REPORT OF CARBON FOOTPRINT 2023

NATIONAL COMPANY FOR CEMENT BENI SUEF

Prepared by

Carbon Footprint And Sustainability Center - Scientific Consulting Office

Reviewer

International Expertise House ESG

DR. MOSTSFA ELSAYED DHERBINY

INDEPENDENT AUDITOR

Abstract of the National Company for Cement's Carbon Footprint Report 2023

1. Introduction

The National Company for Cement NCC in Beni Suef has undertaken a significant step towards sustainability by measuring and disclosing its carbon footprint for 2023. This report follows international protocols, including the Greenhouse Gas Protocol GHG, the Cement Sustainability Initiative CSI, and ISAE 3410 standards. This study provides a comprehensive analysis of NCC's emissions, methodologies, and sustainability strategies, highlighting key findings and areas for improvement.

Cement production is a major contributor to global greenhouse gas GHG emissions, primarily due to the calcination process and fossil fuel consumption. The NCC Carbon Footprint Report for 2023 represents the company's first verified assessment, offering a benchmark for future sustainability efforts.

2. Methodology and Reporting Standards NCC employed a rigorous methodology for quantifying its emissions, adhering to internationally recognized frameworks:

- GHG Protocol: The corporate accounting and reporting standard for emissions.
- Cement Sustainability Initiative CSI: A sector-specific guideline for emissions reporting in cement production.
- ISAE 3410: International Standard on Assurance Engagements for GHG statements, ensuring data reliability and accuracy.

The company selected 2022 as the base year, allowing a comparative analysis of emission trends over time.

ملخص البصمة الكربونية للشركة الوطنية للأسمنت 2023

1. المقدمة

اتخذت الشركة الوطنية للأسمنت NCC في بني سويف خطوة مهمة نحو الاستدامة من خلال قياس والإفصاح عن بصمتها الكربونية لعام 2023، يتبع هذا التقرير بروتوكولات دولية، بما في ذلك بروتوكول غازات الاحتباس الحراري GHG، مبادرة استدامة الأسمنت CSI، ومعيار ISAE 3410 توفر هذه الدراسة تحليلًا شاملاً لانبعاثات NCC ومنهجياتها واستراتيجياتها في الاستدامة، مع تسليط الضوء على النتائج الرئيسية والمجالات التي تحتاج إلى تحسين.

يُعد إنتاج الأسمنت مساهمًا رئيسيًا في انبعاثات غازات الاحتباس الحراري GHG عالميا، وذلك بسبب عملية التكليس والاستهلاك الكبير للوقود الأحفوري. يمثل تقرير البصمة الكربونية لعام 2023 أول تقييم موثق للشركة، مما يوفر معيارًا لجهود الاستدامة المستقبلية.

2. المنهجية والمعايير المستخدمة في التقرير اتبعت NCC منهجية صارمة لتحديد انبعاثاتها، مع الالتزام بأطر عمل معترف بها دوليًا:

- **بروتوكول GHG: معيار المحاسبة والإبلاغ عن الانبعاثات.**
- **مبادرة استدامة الأسمنت CSI: دليل قطاعي للإبلاغ عن الانبعاثات في صناعة الأسمنت.**
- **ISAE 3410: معيار دولي لضمان بيانات غازات الاحتباس الحراري، مما يضمن موثوقية البيانات ودقتها.**

اختارت الشركة عام 2022 كسنة أساس، مما يسمح بإجراء تحليل مقارن لاتجاهات الانبعاثات بمرور الوقت.

3. Carbon Footprint Findings

3.1 Total Emissions Overview

NCC reported total CO2 equivalent emissions CO2e for 2023 as 11,821,825 metric tons, compared to 11,484,604 metric tons in 2022. The increase is primarily attributed to higher clinker production, rising from 13,011,519 tons in 2022 to 13,136,747 tons in 2023.

3.2 Scope 1 and Scope 2 Emissions

Scope 1: Direct Emissions

- Process Emissions: 7,157,745 tons CO2e
- Coal Combustion: 3,808,410 tons CO2e
- Heavy Fuel Oil HFO: 329,050 tons CO2e
- Used Gasoline: 2,750 tons CO2e
- Diesel & Gas: **30,273** tons CO2e

Scope 2: Indirect Emissions

- Electricity from the grid: 493,597 tons CO2e

3.3 Emission Intensity

The report states that emissions per ton of clinker increased slightly from 0.88 tons in 2022 to 0.9 tons in 2023. This highlights the need for efficiency improvements despite production growth.

3. نتائج البصمة الكربونية

3.1 نظرة عامة على إجمالي الانبعاثات

أبلغت NCCعن إجمالي انبعاثات مكافئ ثاني أكسيد الكربون CO2e لعام 2023 بمقدار 11,821,825 طنًا متريًا، مقارنة بـ 11,484,604 طنًا متريًا في عام 2022. يرجع هذا الارتفاع بشكل أساسي إلى زيادة إنتاج الكلنكر، حيث ارتفع من 13,011,519 طنًا في 2022 إلى 13,136,747 طنًا في 2023.

3.2 انبعاثات النطاق 1 والنطاق 2

النطاق 1: الانبعاثات المباشرة

انبعاثات العمليات: 7,157,745 طن CO2e
احتراق الفحم: 3,808,410 طن CO2e
زيت الوقود الثقيل :HFO 329,050 طن CO2e
المستخدم من البنزين: 2,750 طن CO2e
الديزل والغاز : 30,273 طن CO2e

النطاق 2: الانبعاثات غير المباشرة

- الكهرباء من الشبكة: 493,597 طن CO2e

3.3 كثافة الانبعاثات

ذكر التقرير أن الانبعاثات لكل طن من الكلنكر زادت بشكل طفيف من 0.88 طن في 2022 إلى 0.9 طن في 2023. وهذا يشير إلى الحاجة إلى تحسين الكفاءة على الرغم من نمو الإنتاج.

4. Key Sustainability Strategies and Challenges

4.1 Decarbonization Plans

NCC plans to adopt a Corporate Carbon Emissions Management Plan ICEM to align operations with 2030 climate goals. The plan includes:

- Enhancing emission tracking and reporting.
- Implementing energy efficiency measures.
- Exploring alternative fuels and carbon capture technologies.

4.2 Challenges in Carbon Management

- Reliance on Fossil Fuels: Coal remains a dominant fuel source, contributing significantly to emissions.
- Process Emissions: The calcination of raw materials is an unavoidable emission source in cement manufacturing.

5. Recommendations for Improvement To enhance sustainability, NCC should consider:

Alternative Fuels: Increasing the use of waste-derived fuels and biomass to replace coal.

Carbon Capture Utilization and Storage CCUS: Implementing emerging technologies to capture CO2 at source.

Renewable Energy Integration: Expanding solar or wind power to reduce Scope 2 emissions.

Comprehensive Scope 3 Assessment: Incorporating supply chain emissions to provide a holistic sustainability profile.

Continuous Monitoring & Verification: Strengthening data management and independent verification processes.

4. استراتيجيات الاستدامة والتحديات الرئيسية

4.1 خطط إزالة الكربون

تخطط NCC لاعتماد خطة إدارة انبعاثات الكربون المؤسسية ICEM لمواءمة العمليات مع أهداف المناخ لعام 2030. تشمل الخطة:

- تحسين تتبع الانبعاثات والإبلاغ عنها.
- تنفيذ تدابير كفاءة الطاقة.
- استكشاف الوقود البديل وتقنيات احتجاز الكربون.

4.2 تحديات إدارة الكربون

- الاعتماد على الوقود الأحفوري: لا يزال الفحم مصدرًا رئيسيًا للطاقة، مما يساهم بشكل كبير في الانبعاثات.
- انبعاثات العمليات: يُعد تكليس المواد الخام مصدرًا لا مفر منه للانبعاثات في تصنيع الأسمنت.

5. توصيات للتحسين لتحسين الاستدامة، يجب على NCC النظر في:

الوقود البديل: زيادة استخدام الوقود المشتق من النفايات والكتلة الحيوية لاستبدال الفحم.

احتجاز الكربون واستخدامه وتخزينه CCUS: تنفيذ التقنيات الناشئة لاحتجاز CO2 عند المصدر.

دمج الطاقة المتجددة: توسيع نطاق استخدام الطاقة الشمسية أو الرياح لتقليل انبعاثات النطاق 2.

تقييم شامل للنطاق 3: دمج انبعاثات سلسلة التوريد لتوفير ملف استدامة متكامل.

المراقبة المستمرة والتحقق: تعزيز إدارة البيانات وعمليات التدقيق المستقلة.

