CONSTRUCTION INDUSTRY COUNCIL

CIC GREEN PRODUCT CERTIFICATION

Assessment Standard

Cement

(Version 2.0)

Cement

Summary of Assessment Criteria

CORE CRITERIA

<table>
<tr><th rowspan="2">Criteria</th><th rowspan="2">Requirements</th><th rowspan="2">Verification</th><th colspan="2">Point</th><th rowspan="2">Index</th></tr>
<tr><th>Basic</th><th>+Bonus</th></tr>
<tr><td colspan="6">CARBON</td></tr>
<tr><td>CFP quantification</td><td>Provide a life cycle assessment report with the carbon footprint of products (CFP) in kgCO2e/t of product, covering at least A1 to A3 and meet the requirement in below.
<table>
<tr><th>Points</th><th>CFP
(tCO_2e / t of product)</th></tr>
<tr><td>50 Basic + 40 Bonus</td><td><0.658</td></tr>
<tr><td>50 Basic + 30 Bonus</td><td>0.659-0.790</td></tr>
<tr><td>50 Basic + 20 Bonus</td><td>0.791-0.966</td></tr>
<tr><td>50 Basic + 10 Bonus</td><td>0.967-1.097</td></tr>
<tr><td>50 Basic</td><td>>1.098</td></tr>
</table></td><td>CFP quantification report

OR

Environmental Product Declaration (EPD)</td><td>50</td><td>+10/+20
+30/+40</td><td>4.1.1</td></tr>
<tr><td></td><td></td><td>Subtotal:</td><td>50</td><td>+40</td><td></td></tr>
</table>

NON-CORE CRITERIA

<table>
<tr><th rowspan="2">Criteria</th><th rowspan="2">Requirements</th><th rowspan="2">Verification</th><th>Points</th><th rowspan="2">Index</th></tr>
<tr><th>+Bonus</th></tr>
<tr><td colspan="5">RESOURCE</td></tr>
<tr><td>Waste Management</td><td>The manufacturer implement waste management system aimed at minimizing waste generation and promoting the recycling of materials produced during the manufacturing process.</td><td>Waste Management Report</td><td>+5/+10</td><td>4.2.1</td></tr>
<tr><td colspan="5">ENVIRONMENT</td></tr>
<tr><td>Regional Materials</td><td>Meet 95 % localisation degree of raw materials.

Raw Materials Transported by transportation
<table><tr><td>Road</td><td>Rail</td><td>Sea</td></tr><tr><td>≤ 800 km</td><td>≤ 1600 km</td><td>≤ 4000 km</td></tr><tr><td colspan="3">radius of the manufacturer</td></tr></table></td><td>Self-prepared calculation report with relevant supporting e.g Purchase Order, Delivery Note</td><td>+5</td><td>4.3.1</td></tr>
<tr><td colspan="5">PERFORMANCE</td></tr>
<tr><td>Advancement</td><td>Products that achieve a valid “Product Conformity Certification Scheme for Cement Products” certificate</td><td>Valid certificate of Product Conformity Certification Scheme</td><td>+5</td><td>4.4.1</td></tr>
<tr><td colspan="5">INNOSMART</td></tr>
<tr><td>Innovations & Additions</td><td>Adopt new practice, technology and strategy; OR Achieve exemplary performance</td><td>Narrative with supporting</td><td>+5</td><td>4.5.1</td></tr>
<tr><td></td><td></td><td>Subtotal:</td><td colspan="2">+10 (Maximum)</td></tr>
</table>

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1. INTRODUCTION

1.1 PURPOSE

The CIC Green Product Certification Scheme (the “Scheme”) is a green product labelling scheme, owned by the Construction Industry Council (CIC) and implemented by the Hong Kong Green Building Council (HKGBC). The primary goal of the scheme is to support Hong Kong’s transition to a low-carbon economy by encouraging the adoption of environmentally friendly construction practices.

With the Green Product Certification, various stakeholders, including consumers, building professionals, construction practitioners and policymakers, can easily and unequivocally identify environmentally preferable construction materials and building products. This certification serves as a reliable indicator of a product’s sustainability, helping to drive market demand for greener options.

To ensure the credibility and effectiveness of the certification, the CIC and the HKGBC has jointly developed this Technical Assessment Standards (the “Standard”), which sets out the assessment criteria and their benchmarks to govern the application and award of a label under the Scheme. The comprehensive assessment evaluates the overall sustainability of construction materials and building products across multiple dimensions. These dimensions include environmental impact, resource efficiency, technical performance, and the use of smart manufacturing technologies.

The Standard is divided into two main parts:

- General Requirements (Refer to General Requirements provided in separate document). This part introduces Scheme's framework, outlines the application procedure, and details the grades.

- Technical Requirements (This document refers). This part defines the principles, requirements and guides for quantifying and reporting the products’ carbon footprint (CFP), along with other sustainability assessment criteria and scoring standards.

This Standard neither modifies nor supersedes laws and regulations. Compliance with this Standard is not a substitute for, and does not assure, compliance with any applicable laws or regulations. Compliance with all applicable laws and regulations is a prerequisite for the manufacturing and marketing of the product.

