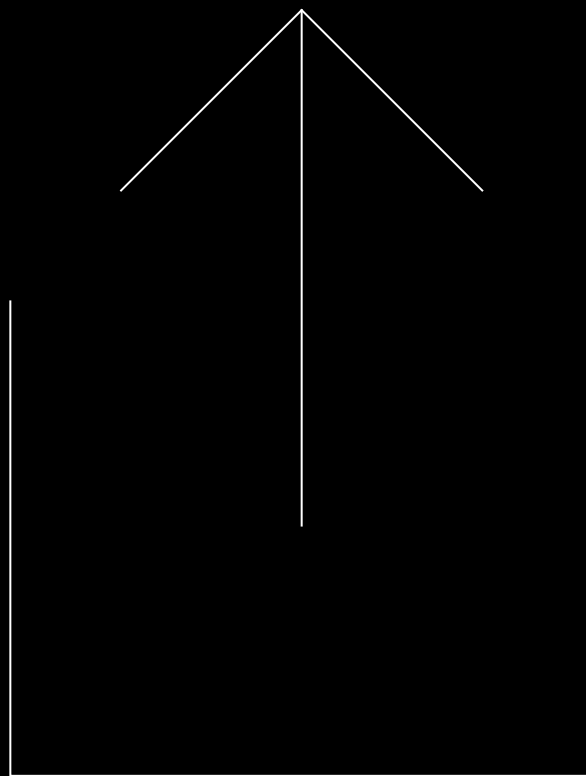


Greenhouse Gas (GHG) Emissions Inventory



BRAZILIAN ASSOCIATION
OF MANUFACTURERS OF
CERAMIC TILES, SANITARY
WARE AND RELATED
PRODUCTS

PUBLISHED BY



PROMOTED BY



BRAZILIAN ASSOCIATION OF
MANUFACTURERS OF CERAMIC TILES,
SANITARY WARE AND RELATED PRODUCTS

GREENHOUSE GAS (GHG) EMISSIONS INVENTORY

NAVIGATE:

ANFACER

The Anfacer Initiative + Sustainable
Sector overview

Climate overview

Option for natural gas

Sector emissions

- > Two technologies
- > Highlights
- > Historical series

Methodological approach

- > Principles
- > Guidelines
- > Project boundaries
- > Analysis of uncertainties

Bibliographic references

Credits



PRESENTATION

The Greenhouse Gas (GHG) Emissions Inventory is a management tool that enables measurement of the emissions related to the activities of a company or a group of companies. Based on its results, ceramic tile manufacturers can establish management plans to reduce their emissions.

The increase in the concentration of greenhouse gases in the atmosphere provokes global warming and causes climate change. The problem is characterized by the increase in the average temperature of the planet, a rise in sea level due to the melting of the polar ice caps, more frequent and intense extreme climatic events (tropical storms, floods, heat waves, droughts, snow storms, hurricanes and tornadoes), with serious consequences for human populations and natural ecosystems, and may lead to the extinction of animal and plant species.

According to the global scientific community, the increase in the concentration of greenhouse gases is very probably the result of human activities, in particular the burning of fossil fuels and deforestation to create areas for agriculture and livestock breeding (change in soil use). This underscores the importance of the involvement of the private sector in preventing climate change and in mitigating its effects.

This report presents the greenhouse gas emissions of the ceramic tile sector in Brazil. It is part of the Anfacer Initiative + Sustainable, a wide ranging program created by the Brazilian Association of Manufacturers of Ceramic Tiles, Sanitary Ware and Related Products (ANFACER) to incorporate sustainability into the management and strategy of companies in the industry.

Enjoy reading it!



ANFACER

The Brazilian Association of Manufacturers of Ceramic Tiles, Sanitary Ware and Related Products (ANFACER) plays a key role in positioning the Brazilian industry as one of the main global players in the segment.

In function of its capacity for political and institutional articulation, its strategic vision and its results orientation, over the years ANFACER has achieved significant advances in the development of the sector, boosting its competitiveness and expanding its markets. Worthy of note:

STRATEGIC PARTNERSHIP

APEX-BRASIL is a strategic supporter of the Brazilian ceramic tile industry's internationalization initiatives.

GLOBAL EVENT

EXPO REVESTIR is one of the most important events in the global ceramic tile segment, constituting the main instrument for promoting and expanding the market for the Brazilian industry.

- **The internationalization of the segment**, with the incorporation of competencies and competitiveness within a global context;
- **The commitment to technical conformity**, the enhancement of standardization processes, the stimulation of product and process certification, as well as active participation in international technical committees;
- **The strengthening of Brazilian branded ceramic tiles** by means of initiatives that add value, the development of design with a national identity, commercial promotion and participation in industry events;
- **Valuing technical knowledge and knowledge of legislation**, the national and international markets, among other strategic aspects, as a competitive differential, and promoting its widespread dissemination within the ceramic tile sector with the intensive use of technological resources for managing information and data bases.

It is within this context that ANFACER is focusing its attention and efforts on the Anfacer Initiative + Sustainable, a program aimed at incorporating sustainability into the management and strategy of companies in the sector.



THE ANFACER INITIATIVE + SUSTAINABLE

To transform the ceramic tile sector, driving the incorporation of socioenvironmental criteria into the management and strategy of companies, ANFACER created the Anfacer Initiative + Sustainable.

