



Global Cement and Concrete
Association

GCCA Sustainability Guidelines for the monitoring and reporting of water in cement manufacturing

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Executive Summary

Water management is a major challenge in global sustainability practices. Cement manufacturing requires water for heavy equipment cooling, for exhaust gas conditioning and for other parts of the process. Discharged water may be altered with potential impacts on the environment. Actions must be taken to offset the industry water footprint, particularly at local level, where individual facilities and activities can have implications for other water users in the area.

The GCCA is committed to supporting all of its members and the sector in monitoring and reducing the water consumption and to increase the recycling of water in the manufacture of cement. These guidelines give an introduction to the monitoring and reporting process, specifies applicable rules, and defines the Key Performance Indicators (KPI) that are considered most relevant for the cement industry. The KPIs can also be used by companies to benchmark their performance.

The GCCA publishes aggregated results taking into account legal constraints and confidentiality limitations.

1. Introduction

1.1 The Global Cement and Concrete Association

The Global Cement and Concrete Association (GCCA) is the global voice of the cement and concrete sector. One of the objectives is to develop and strengthen the sector's contribution to sustainable construction across the value chain. The GCCA aims to foster innovation throughout the construction value chain in collaboration with industry associations as well as architects, engineers, developers, contractors and innovators. In this way, the association demonstrates how concrete solutions can meet global construction challenges and sustainable development goals while showcasing responsible industrial leadership in the manufacture and use of cement and concrete. The GCCA was established in January 2018 and is headquartered in London.

1.2 GCCA Sustainability Charter

These *Guidelines for the monitoring and reporting of water in cement manufacturing* are part of a package of guidelines developed to support compliance with the *GCCA Sustainability Charter*¹. The GCCA Sustainability Charter has identified five key pillars, which encompass the sustainability spectrum of the cement and concrete sector, and has set out requirements for full members against each of these:

- Health & Safety
- Climate Change and Energy
- Social Responsibility
- Environment and Nature
- Circular Economy

In applying these guidelines GCCA members must implement the general requirements of the *GCCA Sustainability Framework Guidelines*².

1.3 Background

Water management is a major challenge in global sustainability practices. There is a renewable but fixed amount of water on earth to be shared among people, agriculture, business and the environment. Population growth, increased wealth and industrialization lead to a higher water demand, which is expected to exceed supply by 40% by 2030. Many regions are about to suffer major freshwater deficits over the coming decades and allocation will have to balance these competing needs while managing trade-offs.

Cement manufacturing requires water for cooling heavy equipment and exhaust gases, in emission control systems such as wet scrubbers, as well as for preparing slurry in wet process kilns. Today there are still wet and dry cement kilns but the wet process technology is progressively being replaced by the more efficient dry process kilns. Discharged water may be altered in terms of temperature, acidity or suspended solids with potential impacts on the environment. Quarry dewatering may have an impact on the groundwater level too. Water is also consumed for domestic use at residential units and in welfare facilities within cement operations and not only for industrial purpose. Water recycling is widely applied in the cement industry.

Members must first understand site water flows for each site/plant installation in order to efficiently manage the quantities of water withdrawn, as well as the quality of water discharged, with particular focus on water stressed areas.

¹ GCCA Sustainability Charter, June 2019

² GCCA Sustainability Framework Guidelines, June 2019

1.4 Relation to Other Documents

This document, in conjunction with the 'GCCA Sustainability Framework Guidelines' provides guidance to GCCA full members to fulfil the requirements of the GCCA Sustainability Charter relating to water. It is partially based on and supersedes the 'WBCSD-CSI documents Protocol for Water Reporting, May 2014' and 'Guidance on good practices for water accounting, May 2016'.

2. Relevance

Freshwater is becoming increasingly scarce in large parts of the world. Growing population, increasing industrial and agricultural activities in new markets as well as pollution and climate change impacts are combining to put unprecedented stress on local water resources.