AUDITORS AND EXPERTS INITIATIVE IN
Sustainability
Climate Risk Assessment

Chartered Accountant
Mostafa Sherbiny

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AUDITORS AND EXPERTS INITIATIVE IN
Sustainability
Climate Risk Assessment
Chartered Accountant
Mostafa Sherbiny

Carbon Footprint Report

Independent Assurance Report on the Carbon Footprint Report for the year 2023

The National Company for Cement in Beni Suef

- **Carbon Footprint Auditor - License No. NQI/CFP/11/23/09**
- **Chartered Accountant/Mostafa Sherbiny Registration No. 14776**
- Observer of the Paris Climate Change Agreement at the United Nations and Chairman of the Scientific Chair for Carbon Footprint and Sustainability at ALECSO at the League of Arab States – Mobile : +201028285548 Email : mostafa.shrb@gmail.com

- **Carbon Footprint Auditor - License No. NQI/CFP/14/23/09**
- **Assistant Professor Dr./Abeer Abdel-Kreem Srour**
- Assistant Professor of Accounting and Auditing, Benha University & Member of the Egyptian Tax Association. Email : Abeer.Srour5@gmail.com

To the board of directors and management of the national company for cement in Beni suef.

We have been engaged to perform a reasonable assurance engagement on (the engagement) Carbon Footprint Report for the year 2023 (GHG protocol) of National Company for Cement disclosed under ‘Overview of CO2 emissions and results’, for the year ended December 31, 2023. A listing of these GHG protocol is attached to our independent assurance report.

The base year (2022) was chosen in the carbon footprint calculations as a reference point for measuring and comparing greenhouse gas emissions over time. It was used to track progress in reducing emissions and set future performance targets. Its carbon footprint in 2022 will be compared to emissions in subsequent years

1. Applicable criteria

The greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and International Standard on Assurance Engagements (ISAE) ISAE 3410 Assurance Engagements on Greenhouse Gas.

We believe that these criteria are a suitable basis for our reasonable assurance engagement.

2. Responsibility of National Company for Cement

The national cement company factory in Beni Suef is responsible for preparing the GHG data and information following the greenhouse gas protocol: A corporate accounting and reporting standard financial control methodology (the ‘‘applicable criteria’’), applied as explained in the GHG statement

The national company for cement in Beni Suef is also responsible for internal control as management determines what is necessary to enable the preparation of a GHG statement that is free from material misstatement.

3. Inherent Uncertainty

GHG quantification is subjected to inherent uncertainty because of incomplete scientific knowledge used to determine emissions factors and the values needed different emissions

4. Our responsibility

Our responsibility is to express reasonable assurance conclusions on the direct GHG statement based on the evidence we have obtained. We conducted our reasonable assurance engagement following the international standards on assurance engagements 3410, assurance engagements on greenhouse gas statements that use GHG protocal, issued by the international auditing and assurance standards board. This standard requires us to determine whether anything has come to our attention that causes us to believe that the GHG statement is not fairly prepared, in all material respects.

A reasonable assurance engagement undertaken per ISAE 3410 involves performing procedures (primarily consisting of making inquiries to management and others within the entity, as appropriate, and applying analytical procedures) and evaluating the evidence obtained. The procedures are selected based on our professional judgment, which includes identifying areas where the risks of material misstatement in preparing the GHG Statement in accordance with the Applicable Criteria, are likely to arise.

5. Summary of work performed

A reasonable assurance engagement in accordance with ISAE 3000 involves performing procedures to obtain evidence about the Carbon Footprint, (ISAE) 3410 Assurance Engagements on Greenhouse Gas Statements. The procedures selected depend on the practitioner's judgment, including the assessment of the risks of material misstatement, whether due to fraud or error, in the Carbon Footprint. In making those risk assessments, we considered the internal control relevant to the preparation of the Carbon Footprint.

Additionally, GHG procedures are subject to estimation (or measurement) uncertainty resulting from the measurement and calculation processes used to quantify emissions within the bounds of existing scientific knowledge.

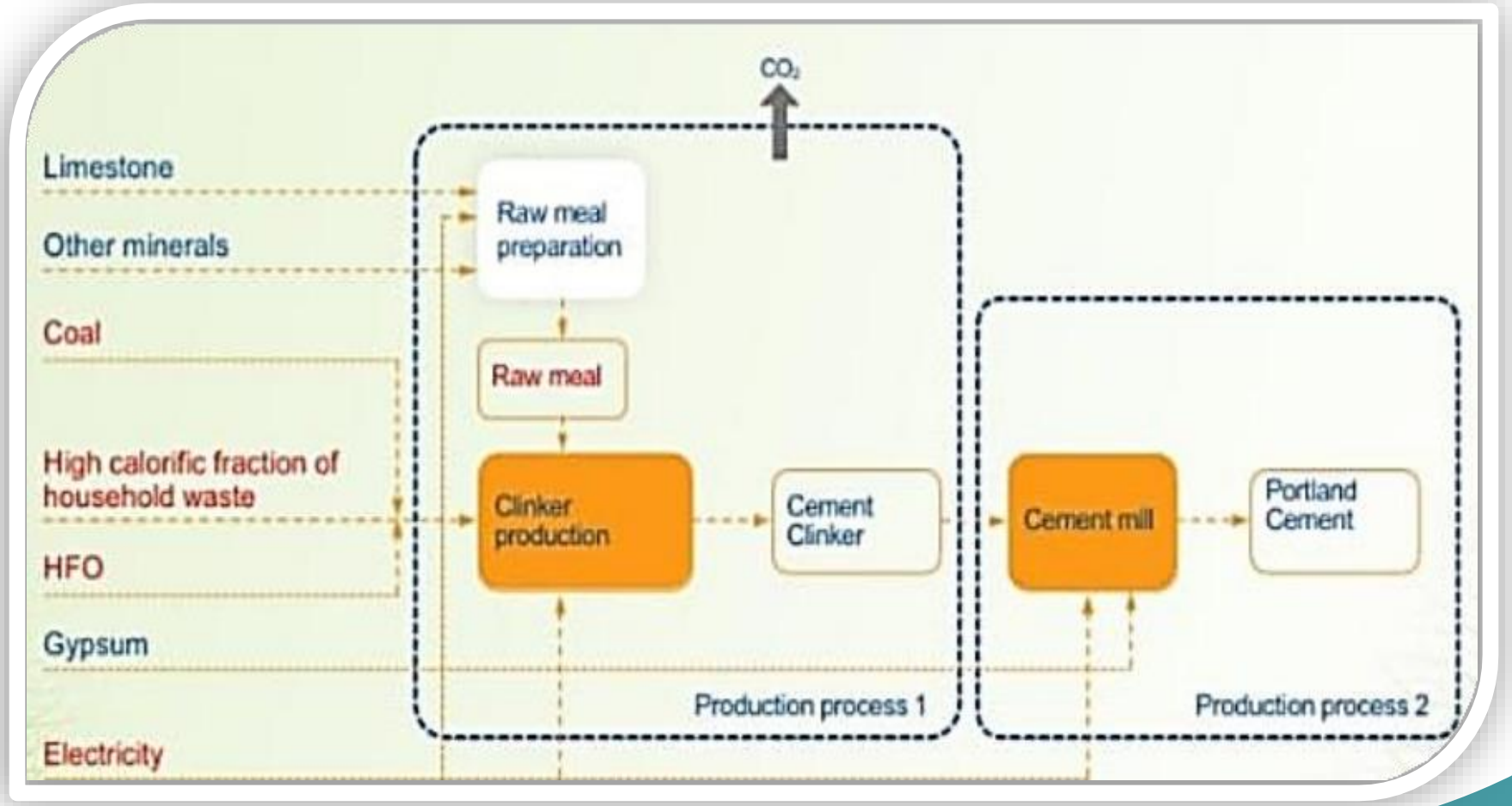
- Our reasonable assurance procedures included, amongst others, the following work:

1. Interviews with key personnel to understand the business processes, including the sustainability strategy, principles management, and the reporting systems used during the reporting period.
2. Assessment of the suitability of the underlying criteria and their consistent application.
3. Evaluating of the reasonableness of estimates made by management.
4. Inquiries with the company's representatives responsible for collecting, consolidating, and calculating the Carbon Footprint to assess the data preparation process, the completeness of the data capture and compilation methods as well as internal controls, to the extent relevant for the reasonable assurance engagement.
5. Checking that the calculation criteria have been correctly applied in accordance with the methodologies outlined in the applicable criteria.
6. Analytical review procedures to support the reasonableness of the data.
7. Identifying and testing assumptions supporting calculations.
8. Testing, on a sample basis, the underlying source information to check the accuracy of the data.
9. Inspecting relevant documentation of the systems and processes for compiling, analyzing, and aggregating data in the reporting period and testing such documentation on a sample basis.
10. Consideration of internal controls relevant to the preparation of the report.
11. Evaluating the overall presentation, structure and content of the report.
12. Reading and reviewing selected material qualitative statements in applicable sections of the report for plausibility and consistency.

We believe that the evidence we have obtained is sufficient and appropriate to provide a reasonable basis for our opinion.