The Scheme is owned by the Construction Industry Council (CIC), 38/F, COS Centre, 56 Tsun Yip Street, Kwun Tong, Kowloon, Hong Kong; and operated by Hong Kong Green Building Council (HKGBC), 1/F, Jockey Club Environmental Building, 77 Tat Chee Avenue, Kowloon Tong, Hong Kong, Phone: +852 3994 8888, Email: cicgpc@hkgbc.org.hk

1.2 BACKGROUND AND SCOPE

Cement is extensively used in the construction industry as an essential ingredient in producing ready-mixed concrete. As cement production is energy-intensive, consuming large quantities of fuel during manufacturing, especially the kilning process, the cement industry alone generated approximately 7% of the global anthropogenic carbon dioxide (CO_2) emissions and is the third-largest industrial energy consumer. (IEA, 2018).

This Standard applies to cement and inter-ground or blended mixtures of cement with other materials, which may include gypsum, limestone, fly ash, blast furnace slag, or naturally occurring pozzolanic materials, e.g. CEM I, CEM II, CEM III.

- CEM I: Portland cement consists of 95% to 100% clinker with a maximum of 5% minor additional constituents (such as limestone).
- CEM II: A composite cement containing clinker, and up to 35% of another single constituent such as fly ash, slag, or limestone.
- CEM III: A composite cement consisting of clinker, and a higher percentage of blast furnace slag ranging from 36%-95%.

2. DEFINITIONS & ACRONYMS

2.1 TERMS RELATING TO CEMENT PRODUCTION

Bypass dust: The discarded dust from the bypass system de-dusting unit of suspension pre-heater, pre-calciner, and grate pre-heater kilns, consisting of fully calcined kiln feed material.

CaO: Calcium Oxide

Cement: A hydraulic binder, i.e. a finely ground inorganic material which, when mixed with water, forms a paste which sets and hardens by means of hydration reactions and which, after hardening, retains its strength and stability even under water.

Cement kiln dust (CKD): The discarded dust from the long dry and wet kiln system de-dusting units, consisting of partly calcined kiln feed material. Extraction and discarding of the bypass dust and CKD serve to control excessive circulating elements input (alkali, sulphur, chlorine), particularly in the case of low alkaline clinker production. The term "CKD" is sometimes used to denote all dust from the cement kilns, i.e. also from the bypass systems.

Clinker: A semi-finished product of kiln which is ground to make cement; and it is obtained by grinding and burning a mixture of mainly calcareous and argillaceous materials in the kiln.

CSI: Cement Sustainability Initiative.

Mineral components (MICs):	Natural or artificial mineral materials with hydraulic properties, used as clinker or cement substitutes (e.g. blast furnace slag, fly ash, pozzolana, etc.
MgO:	Magnesium Oxide
Raw Meal:	The mixture of raw materials in the required chemical composition for the production of cement clinker.
TOC:	Total organic carbon.
WBCSD:	World Business Council for Green Development.
WRI:	World Resources Institute.

2.2 TERMS RELATING TO LIFE CYCLE ASSESSMENT (LCA)

For terms related to LCA, please refer to General Requirements.

3. CFP STUDY – PRODUCT CATEGORY RULE (PCR)

3.1 GOAL

The goal of carrying out a CFP study is to calculate the potential contribution of a specific cement product to climate change expressed as CO_{2e} by quantifying all significant GHG emissions and removals over the cement product's life cycle.

The CFP study reports submitted by Applicants will be evaluated by HKGBC for product certification purposes. This is facilitated by identical CFP quantification and communication requirements under the same product category as stipulated in Annex C of ISO 14067:2018.

This section sets the PCR of cement products for CFP quantification and reporting under the Scheme following the four phases of life cycle assessment (LCA), i.e. goal and scope, LCI, LCIA, and life cycle interpretation. Applicants should refer to the principles and methodology detailed in ISO 14067:2018 and WBCSD (2011) for CFP quantification and reporting.

3.2 PRODUCT DESCRIPTION AND DECLARED UNIT

The CFP study should be conducted on a per-product basis. Refer to Section 1.2 for the description of the Cement product covered under this PCR.

The declaration unit is defined as 1 tonne of cement product. The CFP shall be reported in tCO_2e.