Water scarcity can translate into business risks for a wide range of companies and sectors, including the cement industry. These risks can be addressed through the implementation of a comprehensive water management strategy, which can both mitigate water scarcity risks and provide benefits for local stakeholder relations.

These guidelines define obligations and provide technical guidance on measurements, calculations and estimates to reliably quantify water withdrawal, discharge and consumption, to improve the accuracy of water accounting by companies.

The obligations featured in this document cover cement operations in the following areas:

- Pre-requisites for water measurement, defining site boundaries and identifying water inflows and water out-flows from the site;
- Selection, installation and maintenance of measurement devices.

3. Objectives

This document provides guidance to GCCA full members in order to fulfil the requirements of the GCCA Sustainability Charter relating to water, which falls under the pillar of Environment and Nature. However, the importance of monitoring and reporting should not be reduced to a requirement under the GCCA Sustainability Charter – it is the basis of all efforts to manage and reduce water consumption and supports transparent communication with stakeholders.

The GCCA Sustainability Guidelines for the reporting and monitoring of water in cement manufacturing are focused on water reporting from cement plants but could also be used in other operations like concrete manufacturing. These guidelines detail terminology, definitions and guidance for water accounting and serves as a reference for members as well as for stakeholders. By applying these guidelines, member companies follow a standardised monitoring and reporting approach, which allows them to prepare credible and relevant information on water consumption.

4. Operational Context

4.1 Scope and Principles

Water withdrawals and water discharges must be reported for the water sources and bodies presented in the KPI chapter. Water consumption data should consider the water consumed throughout the process including the plant and the quarry.

Total water withdrawal, water discharge and water consumption must be reported in cubic metres per year (m³/year). The report about water consumption per unit of product indicator must be in litres.

As recommendation, water discharge volumes may be accompanied by water quality parameters specific for each business covered. Each company must decide to report these water quality parameters, and/or add other water quality parameters.

Water already used once for process or non-process purposes and used again is considered to be recycled water. It includes both water recycled for the same purposes and water recycled for different purposes (e.g. cleaning equipment and trucks, road maintenance and irrigation). A water recycling installation is a tank, a pool or a settlement lagoon, artificial or natural, located on the site in which water is returned. It does not have to be impermeable. A settlement lagoon opened to any surface water body (e.g. river, lake) is not a recycling installation. The existence of a recycling installation must be reported.

Water returned to a recycling installation (i.e. recycled water) is not considered water withdrawal, discharge or consumption according to these guidelines. Water added to recycled water to compensate for losses (i.e. make-up water) shall be included as water withdrawal.

Pumping out water from a quarry to lower the water level in order to obtain a dry extraction area is called quarry dewatering. The water collected from the quarry may be rain, ground and/or surface water. The portion of water from quarry dewatering used on site must be reported as "quarry water used" and shall be included as water withdrawal. The portion of water from quarry dewatering that is not used must be reported separately as "quarry water not used".

Rainwater collected and used on site is considered harvested rainwater. It shall be reported as water withdrawal. A company may decide to report rain and storm water runoff collected and discharged without being used as 'storm water'. In this case, it must be reported separately and shall not be included as water withdrawal, discharge or consumption according to these guidelines.

The identification and quantification of major water consumers within the process should be encouraged. Water consumption figures shall be measured or calculated. Depending on the situation, water discharge could be the balance between water withdrawal and water consumption.

4.2 Water Quantification

Indicators for water may be reported using any reporting tool. Companies are free to use other methodologies for specific conditions if they comply with requirements and conform to the principles of these guidelines. Broadly speaking there are three categories of water accounting methodologies:

- **Measurement:**
Quantification of water volume according to the water instantaneously passing by the cross-section of a channel or pipe, using flow measurement or a meter.
- **Calculation by measurement:**
Water volume is gauged by short-term or instant measurement, by multiplying measured flow rate and pump operational hours; or by the difference between two measurements, such as water withdrawal and discharge.
- **Calculation by estimation:**
Water volume is gauged by multiplying rated capacity of the pump manufacturer and pump operating hours; or by using an empirical formula with assumed factors, such as calculating evaporation or infiltration rates.

