

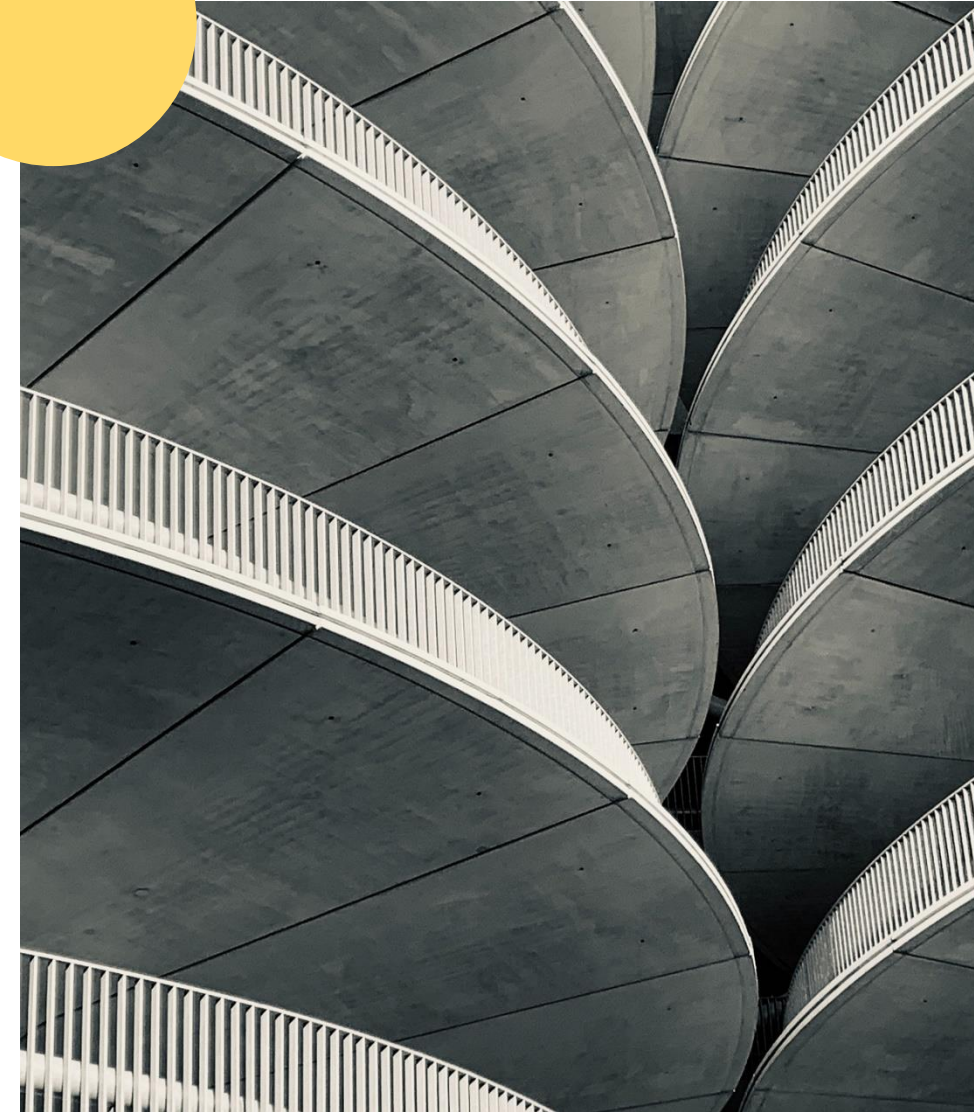
Low-Carbon Concrete

Are You Ready?

Ivan FU

Chairperson, Committee on Environment, CIC

10 November 2022



THE URGENCY

Our planet is burning!



Carbon Neutrality in Buildings – Whole Building Life Cycle



Whole Life Building Cycle

- **2030** New buildings, infrastructure and renovations have at least **40% less embodied carbon with significant upfront carbon reduction** and all buildings must be net zero operational carbon.
- **2050** New buildings, infrastructure and renovations have **net zero embodied carbon**, and all buildings must be net zero operational carbon.

