



**DANE**  
Para tomar decisiones



DSO-Design  
Statistical Methodology and Production Direction  
(DIMPE)

**GRAY CEMENT STATISTICS GENERAL  
METHODOLOGY  
(ECG)**

May 2016



## NATIONAL ADMINISTRATIVE DEPARTMENT OF STATISTICS

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**Methodology and Statistical Production Division (DIMPE)**

Eduardo Efraín Freire Delgado

**Technical Coordination**

Andrea Carolina Rubiano – Public Services Thematic Coordinator

**Thematic Team**

Alexandra Lugo Quiroga

**Design**

Dissemination, Marketing and Statistical Culture

**Translation**

Ximena Díaz Gómez

**2016 Edition**

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## PRESENTATION

The National Administrative Department of Statistics (DANE), as the coordinating entity of the National Statistical System (NSS), and in the framework of the Statistical Planning and Harmonization project, works toward the strengthening and consolidation of the NSS through the following processes: the production of strategic statistics; the generation, adaptation, adoption and dissemination of standards; the consolidation and harmonization of statistical information and the coordination of instruments, actors, initiatives and products. These actions aim at improving the quality of the strategic statistical information, its availability, timeliness and accessibility to meet the high demand that there is for it.

Aware of the need and obligation of providing users with better products, DANE developed a standard guide for the presentation of methodologies, which contributes to the visualization and understanding of the statistical process. With this instrument, the entity developed the methodological papers of its statistical operations and studies that are made available to specialized users and the public in general. Those papers present in a standard, complete and easy-to-read manner the main characteristics of the technical processes and subprocesses of each study, thus enabling its analysis, control, replicability and evaluation.

This set of papers promotes transparency, trust and credibility of the technical quality of the entity for a better understanding and use of statistical information. Such information is produced under the principles of coherence, comparability, comprehensiveness and quality of statistics.

## INTRODUCTION

DANE, in the fulfillment of its institutional mission to produce and disseminate strategic statistical information for the national, sectorial and territorial levels in order to support the planning and decision-making processes on behalf of the entities, presents the Gray Cement Statistics (ECG), which aim to provide information on a monthly basis with respect to the evolution of the production and domestic shipments of gray cement in the country.

Gray cement production is one of the most important inputs for the construction industry as it is linked to its different stages, both for housing and infrastructure. Thus, it becomes a strategic sector for the industry and in general for the country's economy.

The Colombian Institute of Cement Producers (ICPC) provided statistical information with respect to the production and shipments of gray cement since 1973; in April 2009, the ICPC ended operations.

Consequently, DANE's Methodology and Statistical Production Division (DIMPE), in accordance with the institutional mission and the rules of the Quality Management System, provides, with this document, a detailed description of the processes operating in Gray Cement Statistics, which have been applied as of October 2010 and is in force to date.

This methodology document is structured as follows: The first section sets forth the research's background; the second section presents the methodological design of the statistical operation taking into account the scope, objectives and conceptual base; the next section explains the statistical design, where the target population, statistical units, geographical coverage, reference and collection period are established; subsequently, the elements of statistical production that describe the relevant aspects of the preparatory activities, collection, critique and consolidation of data are explained.

The subsequent section explains the methods and control mechanisms for quality and timeliness of information as well as the analysis thereof and further the activities related to the dissemination of statistical information obtained in the development of the research are established. Finally, a glossary of basic terms and annexes containing the collection instrument of the operation are provided.



## 1. BACKGROUND

The Colombian Institute of Cement Producers (ICPC) was created in 1973, as a trade and non-profit organization that aimed, through technical assistance and promotional strategies, to promote the cement industry. With the help of some of the cement companies in the country, the ICPC provided statistical information pertaining to the production and shipments of gray cement on a monthly basis, taking into account variables such as the type of packaging; consumer segments and shipments by departments; as well as the performance of exports and imports of gray cement in Colombia.

In April 2009, the ICPC ended operations with a publication based on the data supplied by three of the cement companies in the country. From that date, the National Administrative Department of Statistics (DANE) resumed the production of Gray Cement Statistics (ECG), with all the cement companies in the country, and maintained the thematic breakdown as that which was being provided by the ICPC. This statistical operation aims to provide monthly information with respect to the evolution of production and domestic shipments of gray cement.

## 2. DESIGN OF THE STATISTICAL OPERATION

It refers to the structure and strategies that aim to be developed for the purpose of providing information pertaining to the production and domestic of gray cement.

### 2.1. THEMATIC/METHODOLOGICAL DESIGN

#### 2.1.1. Information needs

As of October 2010, DANE disseminates the ECG in order to meet the needs of the different users of information and to complement the indicators pertaining to the building activity, to continue the production and dissemination of a strategic indicator in the construction sector that provides information regarding the behavior of monthly production and shipments of gray cement in the country, considering variables such as the type of packaging, consumer segments and shipping by departments.

#### 2.1.2. Objectives

##### a. General objective

To provide monthly information pertaining to the evolution of production and the shipments of gray cement in the country.

##### b. Specific objectives

- To determine the behavior of national shipments of gray cement by type of packaging.
- To establish the evolution of national shipments of cement, according to the distribution channel.
- To establish the evolution of the national shipments of cement according to department of destination and the Bogotá area.