6. Scope limitation

Our engagement scope covers the year 2023 items presented in the GHG statement from the company.



7. Opinion

Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that causes us to believe that The National Company for Cement in Beni Suef GHG Statement, prepared in accordance with the Applicable Criteria for the year 2023, is not fairly stated in all material respects.

8. Purpose of statement

This report, including the conclusion, has been prepared for the Board of Directors and Management of The National Company for Cement in Beni Suef, to assist Management in reporting on the Company's performance and activities. We permit the disclosure of this report within the accompanying GHG statement for the year 2023 to enable Management to demonstrate that they have discharged their governance responsibilities by commissioning an independent assurance report on the selected information contained in the GHG Statement, to the fullest extent permitted by law, the greenhouse gases protocol (GHG), and the Cement Sustainability Initiative (CSI).

9. Our independence and quality control

We have complied with the relevant rules of the professional conduct/code of ethics applicable to the practice of public accounting and related assurance engagements, issued by various professional accounting bodies. These rules are based on the fundamental principles of integrity, objectivity, professional competence, due care, confidentiality, professional behavior, and other assurance engagements. Accordingly, we maintain a comprehensive system of quality control, including documented policies and procedures regarding compliance with ethical requirements, professional standards, and applicable legal and regulatory requirements.

International Expertise house ESG

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Summary of CO_{2e} Emissions by GHG PROTOCOL

	2023	2022
Category 1	**CO_2e (tons)**	**CO_2e (tons)**
Direct Process Emission	**7,157,745**	**7,063,792**
Coal	3,808,410	3,281,942
HFO	329,050	620,601
Diesel	30,167	36,131
Used oil (Gasoline)	2,750	2,351
air conditioner	47.06	47.06
natural gas	59	59
Total	**11,328,228**	**11,004,924**

Category 2	**CO_2e (tons)**	**CO_2e (tons)**
Electricity from Grid	559,385	543,614
Total	**559,385**	**543,614**

Total Emission Category (1&2)	**11,887,566**	**11,548,491**

National Cement Company Factory Overview

The National Cement Company factory in Beni Suef is a major producer of cement in Egypt.
The factory is strategically located in Beni Suef, a major industrial hub, providing access to key transportation networks.

The factory employs hundreds of workers and contributes significantly to the local economy.

A presidential decree was issued to establish (National Company for Cement in Beni Suef) on October 31, 2018 as an Egyptian joint stock company in accordance with the provisions of Law No. 159 of 1981 promulgating the Law of Joint Stock Companies, Partnerships Limited by Shares and Limited Liability Companies and Investment Law No. 72 of 2017, provided that the contribution structure is (National Service Projects Organization with a contribution rate of 98.98% - Al-Arish Cement Company / National Service Projects Organization with a contribution rate of 0.02% - Al-Nasr Company for Services and Maintenance - Queen Service / National Service Projects Organization with a contribution rate of 1%).

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ABBREVIATIONS

NCC	— National Company for Cement.
SCO	—Scientific Consulting Office
SCFC	— Sustainability and Carbon Footprint Center
CO2	— Carbon dioxide
CO_2e	— Carbon dioxide equivalent
G	— Grams
GHG	— Greenhouse gas
GHG Protocol	— Greenhouse Gas Protocol
GJ	— Gigajoule
IPCC	— Intergovernmental Panel on Climate Change
ICEM	— Institutional Carbon Emission Management
kg	— kilogram
kWh	— kilowatt. Hour
SCI	— Cement Sustainability Initiative
WBCSD	— World Business Council for Suitable Development
WRI	— World Resources Institute

EXECUTIVE SUMMARY

National Company for Cement (NCC) aims to lead by example in managing its carbon emissions and disclosing the impact of its internal operations. For the first time, it analyzed carbon emission impacts associated with its internal operations for its 2023 emissions, tracking the carbon footprint from scopes linked with its internal operations. NCC has a plan to monitor and verify its carbon emissions annually. And disclose this information to stakeholders.

This report, as the first verified annual Carbon Footprint Report, provides a comprehensive analysis of the carbon footprint generated by NCC's plant in Bani Suef. Annual data has been prepared for the 12-month period from January 1, 2023, to December 31, 2023. The report identifies the sources of greenhouse gases and categorizes them as consistent with the greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas.

The base year (2022) was providing a reference from which all emissions reductions are measured. The carbon footprint is recalculated for each year, and the results are compared with the emissions of the base year. This helps assess whether emission reduction goals are being met.