The CFP Study shall include at least the following description of the product

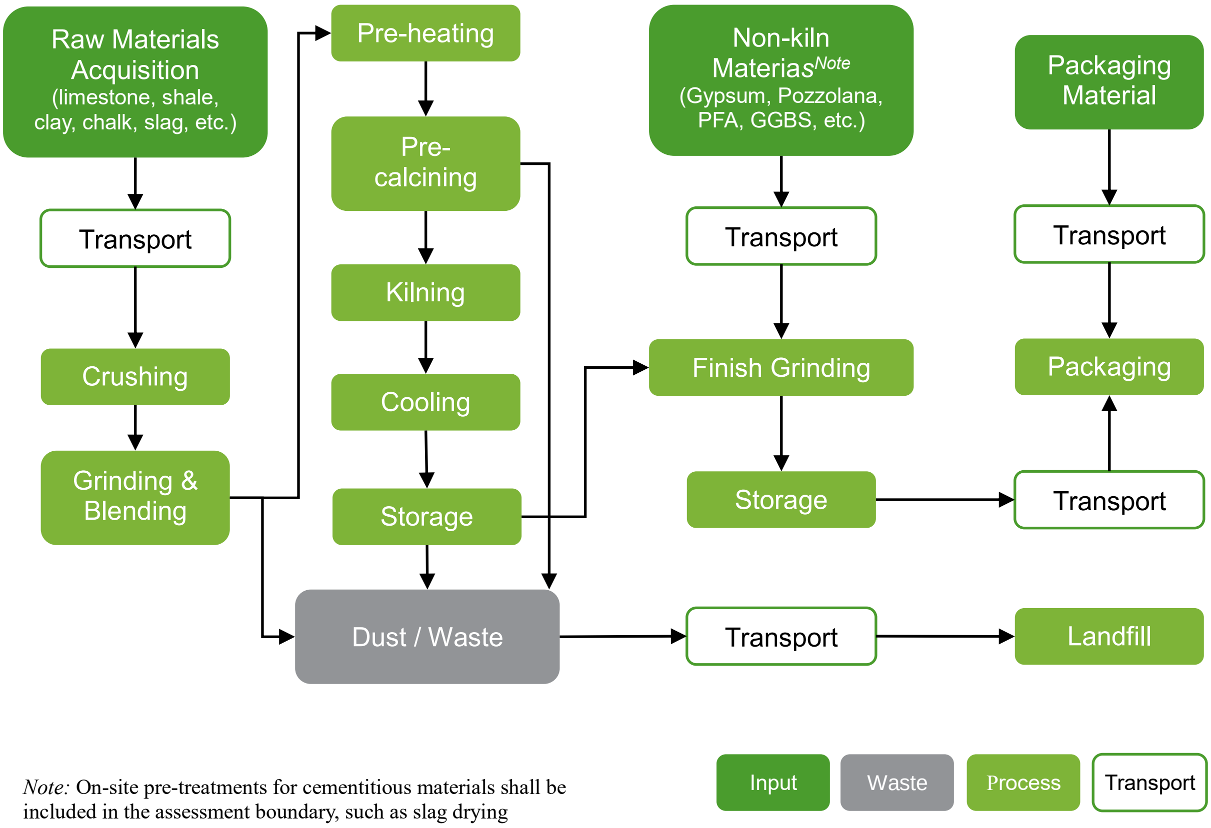
- Mix composition
- Specified compressive strength

3.3 SYSTEM BOUNDARY

The PCR is developed to capture the product stage A1-A3 (Cradle-to-gate) as defined in ISO 14025:2006, ISO 14067:2018, ISO 21930:2017, GB/T 24067-2024 or BS EN 15804:2012+A2: 2019.

3.3.1 Overview of Process Map of Cement Manufacturing

The key unit processes of cement manufacturing within the stipulated system boundary are presented in Figure 1 for CFP quantification. The raw materials of cement i.e. calcium silicate minerals are first quarried or mined and transferred to the manufacturing facility to be crushed into fine powder, blended and milled before entering into a pre-heater and eventually a large rotary kiln where materials reach a temperature of 1,450°C. The most carbon-intensive stage of the process is pre-calcining; the chemical reactions in the calcination process typically emit 60-70% of direct CO_2 emissions. Fuel combustion generates the rest 30-40% of direct CO_2 emissions (IEA, 2018). The clinker or kiln product is cooled to ensure the maximum yield for the compound that contributes to the hardening properties of cement and the excess heat is typically routed back to the preheater units. Supplementary cementitious materials such as slag, fly ash, fine limestone, pozzolana or other materials can be interground or blended to replace part of the clinker. Prior to packaging, gypsum is added to the clinker to control the setting time. The end product is a very fine-grained blended cement (≈ 10 micron).



Note: On-site pre-treatments for cementitious materials shall be included in the assessment boundary, such as slag drying

Figure 1 Process Map of Cement Manufacturing[1]

[1] The figure shows a typical cement production process. There are older, much less efficient technologies, for example the wet kiln into which the raw material is fed as slurry and not as a powder (dry kiln).

3.3.2 Sources of GHG Emissions

The qualitative and quantitative data for inclusion in the life cycle inventory shall be collected for all unit processes that are included in the predefined system boundary and process map. The assessment and reporting of GHG emissions and removals of cement are divided into direct emissions and indirect emissions.

> **Direct vs. Indirect Emissions**
>
> The direct emissions stem from sources that are owned or controlled by the material supplier. The indirect emissions originate from sources that are controlled by third parties, but they are nonetheless related to the activities of the material supplier.
>
> WBCSD (2013b)

The GHG assessment framework is developed based on the ISO 14067:2018 "Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification" and the "CO_2 and Energy Accounting and Reporting Standard for the Cement Industry" issued by WBCSD (2011). The Applicant is required to quantify and report the carbon footprint of a specific cement product using the CFP quantification tool (in Excel format) provided by our designated operator, HKGBC or providing an EPD report compliance with applicable standards, including ISO 14025:2006, ISO 14067:2018, ISO 21930:2017, GB/T 24067-2024 or BS EN 15804:2012+A2:2019.

The assessment of the GHG emissions generated and removed throughout the cement product processes shall be made based on an attributional approach, i.e. by assessing the carbon contents associated with inputs and outputs of a specific process. For instance, the GHG emissions of by-product gases, either for internal or external use, should first be subtracted within the process boundary. Subsequently, the GHG emitted from the fuel combustion and chemical reduction owing to the use of the by-product gas associated with the assessed product should be assessed and reported in the subsequent processes.

3.3.2.1 Direct Emissions

The sources of direct GHG emissions include i) raw material calcinations and combustion; ii) combustion of kiln fuels; and iii) combustion of non-kiln fuels.

i) Raw Materials Calcination and Combustion

CO_2 will be released from the following three sources related to raw materials:

- Calcinations of carbonates during the pyro processing of raw meal for clinker production[2].
- Calcination of cement kiln dust (CKD) and bypass dust leaving the kiln system; and
- Combustion of total organic carbon (TOC) contained in raw materials.