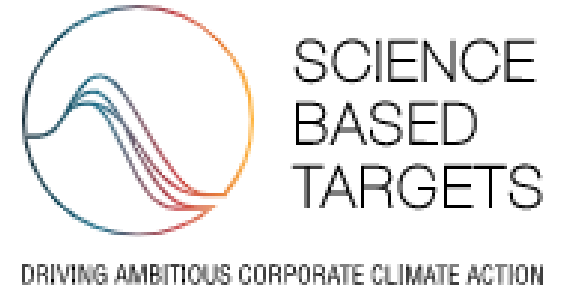


Regions with Whole Life Carbon Roadmaps in Place

- **EU** Policy Whole Life Carbon Roadmap for buildings
- **UK:** Net Zero Whole Life carbon roadmap for the Built environment
- **The Netherlands:** Whole Life Carbon Roadmap
- **Spain:** Whole Life Carbon Roadmap for a decarbonized built environment
- **Finland:** Action Plan for a Carbon Neutral Built Environment
- **Poland:** How to Decarbonise the Built Environment by 2050: Whole Life Carbon Roadmap
- **France:** A pathway to decarbonisation (2050)



HK Private Sector Accelerates in Scope 3 Emissions Reduction



39 HK Companies have already committed to SBTi

- **16** of which are committed to Scope 3 emissions reduction
- **8** of them are developers and
- **1** of them is construction materials provider

Drive for private sector to look at whole life carbon

- Maintain Industry leadership
- Reputation
- Financial viability (e.g. one of the companies have 40% of its current bond and loan facilities come from green financing)
- Manage and pre-empt climate risks (e.g. possible change in regulations in future)

Examples with HK Companies with Scope 3 commitment

Alliance Construction Materials Limited	Chinachem Group	HongKong Land Holdings Limited	New World Development Company Limited	Swire Properties Limited
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Cement

accounts for

2.4 Gt (7%)

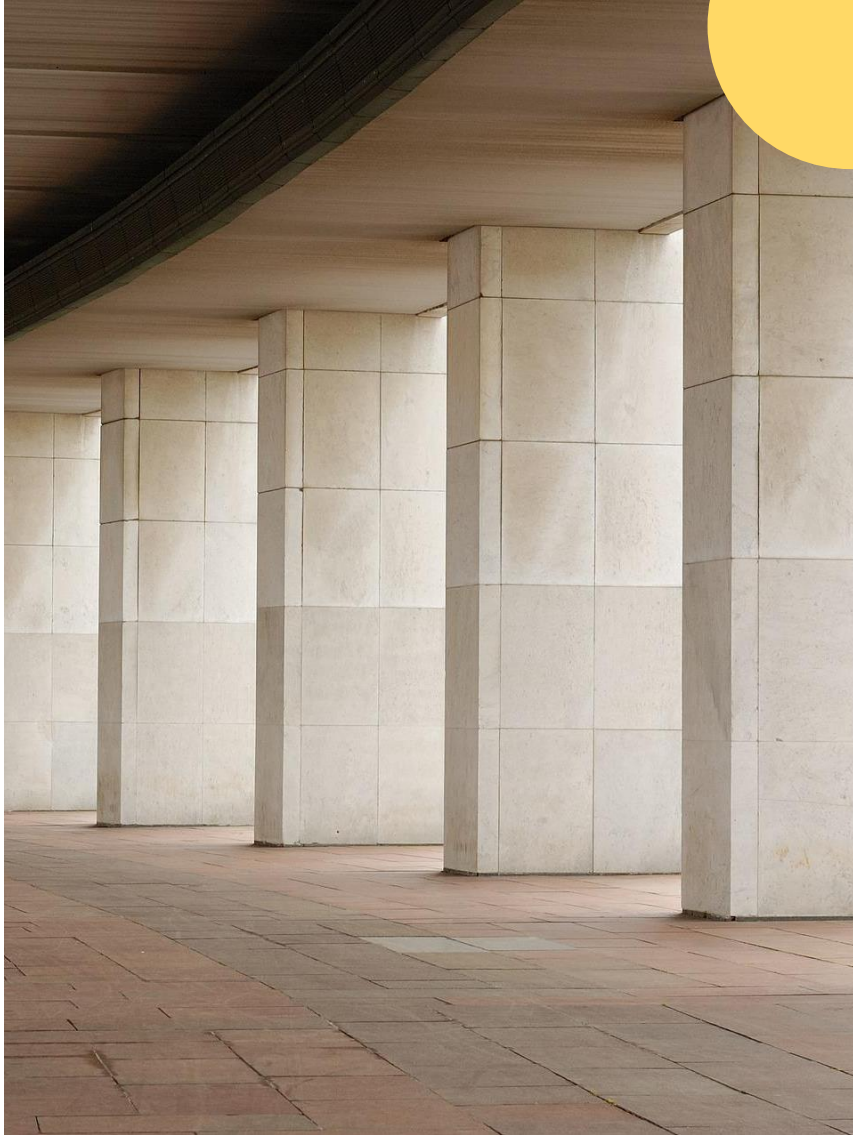
of global carbon emissions (34.29 Gt)

GLOBAL INITIATIVES on Low-carbon Concrete

Where is HK Now?

