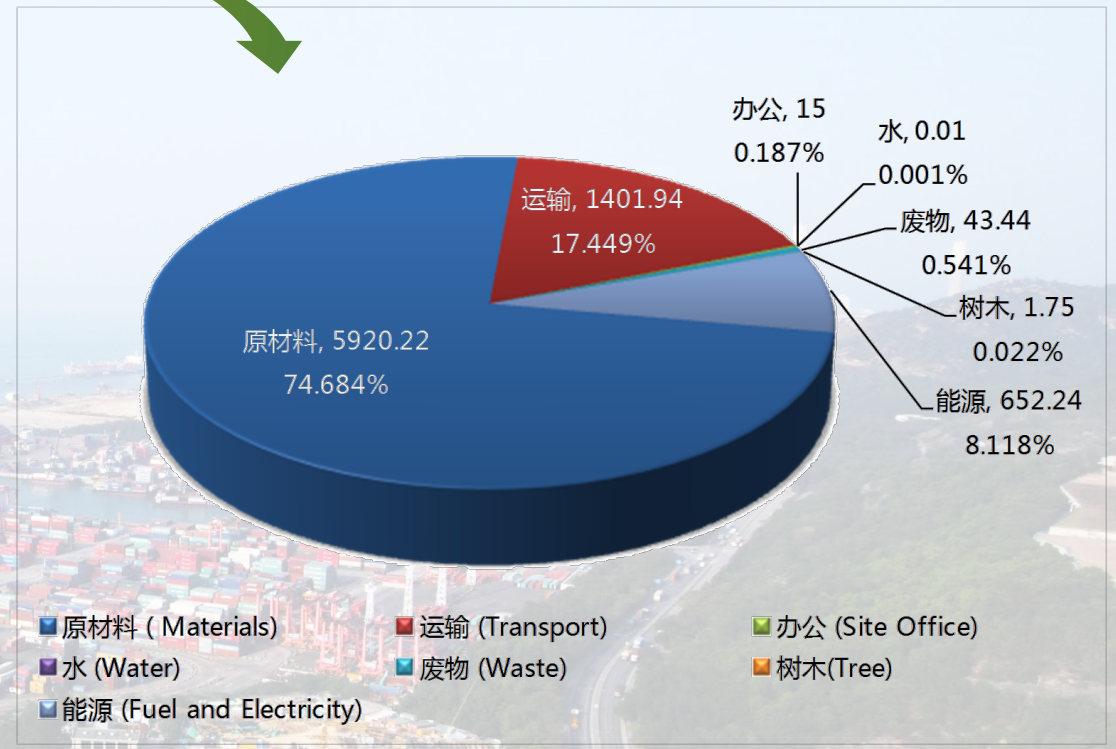
Water Reuse

- ❑ Rainwater and groundwater collection for car wash
- ❑ Collect condensation from AC for shoes wash
- ❑Rainwater collection for sprinkling dust

3 Application in STW — Case Sharing



Proportion of greenhouse gas emission from PPSTW in 2005



Proportion of greenhouse gas emission with the low carbon technology application during carbon audit

3 Application in STW — Case Sharing

Tree transplant and conservation

Compare to conceptual design
Green cover increased 36%

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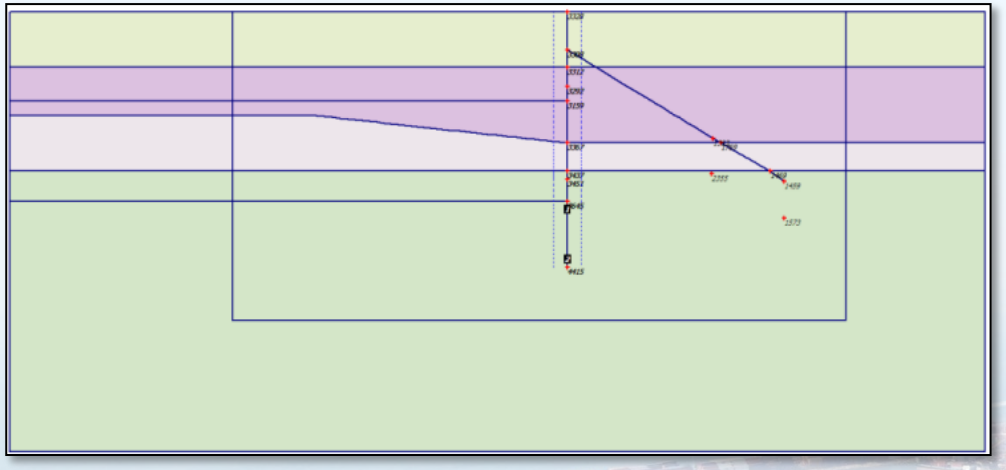