The objective of this wide-ranging program is to enable Brazilian companies to add environmental and social value to their businesses, while at the same time generating financial results. This will enable the sector to reinforce its global leadership and gain a competitive differential in the national and international markets.

The transparent disclosure of social, environmental and economic information is a key part of the initiative, a commitment that demands the engagement of leaders, alignment with the principles of sustainability and conformity with basic management and compliance requirements.

The Initiative gains even greater relevance in function of the role that the Brazilian ceramic tile industry plays in the civil construction segment, a sector that generates major impacts in the country.

Another key point is that the Initiative also generates value for other stakeholders, functioning as a platform for dialogue and partnerships with architects and interior designers, engineers and construction companies, resellers and consumers in general.

The work, which began in 2016 with the execution of technical measures and the drafting of documents, entered a new phase in 2019, focused on engaging member companies. The participation of the manufacturers contributes towards the positioning of Brazilian ceramic tiles on the national and international markets, as well as enhancing management and driving innovation.



REFERENCE DOCUMENTS

The following publications were released by the Anfacer Initiative + Sustainable:

- Avaliação do Ciclo de Vida – Placas Cerâmicas para Revestimento [média nacional] (Life Cycle Assessment – Ceramic Tiles for Coating [national median])
- Greenhouse Gas (GHG) Inventory
- Tabela Ambiental® (Environmental Table®)
- Guia para Sustentabilidade (Guide for Sustainability)

All the publications are available on the website: www.iniciativaanfacer.com.br.



2030 AGENDA

Given its importance, the Brazilian ceramic tile sector is in a position to contribute to the 2030 Agenda, an ambitious action plan for people, for the planet and for universal prosperity to be achieved over the coming years.

The 2030 Agenda was launched in September 2015, when the 193 member countries of the United Nations Organization (UNO) committed to the Agenda, its 17 Sustainable Development Goals (SDGs) and its 169 targets.

Private sector engagement is fundamental for achieving the SDGs, and the Anfacer Initiative + Sustainable supports and promotes this agenda because it has the human resources and funds to tackle such a challenge. It also promotes the engagement of the sector around this global challenge.

+ INFORMATION

Learn about the Anfacer Initiative + Sustainable:
www.iniciativaanfacer.com.br



SECTOR OVERVIEW

Brazil exercises a leading role in the global ceramic tile market, occupying the position of third largest producer worldwide.

With an installed production capacity of 1,055 million m², sales in recent years have averaged 800 million m², of which 706 million m² were destined for the domestic market and 94 million m² for export.

The fact that Brazilian industry employs two manufacturing technologies (dry route and wet route) makes it more competitive than the other producer countries, which employ a single production method.

In addition to its strategic differential and significant numbers, the Brazilian industry is a global benchmark in energy and water efficiency.

BRAZIL'S PRODUCTION OF CERAMIC TILES
TOTALS 790 MILLION M²

INSTALLED PRODUCTION CAPACITY OF
1,055 MILLION M²

US\$ 344.5 MILLION WAS THE TOTAL OF
BRAZILIAN CERAMIC TILE EXPORTS

93 COMPANIES IN THE SECTOR
– 60 OF WHICH ARE ANFACER MEMBERS

22.5 MILLION UNITS PRODUCED

26 MANUFACTURING UNITS IN 8 STATES

25,000 DIRECT JOBS

200,000 INDIRECT JOBS

*2017 DATA



CLIMATE OVERVIEW

The Earth's climate is changing. In the last 22 years (up to 2018), the 20 hottest years ever were recorded since measurements began in 1850.

Scientists indicate the growing levels of greenhouse gases (GHG) in the atmosphere as the main drivers of climate change. While the atmospheric concentrations of these gases indicate a relationship with emissions caused by human activities.