[2] Calcination CO_2 can be calculated in two ways: based on the volume and carbonate content of the raw meal consumed (input method), or based on the volume and composition of clinker produced (output method) plus dust leaving the system. Output method is adopted in this Guide and the CFP assessment tool. However, Applicants may choose to apply the raw meal-based input method of the clinker-based output method based on data availability.

Emissions of methane (CH_4) and nitrous oxide (N_2O) from cement kilns are insignificant due to the high combustion temperatures in the kilns. The other GHGs covered by the Kyoto Protocol (PFC, HFC, SF_6, NF_3) are irrelevant in the cement context and can therefore be ignored.

Calcination of Raw Materials for Clinker Production[3]

CO_2 from the calcination of carbonates in the raw meal shall be calculated based on the volume of clinker produced and an emission factor per tonne of clinker. The emission factor shall be determined based on the measured CaO and MgO contents of the clinker and corrected if relevant quantities of CaO and MgO in the clinker stem from non-*carbonate* sources. This could be the case when, for example, calcium silicate or fly ash being used as a raw material has entered the kiln. The determination of the emission factor for clinker shall be clearly documented. In the absence of any explicit data, a default of 525 kg CO_2/t clinker shall be used.

Calcination of Dust

CO_2 from bypass dust or CKD leaving the kiln system shall be calculated based on the complete volumes of dust leaving the kiln system and an emission factor. Bypass dust is usually fully calcined. Therefore, the emissions related to the bypass dust shall be calculated using the emission factor for clinker. CKD, as opposed to the bypass dust, is usually not fully calcined. The emission factor for CKD shall be determined based on the emission factor for clinker and the calcination rate of CKD, in accordance with Equation 1. This equation has been incorporated into the CFP quantification tool.

$$EF_{CKD} = \frac{\frac{EF_{Cli}}{1 + EF_{Cli}} * d}{1 - \frac{EF_{Cli}}{1 + EF_{Cli}} * d} \qquad \textit{Equation (1)}$$

where:

EF_{CKD}	=	emission factor of partially calcined cement kiln dust (tCO_2/t CKD)
EF_{cli}	=	plant specific emission factor of clinker (tCO_2/t clinker)
d	=	CKD calcinations rate (released CO_2 expressed as a fraction of the total carbonated CO_2 in the raw meal)

The calcination rate *d* of CKD shall preferably be based on the plant-specific data. However, if such data does not exist, a default value of 0 shall be used for dry process kilns as CKD is usually not calcined in this process. A default value of 1 shall be used for other processes (half dry, half wet or wet). Should there be no plant-specific data on the dust volume, the Intergovernmental Panel on Climate Change (IPCC) default for CO_2 from discarded dust (2% of clinker CO_2) shall be used. However, using plant or company-specific data is preferred.

[3] The CO_2 emissions from the calcination of relatively small amounts of carbonates in fuel ashes added to the kiln system shall be accounted by the reporting of fuel CO_2 emissions. This is assured by determining the CO_2 emission factors for fuels based on the total carbon content of the fuels, which includes both total organic carbon (TOC) and total inorganic carbon (TIC). Materials with high contents of both TOC and TIC (e.g. municipal sewage sludge) can be regarded as fuel and/or raw material. In any case, the complete CO_2 emissions resulting from their use shall be accounted.

Combustion of Total Organic Carbon (TOC)

In addition to the inorganic carbonates, the raw materials used for clinker production usually contain a small fraction of organic carbon, which is mainly converted to CO_2 during the pyro-processing of the raw meal. CO_2 emissions from organic carbon in raw materials shall be quantified and reported for the sake of completeness of the inventory. Since their contribution to the overall emissions is small, a simplified self-calculating mechanism has been implemented in the CFP quantification tool using the following default values:

- Default raw meal to clinker ratio: 1.55
- Default TOC content of raw meal: 2 kg/t raw meal (dry weight, corresponding to 0.2%)

The Applicant is not required to analyse these emissions any further unless there are indications that the organic carbon is more relevant in their context. Furthermore, any volumes of dust leaving the kiln system are not automatically reflected in this default calculation. To analyse the TOC-related emissions in greater detail, manufacturers producing substantial quantities of dust should enter their plant-specific raw meal to clinker ratios. The plant-specific raw meal to clinker ratios should exclude the ash content of the fuels used in order to avoid double counting.

ii) Combustion of Kiln Fuels

Kiln fuels include all conventional and alternative fuels fed to the kiln system plus fuels used for drying and processing the raw materials or other kiln fuels, irrespective of the potential use of waste heat for the production of electrical power.

Conventional Fuels

Conventional kiln fuels are fossil fuels, e.g. coal, petcoke, fuel oil and natural gas. The preferred approach is to calculate CO_2e from conventional kiln fuels (the same applies to alternative and non-kiln fuels) based on fuel consumption, lower heating values, and matching CO_2e emission factors. Fuel consumption and lower heating values of fuels should be regularly measured at the plant level. It is important to note that the applied heating value always has to match the status of the fuel, especially with respect to the correct moisture content during its weighing (raw coal or dried coal).

