

Guidance on Use of ‘Tier 1 CO₂ uptake model for concrete’ Excel Workbook

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Preface

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1 Introduction

1.1 Cement and concrete manufacture

Concrete, the most widely used manmade material, is made by mixing aggregates (crushed rocks) and sand with cement and water. Mortar is made by mixing sand with cement and water.

Cement is the key material which binds both concrete and mortar. Cement is made by crushing and heating limestone (or chalk), together with small amounts of other natural materials, such as clay or shale, in a kiln to very high temperatures of around 1450°C. This breaks down the calcium carbonate in the limestone into calcium oxide and carbon dioxide, in a chemical reaction known as calcination. The calcium oxide then reacts with silica to form a substance called clinker, which contains mainly calcium silicates. The clinker is then ground with gypsum to the very fine grey powder known as cement. Traditional Portland cement, or CEM I, is typically 95% clinker and 5% gypsum. The clinker content of cement or concrete can be reduced by including materials such as fly ash (a by-product from coal fired power stations), limestone and blast furnace slag (a by-product of iron production which is granulated and ground for use in cement), although this will also change its binding properties.

1.2 CO₂ emissions to the atmosphere from cement production

There are two sources of carbon dioxide emissions in cement manufacture:

- Fuel emissions: carbon dioxide emissions arising from combustion of fuel used to heat the kiln to very high temperatures of around 1450°C.
- Calcination emissions: carbon dioxide emissions from the calcination chemical reaction occurring when the limestone is heated to 1450°C and the calcium carbonate breaks down into calcium oxide and carbon dioxide. Calcination emissions typically account for approximately 60-66% of the carbon dioxide emissions from cement manufacture.

1.2.1 CO₂ removals from the atmosphere due to carbonation of concrete

Once the cement is used to produce concrete, or other cement-containing products, the calcination chemical reaction naturally reverses. The concrete starts to reabsorb carbon dioxide from the atmosphere, mineralizing the concrete and enhancing its stone-like properties. This process is called carbonation (or sometimes referred to as recarbonation), and occurs in all concrete structures - buildings, pavements, tunnels, dams, bridges - throughout their life. Mortar, which is made by mixing sand with cement and water, also carbonates.

The science of carbonation is well established and already included in standards for calculating the carbon footprint of concrete buildings, structures, and products. The 2006 IPCC Guidelines for National Greenhouse Gas Inventories do not present a methodology for calculation of carbonation (nor does the 2019 Refinement to the 2006 Guidelines). However, the 2006 Guidelines do note that it is an area for future work before inclusion into national inventories.

1.3 UNFCCC reporting of CO₂ emissions due to cement production

National CO₂ emissions from cement production are included in national Greenhouse Gas Inventories (GHGI). National GHGI contain annual data on all greenhouse gas emissions from the baseline year 1990 and are reported annually to the United Nations Framework Convention on Climate Change (UNFCCC).

For cement production, the fuel and calcination emissions are reported separately in the GHGI.

1.3.1 Fuel combustion emissions

Fuel combustion emissions are reported to the UNFCCC under the source sub-category 1A2f Stationary combustion in manufacturing industries and construction – non-metallic minerals.

1.3.2 Calcination emissions

Calcination emissions are reported to the UNFCCC under the source sub-category 2A1 Industrial Processes and Product Use – Mineral Industry – cement production

1.3.3 Calculation of emissions for reporting

Within the IPCC Guidelines for Greenhouse Gas Inventories, a tier represents the level of methodological complexity used to calculate emissions for a specific source sub-category.

Tier 1 is the basic method. Tier 1 methods for all categories are designed to use readily available national or international statistics in combination with the provided default emission factors and additional parameters that are provided, and therefore should be feasible for all countries.

Tier 2 is intermediate, and Tier 3 is most demanding in terms of complexity and data requirements. Tiers 2 and 3 are sometimes referred to as higher tier methods and are generally considered to be more accurate on condition that adequate data are available to develop, evaluate and apply a higher tier method.

The 2006 IPCC Guidelines give guidance on the choice of the most appropriate method to calculate cement calcination emissions, based on national circumstances, and on how to calculate calcination CO₂ emissions at each Tier.

