Unit-Discipline-Work)

DEMOCRATIC REPUBLIC OF SAO TOME AND PRINCIPE
MINISTRY OF INFRASTRUCTURES NATURAL RESOURCES

First Biennial Update Report of São Tomé and Príncipe

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SAO TOME, JANUARY 2022

DEMOCRATIC REPUBLIC OF SAO TOME AND PRINCIPE

MINISTRY OF PUBLIC WORKS, INFRASTRUCTURE, NATURAL RESOURCES AND ENVIRONMENT

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PREFACE

São Tomé and Príncipe signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, ratified on October 27 1999, and become a full member of the Convention. In this framework, the country undertakes to prepare and periodically submit a Biennial Update Report (BUR), in accordance with the Convention Guidelines.

Thus, São Tomé and Príncipe's first Biennial Update Report (BUR) was prepared in accordance with the UNFCCC guidelines on biennials (Annex III, dec.2/CP.17).

The present BUR contains an inventory of the main greenhouse gas (GHG) emissions for STP, covering the Energy, Industrial Processes and Product Use, Agriculture, Forestry and Other Land Uses (AFOLU) and Waste sectors.

On the other hand, information on mitigation measures and their effects is provided, the national measurement, reporting, and verification (MRV) system in place, as well as information on capacity building needs and financial needs,to allow the country to regularly provide consistent information on GHG emissions.

São Tomé and Príncipe is resolutely committed to the fight against climate change and considers this First Biannual Report not only as a document that contains information to fulfill its obligations under the UNFCCC, but above all as an instrument to facilitate decision-making for a climate-resilient development and demonstrate the level of positive effects of mitigation and adaptation actions on emissions reduction and sustainable development.

It is in this context that the Government of São Tomé and Príncipe hereby submits its first Biennial Update Report (BUR) within the scope of the United Nations Framework Convention on Climate Change and takes advantage of the opportunity to thank all the support received and all the contributions that allowed to carry out this important task.

The Minister of Infrastructure and Natural Resources

Signed

Osvaldo Abreu

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Acronyms and acronyms

AFOLU	Agriculture, Forestry and Other Land Uses
BURs	BianualUpdated Report
CH_4	Methane
NCs	National Communications
CO	Carbon monoxide
CO_2	Carbon dioxide
UNFCCC	United Nations Framework Convention on Climate Change
CQNUMC	United Nations Framework Convention on Climate Change
DETPEJA	Directorate of Technical, Vocational, Young and Adult Education
DGA	General Directorate for Forestry
DGA	Directorate General for the Environment
DNT	Non-Transmissible Diseases
SAI	Education, Training and Public Awareness
PPE	Personal Protection Equipment
FCT	Faculty of Science and Technologies
FOLU	Forest and Other Land Uses
GBP	Best Practices Guide
GHG	Greenhouse Gas
GT	Working group
GWH	Gigawatt-hour
HFC	Hydrofluorocarbons
ICCO	International Cocoa Organization
HDI	Human Development Index
IGEE	Greenhouse Gas Inventory
INDCs	Determined Contribution Intentions
INE	National Institute of Statistics
INM	National Institute of Meteorology
IOF	Family Budget Survey
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Uses
GO	Responsible Institutions
ISCVSM	Higher Institute of Health Victor Sá Machado
ISEC	Higher Institute of Education and Communication

IUCAI	University Institute of Accounting and Informatics
$KTCO_2eq$	Kilotonneof Carbon Dioxide equivalent
MECC	Ministry of Education, Culture and Science
MRV	Measurement, Reporting, and Verification
MW	Megawatt
N_2O	Nitrous oxide
NDC	Nationally Determined Contributions
ºC	degree celsius
GDP	Gross Domestic Product
GNP	Gross National Product
PND	National Development Plan
QA/QC	Quality Control and Assurance
SN	Second National Communication
SN-MRV	National Measurement, Reporting, and Verification System
STP	São Tomé and Principe
TBA	Gross Admission Fee
TBE	Gross Education Rate
TCN	Third National Communication
HUH	European Union
UÉvora	Évora University
PMU	Project Management Unit
USD	US dollar
USTP	Public University of São Tomé and Príncipe
VoA	Voice of America
ZEE	Exclusive Economic Zone

