2019 GHG INVENTORY

Corporate inventory of the GHG emissions of Banco Bradesco S/A in 2019

Banco BRADESCO S/A
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2019 GHG Inventory Banco Bradesco S/A

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AUTHORS	WAYCARBON

Bruna Dias; bruna.dias@waycarbon.com

Rosangela Silva; rosangela.silva@waycarbon.com

Danilo Vassari; danilo.vassari@waycarbon.com

Elisa Morandi; elisa.morandi @waycarbon.com

Vitor Magno; vitor.magno@waycarbon.com

COLLABORATORS	BANCO BRADESCO

Guilherme Rinco de Santana; guilherme.santana@bradesco.com.br

Guilherme de Melo Silva; guilherme2.m.silva@bradesco.com.br

Diego Cardozo de Mello Nunes; diego.nunes@bradesco.com.br

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Bradesco – 2019 GHG Inventory -2020_06_01	06/01/2020	5th version	2nd version

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SUMMARY

SUMMARY

The inventory of greenhouse gas (GHG) emissions is the management tool that permits appraisal of an organization's impact on the global climate system. This Study appraised the GHG emissions of Banco Bradesco S/A in 2019.

In the year 2019, the Scope 1 direct emissions of Banco Bradesco S/A were 10,333.76 tCO_2e, while the Scope 3 indirect emissions were 189,157.96 tCO_2e. Scope 2 emissions from purchased electric power were calculated using two different approaches: Location Based- LB (which considers the average of the National Interconnected System as the emission factor) and Market Based - MB (which considers the grid's emission factor, as well as the emission factors from renewable energy acquired in the Free Contracting Environment). The emission difference between the LB and MB approaches was 294.76 tCO2e, due to the consumption of 3,094.4 MWh of renewable energy (80% of which from sources with emission factor 0 and 20% arising from biomass thermoelectric plants) of the Free Contracting Environment. We present the results in Table 1:

Table 1. Results of GHG emissions per scope and category for 2019 (tCO2e).

Scope	Category	Emission (tCO2e)		Significance (%)
Scope 1	Stationary combustion		765.97	7.41%
	Mobile combustion		973.40	9.42%
	Fugitive gases		8,594.39	83.17%
	Total Scope 1		**10,333.76**	
Scope 2	Acquisition of electricity	**LB** 38,641.73	**MB** 38,346.97	100%
Scope 3	Employee transportation (from house to work)		99,504.60	52.60%
	Waste generated in operations		5,234.02	2.77%
	Transportation and distribution (upstream)		63,088.79	33.35%
	Business trips		21,330.55	11.28%
	Total Scope 3		**189,157.96**	
Total - LB			**238,133.46**	
Total - MB			**237,838.70**	

Source: Own elaboration based on data from Climas software.

Moreover, a total of 348.22 tons of tCO_2 from a Scope 1 renewable source, and 33,677.77 tCO_2 relating to Scope 3 were emitted. Considering the MB approach, 700.14 tCO_2 of Scope 2 renewable source energy were emitted.

The Banco Bradesco S/A Scope 1 emissions in the year 2019 totaled 10,333.76 tCO_2e. The fugitive emissions characteristic of exchanges of refrigeration gases in air-conditioning devices were the most representative, accounting for approximately 83.17% of the Scope 1 emissions. In second place come the emissions resulting from consumption of fuels by the Organization's mobile (land and air) fleet, which represented 9.42% of the direct emissions. The consumption of diesel oil in electricity generators represented 7.41% of the total. Banco Bradesco S/A's Scope 3 emissions in 2019 totaled 189,157.96 tCO2e, representing an increase of 8.82% over the base year (2018 = 173,818.74 tCO2e), considering national and international standards.

In the Location Based approach, the Scope 2 emissions of Banco Bradesco S/A in the year 2019 totaled 38,641.73 tCO_2e, representing an increase of 2.83% in relation to the previous year (2018 = 37,577.67 tCO_2e), considered the base-year. In terms of consumption, there was a total increase in the Organization's electricity consumption of roughly 0.32%. Moreover, there was an increase of 1.35% in the average grid emission factor compared to the previous year (0.0740 tCO_2/MWh in 2018 vs 0.0750 tCO_2/MWh in 2019).

In 2019, Banco Bradesco S/A purchased electricity from renewable sources in the incentivized Free Contracting Environment (ACL), being able to account for Scope 2 emissions under the Market Based - MB approach Under this approach, Banco Bradesco Scope 2 emissions in the year 2019 totaled 38,346.97 tCO_2e.

According to the Brazilian GHG Protocol Program, the LB approach quantifies Scope 2 GHG emissions by acquiring electricity using the average electricity generated from the National Interconnected System as the emission factor, whose reporting is mandatory. On the other hand, the MB approach quantifies Scope 2 GHG emissions for the acquisition of electricity using the specific emission factor for each source of electricity generation that the inventory organization chose to purchase or consume, whose reporting is voluntary.

Breaking the totals down by operational units, Banco Bradesco is responsible for most of the Scopes 1, 2 and 3 emissions. This representativeness is expected owing to the size of the Organization's banking arm compared with the other units, as presented in Table 2.

Table 2. Results of GHG emissions per company for 2019 (tCO2e).

Operating Unit	Scope 1	Scope 2 - LB	Scope 2 - MB	Scope 3	Total -	Total - MB
Bradesco	10,173.86	38,093.77	37,799.01	150,558.33	198,825.96	198,531.20
Bradesco Argentina	0.49	4.11	4.11	2.18	6.79	6.79
Bradesco Europa	1.77	3.35	3.35	51.04	56.16	56.16
Bradesco Grand Cayman	0.63	0.90	0.90	6.05	7.59	7.59
Bradesco New York	0.89	51.42	51.42	79.53	131.83	131.83
Cartões	1.16	115.25	115.25	1,255.32	1,371.72	1,371.72
Financiamento e Promotora	0.00	0.00	0.00	1,524.68	1,524.68	1,524.68
Scopus Tecnologia	72.29	129.98	129.98	79.14	281.41	281.41
Seguros	82.68	242.95	242.95	35,601.69	35,927.32	35,927.32
Grand total	**10,333.76**	**38,641.73**	**38,346.97**	**189,157.96**	**238,133.46**	**237,838.70**

Source: Own elaboration based on data from Climas software.

The GHG inventory is the first step in the diagnosis and should be continually enhanced. Therefore, it is recommended that Banco Bradesco S/A:

- Improved quality of input data, with frequent flow of operating information, organization of evidence and expansion of monitored sources.
- Invest and continually expand the purchase of electricity in the Free Contracting Environment (ACL), via distributed generation or self-production, prioritizing mainly the acquisition or production of electricity from renewable sources.

1. INTRODUCTION

The problems arising from global warming and climate change make the low-carbon economy a central issue for sustainable development. And, therefore, further ways are being sought to reconcile the economic development and the protection of the climate system.

The Paris Agreement, signed by several countries in 2015 at the annual event of the United Nations Framework Convention on Climate Change, aims to limit global warming to 2°C, ideally to 1.5°C. To this end, all levels of government, as well as the private sector, must make commitments to create bold short and long-term targets, aligned with a future of zero net emissions. Thus, it is necessary to reduce all emissions caused by human activity to near zero - such as those from vehicles and plants powered by fossil fuels, for example.

In this context, it becomes highly relevant to quantify and manage the emissions of greenhouse gases (GHG) in the corporate environment. This can be made through the GHG Emission Inventory, which is a management tool that permits the quantification of GHG emissions of a certain organization.

Based on the definition of its scope, the identification of the GHG sources and sinks, and the accounting for their respective emissions or removals, the Inventory makes it possible to find out the profile of the emissions resulting from the organization's activities.

The information generated based on the drawing up of a GHG Emission Inventory can fulfill the following objectives:

- **Monitoring of GHG emissions:** keeping track of and recording the evolution of the emissions over time. Identifying opportunities for gains in terms of operational efficiency and reduction of costs;
- **Benchmarking:** comparing the emissions of each operating unit or each sector/division of an organization;
- **Evaluation of risks and opportunities:** identifying and mitigating regulatory risks and those associated with future obligations in relation to GHG emission rates or emission restrictions, as well as appraising potential cost-effective emission reduction opportunities;

- **Establishment of targets:** providing inputs for establishment of GHG emission reduction targets and planning of mitigation strategies;
- **Monitoring of results of mitigation actions:** quantifying advances and improvements resulting from strategic initiatives related to the Climate Change issue;
- **Participation in climate information disclosure programs:** permitting the disclosure of information on the organization's climate performance (e.g. GHG Protocol, CDP, ISE, ICO2).

Among the protocols and standards available for the compilation of corporate GHG inventories, the following references have been adopted in this study:

- Brazilian/International Standard NBR ISO 14064; Brazilian Association of Technical Standards, 2007 (ABNT, 2007);
- Specifications of the Brazilian GHG Protocol Program; Verification specifications of Brazilian GHG Protocol Program; GHG Corporate Protocol - Brazilian GHG Protocol Program (PBGHGP) - Getúlio Vargas Foundation; World Resources Institute (FGV/GVces; WRI, 2011);

The protocols listed above have international credibility. The main purpose in adopting them is in obtaining a report that can be compared in national and global environments.

It should be highlighted that this inventory can be verified within the scope of the protocols listed above. The objective of having this inventory verified by a third party is to obtain an independent declaration of the quality of the inventory and the consistency of the information contained in it, so as to assure that its users can have an accurate appraisal of the standard of emissions of the organization's value chain.

1.1. BANCO BRADESCO

Banco Bradesco S/A is one of the largest financial groups in Brazil, with a sound performance aimed at contributing to the achievement of its customers' objectives, through a diversified business model operating in both banking and Seguros activities. Since its establishment (1943), Banco Bradesco S/A has been striving to provide excellent services, always seeking efficiency and technological innovation to better serve its customers.

Banco Bradesco S/A's mission is to contribute to sustainable development and, therefore, the Organization seeks alignment with the best sustainability practices available in the market. In 2019, for the second consecutive year, Banco Bradesco S/A was one of the companies included in the silver category of "The Sustainability Yearbook 2020", a publication that lists companies around the world with the best sustainability practices.

Eco-efficiency is part of Banco Bradesco S/A's strategic management, linking environmental performance to financial performance through optimization of processes, recycling, technological innovations and savings in the use of natural resources and materials. The goal is to reduce the environmental impact and contribute to operational efficiency.

In an integrated way, the Organization considers the environmental issues in the development of its activities and, through the Eco-Efficiency Management Program, invests in initiatives with specific targets for reducing water consumption, energy, printing paper and greenhouse gas emissions (GHG). The program is developed by the Corporate Sustainability area and involves several departments and associated companies, which are responsible for the initiatives and for the monitoring of data and indicators. The Program is monitored by the Sustainability Committee and the Sustainability and Diversity Committee.

Between 2010 and 2015, the first cycle of the Ecoefficiency Master Plan was developed and successfully concluded, meeting the established targets. In the following cycle (2016-2018) we reached more than 60% of the established targets, with the exception of business trips, transportation of money and pouch transportation. To continue the improvement process, a new cycle began in 2019 and will be extended up to the end of this year (2021), with absolute annual targets (Table 3), based on the comparison with the previous year.

Moreover, in 2019, Banco Bradesco S/A purchased electricity in the Free Contracting Environment (ACL), which is generated from renewable sources such as solar, wind, biomass or small hydroelectric plants (PCHs). This change was implemented in some of Bradesco's administrative buildings as of August 2019: Paulista, BH Comércio, Niterói, Nova Central and Alphabuilding. According to the methodology of the Brazilian GHG Protocol Program, this purchase of renewable energy can be counted in the inventory in the Market Based - MB approach, with the purpose of providing visibility to sustainable actions, such as renewable energy consumption. However, the Location Based (LB) approach regarding the energy acquired from the National Integrated System must be maintained in the inventory since the company is connected to the Brazilian grid.

The emission reduction targets can be considered for the Market Based approach. Thus, the company's commitment to being a consumer of renewable energy contributes to the GHG emission reduction targets.

Table 3. Reduction targets for the 2019-2021 Eco-Efficiency Master Plan, with reductions compared to the previous year.

Aspect	Unit	Absolute Targets			
		2019	2020	2021	Plan's total target
Water	m^3	-2.0%	-2.5%	-2.5%	-6.84%
Energy - reduce consumption	kWh	-3.7%	-5.6%	-3.7%	-12.46%
Energy - clean energy	tCO_2e	-0.5°%	-4.0%	-7.0%	-11.16%
Printing paper - purchases and processes	sheets	-20.0°%	-2.98%	-2.98%	-24.47%
Own air fleet	liters	-	-6.78%	-6.78%	-13.2%
The Bradesco Organization's Own Ground Fleet	liters	-4.5°%	-4.5%	-4.5%	-12.9%
Transport in taxi	R$	-4.2°%	-1.12%	-1.12%	-6.53%
Transportation of money	R$	-0.86%	-0.83%	-0.81%	-2.47%
Air Travel	km	-	-1%	-1%	-2.04%

Source: Bradesco IR[1]

[1] Data taken from the Banco Bradesco – IR website (https://www.bradescori.com.br/siteBradescoRI/Uploads/Arquivos/Relatorios/615/615_1_Vers%c3%a3o%20final.pdf)

2. METHOD EMPLOYED

The Banco Bradesco S/A's 2019 Emission Inventory was developed via CLIMAS[2], a computer software calculation program developed by WayCarbon.