1.4 UNFCCC reporting of CO₂ uptake due to carbonation of concrete

Until very recently, carbon dioxide removals from the atmosphere due to carbonation of concrete, although mentioned in the IPCC Guidelines, had not been reported by any country in their National Greenhouse Gas Inventory Report to the UNFCCC. In 2018, IVL published a report outlining methodologies to calculate CO₂ removals from the atmosphere due to carbonation for reporting in National Greenhouse Gas Inventory Reports to the UNFCCC. An updated version was published in 2021. The IVL report describes methodologies at three Tiers of complexity, Tier 1, Tier 2, and Tier 3, to calculate CO₂ removals from the atmosphere due to carbonation of cement-containing products, which individual countries are now testing in their National Greenhouse Gas Inventory reporting. Sweden was the first country to include CO₂ removals from the atmosphere due to carbonation in their National Greenhouse Gas Inventory Report, as a memo item in their 2020 submission to the UNFCCC, using the Tier 1 methodology described in IVL 2018.

Carbonation is the reverse of the cement calcination reaction. Therefore, removals of CO₂ from the atmosphere due to carbonation are to be reported under the source sub-category 2A1 Industrial Processes and Product Use – Mineral Industry – cement production

Note that, Tier 1 of the IVL methodology is based upon the reported calcination emissions. For the higher Tiers of the IVL methodology, additional data on concrete use is required. Therefore, CO₂ removals due to carbonation may be calculated using the IVL Tier 1 methodology, even if the CO₂ emissions due to cement production are calculated using a higher Tier methodology.

2 Scope of this guidance and accompanying workbook

The workbook enables you to carry out a Tier 1 calculation of CO₂ removals from the atmosphere due to carbonation of cement-containing products, using the methodology described in IVL 2018. You can then submit this calculation to your national Greenhouse Gas Inventory Agency for inclusion in your National Greenhouse Gas Inventory Report (NIR).

Note that the Tier used to calculate national CO₂ removals from the atmosphere due to carbonation of cement-containing products does not need to be the same as the Tier used to calculate national CO₂ emissions from cement production.

The IVL 2018 report also describes Tier 2 and Tier 3 methodologies to calculate CO₂ removals from the atmosphere due to carbonation of cement-containing products. However, these are outside the scope of this workbook and guidance.

2.1 Who should use the workbook?

The workbook is aimed at cement industry professionals, government officials and agencies responsible for compiling National Greenhouse Gas Inventories. It is expected that most users will have knowledge of either the cement industry or GHGI compilation. However, with the aid of this guidance, the workbook should be accessible to any user who has access to the appropriate industry statistics and is familiar with basic Excel spreadsheets.

Cement industry professionals seeking to include CO₂ uptake by carbonation in their National Inventory Report to the UNFCCC are advised to make early contact with the government officials and agencies responsible for compiling their National Greenhouse Gas Inventory.

The workbook has been developed primarily for industrialised countries, that are an Annex I Party to the UNFCCC, but can also be used by countries that are a Non-Annex I Party.

2.2 Data requirements

The workbook requires annual data on national cement clinker production and cement clinker imports and exports. If available, data for calcination emissions from national cement clinker production and the percentage of clinker used in mortar for rendering should also be input.

Data can come from industry statistics or national statistics. Clinker production data and calcination emissions data must be consistent with the data used to report CO₂ emissions from cement production in your NIR (see section 1.3 and section 5).

The workbook assumes that users have access to annual data timeseries going back to 1990, in line with UNFCCC reporting requirements for Annex I Parties (section 5.1). Countries which are Non-Annex I Parties are likely to have shorter timeseries (section 5.2). You should include as many years data as you have available. You can add information on data availability to the 'Country notes' sheet of the workbook.

Further detail on input data requirements is given in Section 4.

2.3 Further guidance

For further guidance on data availability in your country, please contact your national cement industry association, if any, or the leading cement supplier(s), and government officials responsible for compiling your GHGI.

For further help on use of the Excel workbook, please use the contacts listed on the 'Introduction' sheet.