Measurement offers the most accurate and reliable methodology for water accounting. There are different devices for measuring the volume or flow rate of water passing through a pipe or channel. Meters offer the most accurate and reliable way to gauge water flow, and ensure accurate and continuous flow records.

There are two types of data sources:

- Periodic water monitoring
- Continuous water monitoring systems

It is a member's decision whether to install water measurement devices on water withdrawals, water discharges and the main water consumption points. Priority should be given to sites in water stressed areas and/or to sites where water risks have been identified.

Continuous monitoring systems are highly recommended. The process for continuous and periodic monitoring including data management shall be put in writing and made available at site level to those in charge of monitoring and reporting, and include the following:

- Identification of measured flows (plant water network showing points measured, calculated or estimated)
- Standards and methodologies applied for periodic monitoring
- A monthly frequency is recommended
- Log sheets
- People-in-charge

A quality assurance process must be implemented at each plant to ensure the data measured correctly represent correctly real data. This process shall include training of all employees involved in operational and maintenance checks as well as the definition of clear responsibilities in each step (maintenance, calibration of water meters, monitoring, and data logging).

Water data need to undergo a validation process to evaluate whether the data is within the usual range. The coherence of the water withdrawal, water discharge and water consumption data needs to be checked by applying a simple water balance calculation. Significant variations in water KPIs over time need to be checked and explained.

Member company employees who monitor, report and validate water data shall be trained to have a basic knowledge of water measurement in order to assess the coherence of the data.

5. Key Performance Indicators

The GCCA is aware of the need to track the progress of improvements and to communicate this progress to all stakeholders. These guidelines therefore include a number of simple, reliable and representative KPIs.

KPI 1: Water withdrawal – Water discharge = Water consumption

Total water withdrawal by source (GRI 306-1)

The sum of all water drawn into the boundaries of the reporting organisation from all sources (including surface water, groundwater, quarry water used, municipal water, external wastewater, harvested rainwater) for any use over the course of the reporting period. Explanation of water sources and bodies:

Water withdrawal – freshwater sources

- Surface water³: water from rivers, lakes, natural ponds
- Groundwater⁴: water from wells, boreholes, etc.
- Quarry water used⁵: water collected in the quarry and used on-site
- Municipal/potable water⁶
- External wastewater

Harvested rainwater

- Water collected, stored and used for process and non-process purposes

Water withdrawal – non-freshwater sources

- Seawater: water extracted from the sea or the ocean
- Surface water: brackish or saline source⁷
- Groundwater: brackish or saline source⁸
- Quarry water used⁹: water collected in the quarry and used on-site
- External wastewater

³ Includes sources located on and outside the site.

⁴ Includes sources located on and outside the site.

⁵ Could be water from rain, ground and/or surface.

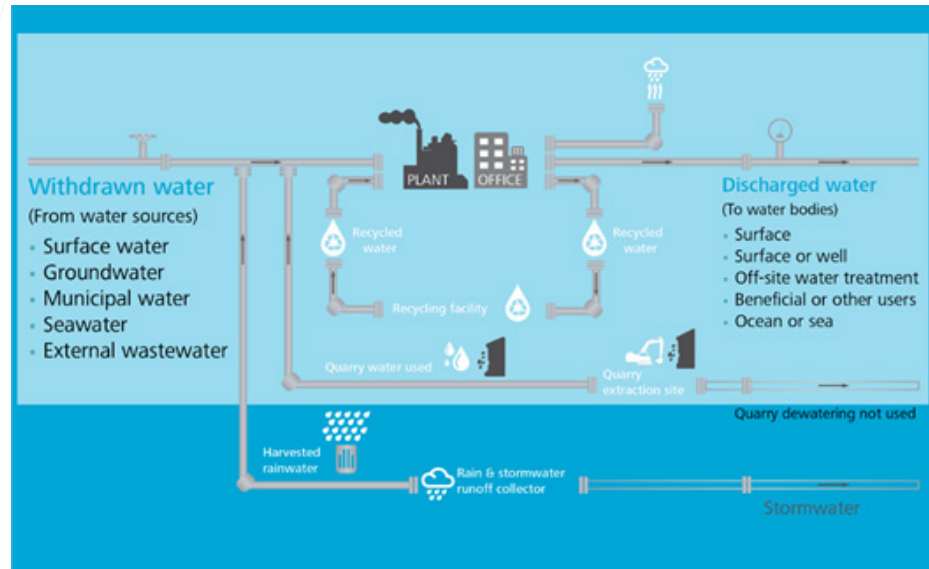
⁶ Includes water purchased from public grid and third parties.