2.1. PRINCIPLES OF INVENTORY COUNT AND PREPARATION

The following principles guided the preparation of this study as Brazilian Program for the GHG Protocol guidelines (FGV/GVces; WRI, 2011):

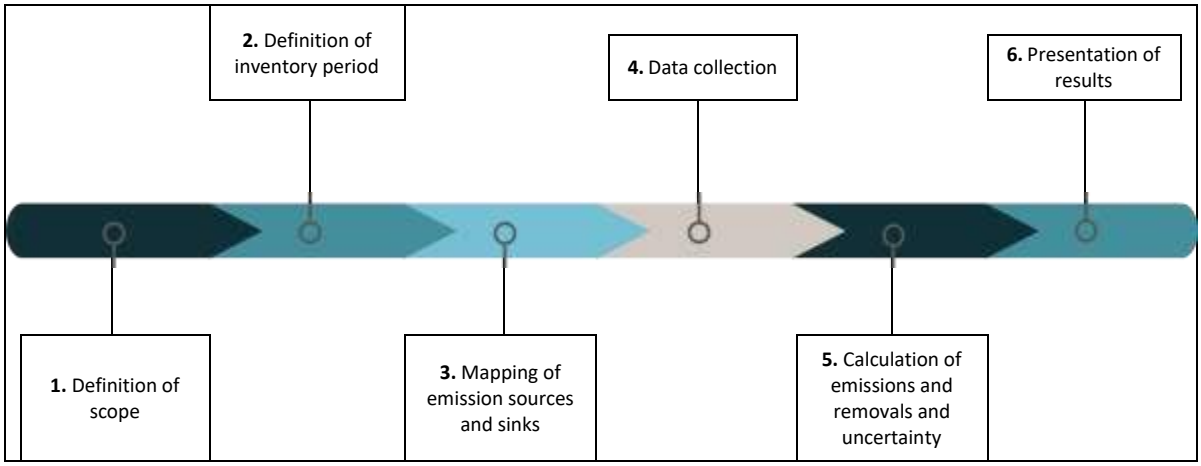
- **Relevance:** Assuring that the GHG Inventory appropriately reflects the emissions of the process in focus and that it meets the decision-making needs of its users;
- **Integrity:** Recording all the GHG emission sources and activities within the selected limits of the inventory; Documenting and justifying any specific exclusions;
- **Consistency:** Using recognized and technically sound methodologies that permit comparisons of the emissions with those of other similar processes; Clearly documenting any alterations in data, inventory limits, methods employed or any other relevant factors in a given time interval.
- **Transparency:** Dealing with all the relevant matters in a coherent and factual manner, supported by objective evidence; and Revealing any relevant suggestions, as well as making appropriate reference to the methodologies for calculation and recording and, further, to the sources of data employed.
- **Accuracy:** By means of application of appropriate data, emission factors or estimates, assuring that the quantification of GHG emissions is not under- or over-estimated. Reducing the skews and uncertainties to the minimum possible and obtaining a level of determination that renders decision-making security possible.

[2] CLIMAS is a calculation software program developed by WayCarbon, which has a database with the most up-to-date emission factors available for each type of source (for example, the Brazilian GHG Protocol Program for Brazil and, when available, internationally accepted references such as the GHG Protocol, IPCC, EPA and DEFRA).

2.2. INVENTORY COMPILATION STEPS

The conceptual steps used in drawing up this inventory are presented in the following flowchart and explained afterwards (Figure 1):

Figure 1. Flowchart of methodological steps for conducting inventories.



Source: Own elaboration WayCarbon.

First of all, define the scope of the (Step 1), that is, it is necessary to determine which installations and activities of the organization will be covered by the inventory, hence establishing its organizational limit. Next, define the reference period and base-year of the inventory (Step 2).

Then, the organization's GHG sources and sinks are identified (Step 3) and subsequently placed in categorical and hierarchical order. Thereupon, the data gathering process is carried out (Step 4). For performance of the next step, which involves calculation of the emissions (Step 5), the data on the emission activities gathered, as well as the emission factors, are used (see in the next pages). The inventory uncertainties are also calculated in this step. Finally, the results are compiled into an annual report (Step 6).

The Stages identified above have been applied to the GHG inventory of Banco Bradesco S/A as described below.

2.3. DEFINITION OF SCOPE

2.3.1. Organizational boundaries

Two approaches are possible for consolidation of emissions and removals at an organizational level. The following are definitions of each one of such approaches and indication of the option used in this inventory.

☐ Equity interest: the organization assumes the GHG emissions of operations according to its equity interest.

☒ Operating Control: the organization is responsible for 100% of the GHG emissions of the operations over which it has operational control.

Banco Bradesco S/A is made up of a conglomerate of companies. Its activity model is diversified among the financial, Seguros, retirement and capitalization arms, among other activities. Among the companies related to the financial arm, the following stand out:

- Banco Bradesco, banks overseas and other banks acquired in recent years;
- Consortium, financing and leasing companies;
- Fund Management companies;
- Securities Brokerage company.

Banco Bradesco S/A has a total of 4,478 branches and 45 administrative buildings. The Organizational Frontier of this report covers all the operations under the operating control of Banco Bradesco S/A, which encompass all its departments, the principal physical unit (Cidade de Deus), the other administrative buildings, hubs, branches and associated companies and subsidiaries abroad. The Group companies of the Bradesco Organization considered in this inventory are presented in the following table (Table 4):

Table 4. Operating control and equity interest of each company of BancoBradesco S/A.

Operating Units	Location	Operational control	Ownership interest (%)
Banco Bradesco	Brazil	Yes	100%
Bradesco Cartões	Brazil	Yes	100%
Bradesco Seguros	Brazil	Yes	100%
Bradesco Financiamento	Brazil	Yes	100%
Scopus Soluções	Brazil	Yes	100%
Banco Bradesco S. A. Grand Cayman Branch[3]	Cayman Islands	Yes	100%
Banco Bradesco New York Branch[4]	New York	Yes	100%
Banco Bradesco Europa S.A.	Luxembourg	Yes	100%
Banco Bradesco Argentina S.A.	Argentina	Yes	100%

Source: Own elaboration WayCarbon.

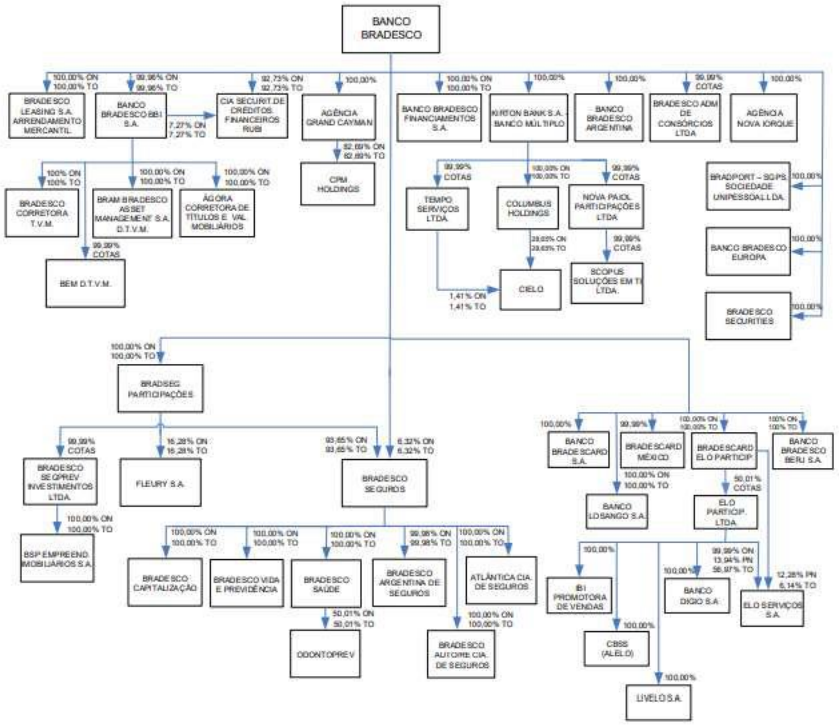
Specifically, Bradesco Cartão and Scopus Soluções operating units were merged into the Banco Bradesco unit throughout 2019. Thus, data collection was grouped into different stages and in a gradual flow.

The corporate organization chart of **Banco Bradesco S/A** and the operating units that are encompassed in this report are presented below (Figure 2):

[3] The Bradesco Organization's subsidiary companies known as Grand Cayman (Cidade Capital Markets Ltd.) and Hong Kong (Bradesco Trade Service Ltd.) are set up at the unit known as Banco Bradesco S. A. Grand Cayman Branch, and their emissions are computed jointly at the latter.

[4] The subsidiary companies Bradesco Securities, Inc. and Bradesco North América LLC are set up at the unit known as Banco Bradesco New York Branch, and their emissions are computed jointly at the latter.

Figure 2. Corporate organization chart of Banco Bradesco S/A (base date: 12/31/2019)



Source: Bradesco RI[5]

2.3.2. Operating boundaries

The definition of operational frontiers considers the identification of the GHC sources and sinks associated with the operations by means of their categorical ordering into direct or indirect emissions, using the scope concept. Below are definitions of each one of the three (03) categories adopted by the GHG Protocol and indications of the options encompassed in this inventory.

[5] Data taken from the Banco Bradesco – IR (https://www.bradescori.com.br/siteBradescoRI/Uploads/ModArquivos/2008/2008_1_Principais%20Controladas%20e%20Coligadas%2031%2012%202019.pdf)

☒ Scope 1: Direct emissions of GHG gases from sources owned or controlled by the organization.

☒ Scope 2: Indirect GHG emissions arising from the acquisition of electric power that is consumed by the organization.

☒ Scope 3: Optional reporting category, considering that all the other indirect emissions that are not included in Scope 2. They are a consequence of the organization's activities, but they occur due to sources that do not belong to or are not controlled by it.

2.3.3. Period covered

This inventory includes emissions from activities carried out by Banco Bradesco S/A in 2019 (from January 1, 2019 to December 31, 2019).

2.3.4. Base year

The base-year is the reference point in the past in relation to which the current atmospheric emissions can be compared with consistency.

The recalculation retroactive to the base-year should be performed whenever there are changes that result in either a rise or fall in emissions, that is, whenever the alteration compromises the consistence and relevance of the analyses over time. The following cases may result in the need for recalculation of the emissions:

- Significant structural changes that alter the boundaries of the inventory: (i) mergers, acquisitions and divestitures; (ii) outsourcing and incorporation of activities causing emissions; and (iii) change of the activity causing emissions into or out of the geographical limits of the Program (GHG Protocol Brazil);
- Significant alterations in the calculation methodology, improvement in the preciseness of the emission factors or activity data that result in a significant impact on the emission data or base-year; and/or
- Discovery of significant errors or a determined number of accumulated errors that result in significant changes in the results.

Up to the inventory for the year 2015, the 2011 base-year was used in the Banco Bradesco S/A's corporate reports on emissions. Even so, owing to the acquisition of HSBC in 2016, Bradesco decided to change its base-year to 2015. In 2019, a management cycle is in place, providing for annual Eco-efficiency targets with reduction based on the previous year. Thus, the base year 2018 was considered for this Inventory. The Company believes that is aligned with the objectives and strategies of reducing emissions that are more appropriate to the organizational and growth profile of Banco Bradesco S/A.

2.3.5. Greenhouse gases

According to the Brazilian Program for the GHG Protocol, Inventories should cover the seven (7) types of GHG that are part of the report on the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro-fluorocarbons (HFCs), per-fluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen tri-fluoride (NF_3). In addition, the Montreal Protocol includes gases that deplete the ozone layer, such as the hydro-chlorofluorocarbons (HCFCs), which also contribute to global warming.

Each GHG has an associated Global Warming Potential (GWP), which is the measure of how much each gas contributes to global warming. The GWP is a relative value that compares the heating potential of a determined quantity of gas with the same quantity of CO_2 that, for standardization purposes, has a GWP value equal to 1. The GWP is Always expressed in terms of equivalence of CO_2 - CO_2e. Table 5 shows the values of the GWP used in the Banco Bradesco S/A Inventory:

Table 5. Global Warming Potential (GWP) of greenhouse gases

Gas	PAG
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298
Sulfur hexafluoride (SF_6)	22,800
Nitrogen trifluoride (NF_3)	17,200
PFCs	7,390–17,700
HFCs	12 – 14,800
HCFCs	5 – 14,400

Source: PBGHGP, 2020.

The Banco Bradesco S/A Inventory considered the emissions of CO_2, CH_4, N_2O, HFCs (HFC-32, HFC-125, HFC-134a, HFC143a and HFC-152a) and HCFCs (HCFC-22, HCFC-124 and HCFC-141b), according to the sources of emission mapped and the availability of data. In addition, the Inventory also computed the emissions of CO_2 of renewable origin[6].

The gases CO_2, CH_4, N_2O, HFCs and HCFCs are generated at Banco Bradesco S/A in the following manners:

- CO_2: generated in the burning of fossil fuels (like diesel oil, natural gas and liquefied petroleum gas) by mobile and stationary sources;
- CH_4: generated in the burning of fuels by mobile and stationary sources and in the decomposition of organic materials in processes for anaerobic treatment of solid waste;
- N_2O: generated in the burning of fuels by mobile and stationary sources; and
- HFCs and HCFCs: generated in the leakages of cooling gases.

2.3.6. Inventory exclusions

Since 2015, there has been no inclusion of sources of emission associated with the consumption of LPG and natural gas for the preparation of food (0.02% and 0.04% of Scope 1 in 2011), the fugitive emissions from reloading off fire extinguishers (0.89% of Scope 1 in 2014) and the emissions from the process of turning organic waste from the Cidade de Deus into compost (0.36% of Scope 1 in 2014), as such emission sources have values below the GHG inventory emission calculation uncertainty. All the other Scope 1 and Scope 2 emission sources of the units encompassed in the 2019 GHG inventory have been considered.

[6] Renewable Emissions of GHG Inventory - emissions of CO_2 arising from the use of biomass energy from a renewable source. This study has adopted the definition of renewable biomass formulated by the Executive Board for the Clean Development Mechanism of the United Nations Climate Change Framework Convention (EB 23, Annex 18). Emissions of this type do not contribute to increasing the concentration of CO_2 in the atmosphere on a long-term basis, once they are part of the carbon natural cycle.

2.4. IDENTIFICATION OR REVALIDATION OF SOURCES AND SINKS

The emission sources have been identified and hierarchically ordered within the Company's organizational structure. Within the CLIMAS system developed by WayCarbon, a mapping exercise was conducted of the Company's sources of emission and each one was classified according to the attributes described as follows (Table 6):

Table 6. Description of the attributes registered for the database levels of input information.