Default emission factors per GJ lower heating value are extracted from IPCC (2006 and 2019) and listed in the CFP quantification tool. Manufacturers are encouraged to use the plant or country-specific emission factors if reliable data is available. The emission factor of fuels shall be based on the total carbon content. Direct calculation of emissions based on fuel consumption (in tonnes) and fuel carbon content (in percent) is acceptable on condition that the material variations in the composition of fuel, and especially its water content, are adequately accounted for. Generally, the IPCC recommends the accounting for incomplete combustion of fossil fuels. In cement kilns, however, this effect is negligible, due to the very high combustion temperature and a long residence time in kilns along with a minimal residual carbon found in clinker. Consequently, carbon in all kiln fuels shall be treated as fully oxidised.

Alternative Fuels

The cement industry increasingly uses a variety of alternative fuels, which are typically derived from waste. Therefore, without this application, the waste would have to be disposed of in some other forms, usually by landfilling or incineration. Alternative fuels include fossil fuel-based fractions, such as waste oil and plastics, and biomass fractions, such as waste wood and sewage sludge. They serve as a substitute for conventional fossil fuels, and IPCC 2006 guidelines for national GHG inventories require the following:

- The amount of GHGs taken up in biomass and the equivalent amount of GHG emissions from the biomass at the point of complete oxidation result in zero net GHG emissions when biomass carbon is not converted into methane, non-methane volatile organic compounds or other precursor gases.
- GHG emissions from fossil fuel-derived wastes (also called alternative fossil fuels), in contrast, is not a priori climate neutral. Direct GHG emissions from the combustion of fossil alternative fuels shall, therefore, be calculated and included in the total of direct emissions.
- GHG emissions from mixed fuels with biomass and fossil fractions (e.g. pre-treated industrial and/or domestic wastes), a split between the fossil and non-fossil fractions of the fuel should be established and the emission factors applied to the appropriate fractions.
- CO_2e emission factors shall be specified at the plant level where practical. In the absence of any plant or company-specific data, manufacturers shall use the default emission factors provided in the CFP quantification tool in accordance with the IPCC and Cement Sustainability Initiative (CSI).

iii) Combustion of Non-Kiln Fuels

Non-kiln fuels include all fuels which are not covered in the definition of kiln fuels used for cement production. GHG emitted from non-kiln fuels is reported separately, by the following application types, to provide flexibility in the aggregation of emissions:

- Quarrying / mining raw materials
- On-site transportation
- Equipment
- Room heating / cooling
- On-site power generation

Carbon in non-kiln fuels is assumed to be fully oxidised, i.e. carbon storage in soot or ash is not accounted for. The resulting overestimation of emissions will usually be small (approximately 1%) and can be neglected in the CFP assessment. Analogous to the case of kiln fuels, the non-kiln fuels are categorised into conventional, alternative and biomass fuels for carbon footprint quantification and reporting.

To calculate GHG emissions from non-kiln fuels, fuel consumption, lower heating values and the matching GHG emission factors are required. If available, measured plant-specific lower heating values shall be used. If the same type of fuel is used as non-kiln fuel and kiln fuel, then the CO_2e emission factors used for reporting shall correspond. Otherwise, measured plant-specific emission factors shall be used, if available. Alternatively, default values provided in the CFP quantification tool can be applied. When electricity is internally (e.g. on-site generated electricity) produced and consumed for a product under study, life cycle data for that electricity shall be used for that product.

Emissions from Wastewater

Some cement plants inject wastewater in their kilns, for example as a flame coolant to control nitrogen oxides (NO_x). The carbon contained in the wastewater is emitted as CO_2. However, Applicants are not required to quantify their CO_2 emissions related to wastewater consumption, because these emissions are insignificant (usually less than 1% of the plant's overall CO_2 emissions), and difficult to quantify. However, Applicants should be prepared to demonstrate that their wastewater discharge has no significant impact on their overall CO_2 emissions.

WBCSD (2011)

3.3.2.2 Indirect Emissions

Key indirect GHG emissions arising from the production of cement include: i) external production of electricity consumed by cement manufacturers; ii) production of bought raw materials, energy commodities and clinker; iii) off-site transportation of raw materials to manufacturing plant; and iv) land use change.

i) External Electricity Production

When a supplier of grid electricity can deliver a specific electricity product with specific life cycle data and guarantee that the electricity sale and the associated GHG emissions are not double counted, life cycle data for that electricity product shall be used. When the supplier of electricity does not provide specific GHG data for the specific electricity product, the GHG emissions associated with the national grid where the life cycle stage occurs shall be used. Where a country does not have a national grid but has several unconnected grids or several countries share a common grid, GHG emissions associated with the relevant grid from which the electricity is obtained shall be used. If specific life cycle data on a process within the electricity supply system are difficult to access, data from recognised databases may be used.

The GHG emissions shall include: the emissions arising from the generation of electricity, e.g. combustion of fuels and generation of electricity lost in transmission and distribution in the grid; upstream GHG emissions (e.g. the mining and transport of fuel to the electricity generator or the growing and processing of biomass for use as a fuel); downstream GHG emissions (e.g. the treatment of waste arising from the operation of nuclear electricity generators or treatment of ashes from coal fired electricity plants); as well as GHG emissions related to construction, maintenance and decommission of the electricity supply system.

ii) Production of Bought Raw Materials, Energy Commodities and Clinker

GHG emissions and removals associated with the use of raw materials such as limestone, gypsum, clay, etc., in the production and packaging of the finished cement product shall be calculated by multiplying the consumption of those raw materials by the embodied carbon emission factors adopted from the Inventory of Carbon and Energy (ICE) provided in the CFP quantification tool. Primary emission factors should be used if data is available.