### 2.1.3. Scope

The volume of total production (destined for the domestic market or for export) and the shipments of gray cement distributed within the country are established for the cement companies located in the country. The volumes of cement entering the country (imports) and exports are excluded from the study.

### 2.1.4. Reference framework

The analysis framework under which the statistical operation was developed is presented below.

#### **a. Theoretical framework**

The first works of stone joined by means of a hydraulic binder from the calcination of algae appeared north of Chile 5,000 years ago. These structures formed the walls of the huts used by the natives of the region (Spanish Institute of Cement and its Applications).

Close to 2500 B.C. mixtures of calcined limestone and gypsum were used to glue the large stone blocks that were used for the construction of the pyramids of Giza in Egypt. In 1950 B. C. similar mixtures were used to fill stone walls, and that was how the mural of Thebes in Egypt was built (Osorio, 2014).

In the 1st Century B.C., in ancient Rome, a natural cement began to be used, which was prepared mainly with a composition of volcanic ashes from Pozzuoli, near Mount Vesuvius; this mixture was waterproof therefore it was used in works such as the dome of the Pantheon, among others.

In 1824, Joseph Aspdin and James Parker patented the first material to be known as Portland cement. It was obtained from argillaceous limestone and stone coal, calcined at high temperatures. The name was due to the similarity of the color of the product with that of the rocks of the island of Portland in the UK (Spanish Institute of Cement and its applications).

Currently there are different kinds of Portland cement according to its properties and applicability: for construction companies, for the manufacture of prefabricated

structures or structures that interact with sulfates. Due to the above, in Colombia, Portland cement type 1 is the most commercialized (Latorre, 2008). It is for this reason that DANE, among its statistics operations, undertakes the commitment to disseminate the evolution of Gray Cement Statistics and thus to complete the indicators pertaining to construction.

### **b. Conceptual framework**

Cement is a construction material, which is obtained from a mixture of ground clay and other calcified materials in powder, which when subjected to high temperatures forms a fine powder with adherent characteristics (Adapted from the glossary of the Colombian Institute of Cement Producers, 2009). Among the different types of cement, there is the Portland cement type 1 or gray which is the most widely used worldwide, principally in construction and structures.

Keeping the thematic breakdown that was being provided by the ICPC, the ECG measure the production and shipments by means of the classification variables (type of packaging, distribution channel and departments of destination) that identify the dynamic that occurs in the construction industry of the country.

- The variable «type of packaging» refers to the process of packaging and distribution of cement used for each cement company, which can be bulk (distributed by tankers and stored in silos) or packed (distributed in paper bags).
- The variable «distribution channel» establishes the segment to which the cement is shipped during the period under study. Research classifies the channels into six groups: concrete companies, commercialization, builders and contractors, fiber cement, prefabricated and «others».
- For the variable «department of destination», the information of 32 departments and the Bogotá area, which includes the shipments for Bogotá, Soacha, Funza, Chia and Mosquera, is taken.

Thus, with this breakdown, this research becomes an important tool for decision-making related to the targeting of housing policies and land zoning plans, as established by Law 388 of 1997.

The research is an input for the internal and external analysis of other research, because due to its study variables, the macroeconomic consistency with statistical operations such as Civil Works, Construction Permits and Housing Construction Cost Index, among others can be ensured.

### **c. Legal framework**

The regulations in which the statistical operation is circumscribed are as follows:

*Law 79 of 1993:* Whereby the carrying out of the Population and Housing Census in all the national territory is regulated. This law applies to statistical operations because the data requested by DANE are strictly confidential; they do not have tax purposes, nor can they be used as evidence in court.

*Decree 1633 of 1960:* Whereby DANE and the businesses it should know are assigned to it.

### **d. International benchmarks**

At the international level there are several entities that build statistics pertaining to the production of gray cement.

- **The Inter-American Federation of Cement (FICEM)<sup>1</sup>:** Conducts annual reports at the worldwide level pertaining to the production and consumption of this material from the information obtained from other sources such as:
  - The Inter-American Federation of the Construction Industry (IAFCI)
  - The Economic Commission for Latin America and the Caribbean (ECLAC)
  - The International Monetary Fund (IMF)
  - The World Bank
  - The Inter-American Development Bank (IDB)

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<sup>1</sup> <http://ficem.org/plataformas/revista-ficem.html>

- The Development Bank of Latin America (CAF)
- The worldwide report for the cement industry International Cement Review (ICR)
- Institutes, Chambers and Associations of cement in Latin America
- **The National Institute of Statistics of Spain (INE)<sup>2</sup>**: Among the construction indicators that this institute publishes is the indicator of production and apparent consumption of cement. It has a monthly frequency.
- In Argentina, the **Association of Portland Cement Manufacturers (AFCP)<sup>3</sup>** generates statistics pertaining to shipments and consumption, with a monthly, annual and cumulative frequency.

### 2.1.5. Design of indicators

Once the validation and consistency processes of the data have been performed, the economic thematic area consolidates information of the reference month for the generation of the output tables and statistical annexes required for publication.

Information outputs contemplate the variables under study with their levels of disaggregation. They contain statistical information on:

- Absolute values in metric tons of gray cement.
- Annual changes, year-to-date and twelve months to one decimal of production and domestic of gray cement disaggregated by type of packaging, distribution channel and department of destination.