Attribute	Description
Operating Unit	Indicates the operational unit to which the source or sink belongs
Process	Indicates the process to which the source or sink belongs
Activity	Indicates the activity that the source or sink performs
Supervised item	Space where further details are recorded for identification of the source of emission
Precursor	Substances that will give rise to GHG emissions
Technology	Technology that, associated with the precursor, gives rise to GHG emissions
Operating parameter	Description of the input data
Measurement unit	Unit of measurement of the consolidated input data
Person in Charge	Person in the Organization responsible for gathering the data.
Data source	Place, record, reference or system from which the data is obtained
Scope	Scope of the emission source according to the classification of the GHG Protocol
Category	Category of the emission source, according to the classification of the GHG Protocol

Source: Own elaboration WayCarbon.

The emission sources considered in the inventory according to the hierarchical order and structured organization in the CLIMAS is presented in Table 7 as follows:

Table 7. Sources of emission considered in the inventory according to the scope, category and hierarchical ordering (process and activity) structured in the CLIMAS system

Scope	Category	Process
Scope 1	Stationary combustion	Electricity generators
	Mobile combustion	Air
		Land
	Fugitive gases	Cooling System
Scope 2	Acquisition of electricity	Consumption of electricity
Scope 3	Category 4: Transportation and distribution - Upstream	Cargo transportation
		Pouch transportation
		Emergency transportation
		Transportation of money

Scope	Category	Process
Scope 3	Category 5: Wastes generated in the operations	Landfill
	Category 6: Business trips:	KM reimbursement
		Taxi
		Air Travel
	Category 7: Employee transportation	Home-work displacement
		Collective employee transportation – chartered vehicles

Source: Own elaboration based on data from Climas software.

As noted in Table 7, the processes defined in the CLIMAS for Banco Bradesco S/A Inventory can be correlated with the categorization by the Brazilian GHG Protocol Program (PBGHGP)[7] . The PBGHGP categories can be found in Annex E - Brazilian GHG Protocol Program Categories.

2.5. DATA COLLECTION

The flow of information for compilation of the inventory occurred with the following sequence of activities:

1. The corporate managers identified the collaborators who manage the information needed for building up the GHG inventory;
2. Collaborators who monitor operations verified the best manner for obtaining the data on the Company's management systems;
3. The information gathered is consolidated by DPOC and finally sent to WayCarbon.

The WayCarbon technical team received the data, critically analyzed the data, compiled it and inserted the operating data in the CLIMAS system

[7] The definitions of the categories were taken from documents issued by the Getúlio Vargas Foundation's São Paulo Business Administration School (FGV EAESP): Technical Note :Classification of scope 1 GHG emissions in the respective categories of sources of emission – version 1.0 (Available at http://mediadrawer.gvces.com.br/ghg/original/ghg-protocol_nota-tecnica_categorias-escopo-1_-v1.pdf) and Categories of Scope 3 Emissions adopted by the Brazilian GHG Protocol Program (Available at http://mediadrawer.gvces.com.br/ghg/original/ghg_ categorias_e3_definicoes_curta.pdf).

Banco Bradesco S/A gathers the data relating to the GHG emission activities according to the operational procedures established in the "Procedures Manual for the Management System for Quantification and Reporting Green-House Gas Emissions and Removals of Banco Bradesco S/A – pursuant to ABNT NBR ISO14064-1" (version MP_4215_64003-04), implemented at each Managerial Department pertaining to the organizational and operational limits established.

The manner for recording the data gathered relating to the GHG emission sources and the respective Departments responsible for these activities are defined in the table below (Table 8).

Table 8. Responsibilities for the data collection activity.

SCOPE	EMISSION SOURCES		DEPARTMENT RESPONSIBLE	PERIODICITY
Scope 1	Mobile Combustion	Own air fleet	EQUITY	Quarterly
		Company ground fleet	EQUITY	Quarterly
	Fugitive gases	Release of refrigerator gas emissions	EQUITY	Quarterly
	Stationary combustion	Power generators	EQUITY	Quarterly
Scope 2	Acquisition of electricity	Electricity purchased for Company's own consumption	EQUITY	Quarterly
Scope 3	Transportation and distribution (upstream)	Transportation of pouches (correspondence and documents)	AOC	Quarterly
		Transportation of cargos (equipment, furniture and print-shop supplies).	EQUITY	Quarterly
		Transportation of money	AOC	Quarterly
		Emergency transportation	BRADESCO SEGUROS	Quarterly
	Waste generated in operations	Solid waste	EQUITY	Quarterly
	Business trips	Taxi	ACCOUNTING	Quarterly
		Airline Tickets	DRH	Quarterly
		KM reimbursement	ACCOUNTING	Quarterly
	Employee transportation (from house to work)	Collective employee transportation (buses and vans provided by the Company)	DRH	Quarterly
		Destination and origin postal codes (CEPs)	DRH	Annual

Source: Own elaboration WayCarbon.

The Corporate Sustainability area of the Controllership Department is responsible for the implementation and maintenance of the applicable standard (ABNT NBR ISO 14064-1) and is accountable for management and maintenance of the controls pegged to the Bradesco Organization's GHG inventory.

The system adopted for control consists of preparing and updating a Master List that contains all the documents pertaining to this managerial system and the respective persons in charge. The Controllership department receives from the persons in charge the respective forms filled out and then analyzes, compiles and groups them for subsequent processing to calculate the annual GHG emissions.

According to the types of data managed and the emission factors existing, the information has been worked for inputting on the CLIMAS system, as presented in the following table (Table 9):

Table 9. Data managed by Banco Bradesco S/A for insertion in the CLIMAS system.

Data type	Source	Calculation description
Passenger*distance	Bus and rail transportation	Distance from home to work (obtained from the HR database) times the percentage of collaborators for the means of transportation (obtained from the Subway urban mobility survey).
	Air Travel	Distance between airports (based on the World Airport Codes) per Defra classification methodology over short, medium and long distances.
Distance	Collaborators' own vehicles	Distance from home to work (obtained from the HR database) times the percentage of collaborators for the means of transportation (obtained from the Subway urban mobility survey).
	Chartered transportation	Distance traveled by chartered service providers to transport employees.
	Transportation and distribution	Data supplied by third parties.
	Reimbursement.	Amount reimbursed divided by reimbursement per km
Energy	Electric power	Data obtained directly from Banco Bradesco control.
Mass	Waste, and Refrigerator Gases	Data obtained directly from Banco Bradesco control.
Brazilian Real	Pouch transportation	Cost incurred on fuel (exclusively) in the service performed.
	Transportation and distribution	Cost incurred on fuel (exclusively) in the service performed.
	Taxi	Cust of fuel divided by the average price per km in Brazil.
Volume	Generators, owned and rented fleet	Data obtained directly from Banco Bradesco control.

Source: Own elaboration WayCarbon.

2.6. CALCULATION OF EMISSIONS AND REMOVALS

The Banco Bradesco S/A Inventory of GHG emissions was prepared via CLIMAS, a calculation software program developed by WayCarbon, which has a database with the most up-to-date emission factors available for each type of source (for example, the Brazilian GHG Protocol Program for Brazil and, when available, internationally accepted references such as the GHG Protocol, IPCC, EPA and DEFRA).

Generically, the GHG emissions and removals are calculated for each source and sink individually according to the following formula:

$$E_{i,g,y} = DA_{i,y} \cdot FE_{i,g,y} \cdot PAG_{g}$$

Where:

- i Index that denotes an activity of the individual source or sink;
- g Index that denotes a type of GHG;
- y Year of reference of the report.
- $E_{i,g,y}$ GEE *g* emissions or removals attributable to the individual source or sink *i* during year *y,* in tCO_2e;
- $DA_{i,y}$ Consolidated activity data relating to the *i* source or sink for year y, measured in unit *u* terms. As pointed out earlier, the consolidated activity data will consist of all the attributes recorded for each source/sink.
- $FE_{i,g,y}$ Factor for emission or removal of GHG g applicable to i source or sink in year y, in t GHG g/u;
- PAG_{g} Global warming potential of the GHG g, in $tCO_2e/tGEEg$.

The choice of the appropriate calculation method derived from the availability of data and specific emission factors, as well as the combustion technologies used in the process, among other matters.

The WayCarbon technical team is responsible for periodically updating the CLIMAS with the emission factors according to internationally consecrated methodologies for compiling GHG inventories. The emission factors are mainly based on the following references (Table 10):

Table 10. References for the emission factors.

Reference	Description	Link
IPCC 2006	IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). *Published: IGES, Japan.*	http://www.ipcc-nggip.iges.or.jp/public/2006gl/
PBGHGP2020	Brazilian GHG Protocol Program, Calculation Tool, version 2020.1.	http://www.ghgprotocolbrasil.com.br/ferramenta-de- cálculo
BEN 2019	2019 Brazilian National Energy Balance: 2018 base year / Empresa de Pesquisa Energética. – Rio de Janeiro: EPE, 2019.	http://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/balanco - energetico-nacional-2019
MCTIC 2020	MINISTRY OF SCIENCES, TECHNOLOGY, INNOVATION AND COMMUNICATIONS ("MCTIC").	https://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_corporativos.html

Source: Own elaboration WayCarbon.

The calculation methods and specific equations for each type of emission source present in the 2019 Banco Bradesco S/A emissions inventory are presented in detail in Annex B - Calculation of Emissions and Removals.

The emission factors used in the inventory and the calculation memorandum[8] are available on the CLIMAS system in Excel® spreadsheets in ANNEX D - Emission Factors.

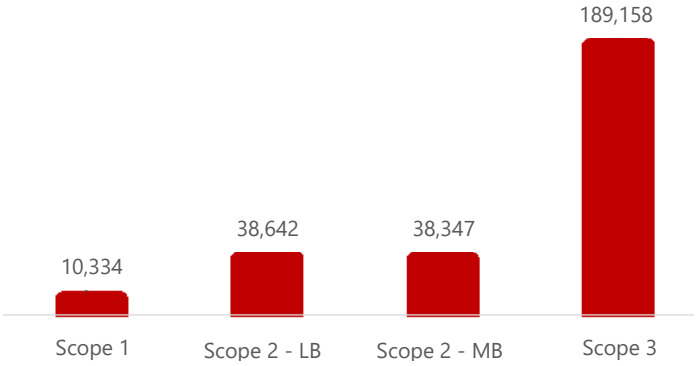
[8] The Inventory calculation memory and emission factors can be accessed via CLIMAS, according to the following steps: a) access Climas; b) click on *Emissões de GEE* (*GHG Emissions)* in the left corner of the screen; c) click on *Auditoria - Extrato de Fatores de Emissão* (Audit - Statement of Emission Factors); d) choose the inventory for the year 2018 and click on *Obter Extrato* (Get Statement); e) in the last table Fatores de emissão (Emission factors), look for the emission source you want to consult in the search field and click on the buttons on the right side with the symbol of an eye; f) Click the button for the field *Memorial de cálculo* (calculation memorandum)

3. RESULTS

The Scope[9] 1, 2 and 3 emissions of Banco Bradesco S/A in 2019 for the year were 10,333.76 tCO_2e and 189,157.96 tCO_2e, respectively. On the other hand, Scope 2 was calculated using two different approaches: Location Based - LB, with emission of 38,641.73 tCO_2e and Market Based - MB, with emission of 38,346.97 tCO_2e. Moreover, a total of 348.22 tons of tCO_2 of Scope 1 and of [10]33,677.77 tCO_2 Scope 3 renewable source energy were emitted. Considering the MB approach, 700.14 tCO_2 of Scope 2 renewable energy were emitted. 24,554.49 tCO_2 of non-Kyoto gases were also emitted.

The Scope[11] 1, 2 and 3 emissions of Banco Bradesco S/A for the year 2019 are presented in Figure 3:

Figure 3. GHG emissions of Banco Bradesco S/A in 2019 by scope (Kyoto-tCO2e)



Source: Own elaboration based on data from the Climas software

Table 11 presents the results of GHG emissions per scope and category. In Scope 1, the category that contributes most to the total is Fugitive (Escape) gases, with 83.17% (8,594.39 tCO_2e). Scope 2 emissions totaled 38,641.73 38.641,73 tCO_2e under the LB approach and 38,346.97 tCO_2e in the MB approach, in both cases only by the Acquisition of electricity category.

[9] GHG emissions regulated by the Kyoto Protocol (carbon dioxide - CO_2, methane - CH_4, nitrous oxide - N_2O and regulated by Montreal Protocol (chlorofluorocarbons – CFCs and hydrochlorofluorocarbons - HCFCs).

[10] Emissions of CO_2 arising from the use of biomass energy from a renewable source. This study has adopted the definition of renewable biomass formulated by the Executive Board for the Clean Development Mechanism of the United Nations Climate Change Framework Convention (EB 23, Annex 18). Emissions of this type do not contribute to increasing the concentration of CO2 in the atmosphere on a long-term basis.

[11] The GHG considered here are those regulated by the Kyoto Protocol (carbon dioxide - CO2, methane - CH4, nitrous oxide - N2O and hydrochlorofluorocarbons – HCFCs).

In Scope 3, the categories Employee transportation (accounting for 52.60%) and Upstream transportation and distribution (33.35%) being the main categories that emit GHG.

Table 11. GHG emissions broken down by scope and category (tCO2e - Kyoto).