3 Methodology

This workbook implements the IVL (2018) Tier 1 methodology to calculate CO₂ removals from the atmosphere due to carbonation of concrete. This is a simplified methodology to estimate the national CO₂ uptake in all concrete within the country: in the use stage (existing structures), in the end-of-life stage (demolition, crushing, stockpiling), and in secondary use. For each use stage, the CO₂ removed from the atmosphere is assumed to be related to the reported calcination emissions from the clinker consumed nationally.

Note that the calculation is based on CO₂ emissions from calcination for cement clinker consumed within the country, rather than cement clinker produced within the country. Therefore, nationally calculated calcination emission values based on clinker production may need to be adjusted for exports and imports of cement/clinker.

The CO₂ uptake factor during the concrete use stage is 0.2, i.e. 20% of national CO₂ emissions from calcination of clinker consumed. Hence

$$\begin{aligned} & \text{CO}_2 \text{ removals due to carbonation of concrete in use stage} \\ & = 0.20 \times \text{calcination CO}_2 \text{ emissions from cement clinker consumed nationally} \end{aligned} \quad \text{Equation 1}$$

Mortar used for rendering applications will carbonate and remove CO₂ more rapidly. Therefore, if a relatively high proportion of the national cement consumption is used as mortar for applications, the CO₂ removals during the use stage are adjusted accordingly using a mortar render factor, MR, which can be between 10% and 30%.

$$\begin{aligned} & \text{CO}_2 \text{ removals due to carbonation of concrete in use stage with high mortar proportion} \\ & = (0.20 + 0.0115 (\text{MR} - 10)) \times \text{calcination CO}_2 \text{ emissions from cement clinker consumed nationally} \\ & \text{where MR, the mortar percentage for rendering applications, is between 10\% and 30\%} \end{aligned} \quad \text{Equation 2}$$

The default CO₂ uptake factor for concrete during the end-of-life stage is 0.02, i.e. 2% of national CO₂ emissions from calcination of clinker consumed.

The default CO₂ uptake factor for concrete in secondary use is 0.01, i.e. 1% of national CO₂ emissions from calcination of clinker consumed.

Hence, the CO₂ uptake factor for all concrete over the three life stages is 0.23, i.e. 23% of national CO₂ emissions from calcination of clinker consumer, plus an adjustment factor if a high proportion of cement is used for mortar and rendering applications.

$$\begin{aligned} & \text{Total CO}_2 \text{ removals due to carbonation of concrete in all life stages} \\ & = (0.20 + 0.0115 (\text{MR} - 10) + 0.02 + 0.01) \times \text{calcination CO}_2 \text{ emissions from cement clinker consumed nationally} \end{aligned} \quad \text{Equation 3}$$

Note: IVL 2018 assumes that national data on end-of-life and secondary use concrete is not available. IVL 2018 gives alternative Tier 1 calculation methodologies which can be used for the end-of-life and secondary use stages if the annual quantities of concrete in these stages are known.

4 Data Input

The workbook requires the following data inputs in the sheet 'Tier 1 DATA INPUT':

- National cement clinker production
- Calcination emissions from national cement clinker production - optional
- Imported cement/clinker (as ktonne clinker)
- Exported cement/clinker (as ktonne clinker)
- Percentage of total national clinker use which is used in mortar for rendering (%) [range between 10-30] - optional

4.1 National cement clinker production

Cement clinker production should already be included in your country's NIR (see section 5). The data you input should be consistent with this.

Data should be input as ktonne clinker in column B of the 'Tier 1 DATA INPUT' sheet.

Do not input cement data. If only cement data is available, you need to derive clinker data as described in Appendix 1.

4.2 Calcination emissions from national cement clinker production

Calcination emissions input data should also be consistent with the data in your NIR/CRF (see section 5).

Remember that calcination emissions are reported to the UNFCCC under the source sub-category 2A1 (see section 1.3.2). Do not include fuel combustion emissions which are reported under source sub-category 1A2f (see section 1.3.1).