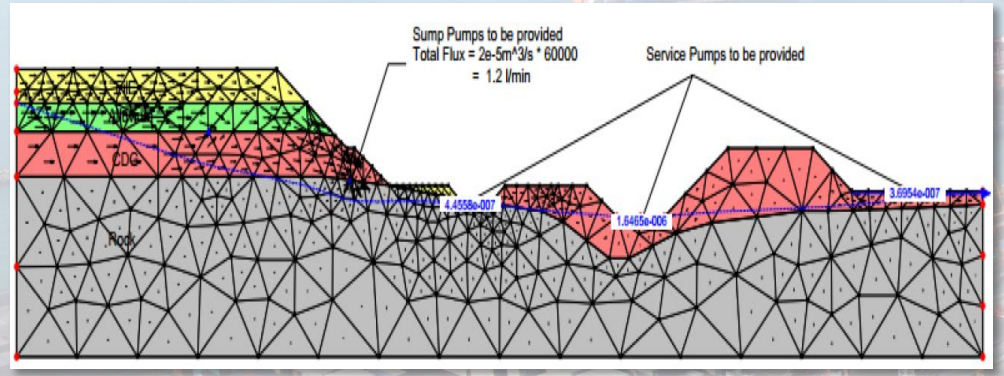

Numerical modelling of finite element method for simulating every single stage in excavation

Material Reduced

- Pipe pile (Ø610)

  8,800m
- Soil nail 99 nos.
- I beam 250 tones

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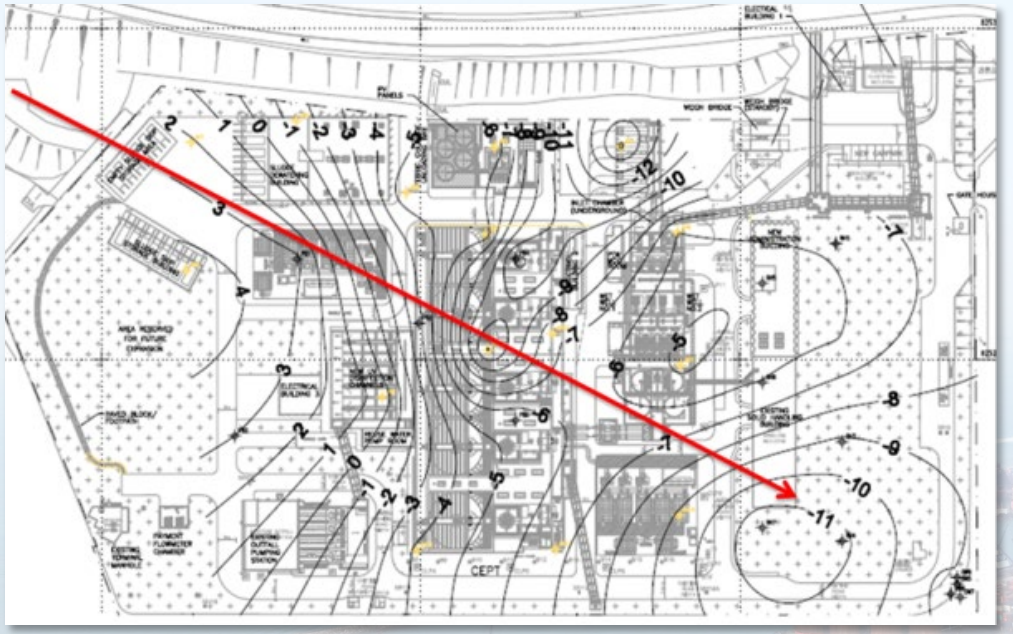
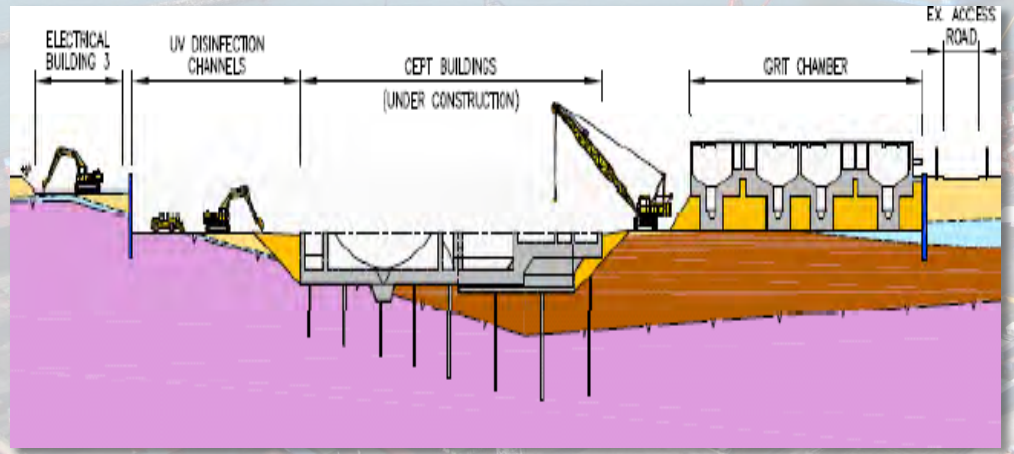


Based on ground investigation, the rockhead contour shown downward from northwest corner to southeast corner with a sink area in middle.