Scope	Category	Issue	Significance
Scope 1	Stationary combustion	765.97	7.41%
	Mobile combustion	973.40	9.42%
	Fugitive gases	8,594.39	83.17%
	Total Scope 1	**10,333.76**	
Scope 2	Acquisition of electricity - LB	38,641.73	100%
	Total Scope 2 - LB	**38,641.73**	
	Acquisition of electricity - MB	38,346.97	100%
	Total Scope 2 - MB	**38,346.97**	
Scope 3	Employee transportation (from house to work)	99,504.60	52.60%
	Waste generated in operations	5,234.02	2.77%
	Transportation and distribution (upstream)	63,088.79	33.35%
	Business trips	21,330.55	11.28%
	Total Scope 3	**189,157.96**	

Source: Own elaboration based on data from the Climas software

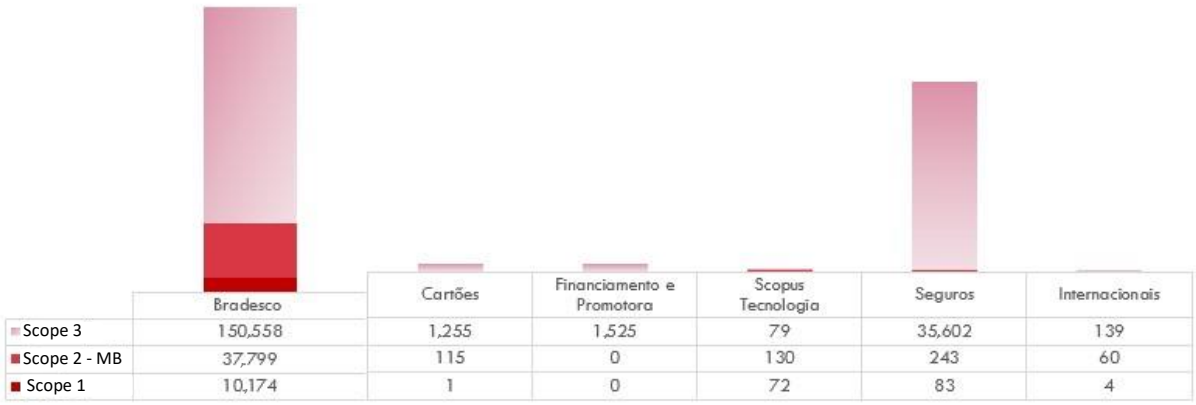
Figure 4 shows the GHG emissions segmented by Company and scope in the LB approach, while Figure 5 presents the MB approach. Compared with the Organization's other companies, Banco Bradesco has higher emissions in all the scopes, accounting for approximately 98%, 99% and 80% of Scopes 1, 2 and 3 emissions, respectively.

Figure 4. GHG emissions per Company[12] - LB approach (Kyoto – tCO2e)

Source: Own elaboration based on data from the Climas software

[12] *The emissions of the **Bradesco**unit are much higher than that of the other companies. Thus, it was separated and a different scale was adopted to facilitate the reader's understanding*

Figure 5. GHG emissions per Company[13] - MB approach (Kyoto - tCO2e)



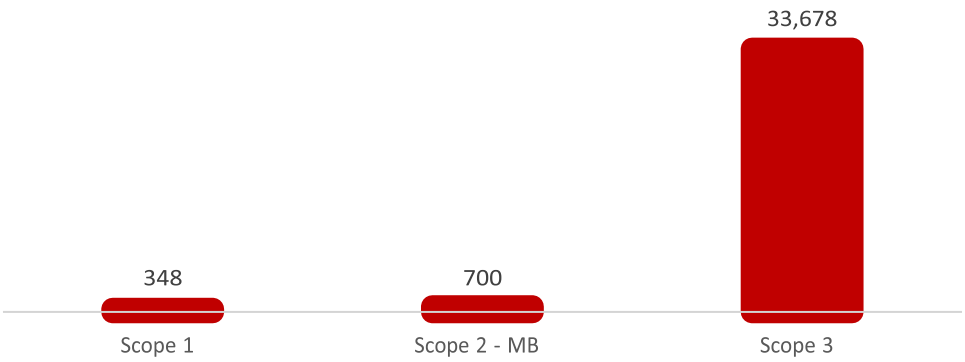
	Bradesco	Cartões	Financiamento e Promotora	Scopus Tecnologia	Seguros	Internacionais
Scope 3	150,558	1,255	1,525	79	35,602	139
Scope 2 - MB	37,799	115	0	130	243	60
Scope 1	10,174	1	0	72	83	4

Source: Own elaboration based on data from the Climas software

3.1. GENERAL RENEWABLE CO2 EMISSIONS

In the burning of renewable fuels, such as ethanol or biodiesel, the CO_2 emitted has a renewable source (i.e., at some time in its life cycle, the CO_2 was captured by a biomass). In 2019, the Organization's emissions reached 348.22 tCO_2 of Scope 1 renewable energy, while for Scope 2 (Market Based), emissions reached 700.14 tCO_2 of renewable energy, due to the portion of energy purchased from renewable sources in the incentivized Free Contracting Environment (ACL) and finally, for Scope 3, 33,677.77tCO_2 of renewable energy were emitted. Such emissions are shown in Figure 6.

Figure 6. Emissions of renewable CO2 per scope (renewable tCO2)



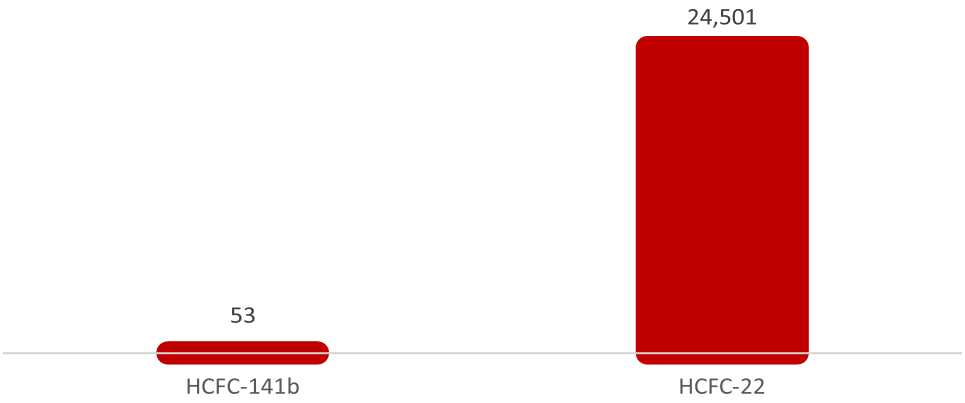
Source: Own elaboration based on data from the Climas software

[13] *The emissions of the **Bradesco**unit are much higher than that of the other companies. Thus, it was separated and a different scale was adopted to facilitate the reader's understanding*

3.2. GENERAL EMISSIONS OF NON-KYOTO GASES

Banco Bradesco S/A's emissions of GHG gases not included in the Kyoto Protocol are shown in Figure 7. Banco Bradesco S/A issued a total of 24,554.49 tCO_2e (53.14 tCO_2e of HCFC-141b and 24,501.35 tCO_2e of HCFC-22) referring to the consumption and replacement of refrigerant gases due to leaks in the refrigeration systems of buildings and branches within the organization.

Figure 7. Gas emissions not considered by the Kyoto Protocol (tCO2e – Non-Kyoto)



Source: Own elaboration based on data from the Climas software

3.3. SCOPE 1 EMISSIONS

The Scope 1 emissions of Banco Bradesco S/A in the year 2019 totaled 10,333.76 tCO_2e, representing an increase of 23.97% in relation to the base year (2018 = 13,591.84 tCO_2e).

considering national and international operating units.

Table 12. Scope 1 emissions broken down by category and source of emission (tCO2e - Kyoto)

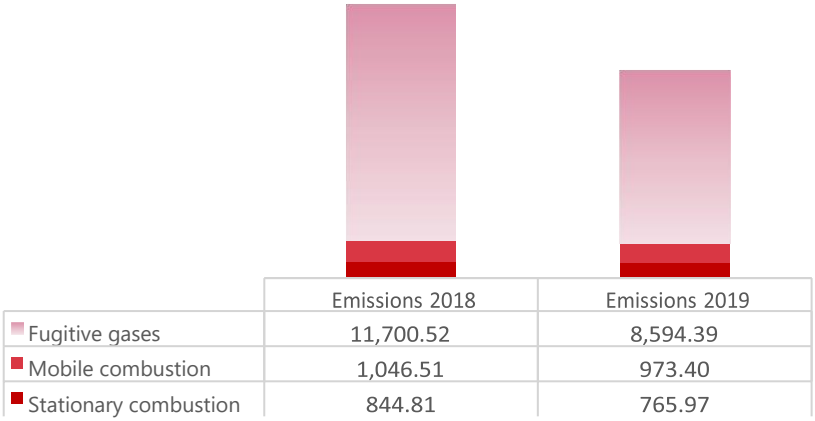
Category	Source	Issue (tCO2e)	Interest (%)
Stationary combustion	Electricity (generators)	765.97	7.41%
Mobile combustion	Air	511.41	4.95%
	Land	461.99	4.47%
Fugitive gases	Cooling System	8,594.39	83.17%
Total Scope 1		**10,333.76**	

Source: Own elaboration based on data from the Climas software

In 2019, the fugitive emissions characteristic of exchanges of refrigeration gases in air-conditioning devices were the most representative, accounting for approximately 83.17% of the Scope 1 emissions as presented in Table 12. In second place come the emissions resulting from consumption of fuels by the Organization's mobile (land and air) fleet, which represented 9.42% of the direct emissions. The consumption of diesel oil in electricity generators represented 7.41% of the total.

A comparison between the scope 1 emissions per category for 2018 and 2019 is shown in the following graph (Figure 8):

Figure 8. Comparison of 2018 x 2019 Scope 1 emission (tCO2e - Kyoto)



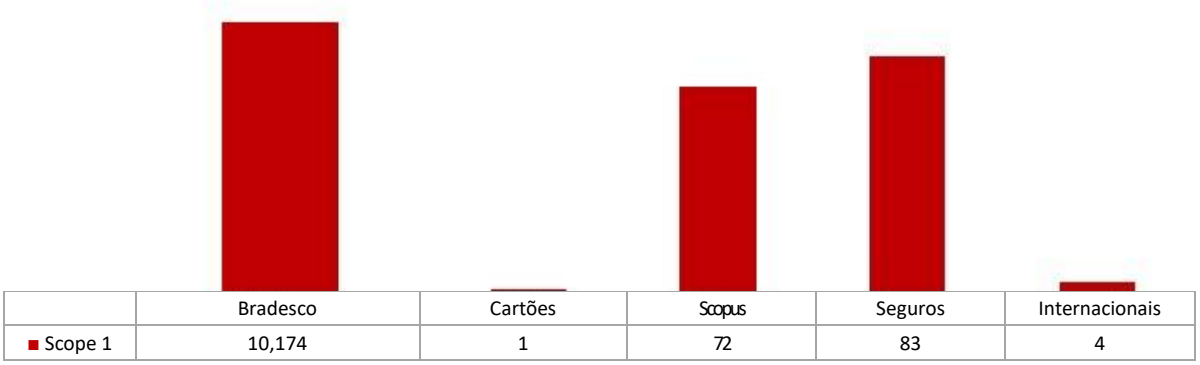
	Emissions 2018	Emissions 2019
Fugitive gases	11,700.52	8,594.39
Mobile combustion	1,046.51	973.40
Stationary combustion	844.81	765.97

Source: Own elaboration based on data from the Climas software

Fugitive category emissions dropped 26.55% in comparison to the prior year. This decrease is associated with a lower replacement of refrigerant gases. Mobile Combustion emissions in 2019 were down 6.99% in 2017 in relation to the previous year. 2019 Stationary Fuel emissions decreased by 9.33% in relation to the previous year, justified by a decrease in the diesel oil consumption in the Organization's generators.

The figure below shows the 2019 GHG emissions of Banco Bradesco S/A broken down by company (Figure 9). Scope 1 emissions in 2019 for Bradesco Argentina, Bradesco Cayman Islands, Bradesco New York and Bradesco Europa operating units are presented together as "International", given their low individual representation. Moreover, there were no Scope 1 emissions for Financiamento e Promotora in 2019.

Figure 9. Scope 1 emissions broken down by Company[14] (tCO^2e - Kyoto)



	Bradesco	Cartões	Scopus	Seguros	Internacionais
Scope 1	10,174	1	72	83	4

Source: Own elaboration based on data from the Climas software

As can be seen in the above graph, Banco Bradesco accounted for approximately 98.45% of the Scope 1 emissions of the Organization in 2019. This representativeness is expected owing to the size of Banco Bradesco's operations compared with the other companies.

Table 13 below shows the emissions per precursor, and it is possible to ascertain that the R-410A is the main precursor emitted. To account for fugitive emissions in international units (represented by the precursor CO_2) an estimate was made based on the number of employees and the use of refrigerant gases at the units in Brazil, making a proportion with the number of employees at the international units.

Table 13. Scope 1 emissions broken down by precursor (tCC_2e - Kyoto)

Precursor	Emission (tCO_2e)	Interest (%)
CO2	3.78	0.04%
Diesel oil / Brazil	770.71	7.46%
Hydrous ethanol	1.47	0.01%
Gasoline / Brazil	455.78	4.41%
HFC-134a	661.58	6.40%
Aviation Kerosene	511.41	4.95%
R-407C	28.67	0.28%
R-410A	7,900.37	76.45%
Total	**10,333.76**	

Source: Own elaboration based on data from the Climas software

[14] *The emissions of the **Bradesco**unit are much higher than that of the other companies. Thus, it was separated and a different scale was adopted to facilitate the reader's understanding*

3.4. SCOPE 2 EMISSIONS - LOCATION BASED APPROACH

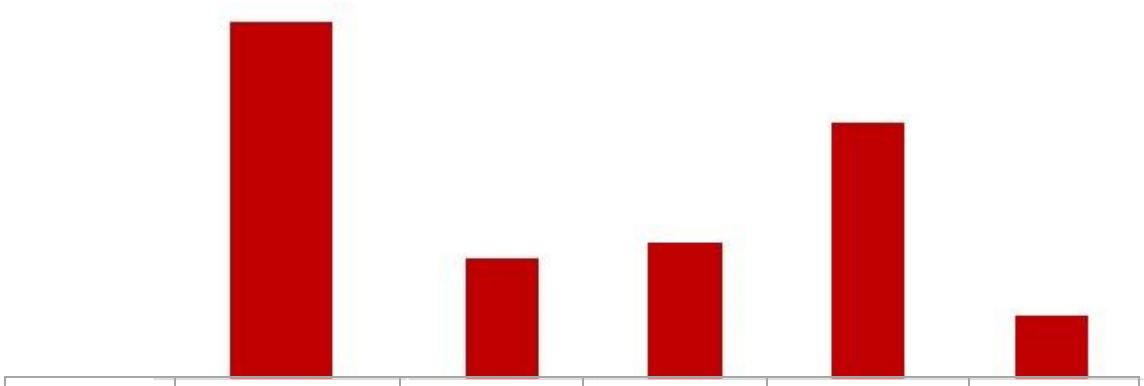
The Location Based approach, a model traditionally adopted by the PBGHGP, quantifies scope 2 GHG emissions using the average emissions for the generation of electricity from the National Interconnected System (SIN) as the emission factor.