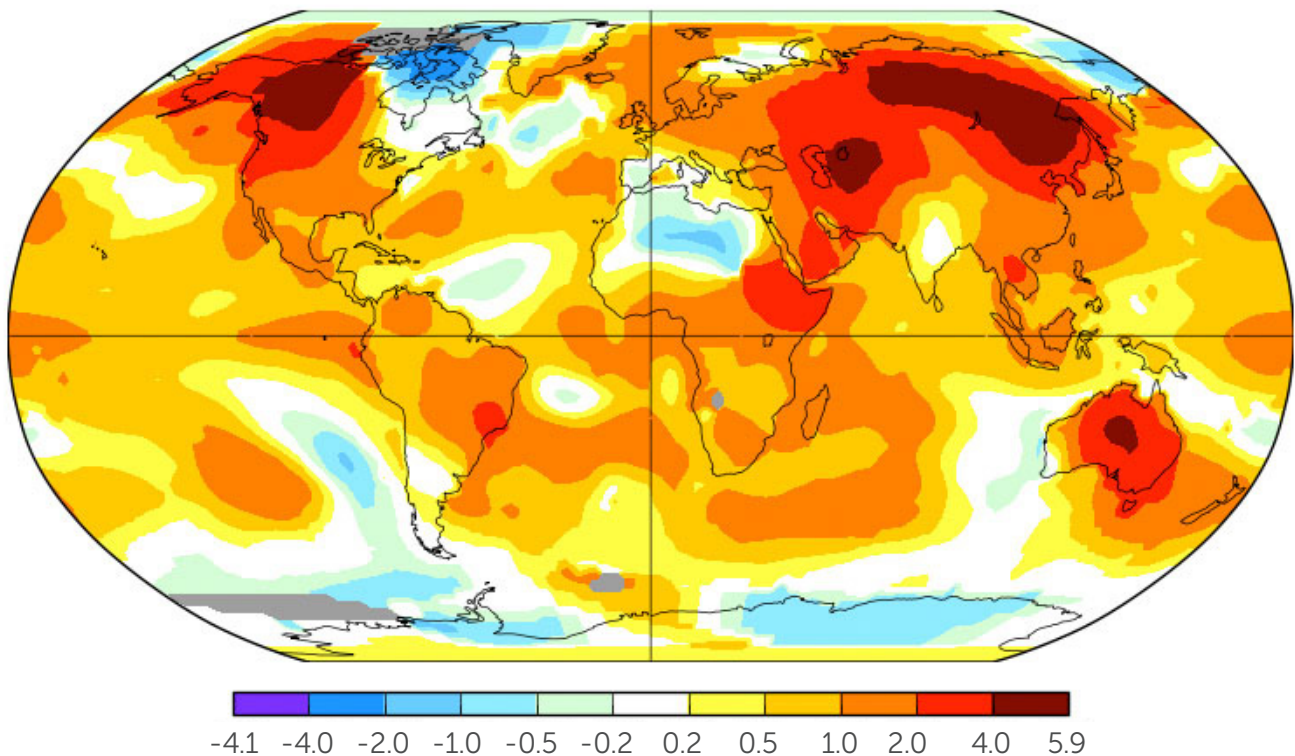
GHG emissions are caused, for example, by burning fossil fuels, by deforestation or by the disposal of organic waste in sanitary landfills. Carbon dioxide (CO₂) is the principal greenhouse gas, accounting for over half of these emissions. The other gases are Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF₆) and Nitrogen Trifluoride (NF₃).

RISING TEMPERATURE

January 2019

0.87°C HIGHER

The difference between the temperature now and the temperature from 1951 to 1980





A WORLD IN TRANSFORMATION

Studies by the World Meteorological Organization (WMO) list the major impacts of climate change:

- **Oceans** – increase in temperature, in sea level and in acidification
- **Poles** – increase in melting of polar caps
- **Agriculture and food security** – threat of loss of land and decrease in production, jeopardizing food production
- **Dislocation of populations** – an increase in migrations due to climatic events
- **Extreme climatic events** – increase in the incidence of tropical storms, floods, heat waves, cold waves, forest fires, droughts, snow storms, hurricanes and tornadoes
- **Biodiversity** – threat of extinction of species
- **General socioeconomic and environmental impacts**

BRAZIL'S COMMITMENT

The Conference of the Parties (COP) was established to enable countries to discuss and create means of combating global warming. At COP21, held in Paris, 195 countries signed a historical agreement, the objective of which was to prevent an increase of over 2°C in the average temperature of the planet compared with pre-industrial levels.

The countries committed to developing strategies and policies to prevent such a temperature increase and to attempt to limit the increase to a maximum of 1.5°C. Brazil committed to a 37% reduction in its GHG emissions by 2025, taking 2005 as base year.

ROLE OF THE PRIVATE SECTOR

Honoring the Paris Agreement depends directly on companies. They represent an important contribution to Brazil's 37% reduction in GHG emissions by 2025 (base year 2005).

The Brazilian ceramic tile industry has acted to reduce its emissions. Firstly, by opting for natural gas as its main energy source, as opposed to mineral coal and fuel oil. And, now, by publishing this emissions inventory, a study which will enable the sector to enhance management and incorporate emissions reduction into business strategy.



WORD FROM THE UNO



"We need to sound the alarm. Not only are things getting worse than expected, but what we are witnessing is more dramatic than the worst forecasts made by scientists".

"I firmly believe that the business community in conjunction with civil society may be the driving force that will ensure everyone understands that honoring the Paris Agreement is essential".

"We need to have a greater ambition and to assume more robust commitments".

António Guterres,

United Nations Secretary-General

GLOBAL TARGET

- > Prevent an increase of more than 2°C in the planet's average temperature compared with pre-industrial levels.
- > Establish efforts to permit a maximum increase of 1.5°C.

BRAZIL TARGET

- > 37% reduction in its GHG emissions by 2025, taking 2005 as base year



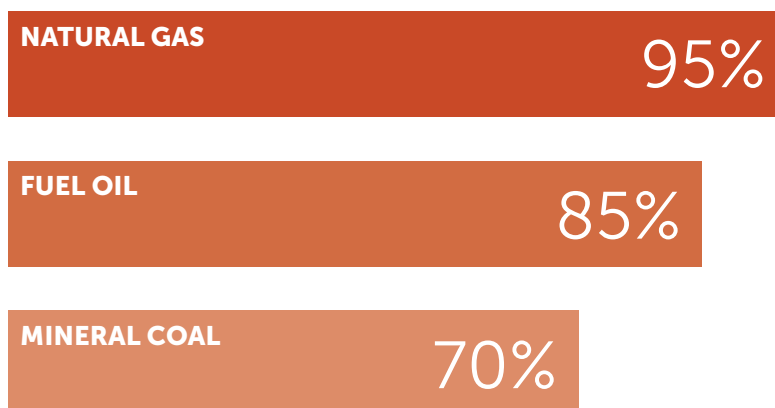
OPTION FOR NATURAL GAS

One of the Brazilian ceramic tile sector's major contributions to reducing greenhouse gas (GHG) emissions was the adoption of natural gas as the main fuel used in the manufacturing process, significantly reducing the use of coal and fuel oil. This is in addition to having a modern, highly energy efficient manufacturing park.