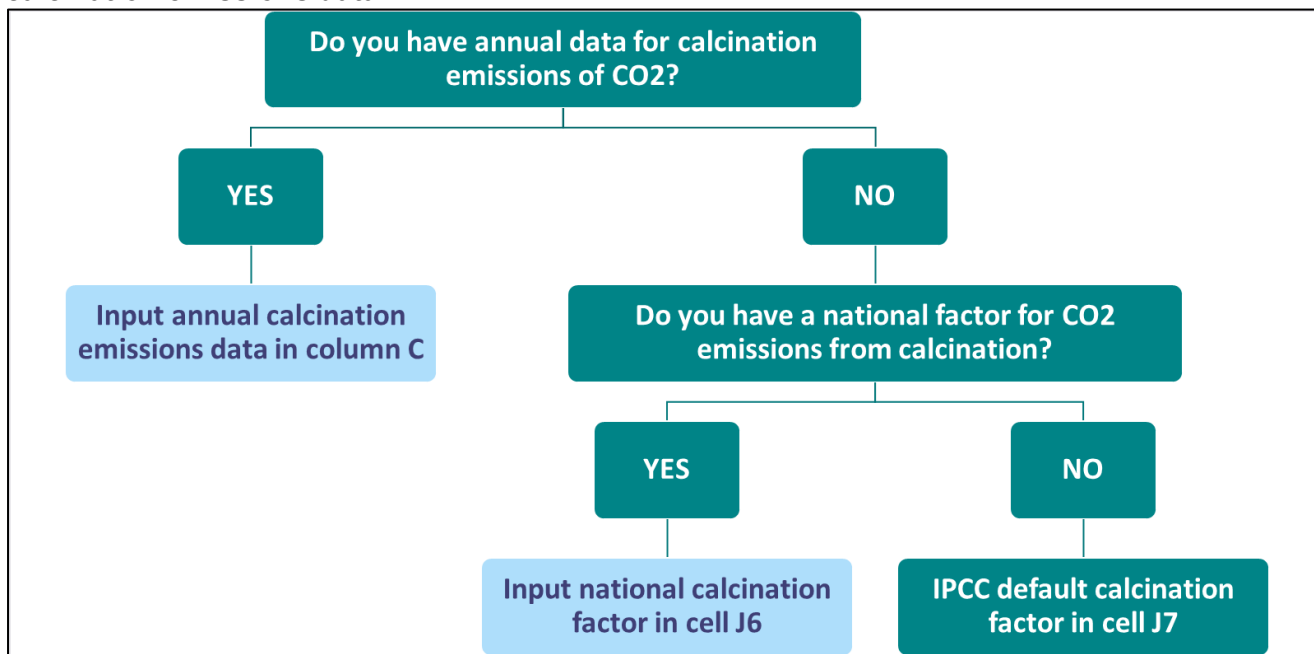
If you have already calculated annual national calcination emissions data for submission to the UNFCCC (see section 5 and overview in sections 1.3.2, 1.3.3), you should input this data in column C.

If you do not have annual national calcination emissions data, the workbook will use an emissions factor to calculate your calcination emissions. You can find out whether you have a national calcination emissions factor from your national NIR (section 5). If you have a national emissions factor for calcination emissions, input this in cell J6.

If you do not have a national emissions factor for CO₂ emissions from calcination, the workbook will use the IPCC default factor, 0.52 ktonne CO₂ from calcination/ ktonne clinker produced, given in cell J7. No further input is required.

The workbook contains a flowchart (Figure 1) to guide the user through the different options.

Figure 1 'Tier 1 CO₂ uptake model for concrete' Excel Workbook flowchart for input of calcination emissions data



Do you have annual data for calcination emissions of CO₂?

- **YES** If you already have annual data for calcination emissions of CO₂ from national cement clinker production, this should be input in column C of the 'Tier 1 DATA INPUT' sheet.
- **NO** If you do not have annual data for calcination emissions of CO₂ from national cement clinker production, the workbook will calculate calcination emissions of CO₂ using a calcination emissions factor.

Do you have a national factor for CO₂ emissions from calcination?

- **YES** If you have a national factor for CO₂ emissions from calcination, input this in cell J6. The workbook will use your national factor to calculate calcination emissions of CO₂ from national clinker production.
- **NO** If you do not have a national factor for CO₂ emissions from calcination, the workbook will use the IPCC default calcination emissions factor to calculate calcination emissions of CO₂ from national clinker production. The IPCC default factor, 0.52 ktonne CO₂ from calcination/ ktonne clinker produced, is given in cell J7. No further input is required.