	CN	SG	UK	HK	CA	AU	US
Certification	✓	✓	✓	✓ Green Product Certification	✗	✓	✗
Incentives	✗	✓	✓	✗ ✓ Beam Plus	✓	✓	✓
Technology	✓	✓	✓	✓	✓	✓	✓
Policies	✓ <混凝土与水泥制品行业“十四五”发展指南> • 建立规模化、高值化利用固废矿物材料技术和标准体系，最大限度降低水泥熟料用量、提高固废利用率。	✗	✓ Routemap	✗	✗	✗	✗



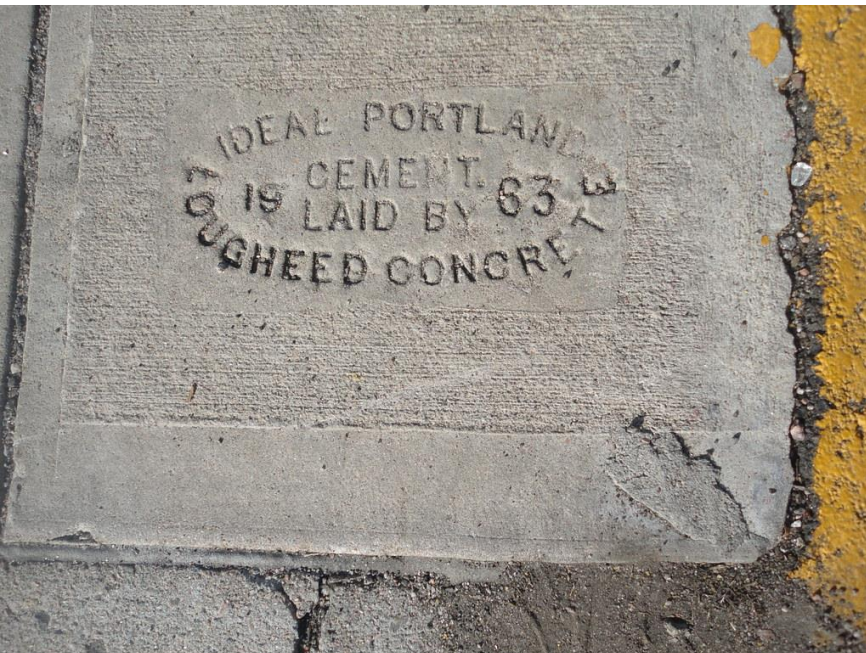


Market OVERVIEW

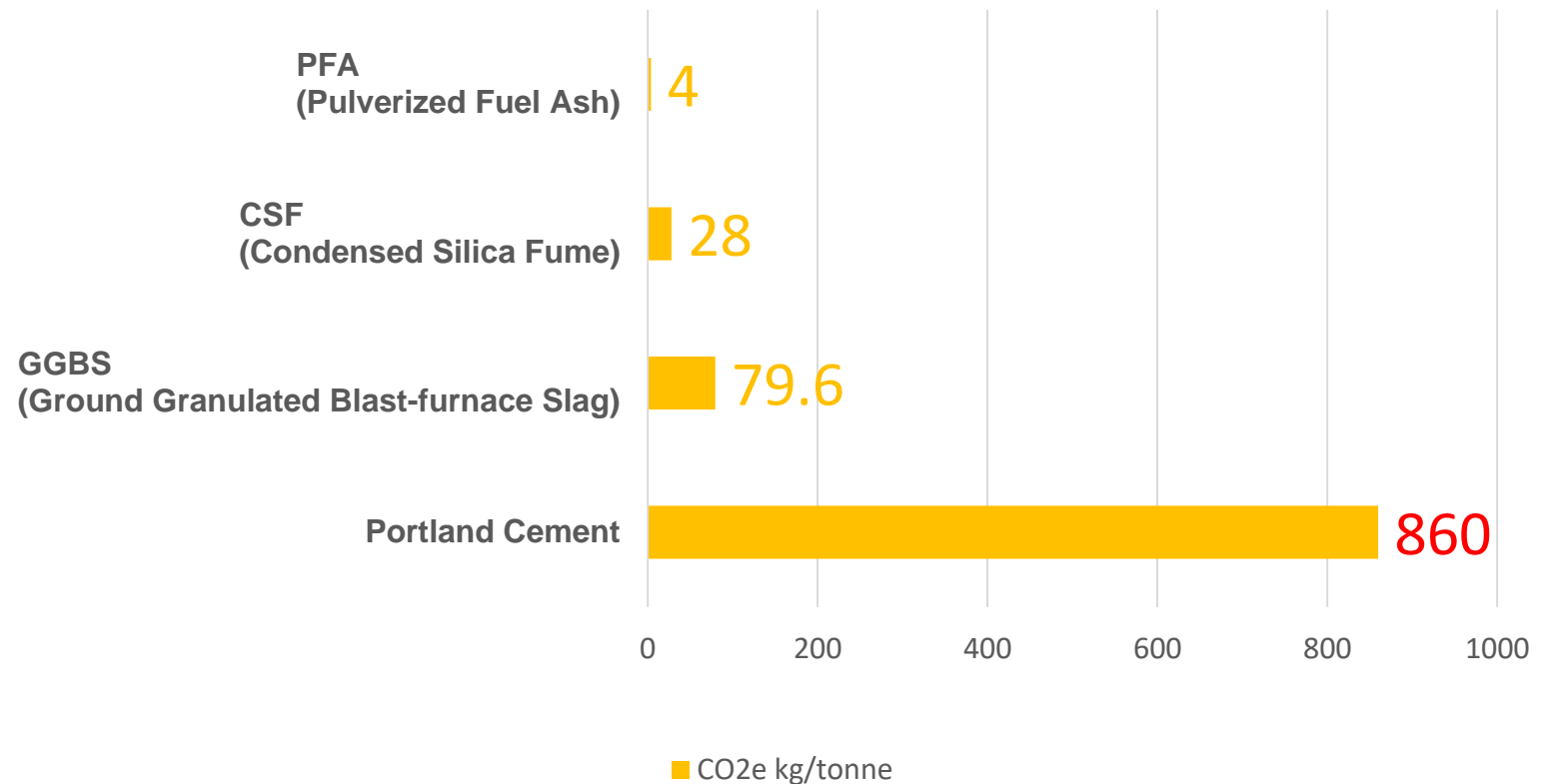
How well does HK market adopt
low-carbon concrete?