Natural gas became a good economic and environmental alternative, offering technical and operational advantages, particularly after the Bolivia-Brazil gas pipeline came into operation in 1999.

Advantages of natural gas¹

GREATER EFFICIENCY IN FIRING



LOWER GHG EMISSIONS

23.08%
Compared with fuel oil

48.38%
Compared with fuel oil

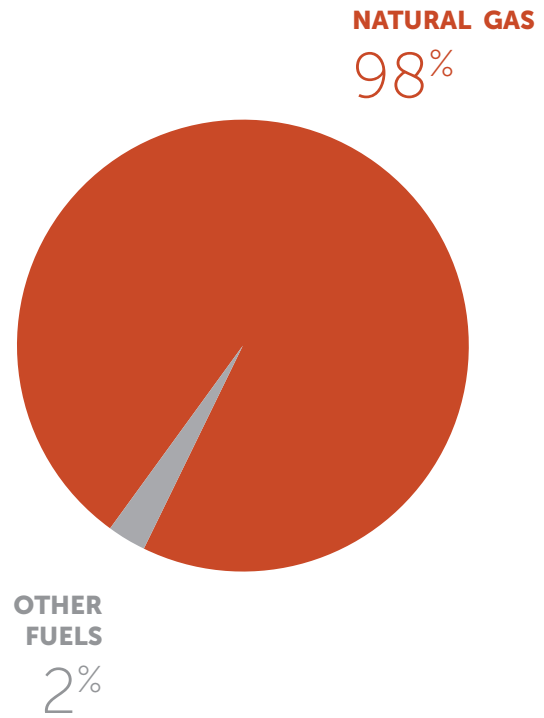
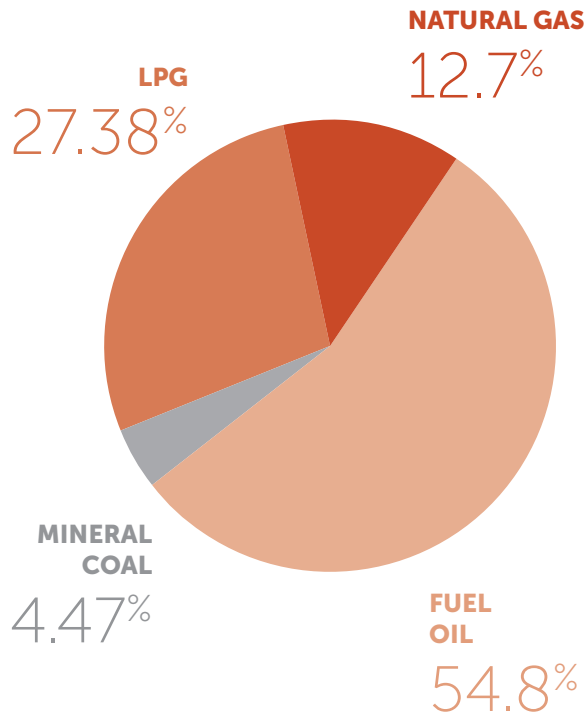
¹ The premises used for the calculation were based on SCGÁS and IPCC data.



FUEL SHARE

1998

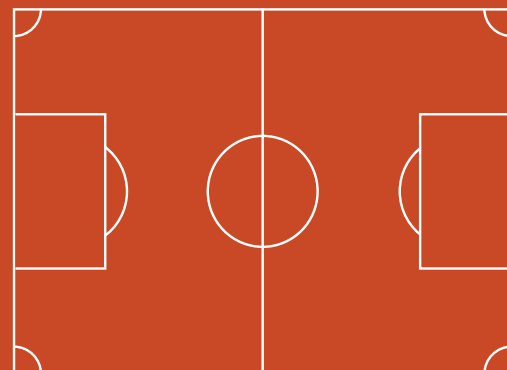
2016



Base year 1998
Source: Anfacer Intelligence System

THE SECTOR'S REDUCTION IN EMISSIONS IS EQUIVALENT TO:

...stopping **1,000 cars** from driving around the planet **836 times**.



...avoiding felling a forest area equivalent to **8,861 football pitches**.



AND IF...

The table shows the difference in emissions if the sector had not changed its energy matrix in comparison with current data. The sector has avoided 4.6 million metric tons of greenhouse gas emissions (tCO₂e) over the last ten years.

YEAR	ESTIMATE OF EMISSIONS IN THE OLD MATRIX (TCO ₂ E)	EMISSIONS IN THE NEW MATRIX (TCO ₂ E)	DIFFERENCE (TCO ₂ E)	PERCENTAGE DIFFERENCE (%)
2006	1,950,674.09	1,662,332.24	288,341.85	-14.78
2007	2,161,621.91	1,825,178.50	336,443.41	-15.56
2008	2,283,175.57	1,941,573.85	341,601.73	-14.96
2009	2,663,417.83	2,255,657.83	407,760.00	-15.31
2010	2,830,311.65	2,399,058.38	431,253.27	-15.24
2011	3,099,266.11	2,623,482.80	475,783.32	-15.35
2012	3,142,548.29	2,659,182.98	483,365.31	-15.38
2013	3,063,644.81	2,593,218.59	470,426.22	-15.36
2014	3,118,661.65	2,638,343.30	480,318.36	-15.40
2015	3,240,007.57	2,751,118.63	488,888.94	-15.09
2016	2,919,623.31	2,483,186.50	436,436.81	-14.95
Total	30,472,952.80	25,832,333.60	4,640,619.21	-15.23

15.23%

The sector's reduction in emissions with the use of natural gas.