EXECUTIVE SUMMARY

NATIONAL CIRCUMSTANCES

São Tomé and Príncipe is a small island state made up of two islands, located in the Gulf of Guinea at 0º 25'N latitude and 6º 20'E longitude, about 380 km west of the coast of the African Continent. The islands occupy an area of 1,001 km², with the island of S. Tomé being the largest with an area of 859 km² and the island of Príncipe with 142 km². The Equator crosses the country, which has a humid tropical climate with two seasons during the year, the rainy season with frequent rainfall throughout most of the year (about nine months, from September to May) and the dry season, named *Gravana*, which lasts about three months (from June to August) and with less hot temperatures.

The country has 178,739 resident inhabitants with a population density of 178.7 hab/km² and the average annual growth rate is 2.45% per year. Being a Small Island Developing State, São Tomé and Príncipe is a low-middle-income country, with a fragile economy and high vulnerability to external shocks and a Gross National Product (GNP) per capita of USD 1,960 in 2019. The country ranks 135th in the Human Development Index (HDI) with a value of 0.625 (UNDP, 2019).

STP has limited resources, its economy being fundamentally based on the production and export of cocoa and a nascent tourism industry. In terms of participation of economic activities in GDP, the tertiary sector, largely informal, represents almost 60% of GDP, and employs 60% of the active population, while the primary and secondary sectors contribute each one to approximately 20% of GDP.

With respect to global environmental issues, the country signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratified it in 1998, having become a full member of this Convention. As a country very vulnerable to global climate change, STP prepared in 2015 the Contingency Plan for Natural Disasters (2016-2020), in 2016, the National Strategy for Disaster Risk Management and in 2017 the Multisectoral Investment Plan for São Tomé and Príncipe,to integrate climate change resilience and disaster risk in coastal zone management into development processes and ensure resilient development.

Likewise, the country ratified the Paris Climate Agreement in 2015 and prepared its first NDC, having joined the NDC Partnership in November 2016. With the support of this organization, the National Plan for the Implementation of NDCs was prepared, based on existing national processes, such as the National Development Plan (NDP, 2017-2021).

GREENHOUSE GAS INVENTORY

The present inventory of greenhouse gas emissions and removal (IGEE) from STP, referring to the year 2018, is the fourth to be prepared by the country and was prepared based on the methodology established by the guidelines of the Intergovernmental Panel on Climate Change in 2006 (IPCC) and the Good Practice Guide (GBP) for calculating GHG emissions.

According to these guidelines, STP's IGEE covers the following sectors: (i) Energy, (iii) Industrial Processes and Product Use, (iii) Agriculture, Forestry and Other Land Uses (AFOLU) and (iv) Waste.

To calculate the GHG emissions, the following gases were considered: (i) Carbon Dioxide (CO_2), (ii) Methane (CH_4), (iii) Nitrous Oxide (N_2O) and (iv)Hydrofluorocarbons (HFC).

An assessment of the level and trend of emissions and removals was also carried out, which made it possible to identify the main sources and sinks of GHGs correspondent to 95% of the country's total emissions, thus identifying the key categories.

Thus, in STP, GHG emissions (for the main gases) in 2018 were estimated at 212.15 Gg of CO_2eq. (excluding FOLU), which represents an increase in emissions of 31% compared to the value of the last inventory carried out in 2012. In turn, removals recorded an increase of around 23%.

Due to its emissions history since the first inventory, STP continues to be a GHG sink country, with the positive balance of emissions in the Forests and Other Land Uses (FOLU) sector,since in recent years there have not been major conversions of forests into other types of land use. Nevertheless, the carbon sequestration capacity of forests has been gradually decreasing over the years.

With respect to HFC emissions, they were estimated for the first time at 7.52 Gg of CO_2eq.