The crossings of variables are performed by type of packaging, distribution channel and department of destination, calculating the changes as follows:

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<sup>2</sup> [www.ine.es/daco/daco42/bme/texto13.pdf](http://www.ine.es/daco/daco42/bme/texto13.pdf)

<sup>3</sup> <http://www.afcp.org.ar/index.php?IDM=15&mpal=3&alias=Despacho%20Mensual>

**Annual change:** It aims to determine the percentage change in the domestic production and/or national shipments of gray cement (metric tons) of the reference month  $i$  of the year  $t$  ( $i, t$ ) compared to the same month of last year ( $i, t-1$ ).

$$r_{i,t,i,t-1} = \left( \frac{X_{i,t}}{X_{i,t-1}} - 1 \right) * 100$$

**Year-to-date change:** It aims to determine the percentage change in the domestic production and/or national shipments of gray cement (metric tons) so far this year compared with the same period last year. This corresponds to the percentage change calculated elapsed between the year to the reference month of the year  $i$   $t$  ( $i, t$ ) and the same period last year ( $i, t-1$ ).

$$r_{i,t,i,t-1} = \left( \frac{X_{i,t}}{X_{i,t-1}} - 1 \right) * 100$$

**Variation accumulated twelve months:** It aims to determine the percentage change in the domestic production and / or national shipments of gray cement (metric tons) in the last twelve months to the reference month, compared with the previous year. This corresponds to the percentage change calculated from the accumulated amount in the last twelve months up to the reference month ( $i, t$ ) and the accumulated amount in the same period of the previous year ( $i, t-1$ ).

$$r_{i,t,i,t-1} = \left( \frac{X_{i,t}}{X_{i,t-1}} - 1 \right) * 100$$

### 2.1.6. Plan of results

The analysis pertaining to the results of the study is descriptive and relies on the output tables containing the number in metric tons of gray cement, both produced and shipped, as well as the annual, year-to-date and twelve-month changes. In the case of the shipments, a breakdown is presented by type of packaging, distribution channel and target of destination.

The output tables are provided in the press bulletin and its annexes, which are published on a monthly basis. The historical series are also available on the DANE website.

### **2.1.6.1. Design of output tables or result tables**

Output tables are defined by DANE as an organized set of data, designed for the purpose of presenting the requirements of information users (DANE, 2009).

These output tables are published on a monthly basis in the press bulletin and annexes of the study and seek to provide information pertaining to the production of gray cement as well as the shipments by type of packaging, distribution channel and department of destination (see Annex C). The following are the output tables of the ECG:

**Table A1. Evolution of production and domestic of gray cement.**

**Table A2. National shipments of gray cement, according to distribution channel.**

**Table A3. Behavior of national shipments of gray cement, according to distribution channel.**

**Table A4. National shipments of gray cement by type of packaging, according to distribution channel.**

**Table A5. National shipments of gray cement by type of packaging.**

**Table A6. National shipments of gray cement, by type of packaging, according to department**

- **Table A6.1. National shipments of gray cement packaged, according to department.**
- **Table A6.2. National shipments of gray cement in bulk, according to department.**

**Table A7. National shipments of gray cement, by department, according to distribution channel**



### 2.1.7. Design of the collection forms

The information of the ECG is received on a monthly basis during the first 12 days of each month and is processed by the Manufacturing Logistics area. Sources report the information with respect to the shipments and the production of gray cement in two collection forms (see Annexes A and B).

**Production reporting form:** This form records information relating to this variable as well as sales both domestic and abroad. Quantities (expressed in metric tons) and the value (expressed in thousand pesos) are reported both in production and sales and this form is structured as follows:

- Header of the production reporting form: It contains fields for the recording of disaggregated information with respect to the source.
- Body of the production reporting form: It contains fields for the recording of information with respect to production and sales in terms of amount and quantity.
- Data of the respondent: It corresponds to the contact details of the person who is responsible for the processing of the production form.

**Shipments reporting form:** This form records the information of national shipments, according to type of packaging, distribution channel and department of destination, and this form is structured as follows:

- Header of the shipments reporting form: it contains fields for the recording of disaggregated information with respect to the source.
- Body of the shipments reporting form: It contains fields for the recording of data corresponding to the metric tons of gray cement shipped in bulk and / or packaged in the reference month, according to distribution channel.

### 2.1.8. Validation, consistency and imputation standards, specifications or rules

The validation and consistency process is performed in order to ensure the quality and integrity of the information with respect to the following aspects: completeness, accuracy and internal consistency. The review should keep the critique rules and the validation and consistency criteria established thematically, in order to replace inconsistent, missing, incorrect or outlier data.

When analyzing the collected data, the following actions are performed:

The variables of mandatory completion are established if:

- Information is incomplete: the Manufacturing Logistics analyst sends a statement (email) to the source in order to report and verify what has happened with the source.
- Data included for each disaggregation level are verified.
- With information from previous periods, the potential atypical cases that may arise are analyzed, in order to ensure the quality of information, should there be any observation, the query is made to the source of information.
- The imputation is solely made for the variable «quantity» (metric tons) of gray cement that the cement manufacturer produced in the analysis period, destined for the domestic market and/or abroad. Atypical or inconsistent data are detected monthly in the database that is compared with historical data, thus the quantity of metric tons of gray cement is analyzed and monitored on a monthly basis by means of the historic changes over time.