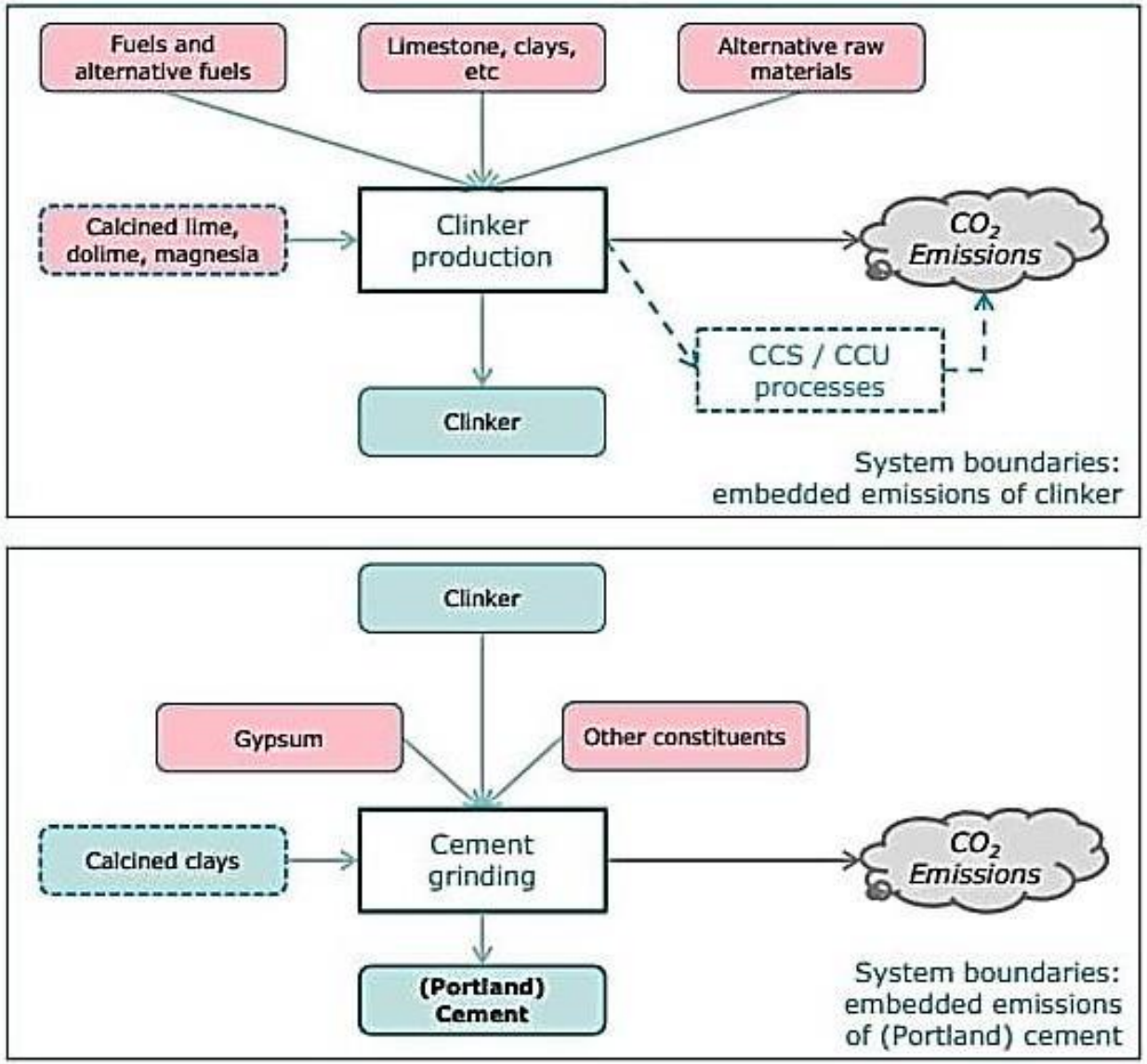

Figure 1: Cement clinker and cement production process

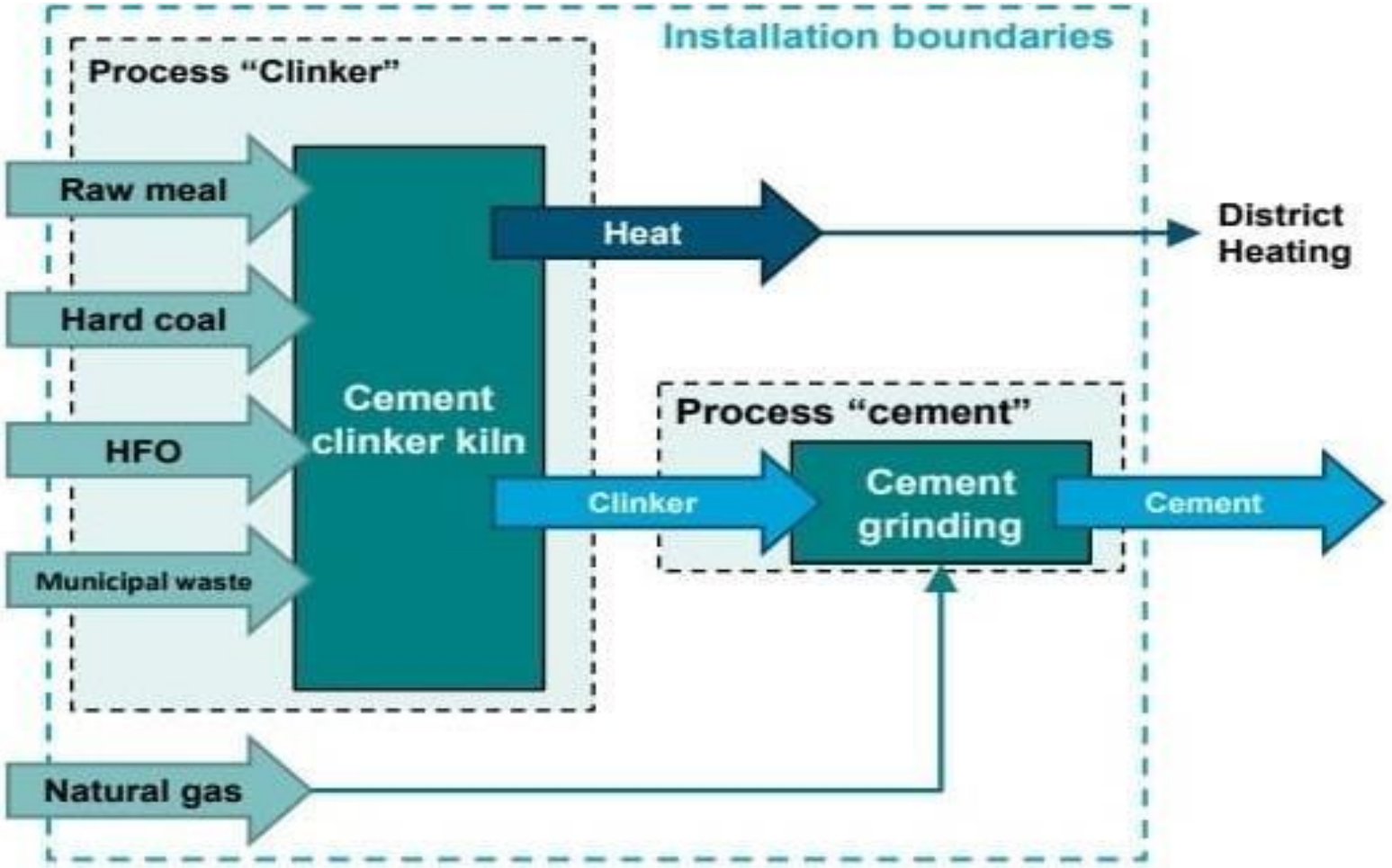

Figure 2: Schematic used to define the system boundaries of an example cement clinker and cement processes

The Base Year: (2022)

- Consistency: The base year provides consistency in calculating and reporting emissions, ensuring that comparisons over time are meaningful.
- Transparency: It allows stakeholders to clearly understand emission performance.

The choice of base year can depend on:

- Availability of reliable data: Ideally, data for the chosen base year should be comprehensive, accurate, and reflective of the entity's normal operations.
- Relevance: A base year should represent typical or average emissions, not an anomaly

The base year is essential for understanding how emissions evolve and is a key part of managing and reducing a carbon footprint in alignment with sustainability goals.

In 2023, emissions from NCC's totaled 11,887,566 metric tons of carbon dioxide equivalent (CO_2e). That is, emissions amounted to 0.905 tons per ton of clinker. Notably, this is the FIRST year the company has issued its annual Carbon Footprint Report emissions from the plant only, excluding the headquarter office. Noting that the represents 100% of NCC's total emission from internal operations.

In 2022, emissions from NCC's plant internal operations totaled 11,548,491 metric tons of carbon dioxide equivalent (CO2e). While emissions amounted to 0.888 tons per ton of clinker. Notably, The reason for this increase is the increase in the percentage of clinker in 2023 (13,136,747) over clinker production in 2022, which amounted to (13,011,519). Fig3

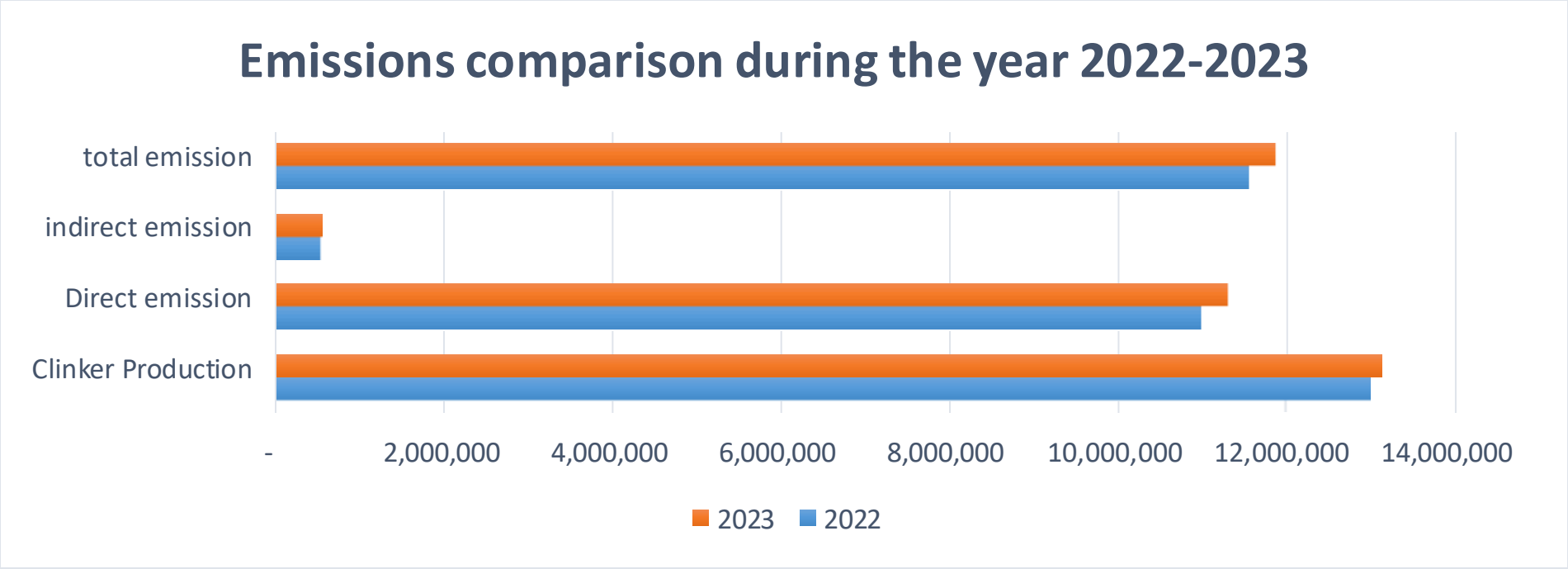

Figure 3: *Emissions comparison during the year 2022-2023*

This report describes the methodology for selecting and collecting data and computing carbon emissions for all relevant emission categories, using internal and external documentation, interviews with key NCC personnel and service suppliers, and source data. To ensure the accuracy of the calculations and the findings, GHG data is managed in strict accordance with the greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas Statements. This document prioritizes open data, the16rocesssing of data to provide results, and enhancement of the data's usability and annual maintenance.

GENERAL DETAILS, PURPOSE, AND POLICY

1.1 Introduction

This report includes the complete greenhouse gas (GHG) emissions inventory of the National Company for Cement (NCC) for 2023. NCC's reporting procedures and emission categorizations adhere to international regulations and standards. This report conforms to the greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas.

This document provides organization-wide information, including corporate overview and goals, boundary conditions of the inventory, emissions quantification methods, data management methods, list of management tools, and auditing processes. The report sets forth the current scope and vision of NCC's commitment to inventory and managing GHG emissions for its internal operations and contains NCC's GHG inventory methodology.

This report includes information that applies to NCC's company located in Bani Suef. This report is utilized for reporting to external stakeholders.