MITIGATION MEASURES

Despite not being a CO_2 emitting country, STP, is decidedly engaged in the process of reducing emissions, participated in COP 21 in 2015 and signed the Paris Agreement for the reduction of emissions, to contribute to the reduction of global temperature. in 2º C.

In this sense, the country, with the update of its NDC in 2021, reaffirmed its commitment to reducing greenhouse emissions by 109 $KTCO_2eq$, which corresponds to an emission reduction of 27% by 2030. Where the following were prioritized mitigation measures/contributions:

I. **Increase in the share of renewable energy (RE);**

II. **Reduction of losses in the network and improvement of energy efficiency;**

III. **Reduction of carbon intensity in mobility**

With the implementation of these measures, the country is committed through the proposed mitigation contributions to reduce its greenhouse gas emissions estimated by 27% through the production of renewable energy (injecting 50% into the national grid by 2030), as well as their increased efforts to ensure the resilience of the most vulnerable communities.

NATIONAL MONITORING, REPORTING AND VERIFICATION SYSTEM - MRV

The SN-MRV System in São Tomé and Príncipe is based on the institutional mechanism created for the process of preparing the NCs, IGHG and BURs, which is structured on two levels: the institutional level of coordination and the level of the working groups responsible for the collection, processing of data and the calculation of emissions, and preparation of sectoral reports

The STP MRV System is not yet properly structured, since the country still does not have an institutional arrangement that includes legal or official agreements defined to implement the MRV system and that support the process of elaboration of NCs, IGEE and BURs on a regular basis. For the system to function continuously and consistently, it is essential to establish adequate communication mechanisms between key institutions, maintaining clarity and understanding of their obligations by all those involved.

To facilitate the data collection process in the future, the country should adopt a mechanism that involves all the involved parties, in the form of a coordination device of the MRV system where all the data for the realization of NCs, IGEE, BURs will be stored.

FINANCIAL, TECHNOLOGICAL AND CAPACITY BUILDING NEEDS

Overall, STP faces major challenges in reporting on greenhouse gas inventories, calculating emission reductions and adaptation options, implementation, and technical and capacity-building needs.

There are many constraints, limitations, and gaps in reporting the information and frequency required by the decisions of the Conferences of the Parties. The implementation of mitigation actions is a major challenge for STP due to the multiple limitations and gaps that exist in different areas, particularly at institutional, organizational, and individual levels.

Most of the restrictions and gaps are recurrent both in the sectors and in the study areas. To mitigate these gaps and constraints, it is essential to develop human, institutional and methodological capacities to increase the capacity to implement technologies, monitor emissions, calculate emission reductions resulting from policies and measures. To achieve sustainable success in all these activities, STP needs adequate financial support.

São Tomé and Príncipe has been consistent in mobilizing crucial financial resources and technical assistance from a variety of sources to help offset the additional cost the economy has in combating climate change. Thus, the resources that the country has committed to raising include financial and technical assistance and technology transfer within the country and internationally.

The elaboration of the National Communications and the BUR made it possible to identify the major challenges, constraints, and gaps in this process, while it has served to train the national technical teams involved in the preparation of these reports.

Thus, constraints must be overcome to speed up the mitigation process, while identifying new mitigation projects and preparing proposals for funding. In terms of technical and capacity development needs, one of the most urgent and pressing challenges facing the country in fulfilling its information obligations under the articles and decisions of the Convention and its implementation concerns the availability of technical capacity. in several areas, namely technical, institutional, and financial methodological.

1. NATIONAL CIRCUMSTANCES

1.1 Country overview

São Tomé and Príncipe is a small, low-middle-income, developing island state with a fragile economy and high vulnerability to external shocks. Given its small size, geographic isolation, limited resources and developing country status, São Tomé and Príncipe is particularly vulnerable to the adverse effects of climate change. The economy depends heavily on the tertiary sector, which is largely informal. Despite some gains from an economic point of view, the country continues to face challenges associated with population growth, poverty, access to quality education, health care, pollution, climate change and access to energy.