### 2.1.9. Nomenclatures and classifications used

The operation uses the statistical classification set forth in the Political-Administrative Division of Colombia (DIVIPOLA), in order to identify the destination of gray cement shipments at the level of department of destination.

In the case of production, the Central Product Classification (CPC) Version 2.0 A. C. is used, in order to make a correct categorization of the products manufactured by the cement companies.

## **2.2. STATISTICAL DESIGN**

### **2.2.1. Basic components of the statistical design**

The elements considered in the design of the statistical operation are as follows:

#### **Universe**

It consists of all the companies producing gray cement that have plants in the country.

#### **Target population**

Defined by all the plants of the companies producing cement in the country.

#### **Census framework**

According to statistical operations performed by DANE for the process comprising the design, production and dissemination of statistical information, the statistical operation is of a census nature, and is conducted with all the companies producing cement in the country.

The update process of the directory is performed by the Geostatistics Division in a continuous manner. Also, the information reported by the main communication media and newsletters published by various state entities, which helps determining if a new source of gray cement is created in the domestic market

#### **Definition of variables**

The ECG operation consists of two variables with respect to which results are presented: study variables and classification variables.

The study variables are:

**Production:** It corresponds to the quantity (metric tons) of gray cement that the cement company produced in the period of analysis, destined for the domestic market and / or destined for export.

**National shipments:** It corresponds to the quantity of gray cement that is distributed in the domestic market during the period under study.

The classification variables are:

**Packaging type:** Packaging and distribution of gray cement may be in bulk (cement distributed by tankers and stored in silos) or packaged (distributed in paper sacks which are composed of two or three layers, depending on the transport conditions to which it will be subject).

**Distribution channel:** Segment to which the cement is shipped during the period under study. Distribution channels are classified into six groups: concrete companies, commercialization, builders and contractors, fiber cement, prefabricated and «others».

**Departments:** It corresponds to the departments of destination of the shipments during the period under study. Bogotá includes the shipments to: Funza, Soacha, Mosquera and Chia.

### **Source of information**

The source used in this study is all the companies that produce cement in the country.

### **Geographical coverage**

National.

### **Geographic breakdown**

The information is disaggregated at the national level and by department of destination, taking into account the criterion for statistical reserve where there should be more than 3 sources of information and the area of Bogotá, which includes the

shipments of cement addressed to Bogotá, Soacha, Funza, Chia and Mosquera. In a like manner, the representativeness of the sources with respect to the market is also taken into account, according to distribution channel for each of the departments.

### **Thematic breakdown**

Production and domestic of gray cement are disaggregated according to type of packaging, distribution channel, department of destination and the area of Bogota.

#### **2.2.2. Statistical units**

##### **Analysis unit**

It consists of the production and national shipments of gray cement, according to type of packaging, distribution channel, department of destination and the area of Bogota.

##### **Observation unit**

It consists of the companies producing cement.

##### **Information Unit**

It includes the companies producing cement

#### **2.2.3. Reference and collection periods**

##### **Reference period**

It corresponds to the expired month immediately preceding the collection.

##### **Collection period**

The collection process is carried out the first 12 days of each month following the end of the reference month.

#### 2.2.4. Census design

The statistical process by means of which the whole universe is studied, in order to obtain data or individual statistical information regarding each and every one of the elements composing the population, which for this statistical operation corresponds to all the plants of the companies producing cement in the country.

#### 2.2.5. Adjustment of coverage

In the event that there is no response from the elements of the target population, an imputation is performed by means of simple average, where the data of the time series of each source and their respective variables are used for the calculation of the indicator.

### 2.3. EXECUTION DESIGN

#### 2.3.1. Training system

The training is carried out every time the processes for the recruitment of personnel are executed. The training is developed around the concepts and the handling of work tools, as well as the operational aspects for the collection of information and with respect to all the topics with which the statistical operation is associated.

#### 2.3.2. Preparatory activities

##### a. Awareness-raising

As an awareness-raising process, institutional committees are held in which an initial contact is made with the sources of information. At such committees, the study is presented highlighting the need to provide the country with reliable and timely statistics.

## **b. Selection of staff**

The personnel needed for the statistical production is established by DANE on a yearly basis, according to internal resolution. It should have at least one professional profile and can be contracted or be part of the Entity staff:

- A person in charge of the logistics part will perform the reception, consolidation and validation of the information reported by the sources; he or she is contracted annually.

A person in charge of the thematic part is to perform to follow-up of the processes, theoretical and methodological frameworks of the study, consolidation, validation and publication of figures. In a like manner, he or she will perform the generation of the output tables files as well as the presentation of the committees; he or she is part of the Entity staff.

### **2.3.3. Design of instruments**

The information of the ECG is processed by the Manufacturing Logistics area, and is received on a monthly basis during the first 12 days of each month. The sources report information pertaining to the production and national shipments of gray cement, on the shipments reporting form (information recorded according to the classification variables: type of packaging, distribution channel and department of destination) and on the production reporting form which includes production data, domestic sales and exports expressed both in quantities (metric tons) and value (thousand pesos).