4.3 Imported cement/clinker (as ktonne clinker)

This data can be obtained from cement industry statistics or national statistics.

Data should be input as ktonne clinker in column D of the 'Tier 1 DATA INPUT' sheet of the workbook.

Do not input cement data. If only cement data is available, you need to derive clinker data as described in Appendix 1.

4.4 Exported cement/clinker (as ktonne clinker)

This data can be obtained from cement industry statistics or national statistics.

Data should be input as ktonne clinker in column E of the 'Tier 1 DATA INPUT' sheet of the workbook.

Do not input cement data. If only cement data is available, you need to derive clinker data as described in Appendix 1.

4.5 Percentage of total national clinker use which is used in mortar for rendering (%)

This data can be obtained from cement industry statistics or national statistics.

Data should be input as a percentage, i.e. as a number between 10 and 30, in column F of the 'Tier 1 DATA INPUT' sheet of the workbook.

If there is no input, or a value less than 10, in column F, the workbook does not make the adjustment for mortar render in equation (2) but instead uses equation (1) to calculate the CO₂ removals for concrete in-use.

The maximum percentage allowed for clinker used in mortar for rendering applications is 30%. If the input in any cell in column F of the 'Tier 1 DATA INPUT' sheet is greater than 30, a mortar render factor of 30% is used in the workbook calculation.

5 Finding your country's National Report submissions to the UNFCCC

As discussed in the previous section, you need to extract the relevant input data for the workbook from your country's submission to the UNFCCC, either from the National Greenhouse Gas Inventory Report (NIR) or the Common Reporting Format (CRF) tables.

To find your country's NIR, go to the [List of Parties to the UNFCCC](#), then navigate to your country page. Your country page will state the Type of Party to the UNFCCC: either Annex I or Non-Annex I.

5.1 Annex I Party

Annex I parties submit a NIR annually.

If your country is an Annex I Party, go to

<https://unfccc.int/ghg-inventories-annex-i-parties/2020>

Scroll down the table of Annex I Party GHG Inventory Submissions until you find your country. Download your NIR. There may be more than one file in the download. You should open the main NIR report.

The main NIR report follows a standard format. You need Chapter 4: Industrial processes and product use (CRF sector 2). The chapter starts with section 4.1 which gives an overview of the sector. Section 4.2 covers the mineral industry and its sub-sectors. Cement production calcination emissions (Source Category 2A1) is the first sub-sector covered.

Within the section Cement Production – Source Category 2A1, you should find a

- Description of the methodology used by your country to calculate calcination emissions from cement production. This description will state the Tier used by your country to calculate calcination emissions (see section 1.3.3 above for a generic description of IPCC Reporting Tiers).

You should also find annual data going back to the baseline year 1990 for:

- Clinker production – this is the 'activity data' for the IPCC Source Category 2A1; and
- CO₂ emissions from the calcination of raw materials in cement production; or
- Nationally used CO₂ emission factors for calcination.

The NIR will also tell you where your country's clinker production 'activity data' is sourced.

5.2 Non-Annex I Party

Non-Annex I Parties are not required to submit a full National Greenhouse Gas Inventory Report (NIR) (although a few do).

Non-Annex I Parties submit two types of National Reports: A National Communication (NC) every four years and a Biennial Update Report (BUR) every two years. Reporting for non-Annex I Parties is consistent with their capabilities and the level of support provided for reporting, so some countries may report less frequently.

To find your NC, go to

<https://unfccc.int/non-annex-I-NCs>

Scroll down the table 'Status of NC submissions' until you find your country. You will see the NCs submitted by your country. Download your latest NC.

To find your BUR, go to

<https://unfccc.int/BURs>

Scroll down the table 'Status of BUR submissions' until you find your country. You will see the available BURs and whether your country has submitted a NIR. Download the latest NIR if available. If no NIR is available, download the latest BUR.

If your country has a NIR, this will follow the standard format for Annex I Parties. Section 5.1 describes where you will find information on cement production in the NIR.