The Scope 2 - LB emissions of Banco Bradesco S/A in the year 2019 totaled 38,641.73 tCO_2e, representing an increase of 2.83% in relation to the base year (2018 = 37,577.67 tCO_2e), considering national and international operating units.

The Organization's electricity consumption remained in line with the previous year, with a slight increase of 0.32%. Moreover, there was an increase of 1.35% in the average grid emission factor compared to the previous year (0.0740 tCO_2e/MWh in 2018 vs 0.0750 tCO_2e/MWh in 2019), justifying the increase in emissions.

The graph below shows the 2019 GHG emissions of Banco Bradesco S/A by company under the Location Based approach (Figure 10). As could be expected, Banco Bradesco accounted for roughly 98.58% of the Organization's total Scope 2 emissions in 2019.

Figure 10. Scope 2 emissions broken down by Company [15] - LB (tCO^2e - Kyoto)



	Bradesco	Cartões	Scopus	Seguros	International
Scope 2 - LB	38,094	115	130	243	60

Source: Own elaboration based on data from the Climas software

[15] *The emissions of the **Bradesco**unit are much higher than that of the other companies. Thus, it was separated and a different scale was adopted to facilitate the reader's understanding*

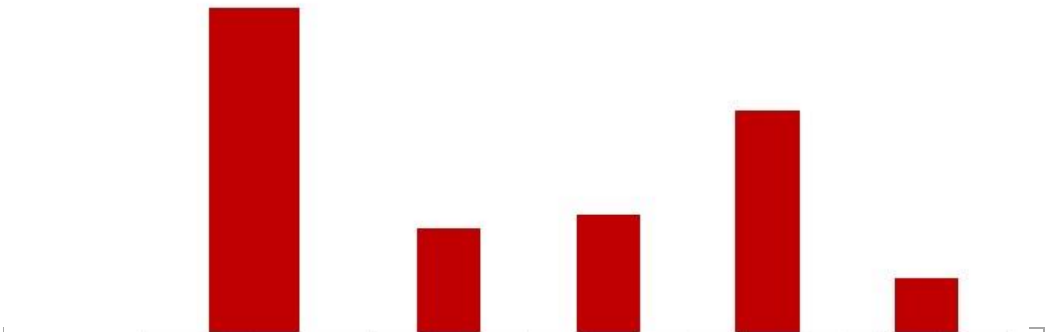
3.5. SCOPE 2 EMISSIONS - MARKET BASED APPROACH

The Market Based approach quantifies Scope 2 GHG emissions using the specific emission factor associated with each source of electricity generation that the inventory organization chose to purchase or consume. Thus, the emission factor is directly linked with the origin of electricity generation, requiring verification and tracking. According to the PBGHGP, the reporting of emissions due to the acquisition of electricity following the purchase-based approach is voluntary, additional and exclusive to organizations that are able to meet all the required quality criteria.

In the Market Based approach of this report, emissions exclusively from the BIPS are presented up to July. As of the month of August, there was electricity consumption from the grid and also from the incentivized Free Contracting Environment (ACL). Namely, 3,094.39 MWh of incentivized energy from ACL was consumed by Banco Bradeco S/A in 2019, with 2,467.68 MWh with an emission factor of 0 and 626.71MWh coming from biomass thermoelectric plants (sugarcane bagasse).

The Banco Bradesco S/A Scope 2 emissions for the year 2019 totaled 38,346.97 tCO2e. The graph below shows the 2019 GHG emissions of Banco Bradesco S/A by company under the Market Based approach (Figure 11):

Figure 11. Scope 2 emissions broken down by Company[16] - MB (tCO²e - Kyoto)



	Bradesco	Cartões	Scopus	Seguros	International
Scope **2** - MB	37,799	115	130	243	60

Source: Own elaboration based on data from the Climas software

[16] *The emissions of the **Bradesco**unit are much higher than that of the other companies. Thus, it was separated and a different scale was adopted to facilitate the reader's understanding*

3.6. SCOPE 3 EMISSIONS

The Scope 3 emissions of Banco Bradesco S/A in the year 2019 totaled 189,157.96 tCO_2e, representing an increase of 8.82% in relation to the base year (2018 = 173,818.74 tCO_2e), considering national and international operating units. Table 14 shows the GHG emissions for the year 2019 divided by category and source:

Table 14. Scope 3 emissions broken down by category and source of emission (tCO2e - Kyoto)

Category	Source	Issue	Interest
Employee transportation (from house to work)	Home-work displacement	97,624.58	51.61%
	Collective employee transportation – chartered vehicles	1,880.03	0.99%
Waste generated in operations	Landfill	5,234.02	2.77%
Transportation and distribution (upstream)	Cargo transportation	6,551.67	3.46%
	Pouch transportation	9,710.22	5.13%
	Emergency transportation	30,733.18	16.25%
	Transportation of money	16,093.72	8.51%
Business trips	KM reimbursement	4,167.59	2.20%
	Taxi	3,368.53	1.78%
	Air Travel	13,794.43	7.29%
Total Scope 3		**189,157.96**	

Source: Own elaboration based on data from the Climas software

Category 7 emissions - Employee transportation (home-work) correspond to a total of 52.60% of Scope 3 emissions, comprising two sources. The first and most representative emission – Employee transportation (home-work) represent the emissions brought on by the displacement of employees between their homes and their places of work, using the different means of transportation neither operated by nor belonging to the organization where the inventory was taken (corresponding to 98.11% of emissions in the category). In this source, there was an increase of 6.08% in 2019 compared to 2018 (97,624.58 tCO_2e in 2019 and 92,030.32 tCO2e in 2018) mainly due to the increase in the number of employees.

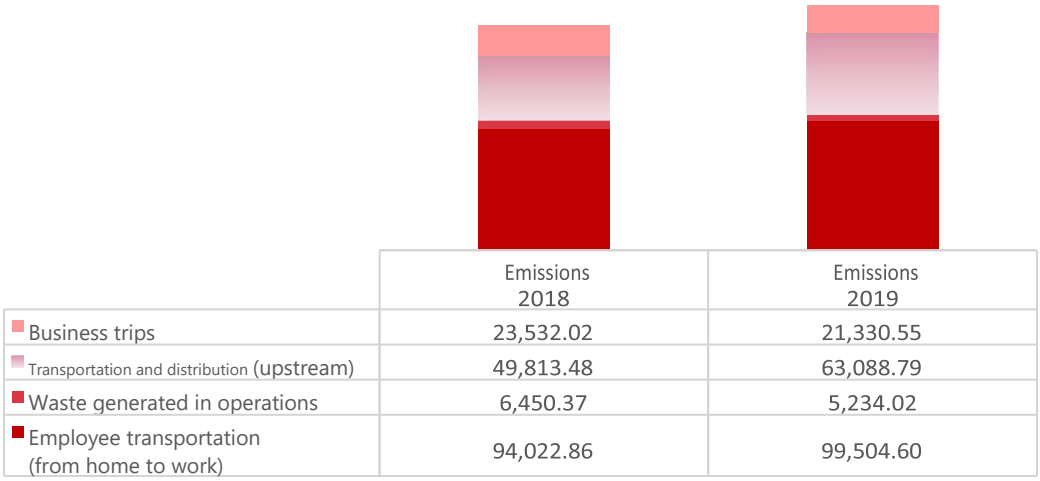
(total of 106,146 in 2019 and 105,368 in 2018).

Category 4 emissions - Transport and distribution (upstream) correspond to a total of 33.35% of Scope 3 emissions. In this category, the sources of Emergency Transportation and Transport of Values, as well as the emissions from Category 6 - Business Trips, correspond to a total of 11.28% of Scope 3 emissions and decreased 9.36% in 2019 compared to the previous year. On the other hand, Category 5 - Waste generated

in operations corresponds to 2.77% of Scope 3 emissions and decreased 18.86% in 2019 compared to the previous year.

The comparison between Scope 3 emissions per category in 2018 and 2019 is shown in the graph below (Figure 12):

Figure 12. Comparison of 2018 x 2019 Scope 3 emission (tCO2e - Kyoto)



	Emissions 2018	Emissions 2019
Business trips	23,532.02	21,330.55
Transportation and distribution (upstream)	49,813.48	63,088.79
Waste generated in operations	6,450.37	5,234.02
Employee transportation (from home to work)	94,022.86	99,504.60

Source: Own elaboration based on data from the Climas software

To calculate emissions from the source Home-work displacement, which has the largest representation in Scope 3, a list supplied by Banco Bradesco's HR department, containing both the quantity of collaborators and both the postal codes (CEPs) of their residences and their places of work throughout Brazil was used. Employees were divided into two groups: (I) those that use a Transportation Voucher (VT) to make their home-work-home; and (II) those who do not use the que a VT (Table 15).

were the main two accounted for 16.25% and 8.51% of emissions, respectively. When compared to 2018, there was an increase of 26.65%, mainly due to the 72.8% increase in Emergency transportation emissions (30,733.18 tCO_2e in 2019 and 17,782.60 tCO_2e in 2018).

Table 15. Groups of home-work-home displacement for Banco Bradesco collaborators in 2019.

Region	Number of Collaborators	
	Group I - with V T	Group II - without VT
State of SP[17]	21,758	26,830
Southeast Region of Brazil (not including SP)	9,749	8,525
South	2,770	12,162
Midwest	856	4,765
North	436	4,118
Northeast	2,338	11,839
Total	**37,907**	**68,239**

Source: Own preparation based on Bradesco's HR data

For the Group I's collaborators in Group I – with VT, the emissions were calculated considering that their home-work-home transportation is by means of bus or subway, based on the same public urban mobility survey used in 2016[18]. For Group II – w/o VT, the emissions were calculated considering that the home-work-home transportation is made exclusively every day using gasoline-powered vehicles.

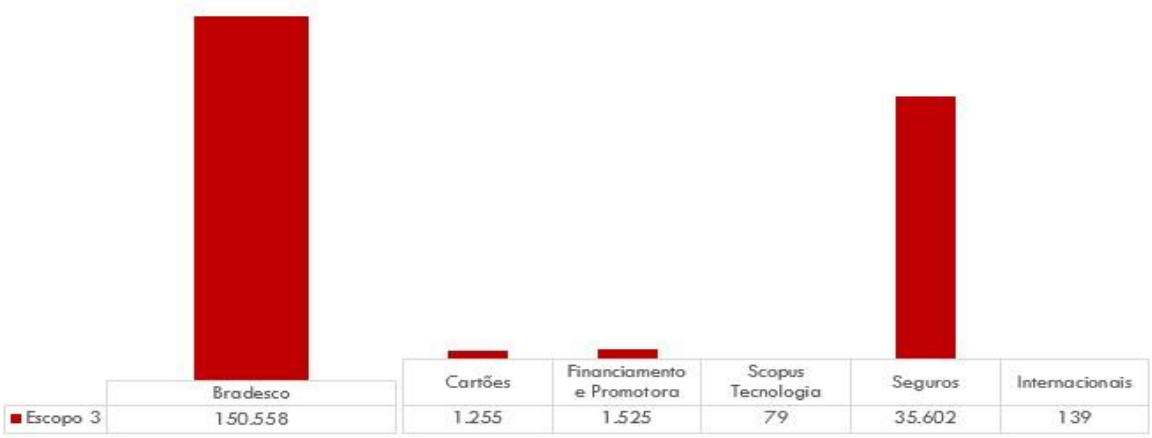
The average distances traveled used in the calculations were obtained based on random samples limited to 1,000 collaborators in the State of São Paulo, 500 collaborators in the Southeast region and 300 employees in each of the other regions. These numbers were used so that the sample was representative, considering a sampling error of 5% and a 95% confidence level.

The following graph shows Scope 3 GHG emissions in 2019 by Banco Bradesco S/A company (Figure 13):

[17] Banco Bradesco S/A reports its emissions to the São Paulo State (SP) Climate Protocol, therefore whenever possible the emissions in that state are presented separately.

[18] The fractions of the modes of public transportation were taken from the following sources:
- State of SP = http://nossasaopaulo.org.br/portal/arquivos/pesquisa-tabelas-2017.pdf
- Rest of Brazil =http://www.ntu.org.br/novo/upload/Publicacao/Pub636397002002520031.pdf

Figure 13. Scope 3 emissions broken down by Company[19] (tCO_2e - Kyoto)



Source: Own elaboration based on data from the Climas software

As expected, Banco Bradesco accounted for most of the Organization's Scope 3 emissions, around 79.59% of them in 2019.

[19] *The emissions of the **Bradesco**unit are much higher than that of the other companies. Thus, it was separated and a different scale was adopted to facilitate the reader's understanding*

4. ANALYSIS OF UNCERTAINTIES

Drawing up an inventory of emissions involves the use of several calculation tools that employ forecasts, parameters and standard emission factors. Use of such tools entails certain levels of uncertainties in the inventory calculations.

To minimize such uncertainties, whenever possible use was made of values based on official sources, such as the appropriate methodologies consulted or market standards, always taking into consideration the principles of conservatism, accuracy and transparency.

Furthermore, all the sources of the parameters used have been filed for subsequent analysis and verification by an External Entity. This section contains a qualitative appraisal of the main uncertainties identified, as well as a quantitative measurement of the uncertainty present in calculating the emissions of each installation of the Bradesco Organization.