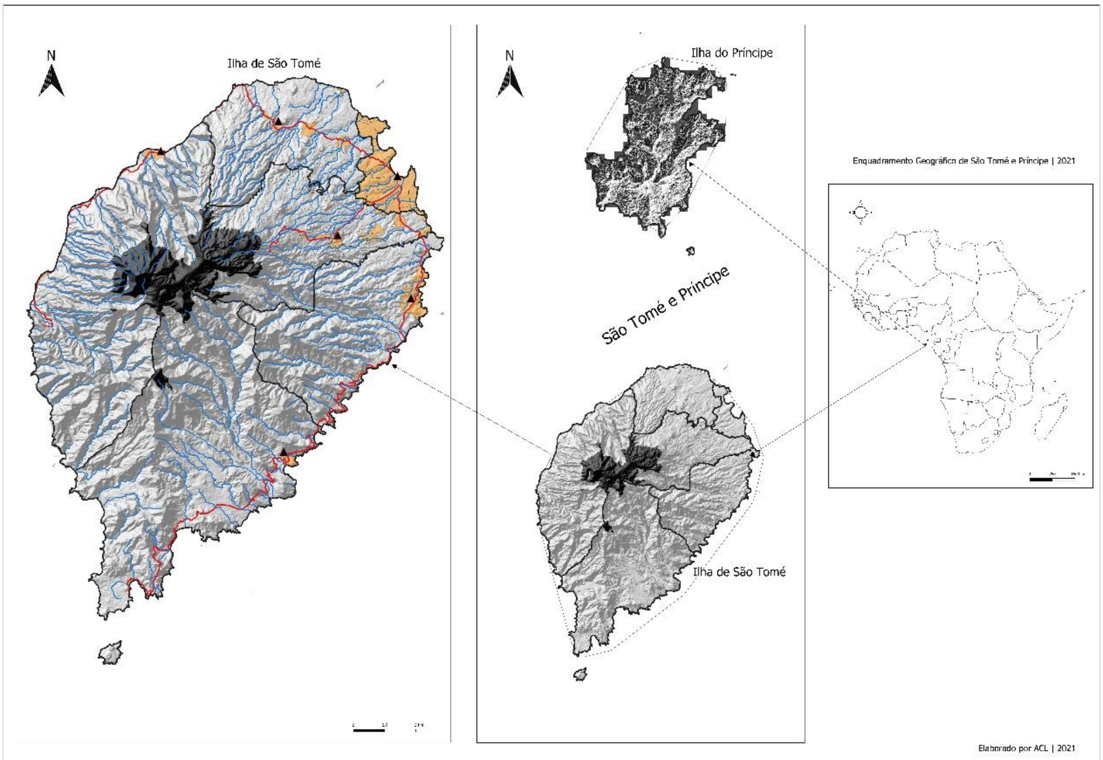
São Tomé and Príncipe aspires to be a medium development country with a growth rate of over 5% per year. Thus, a significant part of the country's resources has been used to improve the lives of Santomeans and ensure the nation's economic future and prosperity. Meanwhile, climate change threatens to delay the country's current economic gains and future aspirations. It is for this reason that the country is investing in actions to fight climate adversities amid various development challenges and promises to do even more through the ambitious actions it has committed to in its Nationally Determined Contributions (NDCs) updated from 2021.

1.2. Geographical Situation of São Tomé and Príncipe

Located in the Gulf of Guinea at 0º 25'N latitude and 6º 20'E longitude, about 380 km west of the coast of the African Continent, the Republic of S. Tomé and Príncipe is an archipelago of volcanic origin and consists of two islands and several islets (figure 1).

The islands have an area of 1,001 km², being 859 km² for the island of S. Tomé and 142 km² for the island of Príncipe and are crossed by the Equator. At the southern end of São Tomé is the Isletof Rolas, where there is a landmark that materializes the place where the Equator Line crosses.