GHG emissions from the mining and production of energy commodities such as coal, natural gas, oil, petcoke, etc. used in the cement manufacturing process should also be accounted for under the indirect emissions. Applicants should apply the emission factor provided by region specific databases or well recognised sources (e.g. Ecoinvent, China Energy Statistical Yearbook, Japan CFP database, etc.).

The emissions from the production of clinker shall be assessed based on the net clinker purchases (i.e. bought clinker minus sold clinker) of the Applicant, and the emission factor of the clinker. For clinker transfer within a company, the actual emission factor of the sending plant should be used. If the clinker is bought externally, a default value from the WBCSD GNR website[4] (WBCSD, 2016) shall be used. As a second priority, the default emission factor of 882 kg CO_2/t value adopted from WBCSD (2013a) can be used to calculate the impact of indirect emissions associated with clinker purchases.

iii) Off-site Transportation of Raw Materials to Manufacturing Plant

Applicants are required to specify the mode of transportation (e.g. road, rail, water or aircraft), type of activity data, vehicle type, distance travelled, fuel used, etc. to measure the GHG emissions associated with off-site transportation of raw materials to the manufacturing plant (see Figure 2). When transportation is outside Hong Kong or the fuel consumption of non-road transport is not known, the fuel / distance-based approach is applicable to the case. The transport emissions associated with the cement product can be measured by adopting the WRI and WBCSD's protocol, namely "GHG Emissions from Transport or Mobile Sources[5]" (version 2.7, 2024) or equivalent resources if deemed appropriate. The fuel-based approach only applies to the case when the transportation happens within Hong Kong and the fuel consumption data are known. The fuel-based emission factors can be obtained from the EPD and EMSD guideline, namely "Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Institutional Purposes) in Hong Kong" (2010 Edition). Fuel consumption data can also be estimated based on the energy consumption indicators as provided by EMSD Energy Consumption Indicator.

[4] The tool is accessible at: https://www.wbcsd.org/resources/cement-industry-energy-and-co2-performance-getting-the-numbers-right-gnr/
[5] The tool is accessible at: https://ghgprotocol.org/calculation-tools-and-guidance

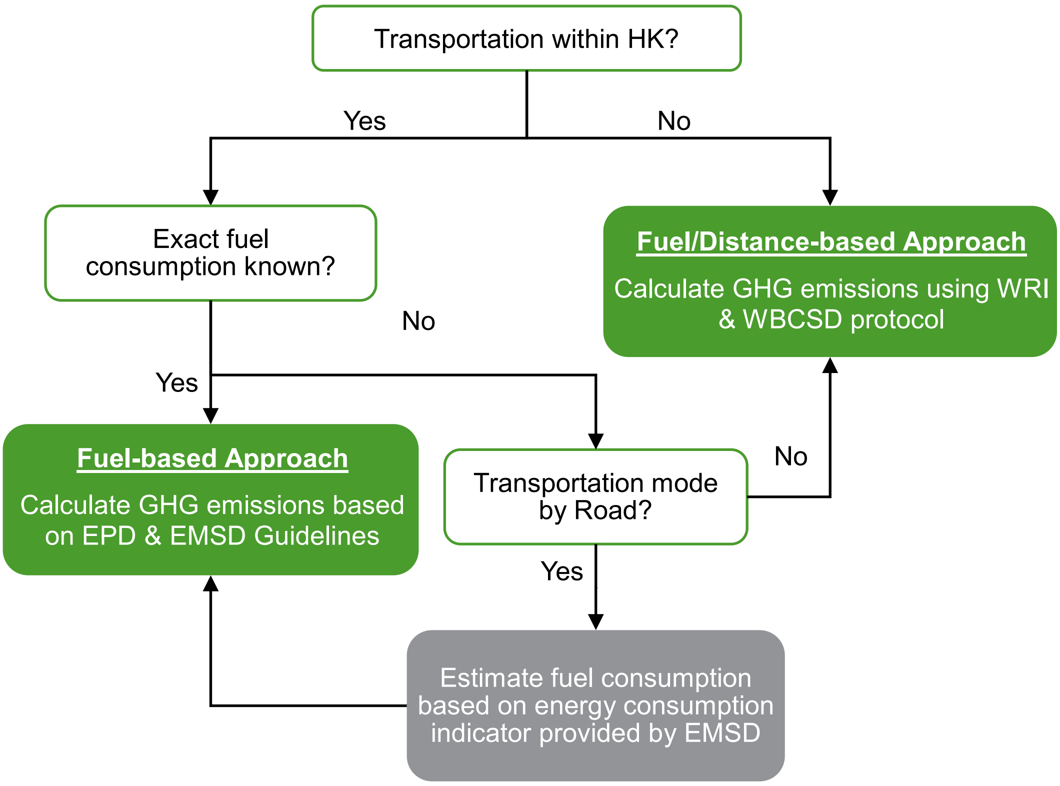


Figure 2 Method Selection for Off-site Transportation Emissions Calculation

iv) Land Use Change

The GHG emissions and removals occurring as a result of direct land use change shall be assessed in accordance with internationally recognised methods such as the IPCC Guidelines for National Greenhouse Gas Inventories and included in the CFP. If plant-specific data are applied, they shall be transparently documented in the CFP study report. If a national approach is used, the data shall be based on a verified study, a peer reviewed study or similar scientific evidence and shall be documented in the CFP study report. Indirect land use change can be ignored in CFP studies under the CIC Green Product Certification.