The uncertainties associated with emission inventories can be classified according to two (2) criteria:

- **scientific uncertainty:** scientific knowledge of the actual emission and/or process of removal has not been perfectly comprehended. An example is the significant involvement of the scientific uncertainty in the use of direct and indirect factors associated with global warming to estimate emissions of various GHG. Most of the factors dealt with in this work are provided by the IPCC.
- **estimate uncertainty:** uncertainty that always arises whenever GHG are quantified. These uncertainties are further classified into model uncertainties, when they are associated with the mathematical equations used to characterize the relations between various parameters and emission processes; and uncertainties of the parameters introduced into the estimative models used as input data in the estimated models.

According to the IPCC Good Practice Guidance recommendations, the inventories should not reveal emissions with skews that can be identified and eliminated, and the uncertainties should be minimized considering all the existing scientific knowledge and resources available.

Such recommendations were followed in all the inventory construction steps, as there was tremendous concern about using the most recent calculation methodologies and emission factors suggested by organizations with a great deal of credibility in calculating emissions. As regards the data used, special attention was paid to the conformity thereof in relation to reality (checking the Company's records and analyzing the data received), and the search for data in units of measurement that could reduce uncertainties associated with emissions.

The procedures used to calculate the uncertainties are presented in ANNEX C - Calculation of Uncertainties. For the Banco Bradesco S/A GHG inventory in 2019, the uncertainties were also calculated using CLIMAS. The results are shown below (Table 16), where:

Table 16. Results of the uncertainties of the 2019 Banco Bradesco S/A Inventory.

Scope	Category	Lower uncertainty	Higher uncertainty
Scope 1	Stationary combustion	1.84%	0.49%
	Mobile combustion	2.29%	2.67%
	Fugitive gases	0.90%	0.18%
	Total - Scope 1	**0.85%**	**0.19%**
Scope 2 - LB	Acquisition of electricity	**1.06%**	**0.21%**
Scope 2 - MB	Acquisition of electricity	**1.39%**	**1.80%**
Scope 3	Transportation and distribution (upstream)	5.29%	4.00%
	Waste generated in operations	10.44%	10.72%
	Business trips	2.85%	1.76%
	Employee transportation (from house to work)	8.05%	5.00%
	Total - Scope 3	**4.74°%**	**3.04%**
TOTAL		**3.56°%**	**2.29%**

Source: Own elaboration based on data from the Climas software

The amount of the lower uncertainty was 3.56%, while the amount of the upper uncertainty was 2.29%, within the 5% limit recommended by the GHG Protocol.

5. RECOMMENDATIONS

In order for companies to adapt themselves to the low carbon economy, a virtuous cycle of analyzing and improving processes should be developed. This set of activities, when detailed and organized, comprises the corporate plan for management of Greenhouse Gas (GHG) emissions.

The road to progress begins with diagnosis of the current situation, by bringing together technical knowledge about the GHG emission issue and applying it to the organization. Once the impact of Climate Change and its risks for the business is mapped, it is possible to appraise process alternatives and select projects to reduce the carbon intensity (GHG emissions per production). Thereupon, a process should be structured for ongoing monitoring of the organization's climate performance, in order to verify the impact of the projects implemented and provide information for updating the diagnosis.

The GHG inventory is the first step in the diagnosis and should be continually enhanced. Improvement recommendations are:

- Expand the sources of emissions monitored; and
    - Calculating the emissions of the other Scope 3 categories as transmission and distribution of electric power, investments (financed emissions) and treatment of effluents sent to the municipal network.
- The company can structure a monthly flow of information and track the Climate Change impact month to month, as a means of environmental management.
- Invest and continually expand the consumption of electricity from renewable sources, with the Free Contracting Environment (ACL), Distributed Generation and or Self-production being encouraged.

Besides the inventory, there are other types of studies for diagnosis of Company's situation in light of the low-carbon economy:

- calculation of impact indicators per product or service provided, which makes it possible to compare companies of different sizes and appraise climactic efficiency.
- the identification of risks and opportunities in regulatory scenarios involving carbon pricing mechanisms, for instance.

The following step is planning and acting on the Climate Change issue. This includes definitions of the strategies for mitigation, neutralization and adaptation.

6. SALES AND PURCHASES OF OFFSETS

Under ISO 14.064 - Part 1, if an organization reports reduction of emissions or increase in removals acquired or developed based on GHG projects quantified using methodologies such as that of ISO 14.064 – Part 2, such organization should list such reductions in emissions or increase in removals separately, based on GHG projects.

Accordingly, mention whether or not there were sales and purchases of offsets. If there were, indicate the corresponding quantity of emissions/removals in tCO_2e.

☒ There were no purchases/sales of offsets.

☒ There were purchases of offsets. Quantity: $tC0_2e$.

☐ There were sales of offsets. Quantity: $tC0_2e$.

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GLOSSARY

Base year: historical period specified for the purpose of comparison of GHG removals and emissions, as well as other related information.

Carbon Dioxide Equivalent (CO2e): unit for comparison of the radiative forcing (global warming potential) of a given GHG to that of CO2.

GHG Emissions: total mass of a GHG released into the atmosphere in a specified time period.

Direct GHG Emissions: GHG emissions from sources belonging too r controlled by the organization. The concepts of financial control and operational control are employed to establish the operational boundaries of the organization.

Indirect GHG emissions related to energy consumption: GHG emissions based on the generation of electric power, heat or steam that is imported/consumed by the organization.

Scope: the concept of 'scope' was introduced by the GHG Protocol for the purpose of aiding companies in defining their operational limits. The scopes are differentiated into 3 categories, separated into direct emissions and indirect emissions.

Scope 1: An organization's direct GHG emissions category involves those that originate at sources which belong to or are controlled by the company within the defined limits. By way of example, we can cite the emissions resulting from the burning of fossil fuels and manufacturing processes.

Scope 2: The indirect GHT category emissions are those related to the external acquisition of energy. An example of this category is the energy consumption generated by the concession-holders that supply the Brazilian National Grid (SIN) and thermo-electric power acquired.

Scope 3: The category of indirect GHG emissions from other sources involves emissions that occur based on the organization's activities, but which originate at sources that neither belong to or are controlled by such organization. Some examples of Scope 3 sources are as follows: transportation of products in vehicles that do not belong to the company, use of third-party vehicles, transportation of employees and business trips.

Emission factor or **GHG removal factor:** factor that relates activity data to GHG emissions and removals.

GHG emission sources: physical unit or process that releases GHG into the atmosphere.

Greenhouse Gas (GHG): atmospheric constituent of natural or anthropogenic origin that absorbs and emits radiation in specific wavelengths within the infrared radiation spectrum emitted by the surface of the Earth, by the atmosphere and by clouds. Among the GHGs, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) and sulfur hexafluoride (SF6).

GHG emission inventory: document that details GHG sources and sinks and quantifies GHG emissions and removals during a given period.

Offset: credits for offset of GHG emissions.

Organization: company, corporation, undertaking, authority, institution – or part or combination thereof, whether or not it is incorporated, state-owned or private, and which has its own functions and administration.

Other indirect GHG emissions: GHG emissions that are different from those indirect emissions related to the energy consumption. They are the consequence of the activities of the organization, but they originate from sources where ownership or control are exercised by other organization.

Global warming potential: factor that describes the radiative forcing of a unit of mass of a given GHG in relation to a unit of carbon dioxide (CO2) mass in a given time period.

GHG removals: total mass of a GHG removed from the atmosphere in a given time period.

GHG Reservoir: physical unit or component of the biosphere, geosphere or hydrosphere with capacity for storing or accumulating GHG removed from the atmosphere by a sink or GHG captured from a source. The total mass of carbon contained in a GHG reservoir in a specific time period can be referred to as the reservoir's carbon stock. A GHG reservoir can transfer its gases to another GHG reservoir. The collection of a GHG from a source before such GHG enters the atmosphere and its storage in a reservoir can be referred to as GHG capture and storage.

GHG sink: physical unit or process that removes GHG from the atmosphere.

ANNEX A - GHG PROTOCOL TABLES

It is important to note that, since reporting international units for GHG Protocol is optional, such emissions are separated from the emissions that occur in Brazil. With this, the results shown in this section are distinct from the others shown in the body of this Report. The aim of this section is to facilitate Banco Bradesco S/A's reporting its data in the public record of emissions.

A.1 Summary of total emissions in metric tons of gas - LB approach (tGHG)

Gas family \ Scope	Scope 1	Scope 2	Scope 3	Total
CH4	**0332763**		**253,017531**	**253,350344**
CO2	**1,709.01 6027**	**38,531.944321**	**178,146.531303**	**213,437.542651**
HFC	**4,263408**			**4,263408**
N2O	**0.073960**		**15,258864**	**15,332324**
Total	**218,710.489227**			

A.2 Summary of total emissions in metric tons of gas - MB approach (tGHG)

Gas family \ Scope	Scope 1	Scope 2	Scope 3	Total
CH4	**0332763**	**0.210043**	**253,017581**	**253,560387**
CO2	**1,709.016027**	**38,273.588635**	**178,146.531803**	**218,129.186465**
HFC	**4,263408**			**4,263408**
N2O	**0.073960**	**0.028006**	**15,258864**	**15,360830**
Total	**218,402.37109O**			

A.3 Summary of total emissions in metric tons of CO_2 equivalent - LB approach (tCO_2e)

Gas family \ Scope	Scope 1	Scope 2	Scope 3	Total
CH4	**8,319075**		**6,325.439525**	**6,333.758600**
CO2	**1,709.016027**	**38,581.944821**	**178,146.581803**	**218,437.542651**
HFC	**8,590.609665**			**8,590.609665**
N2O	**22,040080**		**4,547.141472**	**4,569.181552**
Total	**10,329.984847**	**38,581.944821**	**189,019.162800**	**237,931.092468**

A.4 Summary of total emissions in metric tons of CO_2 equivalent - MB approach (tCO_2e)

Gas family \ Scope	Scope 1	Scope 2	Scope 3	Total
CH4	8319075	5,251075	6325439525	6,339.009675
CO2	1,709.016027	38,273.588635	178,146.58103	218,129.186465
HFC	8.590.6096.65.			8,590.609665
N2O	22,040080	8,345735	4,547.141472	4,577,527340
Total	10,329.984847	38,287.185498	189,019.162800	237,636.333145

A.5 Support table – HFCs (tGHG)

Gas family / Scope		HFC Scope 1
Gas		
HFC-32		1,896021
HFC-125		1,896344
HFC-134a		0471043
HFC-Z27ea		0.000000

A.6 Scope 1 emissions in tons of CO_2 equivalent broken down by category (tCO_2e)

Scope	Category	Gas super family	Koto
Scope 1	Stationary combustion		765,973917
	Mobile combustion		973,401265
	Fugitive gases		8,590.609665
		Total	10,329.984847

A.7 Scope 1 emissions in tons of biogenic CO2 broken down by category (biogenic tCO2)

		Renewable C02	
		Emissions (tGHG)	Removals (t GEE)
Scope 1	Stationary Combustion	79,890285	0.000000
	Mobile combustion	268,324870	0.000000

A.8 Scope 2 emissions in tons of CO2 equivalent broken down by category - LB approach (tCO_2e)

		Gas super family	Kyoto
Scope	Category		
Scope 2	Acquisition of electricity		38,581.944821
		Total	38,581,944821

A.9 Scope 2 emissions in tons of CO2 equivalent broken down by category - MB approach (tCO2e)

		Gas super family	Kyoto
Scope	Category		
Scope 2	Acquisition of electricity		33,287.185498
		Total	38,287.185498

A.10 Scope 3 emissions in tons of CO2 equivalent broken down by category (tCO2e)

		Gas super family	Kyoto
Scope	Category		
	Employee transportation (from house to work)		99,504.604449
Scope 3	Wastes generated in the operations		5,234.018400
	Transportation and distribution (upstream)		63,088.789676
	Business trips		21,191.750275
		Total	189,019.162800

A.11 Scope 3 emissions in tons of biogenic CO_2 broken down by category (biogenic tCO_2)

		Renewable CO2	
		Emissions (tGHG)	Removals (t GEE)
Scope 3	Employee transportation (home-work)	22,623.144709	0.000000
	Transportation and distribution (upstream)	7,988.930076.	0.000000
	Business trips	3,065.694397	0.000000

A.12 Other greenhouse gases not included in Kyoto Protocol (tCO_2e)

	Gas super family	Non-Kyoto
Gas		
HCFC-22		24,501.345550
HCFC-1410		53,142500
Total		24,554.488050

A.13 Emissions outside Brazil (tCO_2e)[20]

	Scope	Scope 1	Scope 2	Scope 3	Total
Country					
Argentina		0.490000	4,113188	2,184404	6,787592
United States		0.890000	51416482	79,525S92	131,832374
Cayman Islands		0630000	0.903655	6,051562	7,585217
Luxembourg		1,770000	3,354850	51,039193	56,164043
Total		3,780000	59,786175	138,801051	202,369,226

[20] The Bradesco Organization's subsidiary companies known as Grand Cayman (Cidade Capital Markets Ltd.) and Hong Kong (Bradesco Trade Service Ltd.) are set up at the unit known as Banco Bradesco S. A. Grand Cayman Branch, and their emissions are computed jointly at the latter.

The subsidiary companies Bradesco Securities, Inc. and Bradesco North América LLC are set up at the unit known as Banco Bradesco New York Branch, and their emissions are computed jointly at the latter.