Key of low-carbon concrete is CEMENTITIOUS MATERIALS



Embodied carbon of cementitious materials

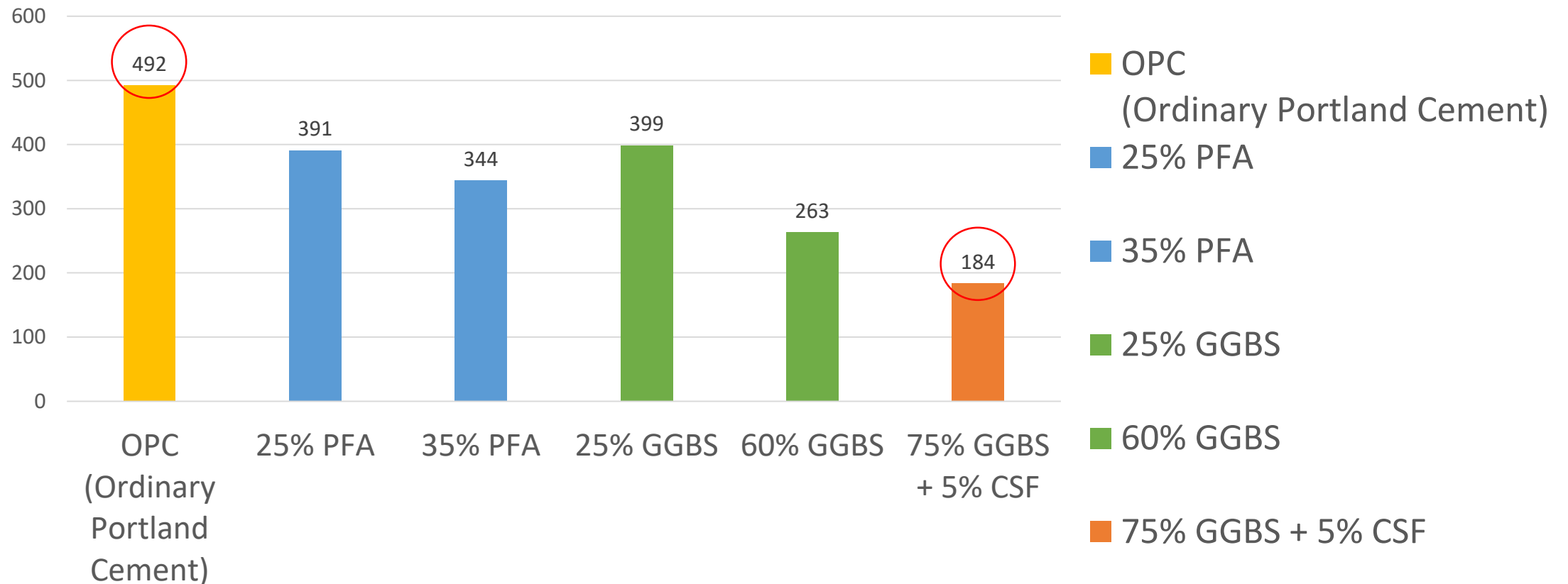


Reference:
Mineral Products Association (UK) – Fact Sheet 18
Hong Kong Construction Materials Association Limited



Achieve at most **63%** of carbon reduction via working on **CONCRETE MIXES**