Table 1 summarises the parameters involved, and the data sources for the calculation of the carbon footprint of cement products.

Table 1: Parameters and Data Sources for Calculating the Carbon Footprint of Cement

	Emission components	Parameters	Units	Sources of parameters
Direct Emissions	***Raw Materials Calcination and Combustion***			
	Calcination of raw materials for clinker production	Clinker produced Emission factor clinker	t kg CO_2/t clinker	Measured at plant level Default = 525; or corrected according to the measured CaO and MgO contents of clinker
	Calcination of dust	Dust leaving kiln system Emission factor clinker	t tCO_2/t clinker	Measured at plant level Calculated as detailed in Section 3.3.2
	Combustion of total organic carbon	Clinker produced Raw meal : clinker ratio TOC content of raw meal Conversion factor for carbon to carbon dioxide	t fraction t /t clinker tCO2/t	Measured at plant level Default = 1.55 (can be adjusted) Default = 0.2% Default = 3.667 (or 44/12)
	Kiln and Non-Kiln Fuel Combustion			
	Conventional kiln fuels	Fuel consumption Lower heating value Emission factor	t GJ/t fuel tCO_2e/GJ fuel	Measured at plant level Measured at plant level IPCC/CSI defaults, or measured
	Alternative fossil fuels	Fuel consumption Lower heating value Emission factor	t GJ/t fuel tCO_2e/GJ fuel	Measured at plant level Measured at plant level CSI defaults, or measured
	Biomass fossil fuels	Fuel consumption Lower heating value Emission factor	t GJ/t fuel tCO_2e/GJ fuel	Measured at plant level Measured at plant level Default = 0 kg CO_2e
Indirect Emissions	**External electricity production**	Power bought from external grid Emission factor	GWh tCO_2e/GWh	Measured at plant level Applicant-specific value or country grid factor
	Production of bought raw materials, energy commodities and clinker	Net raw materials, energy commodities and clinker purchased Emission factor	t tCO_2e/t	Measured at plant level Default factor / Input
	Off-site transportation of Raw Materials to Manufacturing Plant	Mode of transportation Type of activity data Vehicle type Distance travelled Fuel consumed Emission factor	Measured using WRI & WBCSD protocol / EPD&EMSD Guidelines	
	Land use change	Emission factor	Measured in accordance with IPCC Guidelines	

3.3.3 Guidelines for Inclusion of Similar Products

If the discrepancies in environmental performance indicators among the declared products do not exceed 10%, similar products manufactured at one or multiple locations owned by the same company that fall under the same Product Category Rule may be incorporated under a single group product certification, contingent upon the core manufacturing processes being fundamentally the same.

Additionally, when preparing the application, the Applicant must ensure the following:

- The products must share identical chemical and mechanical properties, such as chemical composition and compressive strength.

- All products included in the same group product certification must fall within the same rating category of the carbon label.

Once the Applicant chooses to apply through the group certification, the data reporting for the grouped products shall follow either one of the below approaches.

- **Weighted Average Calculation:** The average must be weighted according to the production volumes of the included products, if applicable. This means that products with higher production volumes will have a greater influence on the overall average, providing a more accurate representation of environmental performance.
- **Worst-Case Reporting:** If a single value is selected for each impact category across all products, the reported value should reflect the worst performance within the range of variation.

4. REQUIREMENTS

4.1 CARBON

4.1.1 CFP quantification - Core Criteria

The applicant is required to achieve 50 Basic Points under this section. Additionally, the applicant can achieve a maximum of 40 Bonus Points under this section.

Requirements

The Applicant shall provide a life cycle assessment report for quantification and reporting of the carbon footprint of products (CFP), following the guidance addressed in the General Requirements and detailed system boundary and GHG emissions related to the raw material used (i.e. ready mixed concrete and reinforcing bar) listed in Section 3. The CFP study report should be prepared in accordance with ISO 14067:2018.

OR

The Applicant shall provide the product's CFP value from a product-level EPD certified in accordance with ISO 14025:2006, ISO 14067:2018, ISO 21930:2017, GB/T 24067-2024 or BS EN 15804:2012. The EPD shall demonstrate the GHG emissions covering the system boundary specified in Section 3.

The benchmark for Cement products is listed in **Error! Reference source not found.** below.

Table 2: Benchmark for Cement under the CIC Green Product Certification

Points	CFP (tCO_2e / t of product)
50 Basic + 40 Bonus	<0.658
50 Basic + 30 Bonus	0.659-0.790
50 Basic + 20 Bonus	0.791-0.966
50 Basic + 10 Bonus	0.967-1.097
50 Basic	>1.098

Verification

To obtain the points under this criterion, the following documents shall be provided for verification:

- CFP quantification report in accordance with ISO 14067:2018, OR
- Product-level Environmental Product Declaration (EPD) in accordance with ISO 14025:2006, ISO 14067:2018, ISO 21930:2017, GB/T 24067-2024 or BS EN 15804:2012.

4.2 RESOURCE

4.2.1 Waste Management – Non-core Criteria

The Applicant can achieve 5 Bonus Points under this section.