A.14 Emissions per group of operating units - LB approach (tCO_2e)

Operating Unit	Scope	Scope 1	Scope 2	Scope 3	Total
Bradesco		10,173.861618	38,093.767516	150,558-334236	198,825.963370
Cartões		1,155896	115,248315	1,255.317B11	1,371.722022
Financiamento e Promotora			0.000000	1,524.675224	1,524,675224
Scopus Tecnologia		72,291548	129,978366	79,142429	281,412343
Seguros		82,675785	242,950624	35,601.693100	35,927.319509
Total		10,329.984847	33,581.944821	189,019.162800	237,931.092468

A.15 Emissions per group of operating units - MB approach (tCO_2e)

Operating Unit	Scope	Scope 1	Scope 2	Scope 3	Total
Bradesco		10,173.861618	37,799.008193	150,558.334236	198,531.204047
Cartões		1,155896	115248315	1,255.317811	1,371.722022
Financiamento e Promotora			0.000000	1,524.675224	1,524,675224
Scopus Tecnologia		72,291548	129,978366	79,142429	281,412343
Seguros		82,675785	242,950624	35,601.633100	35,927.319509
Total		10,329.984847	38,287.185498	189,019,162.80»	237,636 333145

ANNEX B - CALCULATION OF EMISSIONS AND REMOVALS

B.1 FUEL CONSUMPTION IN MOBILE AND STATIONARY EQUIPMENT

The calculation of the GHG emissions caused by the burning of fossil fuels was prepared based on the consumption in volume of fuel or distance traveled, per type of fuel and type of vehicle, in the year 2018. The GHG emissions for this source, when the data are supplied in terms of consumption of fuel, are calculated according to the following formula:

$$Ei,g,y = C_{i,y} \cdot PCI_{i,y} \cdot FE_{i,g,y} \cdot PAG_g$$

Where:

- ***i*** Index that denotes the type of fuel;
- ***g*** Index that denotes a type of GHG;
- ***y*** Year of reference of the report;
- Ei,g,y *g* of GHG emissions or removals attributable to the individual *i* source during year y, in tCO_2e;
- C_{iy} Consumption of fuel *i* for year *y*, in unit of measurement *u,* with *u m3* or *kg*;
- PCI_{iy} Internal Heating Power of fuel *i* for year *y*, in unit of measurement *TJ/u*;
- $FE_{i,g,y}$ Factor for emission of GHG *g* applicable to fuel *i* in year *y*, in tGEE g/*TJ*;
- PAG_g Global warming potential of the GHG g, in tCO_2e/tGEEg.

In cases in which the piece of input data refers to the distance traveled, the calculation of emissions is carried out according to the following formula:

$$Ei,g,y = \frac{Di,j,y}{FC_{i,j,y,}} \cdot PCI_{iy} \cdot FE_{i,g,y} \cdot PAG_g$$

Where:

- ***i*** Index that denotes the type of fuel;
- ***j*** Index that denotes the type of vehicle;
- ***g*** Index that denotes a type of GHG;
- ***y*** Year of reference of the report;

- $E_{i,g,y}$ *g* of GHG emissions or removals attributable to the individual *i* source during year y, in tCO2e;
- $D_{i,j,y}$ Distance traveled by vehicle j which uses fuel *i* during year *y*, in km;
- $FC_{i,j,y,}$ Autonomy of vehicle j, in unit of measurement *u/km,* with *u* m^3 or *kg*;
- $PCI_{i,y}$ Internal Heating Power of fuel *i* for year *y*, in unit of measurement *TJ/u*;
- $FE_{I,G,Y}$ Factor for emission of GHG *g* applicable to fuel i in year *y*, in tGEE g/*TJ*;
- PAG_g Global warming potential of the GHG g, in tCO_2e/tGEEg.

The types of GHG issued in the burning of fuels are CO_2, CH_4 and N_2O.

The consumption levels of gasoline and diesel oil require an additional calculation step, given that in 2019 Brazilian legislation required that such fuels contained biofuels in specific proportions in their respective makeups. For gasoline, the requirement was 27% anhydrous alcohol, and for diesel oil it was 10% through February 2018 and 11% from March onwards. For calculation of the emissions resulting from the consumption of such types of fuel, the biofuel percentages were multiplied by the consumption of fuel prior to the use of the equation described above.

The categories in this report that have been calculated using the formulas above are: consumption of fuels in stationary equipment, consumption of fuels in mobile equipment, outsourced transportation, transportation to and from home and work and business trips (just taxicabs).

B.2 ENERGY CONSUMPTION

The calculation of GHG emissions brought on by the consumption of electricity was carried out based on the data of electricity consumed per operating unit, measured in MWh, in the year 2019. For calculation of such emissions, it is necessary to have the amount of monthly consumption, owing to the variation of the Brazilian national grid's emission factors. For calculation of emissions related to consumption of electric power that occurs in units outside Brazil, annual emission factors supplied by the DEFRA (2015) and by EPA (2016) were used.

The type of GHG considered in the generation of power on the Brazilian national grid is CO_2 and the emissions are calculated according to the following formula:

$$E_{CO2,m,y} = C_{m,y}. FE_{C02,m,y}$$

Where:

- ***m*** Month of consumption relating to the consumption of electricity;
- ***y*** Year of reference of the report;
- $E_{co2,m,y}$ Emissions of CO_2 attributable to the consumption of electricity from the Brazilian national grid in month *m* of year *y,* in tCO_2e;
- $C_{M,Y}$ Consumption of electricity from the Brazilian national grid in month *m* of year *y*, in *MWh*;
- $FE_{i,g,y}$ Emission factor for CO_2 applicable to the electricity from the Brazilian national grid in month *m* of year *y*, in t CO_2/MWh.

The category of electricity consumption for this report was calculated according to the above formula.

B.3 CONSUMPTION OF REFRIGERATOR GAS

The calculation of GHG emissions caused by the consumption of cooling gases was carried out based on the data of gases consumed by operating units, in kg, in the year 2019. The mass of gases consumed is multiplied by their respective global warming potential (GWP) to obtain the quantity of CO_2e, as per the following equation.

$$E_{CO2e,g,y} = C_{g,y} - PAG_G - 1000$$

Where:

- ***y*** Year of reference of the report;
- ***g*** Index that denotes a type of GHG;
- $E_{CO2e,g,y}$ Emissions of CO_2e attributable to the consumption of cooling gas g in year y, in tCO_2e;
- C_Y Consumption of cooling gases in year *y*, in *kg*;
- PAG_g Global warming potential of the GHG g, in tCO_2e/t GEEg.

In the case of blends of cooling gases, the calculation is carried out by multiplying the percentages of each type of cooling gas in the blend according to the above formula.

The category of escaping (fugitive) emissions of this report was calculated according to the following formula.

B.4 SOLID WASTE INTENDED FOR DISPOSAL IN LANDFILLS

To calculate the emissions resulting from sending solid waste and sewage treatment plant (ETE) sludge to landfills, the quantities of waste intended for disposal in landfills per operating unit of Banco Bradesco S/A were gathered.

The CH_4 is generated in the landfills according to the following equations:

$$E_{CH4,y} = QR_y \cdot L_{0,y} \cdot (1 - OX_0)$$

$$L_{0,y} = MCF_0 \cdot DOC_{medium} DOC_f \cdot F_{CH4} \cdot \frac{16}{12}$$

$$DOC_{medium} = \sum (\%_{i,y} \cdot DOC_i)$$

Where:

- ***y*** Year of reference of the report;
- ***i*** Type of waste;
- $E_{cH4,y}$ Emissions of CH_4 attributable to the decomposition of waste disposed of in landfills in year *y,* in tCH_4;
- QR_Y Quantity of waste intended for disposal at landfills in year *y* in *t*;
- $L0_Y$ Methane generation potential in year *y* in *t CH4/ t waste*;
- OX_Q Oxidation factor, non-dimensional;
- MCF_o Methane correction factor based on the quality in the landfill, non-dimensional;
- $DOC_{average}$ Average amount of degradable organic carbon (amount calculated according to the average composition of urban solid waste in Latin America);
- $DOCi$ Degradable organic carbon of waste i;
- $\%i,y$ Fraction of quantity of waste *i* in year *y*;
- $DOC_{f,y}$ Fraction of waste that decomposes, non-dimensional (default amount of 50%, as per the IPCC 2006);
- F_{CH4} Fraction of methane in the biogas, non-dimensional (default amount of 50%, as per the IPCC 2006);
- **12/16** Conversion of mass of C in CH_4, 1.33;

The breakdown of Latin American urban solid waste was considered for calculation of the emissions, according to data taken from the IPCC 2006. Table B.1 shows the amounts of the composition and their respective DOC.

Table B.1 Average composition of urban solid waste in Latin America.

Type of waste i	Percentage (%)	DOC_i
Food waste	44.9%	0.15
Wood	4.7%	0.43
Paper	17.1°%	0.40
Metal	2.9°%	0
Plastic	10.8%	0
Textiles	2.6°%	0.24
Rubber/leather	0.7%	0
Glass	3.3%	0
Other inert	13.0%	0

The average DOC of 0.1622 was calculated based on the data of Table B.1.

The amounts of OX_0 and MFC_0 were obtained from the IPCC 2006, according to the quality of the landfills. Amounts of OX_0 and MFC_0 defined for managed and anaerobic sanitary landfills were considered.

By and large, there is no recovery of methane in the sanitary landfills and anaerobic reactors in Brazil and, therefore, such recovery was not considered in the Banco Bradesco S/A inventory.

The emissions of the waste management category (only sanitary landfill) of this report were calculated according to the above formula.

B.5 AIR TRAVEL

For computation of the GHG emissions associated with air travel, it is first necessary to compute the distances flown in flights. The CLIMAS system features a functionality where the distances in straight lines of the air stretches flown are calculated based on their IATA codes (such as, for example, GRU/FOR for a trip from Guarulhos in the state of São Paulo to Fortaleza, in the state of Ceará). In addition, an 8% correction factor is applied, as recommended by DEFRA, to estimate the actual distance flown in the air stretch, inasmuch as in practice the stretches are not flown in a straight line. After calculation of the distances, the multiple stretches flown are calculated as short-, medium- and long-distance flights.

The GHG emissions resulting from a short-, medium- or long-distance flight are calculated according to the following equations.

$$E_{CO2.e,tr,y} = Distance_{tr} \cdot pax \cdot FE_{CO2.e,tr,y}$$

$$E_{CH4.tr,y} = Distance_{tr} \cdot pax \cdot FE_{CH4.tr,y}$$

$$E_{N20.tr,y} = Distance_{tr} \cdot pax \cdot FE_{N20.tr,y}$$

Where:

- ***y*** year of reference of the report;
- ***tr*** Classification of stretch flown (short-, medium- or long-distance);
- $E_{CO2.e,tr,y}$ Emissions of CO_2 resulting from the burning of fuels by jet airplanes that flew a type *tr* stretch in year *y*, in tCO_2;
- $E_{CH4.tr,y}$ Emissions of CH_4 resulting from the burning of fuels by jet airplanes that flew a type *tr* stretch in year *y*, in tCH_4;
- $E_{N20.tr,y}$ Emissions of N_2O resulting from the burning of fuels by jet airplanes that flew a type *tr* stretch in year *y*, in tN_2O;
- $Distance_{tr}$ Distance in a straight line flown on a type *tr* stretch, corrected by the 8% factor, in *km*;
- pax number of passengers that flew a type *tr* stretch;
- $FE_{CO2.e,tr,y}$ CO_2 emission factor applicable to the burning of fuels by jet airplanes that flew a type *tr* stretch, in *tCO_2/pax.km.*
- $FE_{CH4.tr,y}$ CH_4 emission factor applicable to the burning of fuels by jet airplanes that flew a type *tr* stretch, in *tCH4/pax.km.*
- $FE_{N20.tr,y}$ N_2O emission factor applicable to the burning of fuels by jet airplanes that flew a type *tr* stretch, in *tN_2O/pax.km.*

The emission factors ***($FE_{CO2.e,tr,y}$, $FE_{CH4.tr,y}$ e $FE_{N20.tr,y}$)*** were removed from the tool for calculation of emissions of the 2020 Brazilian Program for the GHG Protocol.

ANNEX C - CALCULATION OF UNCERTAINTIES

The calculations used in the combination of uncertainties, as well as estimates in confidence intervals and their corrections when necessary are presented below, according to the IPCC Good Practice Guidance (2006).

-Combination of uncertainty of (uncorrelated) components of a multiplication or division:

$$I_{total} = \sqrt{I_1^2 + I_2^2 + \cdots I_n^2}$$

Where:

- I_{total}: Total percentage uncertainty of the product of quantities (half of the 95% confidence interval expressed as a percentage). For asymmetric confidence intervals, the greater percentage difference between the average and the limit of confidence was considered;
- I_i: percentage uncertainty associated with each one of the quantities of a multiplication.

-Combination of uncertainty of (uncorrelated) components of a sum or subtraction:

$$I_{total} = \frac{\sqrt{(I_1.x_1)^2 + (I_2.x_2)^2 + \ldots + (I_n.x_n)^2}}{|x_1 + x_2 + \ldots + x_n|}$$

Where:

- I_{total}: total percentage uncertainty of the sum or subtraction of quantities (half of the 95% confidence interval expressed as a percentage). For asymmetric confidence intervals, the greater percentage difference between the average and the limit of confidence was considered;
- x_i and I_i: Quantities and percentage uncertainty associated with each one of the quantities of a multiplication.

Through the model for propagation of uncertainties, as described above, an estimate of half the confidence interval of 95%, expressed as a percentage of the result of the inventory, is produced. As the inventory uncertainty increases, the propagation approach described above systematically underestimates the uncertainty, except in cases in which the quantification models are purely additive.

Therefore, in cases in which the uncertainty is greater than 100% and less than 230% it should be corrected through use of the procedures described below:

$$I_{restated} = I.F_c$$

$$F_c = \left[\frac{(-0{,}720 + 1{,}0921.U - 1{,}63.10^{-3}.U^2 + 1{,}11.10^{-5}.U^3}{I}\right]^2$$

Where:

- $I_{corrected}$: Corrected total uncertainty (half of the 95% confidence level expressed as a percentage);
- I: uncertainty uncorrected total (half of the 95% confidence level expressed as a percentage);
- F_c: Uncertainty correction factor.