4,640,619.21 tCO₂e

Was the reduction in emissions achieved by the sector between 2006 and 2016 with the adoption of natural gas as its main energy source.



SECTOR EMISSIONS

The ceramic tile industry manufacturing chain has a considerable energy consumption in its manufacturing process, in particular in the processes of atomizing, firing and forced drying of the clays, and also in equipment movement in the industrial plants.

Such processes constitute the major sources of GHG emissions in the ceramic tile industry.

This study does not take other sources of emissions into account: the transportation both of inputs and finished product; the burning of the carbonates in the raw material; and the extraction of the raw material.

GASES IDENTIFIED

Three different greenhouse gases (GHG) were identified in the emission sources studied.

GHG	GWP ¹
Carbon Dioxide (CO ₂)	01
Methane (CH ₄)	25
Nitrous Oxide (N ₂ O)	298

1 The Global Warming Potential (GWP) index shows the contribution made by each greenhouse gas. The higher the index, the greater the contribution.

Two technologies

The Brazilian ceramic tile industry uses two manufacturing technologies: the dry route and the wet route. This constitutes a competitive differential considering that global competitors depend exclusively on the wet route process.

The most part of the Brazilian ceramic tile industry uses the dry route, which offers diverse advantages, particularly in relation to water consumption.

See the stages in the two technologies and the type of energy used in each.



DRY ROUTE

GHG	GWP ¹
dry milling	electrical energy
humidification and granulation	thermal energy
pressing	electrical energy
drying	electrical and thermal energy
glazing and decoration	electrical energy
firing	electrical and thermal energy
classification and packaging	electrical energy

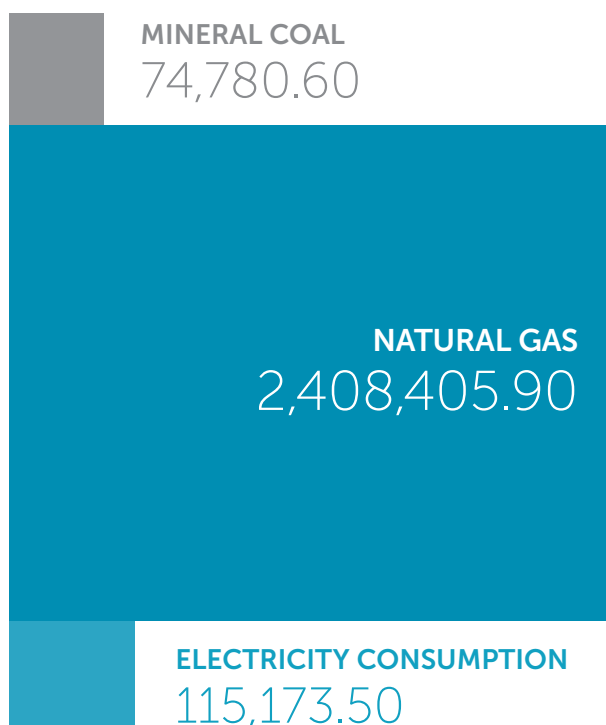
Thermal energy – derived from burning fuels such as natural gas and mineral coal.

WET ROUTE

GHG	GWP ¹
wet milling	electrical energy
atomization	electrical and thermal energy
pressing	electrical energy
drying	electrical and thermal energy
glazing and decoration	electrical energy
firing	electrical and thermal energy
Classificação e embalagem	electrical energy

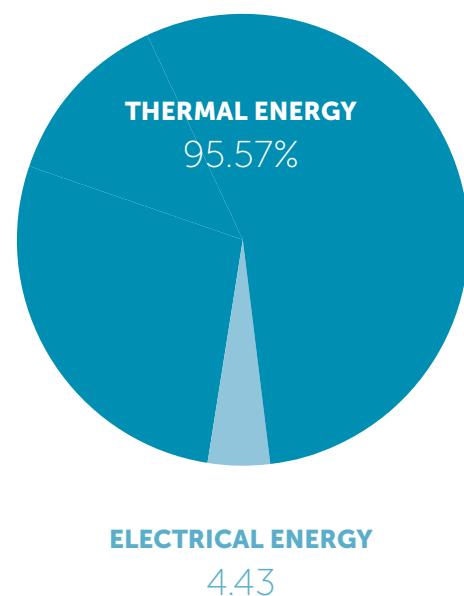
Electrical energy – energy generated and supplied by the Brazilian national grid.