If your country has not submitted a NIR, you may find some information on cement production emissions in your NC and BUR. Note however, that the NC and BUR are unlikely to contain all the data that would be expected in a NIR. In some cases, they may not include any data specific to cement production.

In the NC, you will find a Chapter on Greenhouse Gas Inventory. This will include a description of your national methodology for the whole inventory. It may include a

- Description of the methodology used by your country to calculate calcination emissions from cement production (source category 2A1), for example the Tier used by your country to calculate calcination emissions (see section 1.3.3 above for a generic description of IPCC Reporting Tiers), the national CO₂ emissions factor for calcination if you have one and the source of any cement clinker production 'activity data' (this is usually your national cement industry association).

The NC and/or BUR may also contain annual data for cement production (source category 2A1) within the Chapter on Greenhouse Gas Inventory or as an annex:

- Clinker production – this is the 'activity data' for the IPCC Source Category 2A1; and
- CO₂ emissions from the calcination of raw materials in cement production; or
- Nationally used CO₂ emission factors for calcination.

Note this Tier 1 workbook is designed for Annex I countries which submit a NIR and report annual data going back to the baseline year of 1990.

Non-Annex I Parties are not required to report a complete timeseries back to 1990. Annual data for cement production in your NC/BUR is therefore likely to cover fewer years:

- The baseline years to be included in a NC for Non-Annex I Parties are 1994 and 2000.

- Both the NC and the BUR update the Greenhouse Gas Inventory with data for the most recent years, i.e. the last four years for a NC, and the last two years for a BUR.

6 Workbook output - calculation of CO₂ uptake

The sheet 'Tier 1 CO₂ uptake RESULTS' calculates the CO₂ removals, or CO₂ uptake, from the atmosphere due to carbonation of concrete each year. Years for input data are given in column A.

Column B National cement clinker production (ktonne clinker) – input data is copied from 'Tier 1 DATA INPUT' column B.

Column C Calcination CO₂ emissions from national cement clinker production (ktonne CO₂) – input data is copied from 'Tier 1 DATA INPUT' column C.

Column D Imported cement/clinker (as ktonne clinker) – input data is copied from 'Tier 1 DATA INPUT' column D.

Column E CO₂ emissions from cement calcination process for imported cement clinker (ktonne) are calculated from imported cement clinker using the IPCC default calcination emissions factor.

Column F Exported cement/clinker (as ktonne clinker) – input data is copied from 'Tier 1 DATA INPUT' column E.

Column G CO₂ emissions from cement calcination process for exported cement clinker (ktonne) are calculated as a proportion of the calcination CO₂ emissions from national cement clinker production in column C.

Column H Net imported cement/clinker (as ktonne clinker)

Column I National clinker consumption (as ktonne clinker)

Column J CO₂ emissions from cement calcination process for all clinker consumed nationally

Column K Percentage of total national clinker use which is used in mortar for rendering (%) [range between 10-30] – input data is copied from 'Tier 1 DATA INPUT' column F.

Columns L, N and P contain the respective CO₂ uptake factors for the use stage, end-of-life stage and secondary use (section 3). These factors are then used to calculate the CO₂ uptake in the use stage, end-of-life stage and secondary use in columns M, O and Q, respectively.

Column R gives the total CO₂ uptake in cement containing products for the given year.

7 Using the workbook output

The workbook performs a Tier 1 calculation of the CO₂ uptake by carbonation in cement-containing products. The results then need to be submitted to the National Greenhouse Gas Inventory agency for inclusion in the National Greenhouse Gas Inventory Report to the UNFCCC.

The IVL submission to the Swedish Environmental Protection Agency for the Sweden 2020 NIR (Annexes Annex 8:5: Reporting of CO₂ uptake in concrete) can be used as a reporting template. Cement industry professionals may wish to consult the government officials and agencies responsible for compiling their National Greenhouse Gas Inventory to agree an appropriate reporting format.

The 2006 IPCC Guidelines describe Quality Assurance/Quality Control (AQ/QC) and Verification measures which should be implemented as good practice as part of inventory development and improvement. It is expected that appropriate QA/QC is in place for data inputs already reported in the NIR, such as national cement clinker production (section 4.1) and calcination emissions (section 4.2).