**Completion manual:** It contains and documents the process of reporting information as well as key definitions in order to ensure a proper completion by the source for the statistical operation.

**ECG Methodology:** It contains and specifies the objective, scope, coverage, collection, calculations, analysis and methods used to produce and disseminate the information pertaining to the study.

**Methodological datasheet:** It contains a summary of the most relevant information of the methodology of the study.

**Consistency specifications:** It contains and documents the process of analyzing the information pertaining to the ECG in order to ensure that this stage considers the guidelines and criteria established by the study.

**Operational guidelines:** It contains and documents the operational design. This covers aspects such as: the preparation of the collection instruments; the layout of the structure and operational roles; budget programming; the preparation of the schedule, the contracting and training of the person according to the profile established.

**Glossary:** It contains and documents the meaning of words or terms that are most relevant and used in the study.

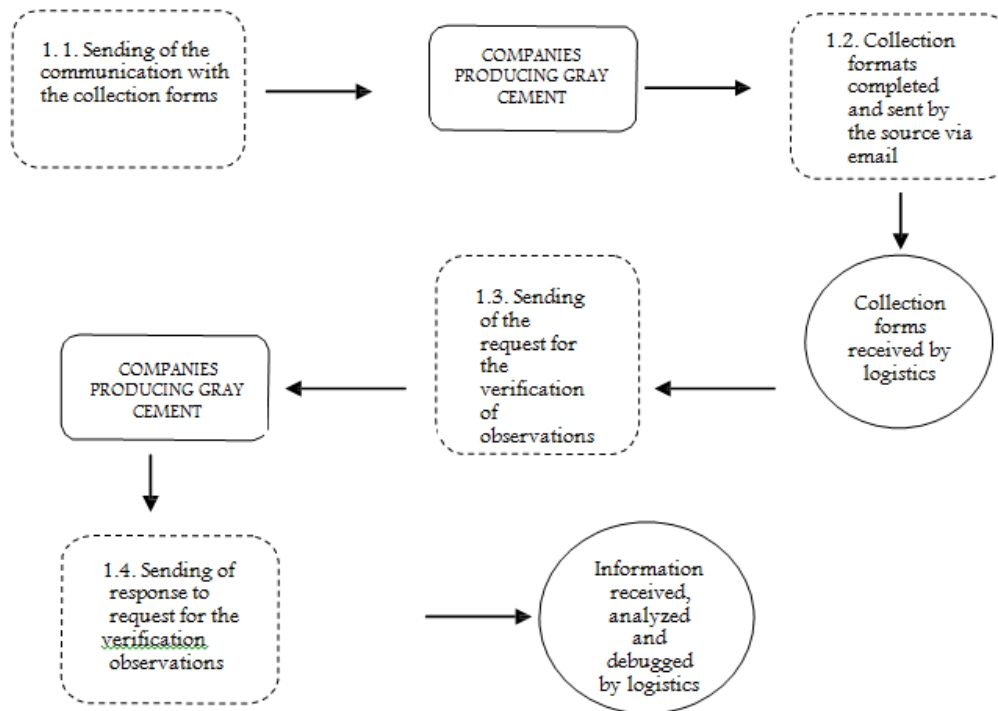
#### 2.3.4. Data collection Operation chart

The information of the ECG uses the self-completion as the data collection procedure from each of the cement companies; the Manufacturing Logistics area in DANE on a monthly basis, sends the collection forms by email (both production and shipments) indicating the reference period and the relevant dates that allow meeting the timelines established (the period corresponding to the information reported and period for the verification of figures).

Each cement company sends the requested information by email, which should be submitted during the first 12 days of each month, subsequently, the official of Manufacturing Logistics makes a general review of the collection forms, verifying the validity and consistency of the information. The inconsistencies found are subject to verification and / or justification on behalf of the source.



**Diagram 1. Collection and reception of the Gray Cement Statistics (ECG) information**



Source: DANE.

### **Methods and mechanisms for the collection**

The collection method used for the information is that of self-completion by email. It consists of the completion of the information requested in the forms sent by DANE Central to the sources (production reporting form and national shipments reporting form), which should be completed and returned by email; subsequently they are received by the Manufacturing Logistics analyst, to be reviewed, validated and to conduct the necessary enquiries.

### **Data transmission**

The information is sent by companies producing cement through the reporting forms, via email. By means of the data analysis tool (Excel), it is stored and consolidated in the Manufacturing Logistics area in DANE.

### **Control of coverage**

This is done on the form of the study directory, considering the following: all the sources should submit a report even if they have not produced cement nor made shipments throughout the month, in order to keep track of the total directory.

As the sources are submitting the information, the coverage rate is calculated in terms of a percentage, where 100 % is the total of sources. If the rate is less than 88 %, it is declared unacceptable.

## **2.4. IT DESIGN**

The information is captured from the files in Excel and is duly protected in order to avoid changes in the forms on behalf of the sources. The Manufacturing Logistics team conducts a review at the microdata level and consolidates it in a database that is sent to the Construction team in an Excel file. The two teams simultaneously validate the information considering the historical data and analyzing at the aggregate level each of the variables of the studies. The information that does not meet the quality parameters is sent to the source to be validated and subsequently a response to those observations is received.

After the required review, the Manufacturing Logistics team sends the final database to the Construction team where the due processing and generation of output tables in Excel is done.