TOTAL EMISSIONS



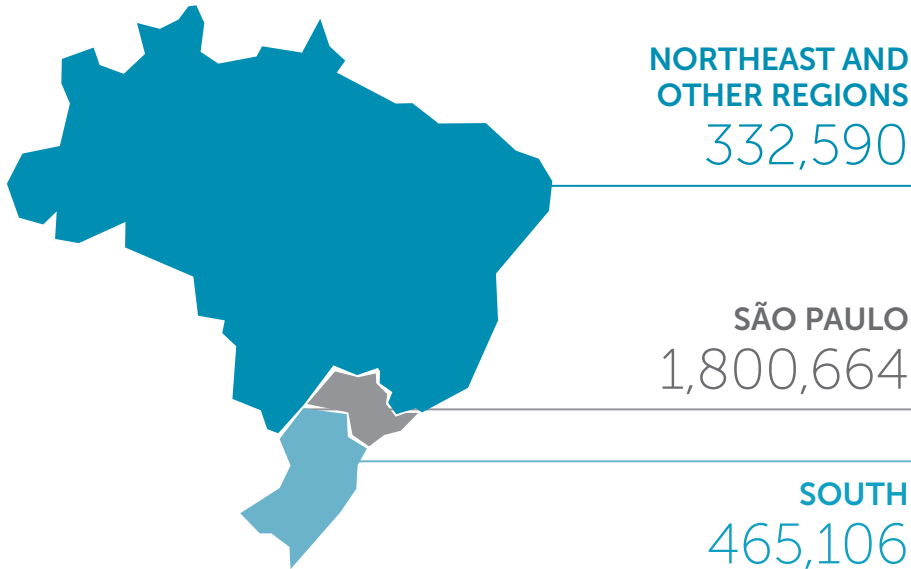
ENERGY SOURCES (%)

Breakdown of Energy Sources



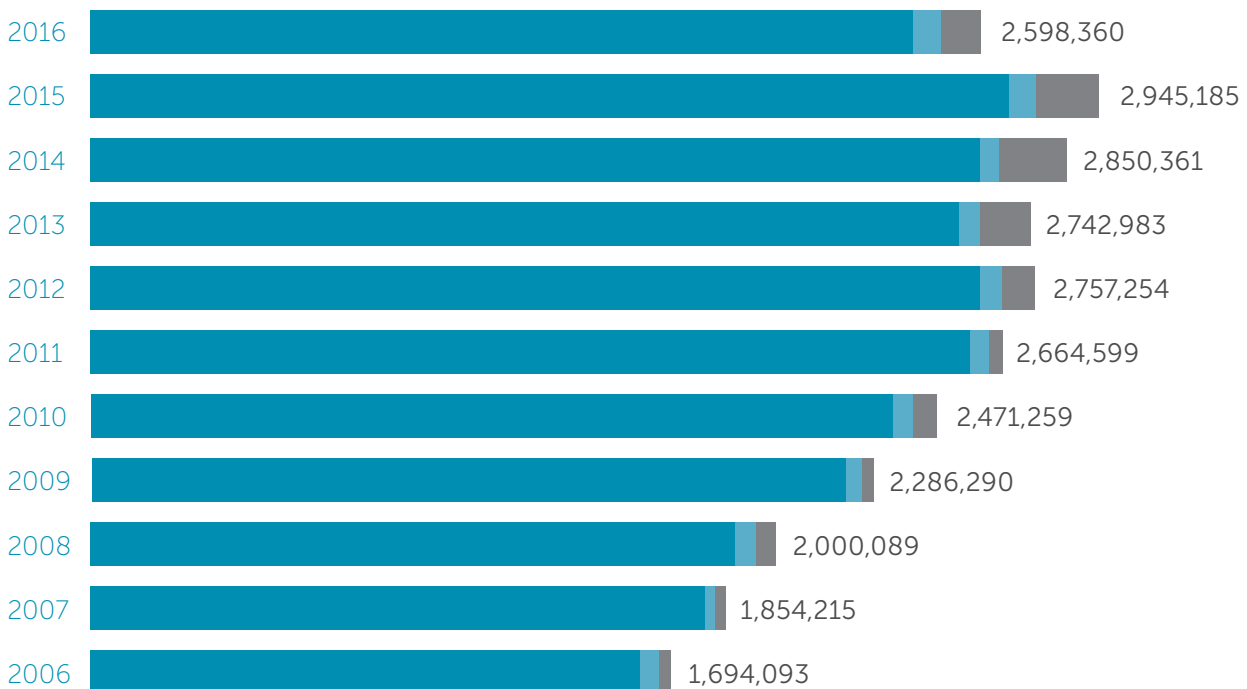


EMISSIONS BY REGION (tCO₂e)