Figure 1– Geographical situation of São Tomé and Príncipe



1.3. Climatic characteristics

The climate is characterized by the existence of two seasons during the year, being the rainy season with frequent rainfall throughout the year (about nine months, from September to May) and the shorter dry season called *Gravana*, which lasts about three months (from June to August) and with less hot temperatures. However, there is a period of about two months called “Gravanito” that fluctuates(1)between December and January in which there is a slight slowdown in rainfall.

The average temperature of the archipelago at sea level is 25.6 ºC, tending to vary with altitude and time of year, albeit slightly. Thus, temperatures decrease with increasing altitude, with mountainous regions being slightly cooler than coastal regions.

The air temperature (São Tomé Airport station), the only station with a series of data from the last 50 years in the period 1992-2009, has an average of 26.2 ºC. There is no great variation

1MRNA-First National Communication- São Tomé and Príncipe- S.Tomé, 2004 between the annual averages, with the maximum temperature being 30.5 °C and the minimum temperature of 20.6 °C in 2017.

Rainfall in the STP archipelago varies significantly with altitude, especially between the North and South regions, ranging from 1,000 mm to the North and 7,000 mm to the South of the island of São Tomé and 2,000 mm to the North and 5,000 mm to the South of the island of Principe. This large difference in precipitation is caused by the orographic distribution of the islands, which determines the precipitation values and their distribution.

In São Tomé and Príncipe, the orographic effect of the volcanic massifs is the determining factor for the abundant precipitation and makes the precipitations have a large rainfall gradient and offer very important water potential at altitude. Thus, given the characteristics of the relief, many defined microclimatic zones predominate, mainly as a function of rainfall, temperature, and relief.

1.4. Aspects Geomorphological

1.4.1. Relief

On the island of S. Tomé, the relief is very rugged, and the Pico de São Tomé, located in the centre-west and measuring 2,024 m in altitude, is the highest point of this island, in addition to other peaks that exceed 1,000m in altitude. The Northernpart of the island is less mountainous, which is why the first cultivators settled there.

On the island of Príncipe, where the North is also less mountainous, the highest peak reaches 948 m in altitude and the relief is also very rugged.

Being of volcanic origin, the two islands that make up the country are part of an eruptive chain, which extends through the Gulf of Guinea, from Mount Cameroon to Ano Bom and continues to Saint Hélène.

The relief has very irregular shapes, mainly on the island of São Tomé. The island of Principe, on the other hand, is less rugged.

1.4.2. Geo-pedological composition

The islands of São Tomé and Príncipe are in the “Line of Cameroon Mountains” (Fitton, 1980), which constituted a volcanic chain of about 1,600 km, extending from the interior of the African continent to the NE (Mount Cameroon on the coast of West Africa) to the island of Pagalu (Ano Bom) SW in the Gulf of Guinea.

Both on the island of São Tomé and on the island of Príncipe, the rocks are particularly volcanic.

The soils are one of the great resources of São Tomé and Príncipe and are, in general, of high fertility and favourable to agriculture, although they sometimes present significant stoniness. They are normally acidic (pH 5 to 5.7) having deficiencies in phosphorus and potassium.

1.4.3. Hydrology

In hydrological terms, the country's total capacity is estimated at 2.1 million m^3 of water per km^2,which is equivalent to 10,000 m^3 per year per inhabitant (Hidroconseil, 2011).

The distribution of water courses follows a radial network from the centre of the islands towards the coastline. The network has more than 50 water courses, with an average length between 5 and 27 km and an elevation of 1,000 to 1,500 meters in altitude.

The regime of water courses is irregular, but not torrential in nature, being linked to the distribution of rainfall, according to the zones and seasons of the year. In the dry season, from June to September, the debt does not represent more than 10% of the annual total. The spatial distribution of the rivers is, however, unequal: more than 60% of the river flow is in the Southwest and South parts of the islands. This fact is due to the greater amount of rainfall recorded in these areas.

1.5. Coastal Zone

It is located between the limit of the Exclusive Economic Zone (EEZ) that extends up to 200 nautical miles and the continental limit that is located at 100 m altitude from the coastline. The country has a coastal area of about 260 km in length and a wide exclusive economic zone of 160,000 km^2, where the continental shelf is relatively small, with about 1,500 km^2, of which two thirds (1,023 km²) belong to the island. from Príncipe and 436 km^2 to the island of São Tomé (2).