1.2 Purpose of this Report

NCC aims to (a) follow the best practices of cement plants regarding consistency, comparability, and completeness in the accounting of GHG emissions, (b) lead by example by managing its carbon emissions, and (c) align its internal activities with a pathway toward low GHG emissions. This report:

- Relates to NCC emissions from internal activities in 2023.
- Reflects NCC's initial attempt to report its GHG emissions in compliance with the greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas.
- Has been prepared in line with the greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas by SCO team. Attempts to use primary data whenever possible, particularly for all major emission sources. In the absence of primary data, a consistent and conservative calculation method is used.
- Does not include confidential information.
- Does not include Categories (Scope 3).

1.3 Introduction to NCC

The National Cement Company factory in Beni Suef is a major producer of cement in Egypt. The factory is strategically located in Beni Suef, a major industrial hub, providing access to key transportation networks. The factory employs hundreds of workers and contributes significantly to the local economy.

A presidential decree was issued to establish (National Company for Cement in Beni Suef) on October 31, 2018 as an Egyptian joint stock company in accordance with the provisions of Law No. 159 of 1981 promulgating the Law of Joint Stock Companies, Partnerships Limited by Shares and Limited Liability Companies and Investment Law No. 72 of 2017, provided that the contribution structure is as follows: (National Service Projects Organization with a contribution rate of 98.98% - Al-Arish Cement Company / National Service Projects Organization with a contribution rate of 0.02% - Al-Nasr Company for Services and Maintenance – Queen Service / National Service Projects Organization with a contribution rate of 1%).

The factories complex Includes (3) cement factories with a total of (6) production lines with a capacity of (6) thousand tons of clinker per day for each line with a total production capacity of (12) million tons of cement annually. It also includes (2) paper sacks production lines with a total production capacity of 200 million sacks annually, and the complex includes 3 central laboratories to test the materials used in the cement industry, as well as the products from the various factories within the complex.

The factories complex is equipped to work with three interchangeable fuel systems (Diesel – coal-HFO – Used oil(Gasoline)) and is equipped with a electricity station with a capacity of (180) mega and a wastewater treatment station at a rate of (600) m3 / day, and a civilized administrative area to serve the workers in the complex of factories on an area of (45) acres that includes Residence and service buildings (conference and lecture halls – dining halls – mosque – fire station – clinic – gas station – water tank – laundry ...) and recreational areas (sports fields – swimming pool) and green areas of 50 thousand square meters, and the complex is equipped with a helipad.

1.3.1 Institutional Carbon Management Policies and Strategies

NCC will in the future adopt a Corporate Carbon Emissions Management Plan (ICEM) (The Plan) to help the Company achieve carbon reduction by 2030 and align its internal activities. The Plan prioritizes emission tracing management and information disclosure. It identifies steps for the company to monitor, verify, and report its institutional carbon footprint, as well as the high- level strategies the company might employ to cut and decarbonize its institutional energy use.

The Plan also sets decarbonization targets for 2030 as part of NCC's efforts to curb climate change.

1.3.2 Institutional Carbon Monitoring, Reporting, and auditing

This report provides a comprehensive analysis of the carbon footprint generated by NCC's company in Beni Suef. It was compiled using internal and external documentation, submitted by key NCC personnel and service suppliers, and source data and data-gathering systems. Further, it describes the methodology for selecting and collecting data and computing carbon emissions for all relevant emission categories.

The greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas, Furthermore, it provides a framework for GHG accounting and auditing to organizations looking to quantify and reduce their GHG emissions.

1.3.3 Carbon Consultative Team / SCFC / SCO

Using its current knowledge and experience, Sustainability and Carbon Footprint Center team to address issues connected to resource usage efficiency, waste reduction, and pollution prevention.

The Carbon Consultative Team's primary objectives are to (a) identify ways to reduce the firm carbon footprint; (b) educate, inspire, and motivate employees to change their behavior both inside and outside of the workplace; and (c) ultimately empower all employees to live greener lives in a greener working environment. Leveraging on the firm team skills and experience, the Carbon Consultative team addresses resource conservation, waste reduction, and pollution control issues.

1.4 Persons Responsible

SCFC / SCO prepared the NCC Carbon Footprint Report 2023 with significant collaboration among departments of the company and the plant team

1.5 Audience and Dissemination Policy

This report is intended for all NCC stakeholders interested in NCC's GHG emissions inventory and the accompanying reporting format, notations, and explanations. In addition, the report communicates:

- NCC's institutional GHG performance, and
- NCC's institutional resolve to achieve GHG performance improvements

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1.6 Reporting Period

This Carbon Footprint Report covers the calendar year from January 1, 2023, to December 31, 2023. NCC's Carbon Footprint Reports

1.7 Reporting Standards, Approach, and auditing

1.7.1 Compliance

The GHG report for the year ending on December 31, 2023, has been prepared by the greenhouse gases protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas

1.7.2 Audit of GHG Inventory

This report has been audited to reasonable assurance by Independent Auditors:

- Chartered Accountant /Dr. Mostafa Elsayed Sherbiny Registration No. 14776 and Carbon Footprint Auditor – License No. NQI/CFP/11/23/09

  Observer of the Paris Climate Change Agreement at the United Nations and Chairman of the Scientific Chair for Carbon Footprint and Sustainability at ALECSO at the League of Arab States – Mobile: +201028285548
  Email: mostafa.shrb@gmail.com

- Carbon Footprint Auditor – License No. NQI/CFP/14/23/09 Assistant Professor Dr. Abeer Abdel-Kreem Srour

  Assistant Professor of Accounting and Auditing, Benha University & Member of the Egyptian Tax Association. Email: Abeer.Srour5@gmail.com

NCC initiated data collection and reporting in a structured format according to the Greenhouse Gases Protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas.

2. PRINCIPLES FOLLOWED IN GREENHOUSE GAS REPORTING

In preparing this report, NCC followed these five principles GHG accounting and reporting shall be based on the following principles

- Relevance
- Completeness
- Consistency
- Transparency
- Accuracy

Relevant GHG sources and sinks at the plant were identified and quantified for the purpose of GHG reporting based on the methodology described in the respective chapters of this report. In the event of uncertainty or lack of data, reasonable assumptions were made based on information accessible on various data platforms to limit the uncertainty and risks associated with GHG accounting.

NCC maintains the records used to collect data for the quantification of GHG emissions. Collecting sufficient and relevant GHG-related information allows the intended users to make decisions with an acceptable degree of confidence and enables the formulation of a road map to reduce internal GHG emissions.

3. GREENHOUSE GAS INVENTORY BOUNDARIES

1. 3.1 Geographic Boundaries of the Inventory

NCC calculates its carbon footprint using the Detailed Output Method (B2) – Corrected Calcination EF. The detailed output method (B2) accounts for CO_2 emissions per ton of clinker produced from the calcination process. As such, it encompasses the NCC plant in Beni Suef, where its plant and administrative functions are located.