The historical information lies in an Excel file, which is properly protected and stored at the Construction team's office.

## 2.5. DESIGN OF METHODS AND MECHANISMS FOR QUALITY CONTROL

This section describes the methods and mechanisms for quality control and monitoring. That is, those elements and means used to ensure the quality of results, in line with the objectives of the statistical operation.

### 2.5.1. Control instruments

Quality control is performed through the consolidation and analysis of the historical series of information pertaining to production and national shipments of gray cement, where, based on information taken from the ICPC for the period January 1990-March 2009, and the one published by DANE (April 2009 to date), monthly and annual changes of the reference period are studied.

Also, the behavior with respect to the production and national shipments of gray cement of each of the sources is analyzed, by department, according to the type of packaging and distribution channel. This allows us to identify significant changes in the information reported and see if it is related to what was reported during the series or, on the contrary, if inconsistencies are found. If there are atypical changes, a request for verification of the figures is sent to the relevant source.

### 2.5.2. Indicators for the quality control of the study's processes

#### **Quality indicator**

It is conducted on a monthly basis in order to verify the consistency of the information by means of the verification form, in order to determine the level of quality of the information critiqued and analyzed to prepare the dissemination products. In order to accomplish this indicator, the completeness of the reports of production and national shipments and the consistency of the information with that which was historically reported are reviewed.

The quality indicator measures the failure to find inconsistencies with a rating equal to 100 %. If inconsistent information is found, the rating of the indicator is decreased, depending on the weight of each field where the inconsistency is found. For example, if the inconsistency is found in the source identification fields (name, date, telephone number, e-mail, etc.), each of these items have a lower weighting than the fields of the form's body, as production and national shipments, according to type of packaging, distribution channel and department of destination.

### **Coverage indicator**

It is conducted on a monthly basis so as to verify and ensure the coverage of all the sources of the statistical operation; in order to carry out this indicator; it is reviewed in order to make sure that the pertinent information is collected from all the sources that are part of the sample in the reference month.

## **2.6. PILOT TESTS DESIGN**

When a statistical operation is performed for the first time, or when it is intended to improve processes where significant changes are made in operational and / or methodological aspects, it is recommended that pilot tests be conducted. Through these tests it is intended to ensure the correct operation of the data collection instruments as well as to select the most suitable operational design for achieving the established objectives.

For the development of these tests, a very small sample of the universe under study is selected to which a survey is conducted, so that it is sufficient to analyze both the methodological and operational aspects where questions may arise.

In general methodological aspects, during a pilot test the proper functioning of the collection instrument should be ensured in terms of the formulation of questions as well as the consistency of information; in a like manner, it is important to perform a constant update of the various manuals and forms in order to maintain consistency with the objective of the statistical operation and/or with the changes that are being developed.

In operational aspects, the conduction of the pilot test is a tool to select the most appropriate collection scheme, calculate the workloads in the different activities of collection, critique and consolidation of information.

Tests were conducted, based on calculation exercises from the information corresponding to the months of January to March, 2009. These exercises gave as a result the ability to make corrections with respect to information and adjustments in: the collection operation; the database; the design for output tables; the presentation of results; the bulletins and the annexes. From this date the ECG has not undergone significant changes in operational and/or methodological aspects justifying the application of pilot tests.

## **2.7. DESIGN OF ANALYSIS OF RESULTS**

### **2.7.1. Statistical analysis**

It is of a descriptive nature and seeks to study the behavior relating to production and national shipments of gray cement over time by performing the calculus of changes and annual contributions, year-to-date and twelve months according to the type of packaging, distribution channel and department of destination.

For the disaggregation levels defined, the results are analyzed in the same months of previous periods in order to determine the seasonality of the series and compare the observed levels. The analysis is then performed on the data time series in order to determine the long-term status with respect to the production of gray cement and the other levels and identify those that make an impact more on the behavior of the total index and thus perform a more thorough analysis at this level.

### **2.7.2. Context analysis**

It is performed based on the historical series of each of the sources. The economic thematic area studies the yearly, year-to-date, twelve months and quarterly changes of the production and national shipments variables, according to type of packaging, distribution channel and department of destination, taking into account the most

important changes, both positive and negative. Once they have been identified, the behavior of the results is evaluated and the possible causes of this behavior are established.

Furthermore, in a macroeconomic context, the ECG are related to the results of other internal and external studies of the construction sector, such as Ready-mix Concrete statistics (EC), Construction Permits (ELIC), Monthly Manufacturing Sample (MMM) Housing Construction Cost Index (ICCV), and Heavy Construction Cost Index (ICCP), among others. When identifying intersectoral relations, this process ensures the macroeconomic consistency of the information.

The above requires permanent enquiry of the press, the studies and specialized magazines. Furthermore, it is necessary to consider the domestic macroeconomic context.

### **2.7.3. Committees of experts**

The study has two levels where the results to be disseminated are analyzed, contextualized and validated, which are as follows:

#### **Internal committee**

It is composed of representatives of the working teams involved in the statistical production, representatives of the DANE Director's Office, Deputy Director's Office the Methodology and Statistical Production division, the Synthesis and National Accounts division and the Regulation, Planning, Standardization and Normalization division. It works permanently and it is in charge of evaluating the processes as well as the results of the study before the dissemination.