Embodied Carbon of Concrete Mixes (kg CO₂e/m₃)

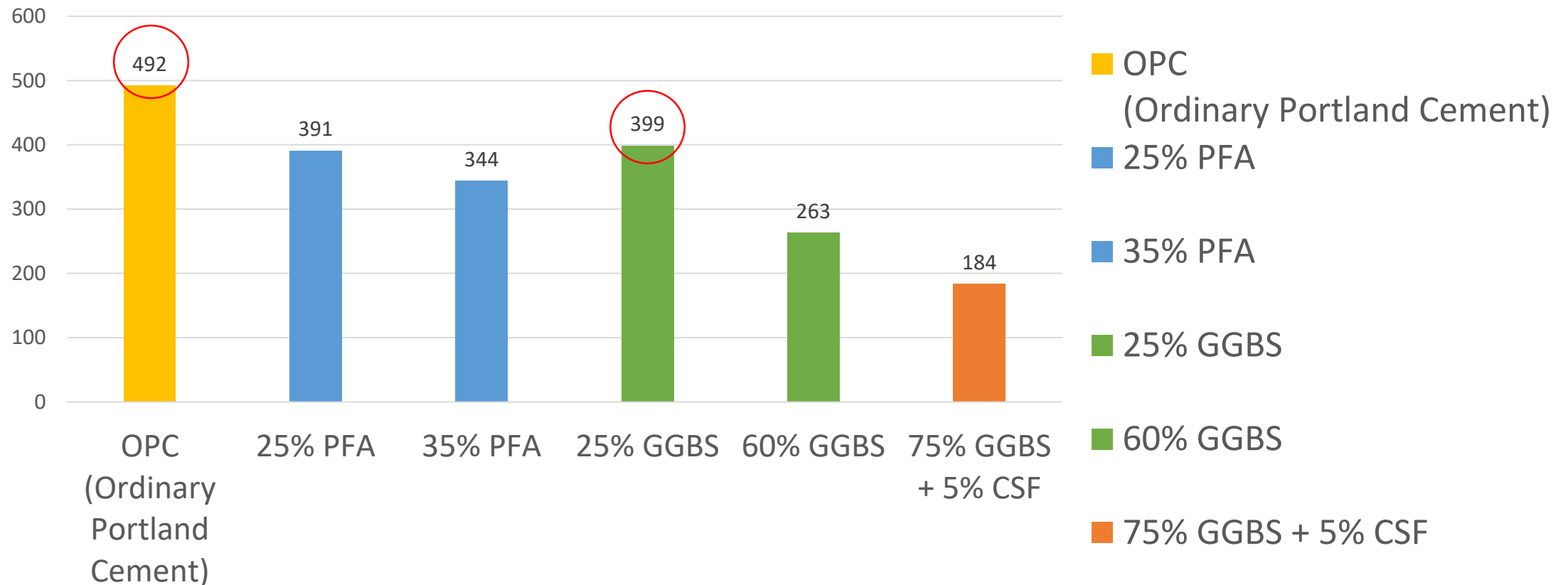


Reference:
Hong Kong Construction Materials Association Limited, Apr 2016



Achieve at least **18%** of carbon reduction via working on **CONCRETE MIXES**

Embodied Carbon of Concrete Mixes (kg CO₂e/m₃)