Cement industry professionals are advised to consult with the government officials and agencies responsible for compiling their National Greenhouse Gas Inventory to ensure appropriate QA/QC is also in place for the CO₂ uptake calculations.

In addition, some common-sense checks can be carried out on the workbook outputs in SHEET: 'Tier 1 CO₂ uptake RESULTS' such as:

- Values for national clinker use in Column I should be positive;
- Values for total CO₂ uptake in Column R should be less than the adjusted CO₂ calcination emissions for national clinker use in Column J.

8 Glossary and definitions

Annex I Party – Countries party to the UNFCCC, which are industrialised or have economies in transition, and are the source of most past and current greenhouse gas emissions. These countries must report regularly on their climate change policies and measures, submit an annual inventory of their greenhouse gas emissions, including data for their base year (1990) and all the years since.

BUR - Biennial Update Report submitted by non-Annex I Parties, containing updates of national Greenhouse Gas (GHG) inventories, including a national inventory report and information on mitigation actions, needs and support received. Such reports provide updates on actions undertaken by a Party to implement the UNFCCC Convention, including the status of its GHG emissions and removals by sinks, as well as on the actions to reduce emissions or enhance sinks.

CEM – Cement types CEM I, CEM II, CEM III, CEM IV, CEM V defined by EN 197-1.

CRF Common Reporting Format tables - a series of standardized data tables containing mainly quantitative information; submitted by Annex I parties as part of their GHGI submission to the UNFCCC.

GHG Greenhouse Gas - the atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Less prevalent - but very powerful - greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). This workbook and guidance considers only CO₂, which is emitted by calcination and removed by carbonation.

GHGI Greenhouse Gas Inventory - The UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention (Annex I Parties) require each Annex I Party, by 15 April each year, to provide its annual GHG inventory covering emissions and removals of direct GHGs (carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF₆) and nitrogen trifluoride (NF₃)) from five sectors (energy; industrial processes and product use; agriculture; land use, land-use change and forestry (LULUCF); and waste), and for all years from the base year to two years before the inventory is due.

IPCC Intergovernmental Panel on Climate Change - The United Nations body for assessing the science related to climate change.

NIR – National Inventory Report submitted annually by Annex I parties as part of their GHGI submission to the UNFCCC, containing transparent and detailed information on the inventory. It should include descriptions of the methodologies used in the estimations (including references and sources of information), the data sources, the institutional arrangements for the preparation of the inventory (including quality assurance and control procedures), and recalculations and changes compared with the previous inventory.

Non-Annex I Party – Developing countries party to the UNFCCC. Non-Annex I Parties report in more general terms on their actions both to address climate change and to adapt to its impacts - but less regularly than Annex I Parties do.

Source Category – Greenhouse Gas Source and Sink Categories used by IPCC and UNFCCC

UNFCCC [United Nations Framework Convention on Climate Change](#)

9 References

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[Sweden 2020 National Inventory Report \(NIR\)](#)

Appendix 1. Calculating clinker data from cement data

Traditional Portland cement, or CEM I, is typically 95% clinker and 5% gypsum.

Other cement types, CEM II, CEM III and CEM IV, are made by adding materials such as fly ash (a by-product from coal fired power stations), limestone and blast furnace slag (a by-product of iron production which is granulated and ground for use in cement) and so have lower clinker content.

According to IPCC good practice, CO₂ emissions should be estimated directly from clinker production data. The estimation of emissions directly from cement production (i.e., applying an emission factor directly to cement production without first estimating clinker production) is not considered to be good practice, because it does not account for clinker imports and exports.

If clinker data is not available, it can be calculated from cement data using the volume of cements and clinker content. If the clinker content is unknown, the IPCC guidelines provide guidance on default clinker content values.

- If cement production is known to be essentially all Portland cement (CEM I), then it is good practice to use a default value of 95% clinker content.
- If cement production cannot be disaggregated by type and it is suspected that significant amounts of blended and/or masonry cements are being produced in addition to Portland cement (CEM I), it is acceptable within good practice to assume an overall clinker fraction of 75%.

Where it is necessary to calculate clinker data from cement data, details of the calculations should be included in the 'Country notes' worksheet.