#### **External Committee**

Academia, guilds, and national government entities take part in this committee. It aims to assess and/or propose methodological changes that are made in the statistical operation, as well as listening to and analyzing the information requirements of the users, in order to implement improvements in the statistical operation.

## 2.8. DESIGN OF DISSEMINATION

The mechanisms and means for the dissemination of the information generated by the statistical operation are mentioned below.

### 2.8.1. Data repository management

The files that serve as input for the calculation of the ECG, as well as the consolidated results, are stored on the equipment of the responsible thematic expert. The resulting information is delivered in Excel files to the users of the statistical operation.

### 2.8.2. Dissemination products and tools

The production of the study results follows a schedule defined monthly. The statistical dissemination is the last process that is fulfilled by DANE, which provides the country and the general public with the results of the ECG study. This process is under the responsibility of the Dissemination, Marketing and Statistical Culture division.

The study products are output tables (see Annex C) that are produced in Excel. In turn, the information of the ECG is published on the website, as well as by press release and its respective annexes.

The study results require two different processes throughout the publications, which is the reason why the series are adjusted over time, and it takes the temporary or permanent status. Each of the statuses of the published information is briefly explained below:

**Provisional:** Set of information subject to review and, therefore, to change; the information is in this status for a one-year period.

**Final:** Set of revised information, i.e., once the preliminary period corresponding to a year has elapsed.

The published series can be modified for the following reasons:

- The sources that are part of the statistical operation make adjustments and / or changes in the reported figures, either by: typing errors, sending accumulated information, unawareness of reporting due to personnel turnover in each of the entities, etc.
- Extensions are made to the thematic coverage (new variables are included in the statistical operation) or extensions of coverage with respect to new sources (new sources are included in the sample).

The information is available to the public through the dissemination of the press release and the bulletin through the website, emails and the data bank. Simultaneously, strategies are designed based on customer segmentation in order to promote and disseminate the statistical products supplied by DANE.

## 2.9. EVALUATION DESIGN

DANE, in its role as the coordinator of the National Statistical System (NSS), focuses its efforts to ensure the quality of the statistical information by establishing and promoting standards for continuous improvement, as well as in the production of statistics based on the Fundamental Principles established by the United Nations and best practices defined by organizations such as the Organisation for Economic Co-operation and Development (OECD) and the Statistical Office of the European Communities (EUROSTAT).

In order to fulfill this function, an improvement plan is developed, which results from the evaluation stage of the statistical quality by the Independent Experts Committee (IEC), which records the findings presented in the assessment report, with the respective improvement actions proposed by the IEC, aimed at strengthening those aspects which in its opinion, affect the quality of the statistical operation updated.



Also, through the monthly internal and external committees, the observations with respect to the statistical operation are recorded with the aim of establishing improvement plans in the short and medium term. Permanent contact with the media, guilds and end users facilitates keeping the information needs of the users of Gray Cement Statistics.

### 3. RELATED MATERIALS

The ECG has the methodological datasheet, which can be accessed through the DANE website. It also has internal instruments that are used for different processes, such as the completion manual, operating guidelines, consistency specifications, glossary, which specify the characteristics that the system should have in order to validate the information and its correct completion in each field of the data capture computer system.

## GLOSSARY

**Bulk cement.** Cement distributed by means of tankers and stored in silos. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Cement.** Ground mixture of clay and other materials calcified in powder, which when subjected to high temperatures form a fine powder with adhesive properties. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Department.** It is a territorial entity (Political Constitution of Colombia, Article 286) which enjoys autonomy for the administration of sectional matters as well as the planning and promoting the economic and social development within its territory under the terms established by the Constitution and laws. Departments exercise functions that are administrative, of coordination, of complementarity of municipal action, of mediation between the national government and the municipalities and of provision of the services as determined by the Constitution and the laws (Constitution of Colombia, Article 298). For purposes of the study, the department corresponds to the destination of shipments of gray cement during the period under study (the area of Bogotá includes shipments bound for Bogotá, Soacha, Funza, Chia and Mosquera). (National Administrative Department of Statistics (DANE). (s. f). *Harmonized Concepts of Colombia*. Retrieved on November 27, 2015).

**Distribution channel.** Market segment to which the cement is shipped during the period. Distribution channels are classified into six groups: concrete companies, commercialization, builders and contractors, fiber cement, prefabricated and «others». (Colombian Institute of Cement Producers [2010]). *Glossary*. Bogotá).

**Distribution channel (Builders and Contractors).** It corresponds to direct sales to builders and contractors at the national level. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Distribution channel (Commercialization).** It refers to the domestic shipments of cement made to specialized stores of the construction industry, wholesalers and hardware stores. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Distribution channel (Concrete companies).** It refers to the domestic shipments made by the establishment to the companies producing concrete for its distribution at the national level and abroad. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Distribution channel (Fiber cement).** It includes the domestic shipments made by the establishment producing cement to those companies engaged in the development of products such as tiles, tanks, sheets, molding, tubes, etc. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Distribution channel (Others).** This channel includes the domestic shipments made by the establishment producing cement for employees, donations, domestic consumption and government. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Distribution channel (Prefabricated).** This distribution channel includes the domestic shipments made by the establishment producing cement to the companies engaged in the manufacture of prefabricated products for the construction industry such as blocks, posts, paving products, etc. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Domestic shipments.** It corresponds to the quantity of gray cement that is distributed in the domestic market during the analysis period. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Gray cement.** Also known as Portland cement type 1; it is mainly used in construction and structures. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Packed cement.** Cement distributed in paper bags, which are generally composed of two or three layers, depending on the conditions of transport to which it will be subject. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Production.** The quantity (metric tons) of gray cement that the cement company produced in the period of analysis, destined for the domestic market and / or destined for export. (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

**Type of packaging.** It refers to the process of packaging and distribution of the cement used by each cement company. The distribution is made in bulk or in bags (packed). (Colombian Institute of Cement Producers. [2010]. *Glossary*. Bogotá).