Reference:
Hong Kong Construction Materials Association Limited, Apr 2016



CIC Green Product Certification **GPC**

Assess carbon footprint on three construction material types, namely:



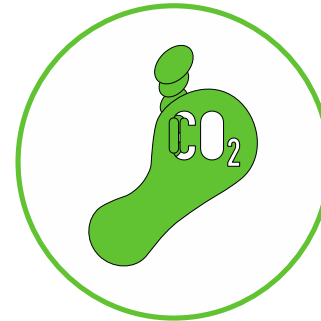
Cement



Ready-mix
Concrete



Structural Steel
and Reinforcing
Bar



Carbon
Footprint



Credits attained
under BEAM Plus
New Building 2.0



CIC GREEN
PRODUCT CERTIFICATION

A primary and
comprehensive building
and construction
materials / products
certification scheme in
HK

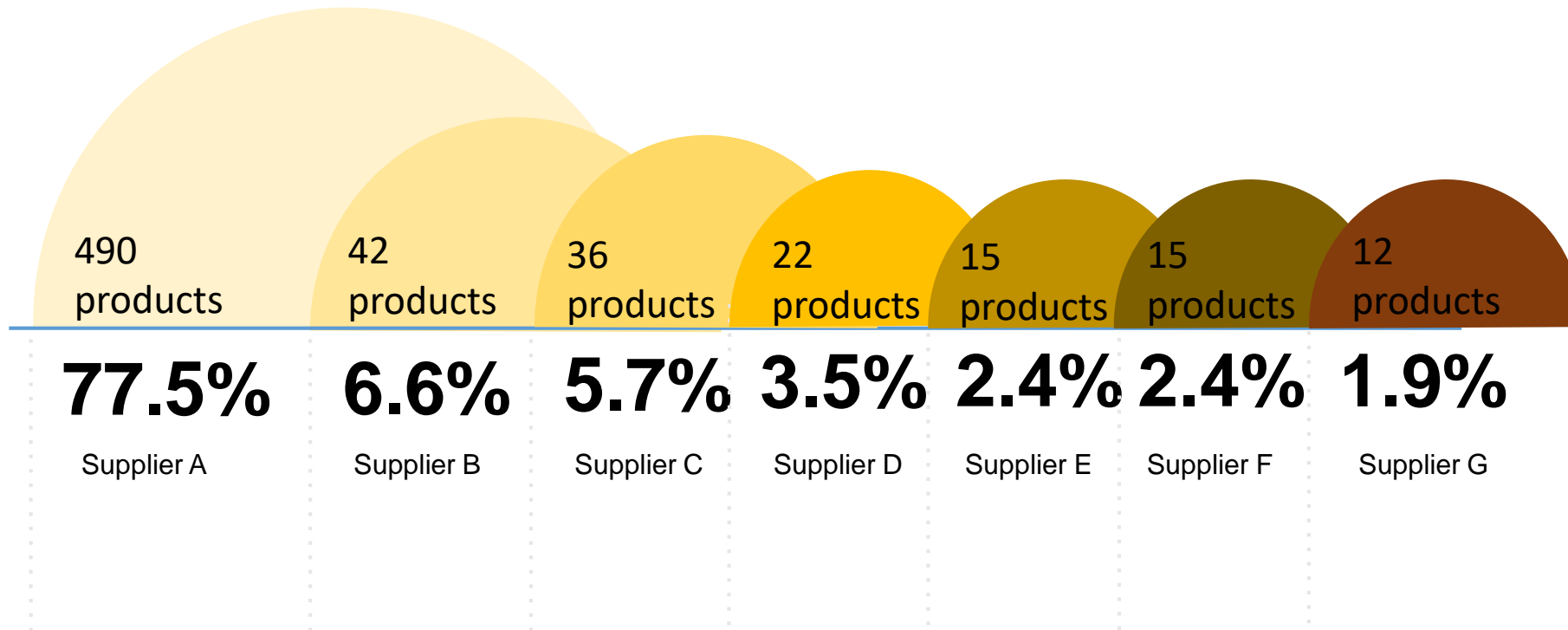


<http://cicgpc.hkgbc.org/hk/>



Seven suppliers provide 632 GPC certified ready-mix concrete in HK (as of Aug 2022)