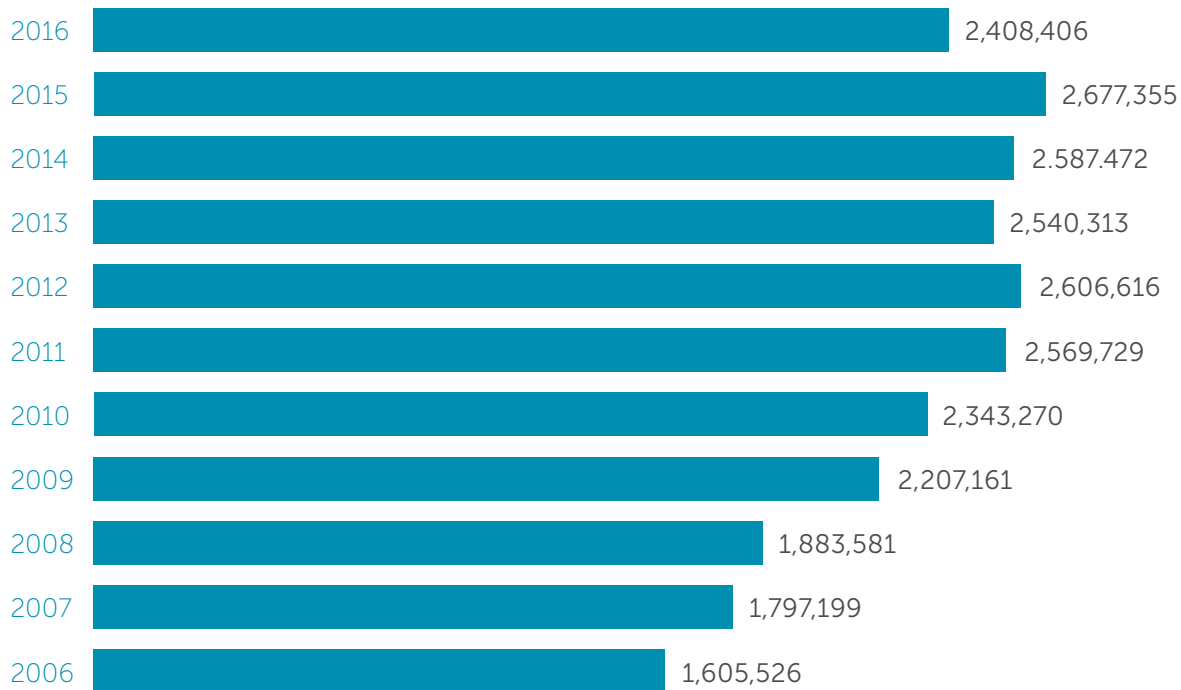
Historical emissions series

TOTAL EMISSIONS BY SOURCE

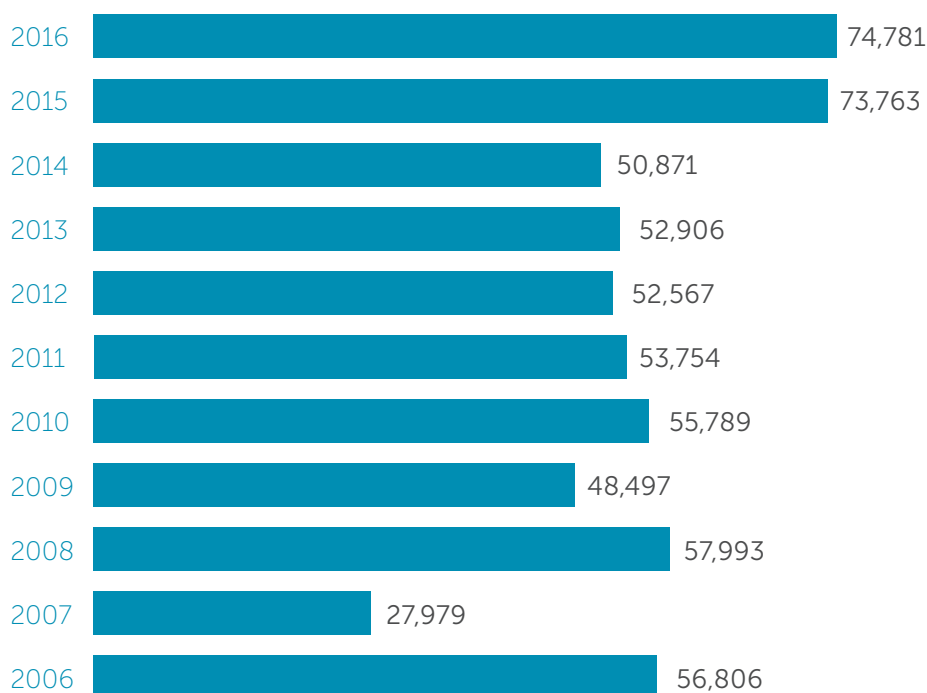




TOTAL EMISSIONS FROM NATURAL GAS (TCO₂E)