For calculation of confidence intervals of the total result using the model based on the average and half of the confidence interval of 95% of the component quantities, a determined distribution should be assumed. If the model is purely additive and half of the confidence interval is less than 50%, normal distribution is an accurate estimate. In such case, symmetric probability distribution can be assumed. For multiplicative models or in cases in which the uncertainty is greater than 50% for variables that should be non-negative, lognormal distribution is an accurate supposition. In such cases the probability distribution is not symmetrical in relation to the average. For those situations the following formulas are to be applied for calculation of the upper and lower limits of the confidence interval of 95%:

$$I_{low} = \left\{\frac{\exp[\ln(\mu_g) - 1{,}96.\ln(\sigma_g)] - \mu}{\mu}\right\}.100$$

$$I_{high} = \left\{\frac{\exp[\ln(\mu_g) + 1{,}96.\ln(\sigma_g)] - \mu}{\mu}\right\}.100$$

$$\sigma_g = exp.\left\{\sqrt{\ln\left(1+\left[\frac{I}{100}\right]^2\right)}\right\}$$

$$\mu_g = exp.\left\{\ln(\mu) - \frac{1}{2}.\ln\left(1+\left[\frac{I}{100}\right]^{-2}\right)\right\}$$

Where:

- I_{low}: Lower limit of confidence interval of 95%, in % terms;
- L_{high}: Upper limit of confidence interval of 95%, in % terms;
- H_g: Geometric average;
- μ: Arithmetic average;
- σ_g: Geometric standard deviation;
- I: Symmetric total uncertainty of the confidence interval of 95%, in % terms;

The uncertainties associated with the calculation elements and emission factors were removed from the references from which the emission factors were obtained.

The uncertainties associated with the input data have been estimated as per the document entitled “GHG Protocol guidance on uncertainty assessment in GHG inventories and calculating statistical parameter uncertainty”. Given the limitations of establishing uncertainty amounts for input data of the Banco Bradesco Inventory, the method used quantifies the uncertainties based on a qualitative analysis of the data, as shown in Table C.1:

Table C.1 Qualitative analysis of uncertainties of the input data.

Data accuracy	Average uncertainty	Upper uncertainty adopted	Lower uncertainty adopted
High	+/- 5%	1%	5%
Good	+/- 15%	5%	15%
Reasonable	+/- 30%	15%	30°%
Poor	> 30°%	30°%	50°%

Banco Bradesco input data was qualified as per the characteristics of the data gathered (Table C.2):

Table C.2 Appraisal of the input data of the 2019 Bradesco Inventory.

Category	Parameter	Source of information	Data accuracy
Stationary combustion	Diesel consumption	Purchase invoice	High
Mobile combustion	Alcohol consumption in medium-sized vehicles	Purchase invoice	High
	Alcohol consumption in small-sized vehicles	Purchase invoice	High
	Diesel oil consumption in large-sized vehicles	Purchase invoice	High
	Gasoline consumption in large-sized vehicles	Purchase invoice	High
	Gasoline consumption in medium-sized vehicles	Purchase invoice	High
	Gasoline consumption in small-sized vehicles	Purchase invoice	High
	Aviation Kerosene consumption	Purchase invoice	High
	Aviation Kerosene consumption (helicopters)	Purchase invoice	High
	Aviation Kerosene consumption (jets)	Purchase invoice	High
Electric power	Energy consumption	Network measurement (bill)	High
Fugitive emissions	Consumption of 39TC gas (HFC-134a)	Purchase invoice	High
	Consumption of 39TC gas (HFC-227ea)	Purchase invoice	High
	Gas consumption - HCFC-22	Purchase invoice	High
	Consumption of HFC-134A gas	Purchase invoice	High
	Gas consumption R-407C	Purchase invoice	High
	Gas consumption R-410A	Purchase invoice	High
	Mass of R141B gas	Purchase invoice	High
	Use of cooling gases - CO2 (Argentina, Cayman, Europe and New York)	Estimated use	Poor
Business trips (air)	Short-distance air travel	Compilation of distances of stretches flown in air travel	Reasonable
	Long-distance air travel	Compilation of distances of stretches flown in air travel	Reasonable
	Medium-distance air travel	Compilation of distances of stretches flown in air travel	Reasonable
Business trips	Distance traveled with gasoline reimbursed	Distances measured	Reasonable
	Distance traveled with ethanol reimbursed	Distances measured	Reasonable
	Gasoline expenditures – taxicabs	Purchase notes Average cost per liter of fuel	Reasonable

Category	Parameter	Source of information	Data accuracy
Business trips	Gasoline expenditures (cooperative taxicabs)	Purchase notes Average cost per liter of fuel	Reasonable
Transportation and distribution (upstream)	Distance traveled by lightweight tow trucks (diesel oil)	Estimated distances	Poor
	Distance traveled by heavy-duty tow trucks (diesel oil)	Estimated distances	Poor
	Distance traveled by motorcycles (road service)	Estimated distances	Poor
	Expenditures on alcohol in small-sized vehicles	Purchase notes Average monthly cost per liter of fuel	Reasonable
	Diesel expenditures	Purchase notes Average monthly cost per liter of fuel	Reasonable
	Expenditures on diesel oil (armored car)	Purchase notes Average monthly cost per liter of fuel	Reasonable
	Expenditures on diesel oil (Federation of Brazilian Banks - FEBRABAN)	Purchase notes Average monthly cost per liter of fuel	Reasonable
	Expenditures on gasoline for light-weight cars (FEBRABAN)	Purchase notes Average monthly cost per liter of fuel	Reasonable
	Motorcycle gasoline expenditures	Purchase notes Average monthly cost per liter of fuel	Reasonable
	Expenditures on gasoline for small-sized vehicles	Purchase notes Average monthly cost per liter of fuel	Reasonable
	Aviation Kerosene expenditures (FEBRABAN)	Purchase notes Average monthly cost per liter of fuel	Reasonable
Employee transportation	Distance traveled by subway-trains	Estimated distances	Poor
	Distance traveled by chartered micro-buses	Estimated distances	Poor
	Distance traveled by chartered buses	Estimated distances	Poor
	Distance traveled by chartered vans	Estimated distances	Poor
	Distance traveled by employee-owned vehicles	Estimated distances	Poor
	Time of passenger transportation	Estimated distances	Poor
Solid waste	Mass of waste sent for composting	Heavy waste – Composition	Reasonable
	Solid waste mass generated	Heavy waste = Good	Reasonable
	Mass of solid waste generated (branches)	Heavy waste = Good	Reasonable
	Mass of solid waste generated (buildings)	Heavy waste = Good	Reasonable

ANNEX D - EMISSION FACTORS

All the calculation memoranda of the emission factors are present in the CLIMAS system. To access them, simply follow the steps below:

1. Access Climas;
2. In GHG emissions, select Auditoria (Audit) - Extrato de factors de emissão (Statement of emission factors);
3. Choose the Inventory and click on “Get statement” to generate the report;
4. In the last table for emission factors (Fatores de emissão), select the emission factor through columns Tecnhology/Precursor and click on the button View (“Factor measures”);
5. In the new window, click on “Memorial” (Memorandum) (last column) to check how the emission factor was built and where its data was taken from.

The memoranda present a detailed description as per the following example.

The following are the main emission and conversion factors used for calculation of Scope 1, 2 and 3 of GHG inventory of Banco Bradesco S/A in 2019.

D.1 Global Warming Potential (GWP)

Gas	PAG
CO2	1
Ch4	25
N2O	298
HFC-S2	675
hFC-125	B500
hFC-1S4a	14B0
hCFC-22	1801
hFC-227ea	B220

D.2 Refrigerator Gas Blends

Type of Gas	HFC-32	hhFC-125	hFC-134a	hFC-227ea
HFC-1S4A	-	-	100%	-
R-407C	23%	25%	52%	
R-410A	50%	50%	-	-

D.3 Emission Factors - Electric Power

Country	$FECO_2$ (t/MWh)	FECh (t/MWh)	FEN_2O (t/MWh)	Source
Brazil	0.0750	-	-	MCTIC, 2020
Electricity - Latin America	0.02881	-	-	DEFRA, 2015
Electricity - Luxembourg	0.06007	-	-	DEFRA, 2015
United States	0.288894	0.000009979	0.0000018608	eGRID, 2018

D.4 Conversion Factors - Mobile Combustion Fuel

Transportation data	Factor	Un.	Source
Diesel oil - Commercial Vehicle	10.5	km/L	PBGHGP2020
Diesel oil - Heavy truck	3.4	km/L	PBGHGP2020
Diesel oil - Light and medium trucks	5.6	km/L	PBGHGP2020
Diesel oil - Road bus	3.0	km/L	PBGHGP2020
Diesel oil - Urban Bus	2.1	km/L	PBGHGP2020
Gasoline - Motorcycles	37.2	km/L	PBGHGP2020
Gasoline - Passenger vehicles	9.9	km/L	PBGHGP2020
São Paulo subway (Metrô-SP) / Passenger kilometer;	0.000007	tCO2e/(pax*km)	METRÔ SP 2015
Urban Bus	47.99	pax	BHTRANS 2009
Taxi per km	2.33	R$/km	WayCarbon 2020

D.5 Emission Factors - Air Trips

AIR TRAVEL	EFCO2	EFCH4	Efn2o	Un.	Source
Air Travel - Long distance	94.851852	0.00037	0.003014	t/pax*Gm	PBGHGP 2020
Air Travel - Medium distance	76,768519	0.00037	0.002424	t/pax*Gm	PBGHGP 2020
Air Travel - Short distance	123,564815	0.004444	0.003915	t/pax*Gm	PBGHGP 2020
Air Travel Cargo - Short distance		0.000003	0.000034	kg/tkm	DEFRA 2016
Short haul flights - International freight transportation	1.21094			kgGHG/tkm	DEFRA 2016
Short haul flights – freight transportation	1.06176			kgCO2/tkm	DEFRA 2016

D.6 Emission Factors - Mobile and Stationary Sources

Precursor	EFCO2	EFCH4	Efn2o	Un.	Source
Natural gas	56,100			kg/TJ	IPCC, 2006
Natural Gas - Mobile combustion		92.0	3.0	kg/TJ	IPCC, 2006
Biodiesel	2.431			$tCO2/m^3$	IPCC, 2006
Biodiesel - Mobile combustion		0.000332	0.00002	$tGEE/m^3$	IPCC, 2006
Biodiesel - Stationary combustion - Commercial / Institutional		10.0	0.6	kg/TJ	IPCC, 2006
Diesel	74,100			kg/TJ	IPCC, 2006
Diesel Oil - Mobile combustion		3.9	3.9	kg/TJ	IPCC, 2006
Diesel Oil - Stationary combustion - Commercial / Institutional		10.0	0.6	kg/TJ	IPCC, 2006
Ethanol	1.457			t/m^3	IPCC, 2006
Ethanol - Mobile combustion		0.000384	0.000013	t/m^3	IPCC, 2006
Gasoline	69,300			kg/TJ	IPCC, 2006
Gasoline - Mobile combustion		25.0	8.0	kg/TJ	IPCC, 2006
Jet fuel	71,500			kg/TJ	IPCC, 2006
Fuel combustion - civil aviation		0.5	2.0	kg/TJ	IPCC, 2006

D.7 Density and Inner Calorific Power (PCI)

Precursor	Density (kg/m^3)	PCI (Kcal/kg)	Source
Biodiesel (B100)	880	9,000	BEN, 2019
Hydrated ethanol	809	6,300	BEN,2019
Natural gas	0.74	8,800	BEN,2019
Automotive Gasoline	742	10,400	BEN,2019
Diesel	840	10,100	BEN,2019
Aviation kerosene	799	10,400	BEN,2019

ANNEX E - CATEGORIES OF THE BRAZILIAN GHG PROTOCOL PROGRAM

According to the Brazilian GHG Protocol Program, the categories are defined in the following manner:

- **Stationary combustion (Scope 1):** GHG emissions derived from the burning of fuels that generate power, generally used to produce water vapor or electric power. Such power is not used for means of transportation. Examples: ovens, burners, heaters and generators.
- **Mobile combustion (Scope 1):** GHG emissions derived from the burning of fuel that generates power used to produce movement and travel over a trajectory. Examples: cars, motorcycles, trucks, buses, tractors, forklifts, airplanes and trains.
- **Fugitive (Scope 1):** escapes of GHG are generally not intentional and occur during the production, processing, transmission, storage or use of gas. Examples: fire extinguishers (CO_2) and leakage from refrigeration and air conditioning equipment (HFC or PFC).
- **Acquisition of electricity (Scope 2):** GHG emissions resulting from the generation of electric power acquired by the company conducting the inventory. This category can be reported through two approaches:
    - **Location Based approach:** Quantification of Scope 2 GHG emissions by electricity acquisition using the average electricity generated in a given electrical system (for example, the National Interconnected System - SIN) as an emission factor, considering its geographical limit and a given period of time. The reporting of this approach is mandatory.
    - **Market Based approach:** Quantification of Scope 2 GHG emissions for the acquisition of electricity using the specific emission factor for each source of electricity generation that the inventory organization chose to purchase or consume. In this approach, the emission factor is directly linked with the origin of electricity generation, requiring verification and tracking. Reporting under this approach is voluntary.
- **Category 4: Transport and Distribution (Upstream) (scope 3):** emissions from distribution of products and transportation bought or acquired by the organization conducting the inventory in vehicles and installations that are neither owned or operated by the organization, as well as from other outsourced transportation and distribution services (including both receiving and shipping logistics).

- **Category 5: Waste generated in operations (Scope 3):** includes the emissions of the treatment and/or final disposal of solid waste and liquid effluents rustling from the operations of the organization conducting the inventory that are controlled by third parties. This category computes all the future emissions (over the course of the process of treatment and/or final disposal) that result from the waste generated in the year for which the inventory was conducted.
- **Category 6: Business trips (Scope 3):** emissions from the transportation of employees for activities relating to the business of the organization conducting the inventory, which transportation is carried out in vehicles operated or owned by third parties, such as aircraft, trains, passenger automobiles and vessels. Considered in this category are all the employees of entities and units operated, rent or owned by the organization conducting the inventory. This category may include employees of other relevant entities (such as, for example, outsourced service providers), as well as consultants and other individuals who are not employees of the organization conducting the inventory but who go to its units.
- **Category 7: Employee Transportation (Scope 3):** The emissions of such category include the transportation of employees between their homes and their place of work. Included in such category is transportation by cars, buses, trains and other types of urban transportation.

Rua Paraíba, 1.000 - 7° andar

CEP 30130 - 141 - Belo Horizonte - MG

Phone | Fax 55 31 3401.1074

BH | SP | RJ

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