MARKET SHARE OF LOW-CARBON CONCRETE UNDER GPC (BY NO. OF PRODUCTS)



Benchmark for Ready-mixed Concrete Under CIC GPC

Table 1. Benchmark for Ready-mixed Concrete under the CIC Green Product Certification

Concrete Grade	C30	C35	C40	C45	C50	C60	C70	C80
E _{da}	296	323	350	373	396	443	490	490
Certification Level	(kgCO ₂ e/m ³)							
Platinum	<252	<275	<298	<318	<337	<337	<417	<417
Gold	252-280	275-306	298-332	318-354	337-375	337-420	417-465	417-465
Silver	281-310	307-339	333-367	355-391	376-415	421-464	466-514	466-514
Bronze	311-340	340-372	368-403	392-429	416-455	465-509	515-563	515-563
Green	>340	>372	>403	>429	>455	>509	>564	>564

CIC GPC Assessment Guide – Ready-mixed Concrete



Ready-mix Concrete



CIC GREEN
PRODUCT CERTIFICATION

Platinum: 483 products (76%)
 Gold: 91 products (14%)
 Silver: 29 products (4%)
 Bronze: 22 products (3%)
 Green: 7 products (1%)

(as of Aug 2022)



Industry Insight

Annual concrete consumption in HK:

Approx. 1,440 Mt

Only 4-5% are PFA Concrete Mix

Market Share of
**Traditional
Concrete**

PFA Concrete Mix



Higher cost for low-carbon concrete? A CONCRETE TRUTH or A Myth?

- Cost varies since seasonal cost of PFA fluctuates, i.e. PFA cost is higher in winter
- As global and local supply of PFA will decrease further, PFA cost will be higher
- Some PFA concrete mix suppliers estimate that low-carbon concrete costs 6-10% more.
- Some contractors and concrete providers reflect that the overall cost of the concrete with high GGBS content for cement replacement should be comparable to OPC.

What should be done to address the cost concerns?



What can be done to address the cost concerns?

- Use GGBS concrete mix
- The industry should work together to explore a affordable / comparable cost solution of GGBS low-carbon concrete.
- One **KEY** is to **address the egg-and-chicken problem**, i.e. the supply and demand



Lack of Demand - contractual and regulatory requirements

- If there are no mandatory contractual requirements, **there is less motivation** for the architect/design consultant to shift to low-carbon concrete.
- Currently, there is no regulation or policy on adoption low carbon concrete. Many public projects are still using 100% OPC concrete.

What should be done?

- Requirements from project owners including public projects, e.g. public housing, infrastructure
- Can start with pilot scheme in public projects




Demand drives Supply

- If there is a higher demand for low-carbon concrete in the market, concrete suppliers will be motivated to transform themselves to take up the market.
- In order to manufacture low-carbon concrete, the concrete plants have to build additional silos (for production of GGBS concrete mix) in suitable areas.



Once a low-carbon concrete supply chain is established, the cost will be more competitive.



A high-angle, perspective view of a large, intricate maze constructed from grey stone blocks. The maze consists of numerous rectangular paths and dead ends, creating a complex, labyrinthine structure. The lighting is bright, casting shadows that emphasize the three-dimensional nature of the stone walls. A yellow rectangular box is superimposed over the center of the maze, containing the text 'TECHNICAL Misconception' in black, bold, sans-serif font.

TECHNICAL Misconception



Technical Misconception on GGBS concrete Mix

Concerns on Early Strength?

- ✓ Modern concrete technology has improved the mix design of high GGBS content concrete which can achieve design strength at early stage for building works.
- ✓ High GGBS content (up to 75%) concrete are widely adopted in piling, substructure and pile cap
- ✓ Maturity sensor to measure early strength build up

More....

GGBS shows better performance than OPC

- ✓ Better workability
- ✓ Better resistance to corrosion and durability
- ✓ Better strength after 28 days



Concrete Maturity Sensors



Mindset Change - Are you Ready?

Thank you



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