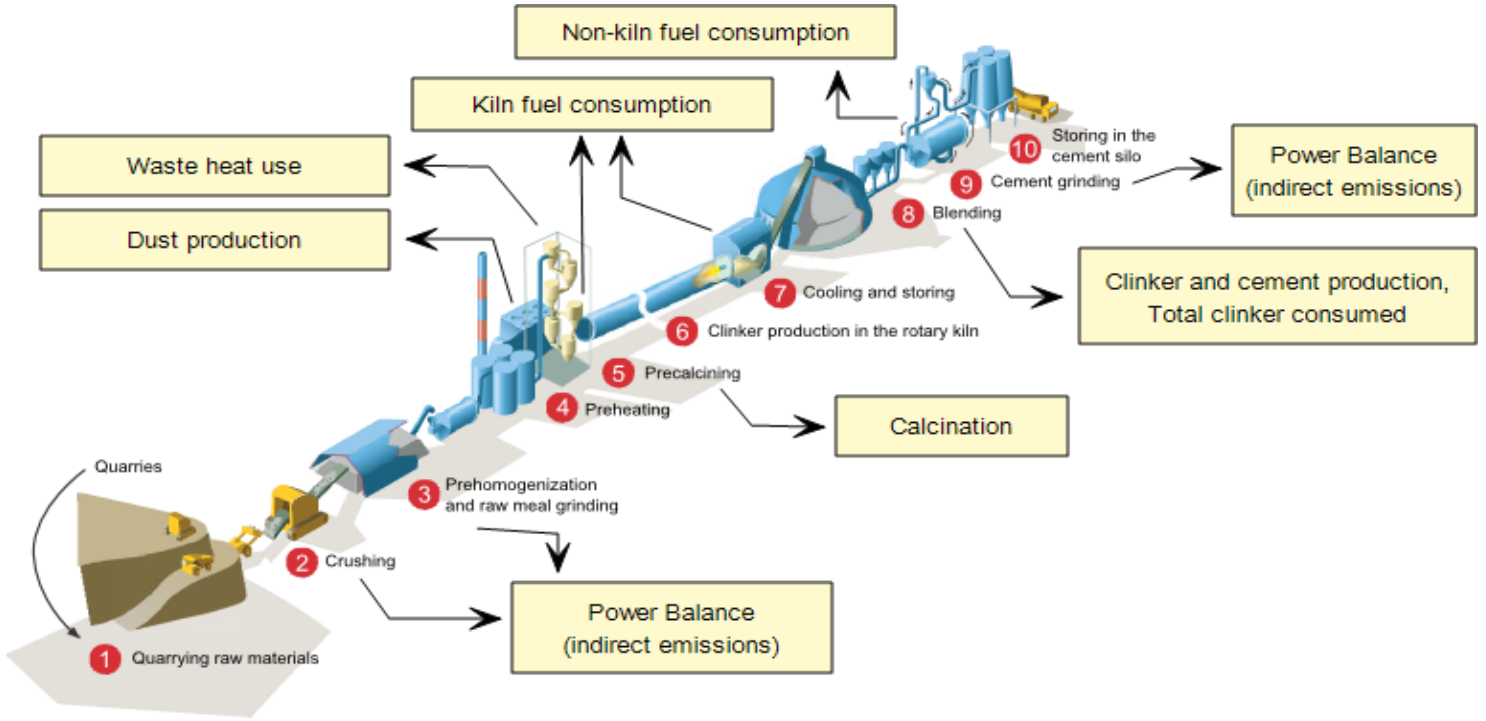

Figure 4: Plant Diagram

3.2 Reporting Boundary

3.2.1 Emissions Categories and Classification

NCC has chosen to set its organizational boundaries for the GHG inventory according to the Detailed Output Method (B2) – Corrected Calcination EF. The detailed output method (B2) accounts for CO_2 emissions per ton of clinker produced from the calcination process. NCC accounts for GHG emissions from its locations where it has direct control over operations and can influence decisions that impact GHG emissions. This includes all owned facilities operated by NCC.

This report is directed by sustainability and carbon footprint center of SCO. Reporting boundaries have been established within the NCC plant, including emissions from process, combustion, mobile source and purchased electricity.

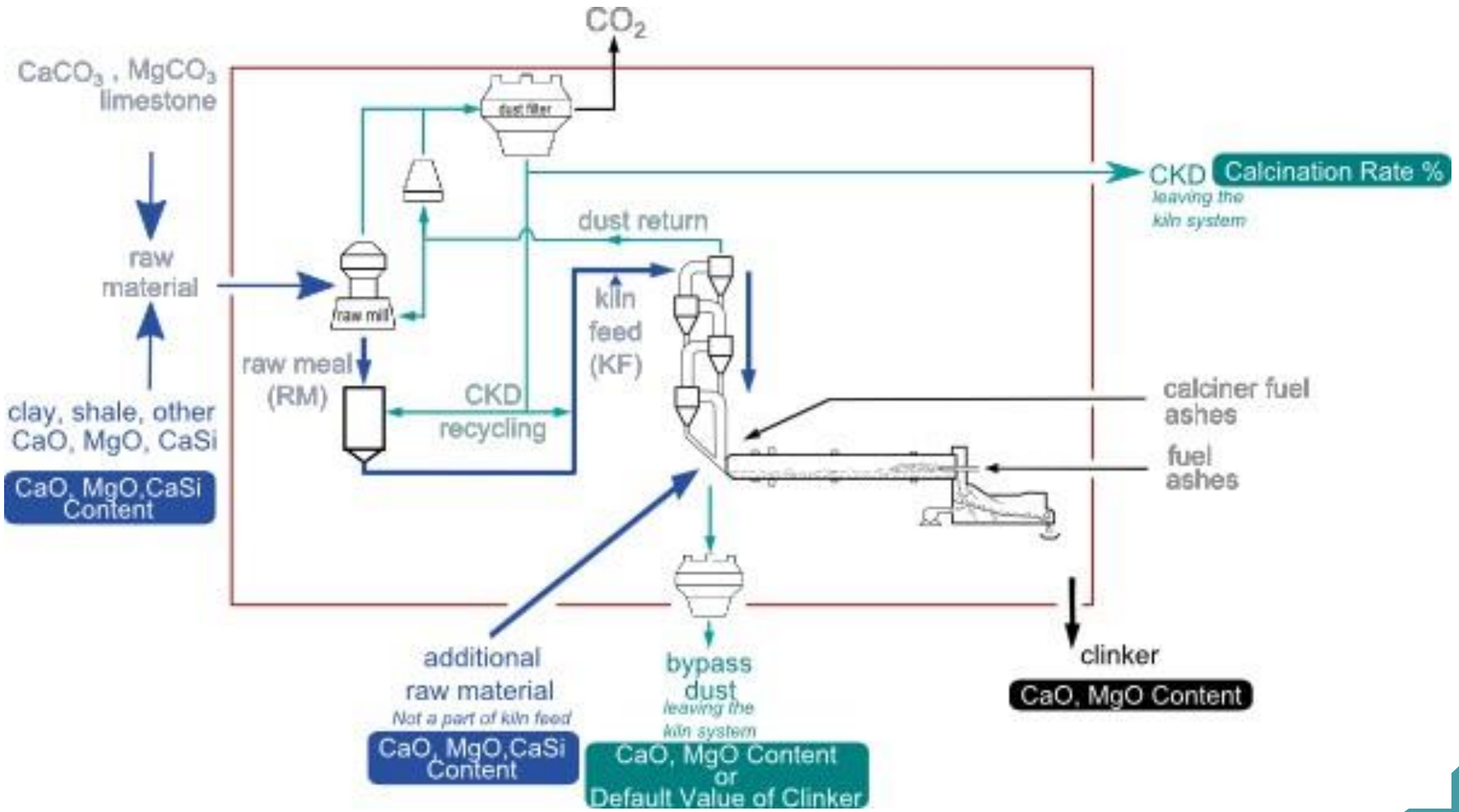

Figure 5: Diagram of the detailed output method (B2)

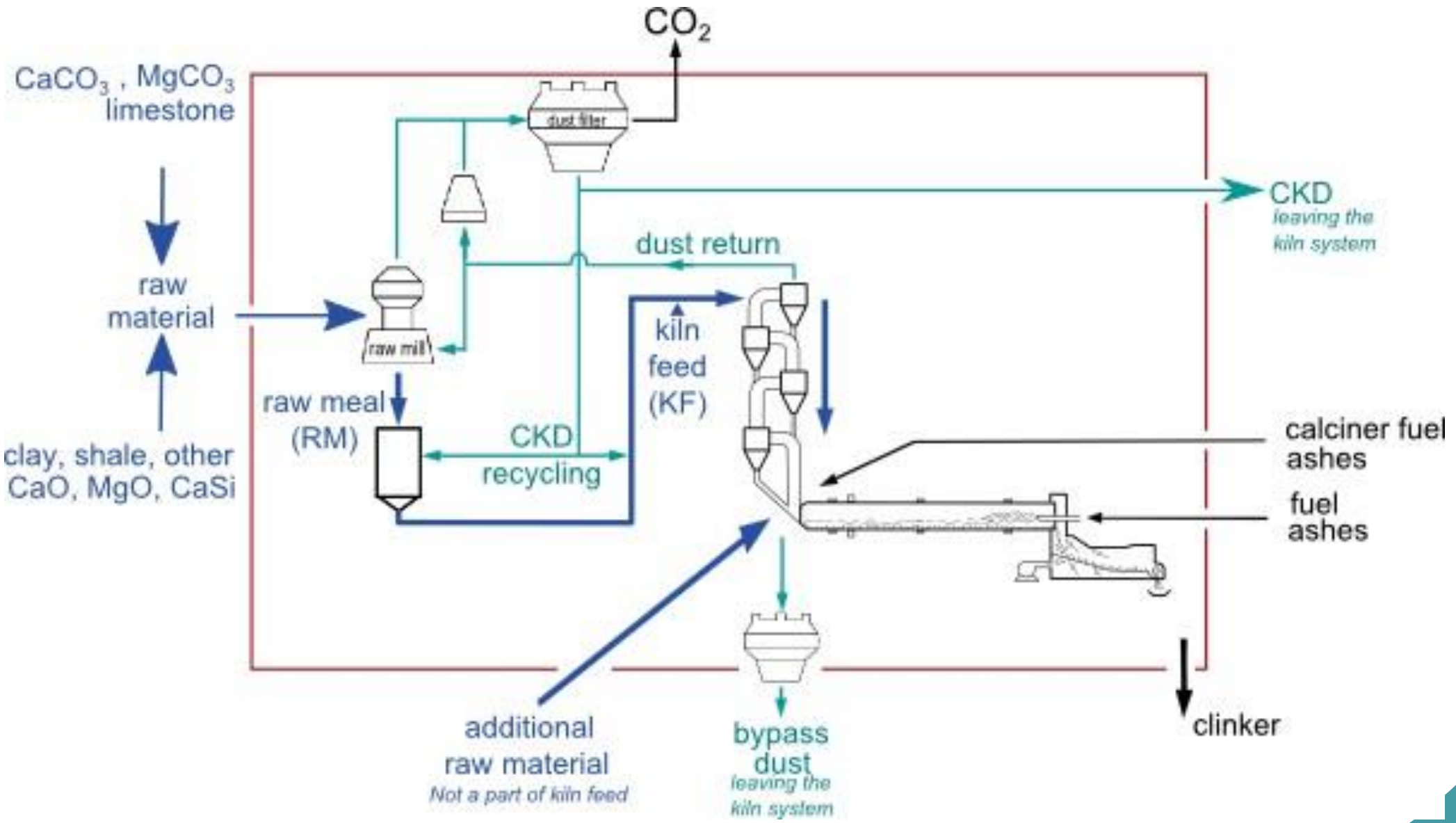

Figure 6: Schematic diagram of material and dust flows in a cement plant

3.2.2 Summary of Emissions Source Inclusions

Establishing operational limits for NCC GHG emissions is mostly influenced by raw materials usage in clinker production, fuel consumption in the process, and fuel usage in purchased electricity.