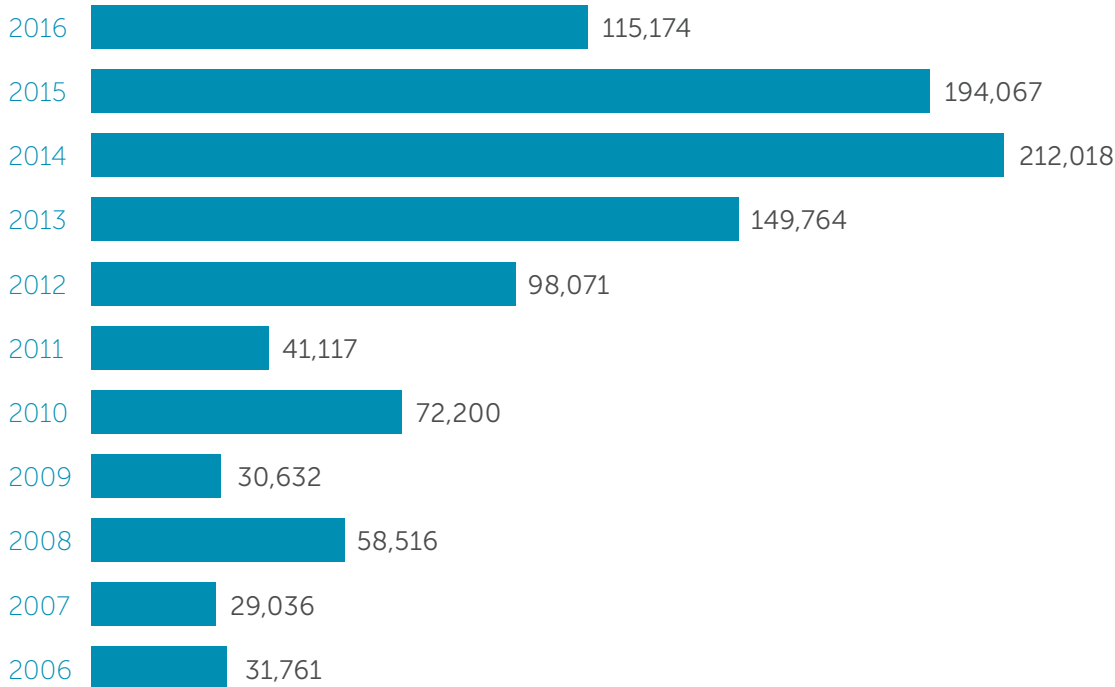


TOTAL EMISSIONS FROM MINERAL COAL (TCO₂E)





TOTAL EMISSIONS FROM ELECTRICAL ENERGY (tCO₂e)



PRODUCTION EMISSIONS

FUEL	PRODUCTION EMISSIONS (tCO ₂ e/m ²)
ANFACER GHG Inventory	0.00314
Ministry of Mines and Energy Technical Report	0.00290

HISTORICAL PRODUCTION EMISSIONS

YEAR	TOTAL EMISSIONS (tCO ₂ e/m ²)	PRODUCTION (MM m ²)	EMISSION/PRODUCTION (tCO ₂ e/m ²)
2006	1,694,092.83	594	0.00285
2007	1,854,214.80	637	0.00291
2008	2,000,089.45	713	0.00280
2009	2,286,289.75	715	0.00320
2010	2,471,258.71	754	0.00328
2011	2,664,599.32	845	0.00315
2012	2,757,254.29	866	0.00318
2013	2,742,982.57	871	0.00315
2014	2,850,361.17	903	0.00316
2015	2,945,185.41	899	0.00327
2016	2,598,360.00	792	0.00328



METHODOLOGICAL APPROACH

The most common methodological approaches, which are in accordance with the IPCC (2006), are bottom-up and top-down.

The bottom-up approach collects the consumption data from all the activities that emit GHG, counting each activity and summing the data to arrive at the total emissions. This approach requires a large volume of data and great organization.

The top-down approach uses data on general consumption, rather than specific emission activities. This approach is generally used the first time that large organizations or countries conduct their inventories, because there is still no control over data from each emission source, although the general data are known or may be estimated with considerable accuracy.

The GHG inventory adopted the entire ceramic tile sector as a boundary and applied a top-down approach, in which only the highly representative emission sources described above were taken into account. The direct emission source data for the sector (scope 1) were obtained from the Anfacer Intelligence system in conjunction with public data from Comgás. Additionally, GHG Protocol, ISO 14.064 and IPCC guidelines were employed.

ANFACER was responsible for supplying the information for undertaking this inventory and, by means of the Anfacer Initiative + Sustainable, has a plan for monitoring energy consumption in the sector.

SUMMARY OF ACTIVITIES

The process for elaborating this inventory entailed:

- A study of the ceramic tile sector;
- Visits to companies and to Comgás;
- The collection and transmission of information;
- A diagnosis of the quality of the information;
- Qualitative analysis of the emission sources;
- Quantitative analysis of the emission sources;
- Validation of the data;
- Elaboration of the GHG emissions inventory.



Principles

RELEVANCE

Selection of emission sources, data and methodologies appropriate for the requirements and the activities undertaken.

INTEGRITY

All relevant GHG emissions covered by the inventory are included and any exclusion is justified.

ACCURACY

Uncertainties are reduced as far as is practicable to ensure that the quantification of the GHG emissions is not far from the actual amounts and that any errors and uncertainties are determined.

TRANSPARENCY

Disclosure of sufficient and appropriate GHG emission information to enable the developer to take decisions with a reasonable degree of confidence.

Guidelines

- > Brazilian GHG Protocol Program
- > International Organization for Standardization – 14.064
- > IPCC Guidelines for GHG Inventories

Project Boundaries

The ANFACER membership comprises the great majority of the companies in the sector. Due to this representativeness, the boundary of this emissions inventory is the entire Brazilian ceramic tile sector.

Analysis of Uncertainties

The work on elaborating this emissions inventory involved the creation of an information quality process, aimed at diminishing uncertainties as far as possible (scientific uncertainties and uncertainties related to estimates and the parameters used).



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CREDITS

ANFACER

Iniciativa Anfacer + Sustentável

President

José Nilson Crispim Junior (Elizabeth)

Vice Presidents

Benjamin Ferreira Neto (Alfagres)

Paulo Cesar Benetton (Cecrisa)

Raul Penteado de Oliveira Neto (Deca)

Superintendent

Antonio Carlos Kieling

Executive Director

Mauricio Borges

General Coordination

Amanda De Andrade Neme

Technical team

Laura Paiva

Anderson Vieira

Lilian Dias (CCB)

Technical consulting

GSS Sustentabilidade

Coordination

Paulo Augusto Zanardi Júnior

Technical team

Cristiane Moraes

Gabriel Chaves

Kenneth Huari

Washington Fiorese

Communication agency

rpt.com

The logo features a stylized green plus sign with a yellow square on its left side, followed by the word "Sustainable" in a large green font and "ANFACER INITIATIVE" in a smaller white font below it.

Sustainable

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