⁷ Includes sources located on and outside the site.

⁸ Could be water from rain, ground and/or surface.

⁹ Could be water from rain, ground and/or surface.

Figure 1: Diagrammatic representation of site perimeter and associated indicators



Total water discharge by quality and destination (GRI 303-1)

The sum of water effluents discharged over the course of the reporting period to ocean, surface, subsurface/well, off-site water treatment, and beneficial/other use through a defined discharge point (point source discharge), over land in a dispersed or undefined manner (nonpoint source discharge), or wastewater removed from the reporting organisation via truck.

Domestic sewage discharge is added to GRI 303-1 total water discharge effluents according to these guidelines.

Water discharge – freshwater discharge by receiving body

- Ocean
- Surface
- Subsurface/well
- Off-site water treatment
- Beneficial/other user

Water discharge – non-freshwater discharge by receiving body

- Ocean
- Surface
- Subsurface/well
- Off-site water treatment
- Beneficial/other user

Water sources not used

- Quarry water not used: water collected in the quarry and discharged without being used
- Storm water: water from rain and storm runoff collected on the site and discharged without being used

Total water consumption

Water evaporated for cooling purposes, water evaporated from water storage facilities, water lost via transmission, water incorporated in the organisation's products and on-site uses. Water consumption removes water from a system and makes it unavailable for further use. The total water consumption includes rainwater harvested onsite for any use; it differs from total freshwater consumption, which excludes harvested rainwater.

KPI 2: Amount of Water consumption per unit of product

The total amount of water consumption of a site (KPI 1) divided by the total production of the site in the same period:

- Water indicators are reported solely for the business considered. Sites or premises with various activities, the activities external to the business covered shall be excluded (e.g., in a cement plant, the water consumed to produce ready-mix concrete or aggregate would be excluded).
- Where the water network of a cement plant and a quarry are connected (i.e. the cement plant is located in the quarry), the water indicators shall cover both the cement plant and quarry operations; otherwise water for quarry operations shall be excluded.
- All water consumption on the site must be considered as follows:
 - Cement plants: slurry for wet process or granulation for the semi-dry or semi-wet process, cooling the off-gases, off-gases treatment system (e.g., wet scrubbers), cooling the mechanical equipment and the materials (e.g., in cement coolers) and watering the materials;
 - Non-process use: cleaning and washing equipment and trucks, watering roads to control dust and green areas, general services (e.g., compressors, boilers), offices, amenities for workers;
 - Losses through the distribution network should be considered as well.
- Where a power plant (namely a captive power plant) is located on the same premises as a cement plant, the water indicators should be reported separately, but the systems for waste heat recovery, which is included in the cement process, must be reported with the cement plant.

Table 1: Basic Parameter – Unit – Explanation

Basic Parameter	Unit	Explanation
1 Total Water withdrawal – Water Discharge = Water Consumption	m ³ /year	Total water withdrawal by source (G4 – EN 8 from GRI) – Total water discharge by quality and destination (G4 – EN22 from GRI) = Total water consumption.
2 Amount of Water Consumption per unit of product	Litres/tonne in cementitious products	The total amount of water consumption of a site (KPI 1) divided by the total production of the site in the same period.