Requirements

The Applicant shall provide a waste management plan that outlines effective policies and procedures to minimise waste and recycle waste materials from manufacturing, and a waste audit report that includes measurement of solid waste generated and managed to divert from landfills. This report should cover the last 12 months and include the following:

(i) Quantities and types of waste recovered for on-site usage
(ii) Quantities and types of waste diverted from landfills (e.g. to the recycling facility, sorting facility, public fill, etc.)
(iii) Quantities and types of waste disposed of to landfills; information and disposal locations for all wastes; and
(iv) Initiatives taken to reduce waste generation and improve recovery/recycling of waste

Verification

To obtain the points under this criterion, the following documents shall be provided for verification:

- A waste management plan and a waste audit report with data support, including but not limited to trip tickets to downstream recyclers, shall be provided for verification.

4.3 ENVIRONMENT

4.3.1 Regional Materials – Non-core Criteria

The Applicant can achieve 5 Bonus Points under this section.

Requirements

Products that achieve a 95% localisation degree of raw materials will be granted 5 bonus points. The localisation degree of raw materials is calculated based on the usage rate of materials transported within certain distances with appropriate transportation methods.

The calculation focuses primarily on the primary raw materials. A statistical period of approximately 12 months is recommended; if the company has not been in operation for 12 months, the period can be appropriately shortened but should not be less than 6 months. The calculation is performed according to the formula:

$$T = \frac{M_{gt}}{M_t} \times 100\%$$

Where:

T - The localisation rate of raw materials.

M_{gt} - The total amount of primary raw materials used during the statistical period that were transported over a distance within an 800km radius of the HKSAR by road transportation, within a 1,600km radius by rail transportation, or within a 4,000km radius by sea transportation, excluding water, measured in tons (t)

M_t - The total amount of raw materials used during the statistical period, excluding water, measured in tons (t)

Verification

A self-prepared calculation report with data support shall be provided to obtain the points under this criterion. This report should contain, but not be limited to, the purchase order form showing the quantity of raw materials used, a map showing the origin of the raw materials, the location of the plant, and the transportation methods.

4.4 PERFORMANCE

4.4.1 Advancement – Non-core Criteria

The Applicant can achieve 5 Bonus Points under this section.

Requirements

Products that achieve a valid "Product Conformity Certification Scheme for Cement Products" certificate will be granted 5 bonus points. The assessment body[6] shall be accredited by the Hong Kong Accreditation Service (HKAS) or its Mutual Recognition Agreement (MRA) partners in accordance with this scheme and ISO/IEC 17065:2012 standards.

Verification

To obtain the points under this criterion, the following documents shall be provided for verification:

- Valid certificate of Product Conformity Certification Scheme for Cement Products

4.5 INNOSMART

4.5.1 Innovations & Additions – Non-core Criteria

The Applicant can achieve 5 Bonus Points under this section.

Requirements

Cement manufacturers who exceed basic industry requirements can qualify for 5 bonus points by showcasing innovative, sustainable production practices. This includes but is not limited to implementing Carbon Capture, Utilisation, and Storage (CCUS) technologies and digitalisation efforts that enhance operational efficiency.

[6] The certification body list accredited by HKAS is accessible from https://www.hkctc.gov.hk/en/tcsector/ba/construction_product_cert_c.html

Examples of incorporating various innovative and smart technologies to improve efficiency, reduce energy consumption, and optimise performance are given in Table 3.

Table 3: Example of innovative and smart technologies

Examples	Descriptions
Decarbonisation Strategies	• CO_2 Capture Technologies: Implement carbon capture and storage (CCS) technologies that capture CO_2 emissions from cement production. This captured CO_2 can be reused in other processes or stored underground. • Carbon Mineralisation: Some manufacturers are exploring using captured CO_2 to create stable carbonates, which can be used as a raw material in cement.
Environmental Impact Reduction	• Energy Efficiency: Employ energy-efficient technologies in the kiln, such as preheaters, to reduce fuel consumption. • Alternative Fuels: Use renewable or waste-derived fuels (e.g., biomass, industrial waste) in the kiln to replace fossil fuels, lowering carbon emissions.

<u>Verification</u>

To obtain the points under this criterion, the following documents shall be provided for verification:

- Submit a writing report (maximum of 1000 words). The report should outline the solution, objectives, and evaluation to meet the criteria set by smart technologies.
- The attachment should contain evidence of implementation and the technical specifications.

5. SCORING

The points for meeting each criterion stated in this Standard are summarised below.

Table 4: Points to be awarded under the assessment criteria of this Standard

Label	Evaluation criteria	Points		Related HK Beam Plus Credits
		Basic	+Bonus	
Carbon	CFP quantification [CORE]	**50**	+10/+20/ +30/+40	MW 10
Resource	Waste Management		+5	
Environment	Regional Materials		+5	MW 8
Performance	Advancement		+5	
InnoSmart	Innovations & Additions		+5	IA
	(Maximum possible:100) Total:	**50**	**+50**	

Applicants must demonstrate that they have achieved the basic points under the CORE criteria. They may also apply for other sustainability labels beyond the Carbon Label. However, only a maximum of 10 bonus points from any combination of TWO labels will be included in the final score for their rating. These bonus points can be earned from any assessment criteria under the Resources, Environment, Performance, and InnoSmart Labels.

Related BEAM Plus Credits refer to these relevant credits under BEAM Plus New Buildings Version 2.0, as listed below.

- MW 8: Regional Materials
- MW 10: Life Cycle Assessment
- Innovations & Additions

6. REFERENCES

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WRI (2024) "GHG Emissions from Transport or Mobile Sources". Available from https://ghgprotocol.org/calculation-tools-and-guidance