Table 1: ***Summary of Included Sources of Emissions, 2023***

Category	Emission Sources	Methodology	Data Source
		Clinker produced (in Tons clinker)	Measured at plant level
		CaO + MgO in clinker (in %)	Measured at plant level
	CO_2 from raw materials'	CaO + MgO in raw materials (in %)	Measured at plant level
	calcination	CKD (in Tons CKD)	Measured at plant level or default value
Category 1 (Scope 1)	• From clinker produced	Emission factor clinker (in kg CO_2/ ton clinker)	As calculated or default value
	• From dust emissions	Dust calcination degree (in % calcined)	Measured at plant level or default
		Emission factor CKD (in kgCO_2/ton CKD)	Default value

Category	Emission Sources	Methodology	Data Source
	Fossil fuels: kiln • Coal • HFO • Used Oil (Gasoline) • Diesel Diesel for mobile equipment	Fuel consumption (in Tons/liters)	Measured at company level
		Net calorific value (in GJ /t fuel & GJ /l fuel)	Measured at company level
		Carbon content (in w/w)	Measured value
		Emission factor (in Kg CO2 /GJ fuel)	Measured or default
		Fuel consumption or distance travel (in Liter or kilometer)	Measured at company level
		Emission factor (in kg CO2/liter or kg CO2/km)	Measured or default
Category 2 (Scope 2)	Electricity from Grid	Power consumption (in kWh)	Measured at company level or Electricity billing
		Emission factor (in Gram CO2/liter)	Measured or default

4. QUANTIFIED GREENHOUSE GAS INVENTORY OF EMISSIONS

4.1 Consolidated Statement of Greenhouse Gas Emissions

5. Table 2: Summary of CO2e Emissions by GHG PROTOCAL 2022-2023

	2023	2022
Category 1	**CO_2e (tons)**	**CO_2e (tons)**
Direct Process Emission	**7,157,745**	**7,063,792**
Coal	3,808,410	3,281,942
HFO	329,050	620,601
Diesel	30,167	36,131
Used oil (Gasoline)	2,750	2,351
air conditioner	47.06	47.06
natural gas	59	59
Total	**11,328,228**	**11,004,924**

Category 2	**CO_2e (tons)**	**CO_2e (tons)**
Electricity from Grid	**559,385**	**543,614**
Total	**559,385**	**543,614**

Total Emission Category (1&2)	**11,887,566**	**11,548,491**

4.2 Methodologies for the Collection and Quantification of Data

By the Greenhouse Gases Protocol (GHG), the Cement Sustainability Initiative (CSI), and ISAE 3410 Assurance Engagements on Greenhouse Gas, the emissions summary consolidates and standardizes emissions data and provides a full explanation of working and estimation.

An overview of emissions sources and their respective data sources are provided in Section 4.2.1. The best available data and computation methods are utilized when estimation is necessary.

The combustion process is defined by the rapid oxidation of substances (i.e., fuels) with the release of thermal energy (i.e., heat). Category 1 activities emit direct GHG such as CO_2 as well as ambient air pollution. The emission of these gases from Category 1 sources depends on fuel characteristics, quantity, and combustion technology. Emissions also vary with operation and maintenance practices.

This report tries to use regional emission factors and international emission factors. It uses the most relevant factors indicated by:

- General rules for calculation of the comprehensive energy consumption
- The notice regarding the management of greenhouse gas emission reports from power generation industry enterprises for the year 2023 using the 2023 country-specific electricity grid greenhouse gas emission factors, as referenced by carbonfootprint.com.

4.2.1 Calculation of Greenhouse Gas Emissions.

Calcination is the release of CO_2 from carbonates during pyro-processing of the raw mix. Calcination CO_2 is directly linked with clinker production. In addition, calcined cement kiln dust (CKD), which is finally released from the stack also accounts for CO_2 emissions. These emissions are to be reported as process emissions within Scope 1.

The approach used in the clinker-based methodology is based on the WBCSD cement protocol, which calculates calcination CO_2 using clinker produced and discarded dust (in line with the methodology suggested under IPCC guidelines). The following equations are applied:

$$Uncorrected\ CO_2\ emission = \frac{Mass\ of\ CaO\ in\ clinker}{M\ Wt\ CaO} M\ Wt\ CO_2 + \frac{Mass\ of\ MgO\ in\ clinker}{M\ Wt\ MgO}\ M\ Wt\ CO_2$$

$$Uncorrected\ CO_2\ emission = \frac{8515568}{56.1}\ 44.0 + \frac{145161}{40.3}\ 44.0$$

$$Uncorrected\ CO_2\ emission = \ 6{,}837{,}364$$

$$Correction\ by\ raw\ material$$
$$= \frac{Mass\ of\ CaO\ in\ (raw\ material\ \&\ Coal\ Ash)}{M\ Wt\ CaO} MWt\ CO_2 + \frac{Mass\ of\ MgO\ in\ (raw\ material\ \&\ Coal\ Ash)}{M\ Wt\ MgO} MWt\ CO_2$$

$$Correction\ CO_2\ emission = \frac{0}{56.1}\ 44.0 + \frac{0}{40.3}\ 44.0$$

$$Correction\ CO_2\ emission = \ 0$$

$$Corrected, direct\ CO_2\ emissions = \ Uncorrected\ CO_2\ emission - \ \ Correction\ CO_2\ emission$$

$$Corrected, direct\ CO_2\ emissions = 6{,}837{,}364\ - \ \ 0$$

$$Corrected, direct\ CO_2\ emissions = 6{,}837{,}364$$

$$Emission\ factor, Corrected\ (EF_{Cli}) = \frac{Corrected,\ \ direct\ CO_2\ emissions}{total\ clinker\ produced}\ mass\ CO_2/mass\ Clinker$$

$$Emission\ factor, Corrected\ (EF_{Cli}) = \frac{6{,}837{,}364}{13{,}136{,}747} * 1000\ mass\ CO_2/mass\ Clinker$$

$$Emission\ factor, Corrected\ (EF_{Cli}) = \ 520.47\ \ mass\ CO_2/mass\ Clinker$$

$$Dust\ produced\ (tonnes\ of\ dust)$$

$$= \text{ dust emission norms specified for your plant } \left(\text{in}\frac{\text{mg}}{\text{Nm}^3}\right)$$

$$* \text{ average clinker production factor for your plant } \left(\frac{\text{Nm}^3}{\text{kg}}\text{ clinker}\right) * \text{ total clinker produced (kg)/1000000}$$

$$Dust\ produced\ (tonnes\ of\ dust) = 30.0\ \left(\text{in}\frac{\text{mg}}{\text{Nm}^3}\right) * 0.728\ \left(\frac{\text{Nm}^3}{\text{kg}}\text{ clinker}\right) * 13{,}136{,}747\ \text{(ton)}/1000000$$

$$Dust\ produced\ (tonnes\ of\ dust) = 286.9$$

$$Emission\ factor\ of\ partially\ calcined\ cement\ kiln\ dust\ \left(\frac{tCO_2}{tCKD}\right) = \frac{\left(\left(\frac{EF_{Cli}}{1+EF_{Cli}}\right)*d\right)}{\left(1-\frac{EF_{Cli}}{1+EF_{Cli}}*d\right)}$$

where,

EF_{CKD} = emission factor of partially calcined cement kiln dust (t CO_2/t CKD)

EF_{Cli} = plant specific emission factor of clinker (t CO_2/t clinker)

d = degree of CKD calcination (released CO_2 as percentage of total carbonate CO_2 in the raw mix feed to the kiln.)