Place the deepest units, i.e. PTW and CEPT, to the sink area. Excavation works were accelerated and considerable cost saving。



Rockhead level from +4mPD downward -11mPD, approximate 15m level difference.

Re-arrange the general layout according to rockhead level to optimize the gravity flow condition and minimize the boost pump consumption by 15%.

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	Low-Carbon Technology	Less Carbon Tootprint	Less Carbon Footprint (CO_2) during 18 Months
Energy	Connect to grid at early stage, minimize the temporary diesel generator	651.9	652.24
	Use solar panel for electricity generation	0.34	
Material	Use PFA cement	2536	5920.22
	Use reinforced glass fiber	363	
	Reuse the excavation soil to back fill	1049	
	Use metal scaffolding	129.52	
	Reusable formwork	1777	
	Open cut method rather than the lateral support	65.7	
Trans portation	Use hybrid vehicle	7.04	01.94
	Tower Crane for lifting works on site		
	Shuttle bus for staff transportation		
	Minimize air transportation by land/sea transportation	1011.1	
Waste	Recycle steel waste generated from site	28.66	43.44
	Surplus concrete for making brick	7.9	
	Recycle the waste by classification	6.88	
Water	Collect rainwater and condensation from AC	0.01	0.01
Tree	Tree transplant and reservation	1.75	1.75
	Total =	8020	8020

8020

Carbon Footprint during Construction Activities		With Low-carbon Technology During 18 Months	Without Low-carbon Technology During 18 Months
CAT 1 Direct Greenhouse Gas Emission	Flowing Combustion Source	43	125
	Stationary Combustion Source	311	1508
	Tree	-2	0
CAT 2 Indirect Greenhouse Gas Emission by using energy	Purchase electricity from power plant	599	N/A
CAT 3 Other Indirect Greenhouse Gas Emission	Reuse waste water	1.8	2.1
	Material		20272
	Material Transportation		1111
	Waste Recycle and Reuse	4254	6048
	Staff Transportation	375	737
Total CO_2 emission, t		21784	29803
Less CO_2 emission, t			8020
Reduce Rate			-27%

27%

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Carbon Audit by Independent Consultant

- Total amount of carbon emission reduced 8,020 tons during the 18 months carbon audit. Equivalent to 348,696 nos. of tree carbon uptake for one year
- Achieve 27% emission reduction rate, far more than original target 15%

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Success application of low-carbon water treatment projects

Expansion of Tai Po Water Treatment Works
Contract Sum: HKD 3.25 Billion

Stonecutters Island Treatment Works
Contract Sum: HKD 5.25 Billion

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Awards from Hong Kong Authority

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Award from China Construction Industry Association

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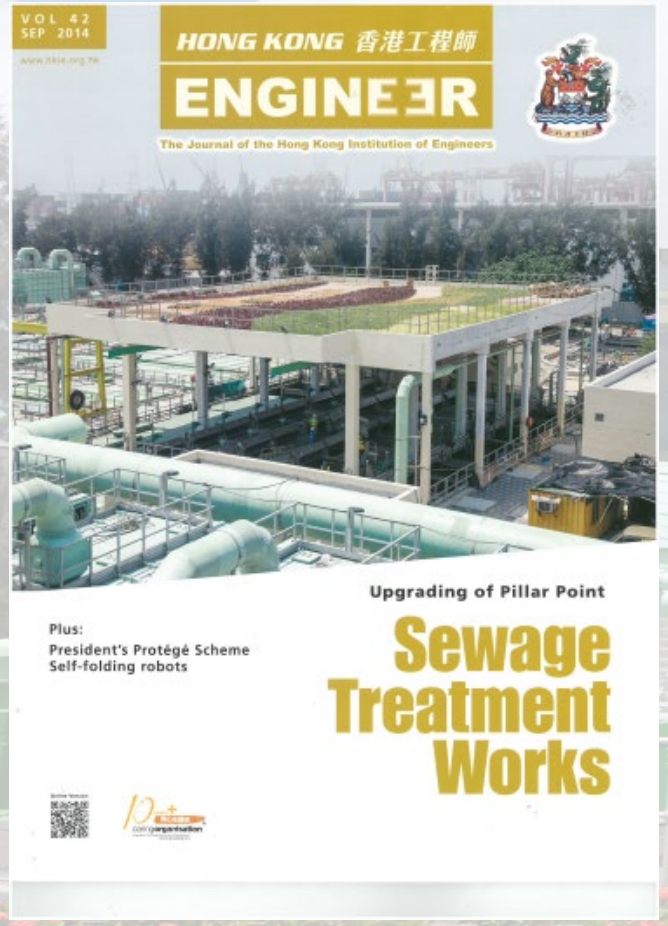
Publication



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THANK YOU !!!