6. Glossary and Definitions

Aggregate operations:

Quarrying, handling and processing non-metallic mineral products for classification or size reduction. Mineral products are supplied from quarries or recycled aggregate products. Processing sand and gravel for a specific market may involve different combinations of washers, screens and classifiers to segregate particle sizes; crushers to reduce oversized materials; and storage and load facilities.

Beneficial use:

Discharges directly to external organisations for specific use by industry, agriculture, for human use or to construct wetlands.

Cement operations:

Quarrying, handling, crushing, milling, burning and cooling materials to produce clinker or cement.

Freshwater:

The constituent content of freshwater shall be defined by local regulations. In the absence of local regulations, a limit of 1000 mg/l of TDS recommended by the World Health Organisation is the gauge for categorising fresh and non-fresh surface water and groundwater.

Groundwater:

Water in soil beneath the soil surface, usually when the water pressure is greater than the atmospheric pressure, and the holes in the soil are filled up with water.

Harvested rainwater:

Rainwater that is collected and used on site.

Municipal supply:

Drinking quality water supplied by a public organisation.

Potable water:

Water suitable for drinking.

Product:

A material of commercial value in one of three forms: cement, aggregate or readymix concrete.

Quarry water:

Water extracted from the cement or aggregates quarry, also called quarry dewatering. It may be any combination of groundwater, surface water, and precipitation.

Ready-mix concrete (RMC) operations:

Concrete manufactured in a factory or batching plant, according to a set recipe, and delivered to a work site, by truck mounted in-transit mixers. Process units include mixers, pumps and handling.

Receiving body:

Destination of water discharges.

Recycled water:

The amount of used water or wastewater used in another cycle that goes back into the same process, or in a higher use in the process cycle, before discharge for final treatment or to the environment.

Recycled or reused water:

The amount of recycled and reused water as a percent of total water withdrawal.

Reporting:

Disclosing data and relevant information to internal and external stakeholders, such as management, employees, governments, regulators, shareholders, the general public, local communities or interest groups.

Reused water:

The amount of used water or wastewater deployed for another function in a lower use in the process cycle, before discharge for final treatment or to the environment. Reuse includes for irrigation inside the boundary of a facility.

Source:

Origin of water withdrawal.

Storm water:

Rain and storm water run-off collected and discharged not used on the site.

Subsurface discharge:

Injection of effluent water into any underground medium for disposal.

Surface water:

All waters on the surface of the earth, including fresh and salt water, ice, and snow, oceans, lakes, rivers, and wetlands, but not including water from the sub-surface, such as groundwater.

Value chain:

The chain of activities of a firm operating in a specific industry.

Water consumption:

Water evaporated for cooling and from water storage facilities, lost via transmission, or used in an organisation's products and onsite, calculated as difference between water withdrawals and water discharges. Total water consumption includes rainwater harvested on site for any use. Unlike total freshwater consumption, it excludes harvested rainwater.

Water discharge:

The sum of water effluents discharged, over the course of the reporting period, to the ocean, surface, subsurface or well, off-site water treatment, beneficial user or other user through a defined discharge point (point source discharge), over land in a dispersed or undefined manner (nonpoint source discharge), or wastewater removed from the reporting organisation via truck.

Water withdrawal (or use):

The sum of all water drawn into the boundaries of the reporting organisation from all sources (including surface water, groundwater, used quarry water, municipal water, external waste water, and harvested rainwater) for any use during the reporting period.

Watershed:

Any area with a common outlet for surface runoff. Synonyms include catchment, drainage area, and river basin.



7. References

WBCSD, 2014

Protocol for Water Reporting. Business solutions for a sustainable world. World Business Council for Sustainable Development, 2014.

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Guidance on Good Practices for Water Accounting. Business solutions for sustainable world. World Business Council for Sustainable Development, 2016.

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