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## ANNEXES

### Annex A. Production reporting form

NOMBRE DEL PRODUCTO		Unidad de medida	Código CPC	PRODUCCION TOTAL DEL PERIODO				VENTAS TOTALES DEL PERIODO			
				CON DESTINO AL MERCADO NACIONAL		CON DESTINO A EXPORTACION		EN PAIS		AL EXTERIOR	
(a)		(b)	(c)	CANTIDAD *	VALOR	CANTIDAD *	VALOR	CANTIDAD *	VALOR	CANTIDAD *	VALOR
				(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
<b>TOTALES ( renglones del 1 al 10)</b>				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
PERSONA QUE DILIGENCIO ESTE FORMATO YA LA CUAL SE PUEDEN DIRIGIR CONSULTAS		NOMBRE		TELEFONO		EMAIL					
<small>Nota: En el ítem (a) si el establecimiento elabora productos diferentes a los diligenciados, por favor relacionelos.                      * = según unidad de medida de la columna (b)</small>											
Observaciones:											

Source: DANE

## Annex B. Shipments reporting form

1. Evolución de la producción y despachos nacionales de cemento gris 2009 (abril) - 2016 (enero) <sup>p</sup>																													
Año	Mes	Toneladas		Variación (%)			Variación (%)																						
		Producción	Despachos Nacionales	Producción		Despachos nacionales																							
				Anual	Año corrido	Doce meses	Anual	Año corrido	Doce meses																				
2. Despachos nacionales de cemento gris por canal de distribución 2009 (abril) - 2016 (enero) <sup>p</sup>																													
								Toneladas																					
Año	Mes	Concreteteras	Comercialización	Constructores y contratistas		Fibrocemento	Prefabricados	Otros <sup>1</sup>	Total																				
3. Comportamiento de los despachos nacionales de cemento gris según canal de distribución Enero 2016 <sup>p</sup>																													
Canal Distribución	Anual			Año corrido			Doce meses																						
	Variación (%)	Contribución ptos. porcentuales		Variación (%)	Contribución ptos. porcentuales		Variación (%)	Contribución ptos. porcentuales																					
4. Despachos nacionales de cemento gris por tipo de empaque según canal de distribución 2009 (abril) - 2016 (enero) <sup>p</sup>																													
								Toneladas																					
Año	Mes	Concreteteras		Comercialización		Constructores y contratistas		Fibrocemento		Prefabricados		Otros <sup>1</sup>		Total															
		Granel	Empacado	Granel	Empacado	Granel	Empacado	Granel	Empacado	Granel	Empacado	Granel	Empacado																
5. Despachos nacionales de cemento gris por tipo de empaque 2009 (abril) - 2016 (enero) <sup>p</sup>																													
Año	Mes	Tipo de Empaque		Total	Variación anual (%)			Variación año corrido (%)			Variación doce meses (%)																		
		Granel	Empacado		Granel	Empacado	Total	Granel	Empacado	Total	Granel	Empacado	Total																
6.1. Despachos nacionales de cemento empacado por departamentos 2012 (enero) - 2016 (enero) <sup>p</sup>																													
DEPARTAMENTO																													
Norte de																													
Año	Mes	Total	Antioquia	Arauca	Atlántico	Bogotá <sup>1</sup>	Bolívar	Boyacá	Caldas	Caquetá	Casanare	Cauca	Cesar	Córdoba	Cundinamarca	Guajira	Hulla	Magdalena	Meta	Nariño	Santander	Putumayo	Quindío	Risaralda	Santander	Sucre	Tolima	Valle del cauca	Resto <sup>2</sup>
6.2. Despachos nacionales de cemento a granel por departamentos 2012 (enero) - 2016 (enero) <sup>p</sup>																													
DEPARTAMENTO																													
Año	Mes	Total	Antioquia	Arauca	Atlántico	Bogotá <sup>1</sup>	Bolívar	Boyacá	Caldas	Caquetá	Casanare	Cauca	Cesar	Córdoba	Cundinamarca	Guajira	Hulla	Magdalena	Meta	Nariño	Norte de Santander	Putumayo	Quindío	Risaralda	Santander	Sucre	Tolima	Valle del cauca	Resto <sup>2</sup>
7. Despachos nacionales de cemento gris por departamentos según canal de distribución 2012 - 2016(enero) <sup>p</sup>																													
								Toneladas																					
Departamento	Año	Mes	Concreteteras	Comercialización	Constructores y contratistas		Otros <sup>1</sup>	Total																					

Source: DANE