$$Emission\ factor\ of\ partially\ calcined\ cement\ kiln\ dust\ \left(\frac{tCO_2}{tCKD}\right) = \frac{\left(\left(\frac{520.47}{1+520.47}\right)*90\right)}{\left(1-\frac{520.47}{1+520.47}*90\right)}$$

$$Emission\ factor\ of\ partially\ calcined\ cement\ kiln\ dust\ \left(\frac{tCO_2}{tCKD}\right) = 0.445$$

Carbon dioxide emissions related to CKD:

$$= \frac{Emission\ factor, Corrected\ (EF_{Cli})}{1000} * Dust\ produced\ (tonnes\ of\ dust)$$

$$= \frac{520.47}{1000} * 286.9 = 128\ ton\ CO_2$$

CO_2 from calcination of bypass dust leaving the kiln system

$$= \frac{Emission\ factor, Corrected\ (EF_{Cli})}{1000} * Dust\ produced\ (tonnes\ of\ dust)$$

$$= \frac{520.47}{1000} * 328419 = 170932\ ton\ CO_2$$

Carbon dioxide emissions related to TOC

$$Dust\ produced\ (tonnes\ of\ dust) = 0.002 * raw\ meal\ (ton)$$

$$= 0.002 * (TOTAL\ CLINKER * 1.55)$$

$$= 0.002 * ((13{,}136{,}747 * 1.55)$$

$$= 40724\ ton$$

CO_2 *from calcination of TOC* $= TOC\ * 44/12$

$$=40724* (44/12)$$

$$= 149321\ \text{ton}$$

$$Direct\ Process\ Emissions = (P_{Cli} *\ EF_{Cli}) + (CKD * EF_{CKD}) +\ (By\ Pass * EF_{Cli}) + TOC\ as CO2$$

$$= (13{,}136{,}747 *\ 0.520) + (286.9 * 0.445) + (328{,}419 * 0.520) + (149{,}321)$$

$$Direct\ Process\ Emissions = 7{,}157{,}745\ ton$$

4.2.1.1 Direct stationary combustion

4.2.1.1.1 CO_2 from fossil fuel combustion

CO_2 from conventional fossil kiln fuels (coal, Diesel, HFO and used oil(Gasoline)) is calculated based on fuel consumption, net calorific values, and CO_2 emission factors. Fuel consumption and net calorific values of fuels are routinely measured at plant level.

Generally, the IPCC recommends accounting for the incomplete combustion of fossil fuels. In cement kilns, however, this effect is negligible due to the very high combustion temperatures, long residence time in the kilns, and minimal residual carbon found in the clinker.

Consumption data calculated based on actual quantity of fuel used in the reporting period; the following equations are applied:

$$Quantity\ of\ Coal$$

$$= Total\ quantity\ of\ fuel\ burned * Average\ net\ calorific\ value$$

$$Quantity\ of\ Coal\ used\ \ in\ energy = 1{,}384{,}192 * 28.66$$

$$Quantity\ of\ Coal\ used\ \ in\ energy = 39{,}367{,}943\ \ GJ$$

$$CO_2\ emission\ from\ Coal\ (tonnes)$$
$$=\ \ Quantity\ of\ fuel\ used\ \ in\ energy$$
$$*\ CO_2\ Combustion\ Emission\ Factor/1000$$

$$CO_2\ emission\ from\ Coal\ (tonnes) =\ \ (39{,}367{,}943\ * 96)/1000$$

$$CO_2\ emission\ from\ Coal\ (tonnes) =\ \ 3{,}808{,}410$$

$$Quantity\ of\ HFO$$

$$= Total\ quantity\ of\ fuel\ burned * Average\ net\ calorific\ value$$

$$Quantity\ of\ HFO = 105{,}230 * 40.40$$

$$Quantity\ of\ HFO = 4{,}251{,}292\ \ GJ$$

$$CO_2\ emission\ from\ HFO\ (tonnes)$$

$$= \ \ Quantity\ of\ fuel\ used\ \ in\ energy * \ CO_2\ Combustion\ Emission\ Factor/1000$$

$$CO_2\ emission\ from\ HFO\ (tonnes) = \ \ (4{,}251{,}292 * \ 77.40)/1000$$

$$CO_2\ emission\ from\ HFO\ (tonnes) = \ \ 329{,}050$$

$$Quantity\ of\ Diesel$$

$$= Total\ quantity\ of\ fuel\ burned * Average\ net\ calorific\ value$$

$$Quantity\ of\ Diesel\ used\ \ in\ energy = (11{,}712{,}830 * 0.87) * 0.04$$

$$Quantity\ of\ Diesel\ used\ \ in\ energy = 407{,}606\ GJ$$

$$CO_2\ emission\ from\ Diesel\ (tonnes)$$
$$= \ \ Quantity\ of\ fuel\ used\ \ in\ energy$$
$$*\ CO_2\ Combustion\ Emission\ Factor/1000$$

$$CO_2\ emission\ from\ Diesel\ (tonnes) = \ \ 407{,}606 *\ 74.01/1000$$

$$CO_2\ emission\ from\ Diesel\ used\ in\ DG\ Set\ (tonnes) = \ \ 30{,}167$$

$$Quantity\ of\ Used\ oil\ (\text{Gasoline})$$

$$= Total\ quantity\ of\ fuel\ burned * Average\ net\ calorific\ value$$

$$Quantity\ of\ Used\ oil\ used\ \ in\ energy = (136{,}151 * 0.74) * 0.394$$

$$Quantity\ of\ Used\ oil\ used\ \ in\ energy = 39{,}696.19\ GJ$$

$$CO_2\ emission\ from\ Used\ oil\ (Gasoline)\ (tonnes)$$

$$= \ \ Quantity\ of\ fuel\ used\ \ in\ energy * \ CO_2\ Combustion\ Emission\ Factor/1000$$

$$CO_2\ emission\ from\ Used\ oil\ (tonnes) = \ \ (39{,}696.19 * 69.3)/1000$$

$$CO_2\ emission\ from\ Used\ oil\ (tonnes) = \ \ 2{,}750.95$$

$$Quantity\ of\ Used\ natural\ gas$$

$$= Total\ quantity\ of\ natural\ gas * Average\ net\ calorific\ value$$

$$Quantity\ of\ Used\ in\ natural\ gas = (29{,}79 * 35.6)$$

$$Quantity\ of\ Used\ oil\ used\ \ in\ natural\ gas = 106{,}052.$$

$$CO_2\ emission\ from\ Used\ natural\ gas\ (tonnes)$$

$$=\ \ Quantity\ of\ \ fuel\ used\ \ in\ natural\ gas$$

$$*\ \ CO_2\ Combustion\ Emission\ Factor/1000$$

$$CO_2\ emission\ from\ Used\ natural\ gas\ \ =\ \ (106{,}052 * 0.561)/1000$$

$$CO_2\ emission\ from\ Usednatural\ gas\ \ =\ \ 59$$

$$Direct\ emissions\ from\ fossil\ fuel\ combustion\ (tonnes)$$
$$= CO_2\ emission\ from\ Coal + CO_2\ emission\ from\ HFO$$
$$+ CO_2\ emission\ from\ Diesel + CO_2\ emission\ from\ Used\ oil(Gasoline)$$
$$+ CO_2\ emission\ from\ Used\ natural\ gas$$

$$Direct\ emissions\ from\ fossil\ fuel\ combustion\ (tonnes) =$$

$$3{,}808{,}410 + 329{,}050 + 30167 + 1{,}692 + 59$$

$$Direct\ emissions\ from\ fossil\ fuel\ combustion\ (tonnes) = 4{,}170{,}436$$

Total Direct Emission = 7,157,745 + 4,170,436 = 11,328,181

4.2.1.2 Indirect greenhouse gas emissions

Indirect emissions from electricity purchased by the cement plant have been included as Scope2 emissions; to calculate CO_2 emissions the following equations are applied:

$$Indirect\ emissions\ from\ purchased\ electricity\ (tonnes\ CO2) = Electricity\ Purchased\ (kWh) * CO2\ emission\ factor(grams\ CO_2/kWh)/1000000$$

$$Indirect\ emissions\ from\ purchased\ electricity\ (tonnes\ CO2) = 1{,}216{,}054{,}905 * 0.46\ /1000$$

$$Indirect\ emissions\ from\ purchased\ electricity\ (tonnes\ CO2) = 559{,}385$$

This report currently excludes categories (scope 3).

5.1.2. Removals

There are no carbon removals to report for the current reporting period.

Report prepared by:

no	Name	Title
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3	Dr. Mohamed Saber Yahia	-Director of Scientific Consultations for the Scientific Consulting Office -Environmental advisor
4	Chemist. George Badie Attia	-Project Manager/ Scientific Consulting Office
5	Chemist. Mustafa Abdel Hamid Fakhri	Managing Director/ Scientific Consulting Office

Thank you