Most of the coast is rocky with very uneven relief, but there are numerous sandy bays that make up a whole system of beaches along the coast.

The ecosystem of the transition zone, formed by brackish water and populated by mangroves is very peculiar, and is characterized by the existence of a great biodiversity consisting of abundant fauna and flora, as well as mineral and water resources.

1.6. Forest and land use

The land use system is characterized by an “ecological ordering of crops”. It is specifically about the natural adaptation of each type of cultivation to the ecological space that is most suitable for it, and consequently, each land is occupied in the way that best suits the sustainable exploitation of the country's agricultural resources.

São Tomé and Príncipe has an abundant forest whose characteristics vary depending on several factors, including relief, altitude and, consequently, the characteristic microclimate of each region.

The main forest ecosystems found on the islands of São Tomé and Príncipe are divided into forest ecosystems in the **low-altitude region,** which includes mangroves, shrubby-tree and herbaceous savannah, shadow forest and secondary forest, and by forest ecosystems of the **altitude region**, which comprises the altitude forest located between 1,000 and 1,800 m, the altitude forest located between 1,800 and 2,000 m and the fog forest (above 1,800 m).

1.7. Population and social development indicators

1.7.1. Structure and evolution of the population

São Tomé and Príncipe has 178,739 inhabitants with a population density of 178.7 hab/km^2 and the average annual growth rate is 2.45% per year. The population is predominantly young, with a birth rate of 26.6 per thousand and an infant mortality rate of 38 per thousand. The average life expectancy is 66 years. (INE, 2012).

2National Environment Plan for Sustainable Development (Vol.II) – UNDP/RDSTP

1.7.2. Economic context

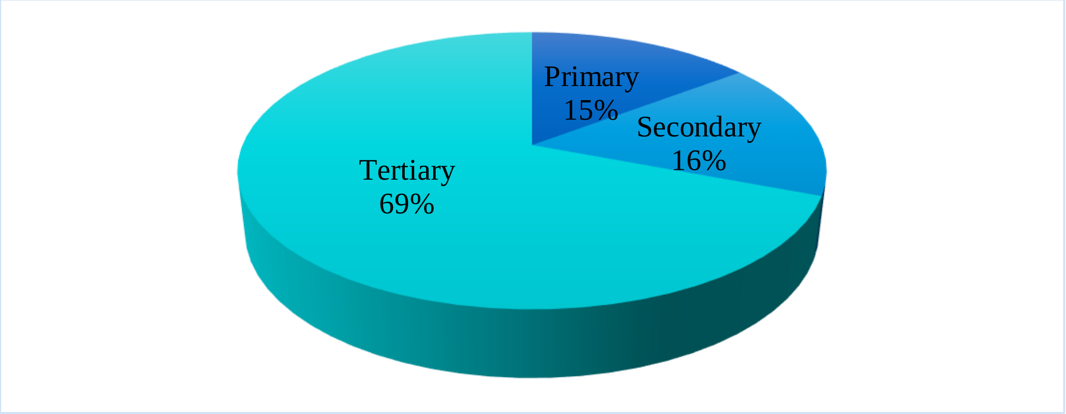
Being a Small Island Developing State, São Tomé and Príncipe is a low-middle-income country, with a fragile economy and high vulnerability to external shocks and a Gross National Product (GNP) per capita of USD 1,960 in 2019. The country ranks 135thin the Human Development Index (HDI) with a value of 0.625 (UNDP, 2019).

The performance of economic activity has been strongly dominated by the tertiary sector. From 2008 to 2017, this sector grew by an average of 4.4% and represents 69.2% of GDP. It was mainly driven by the trade, transport, storage and communications and public administration sectors. The secondary sector represents an average of 16.1% of GDP, having grown by an average of 5.6% during the same period. Still in the secondary sector, the highest growth was registered in the activities of Production, Distribution of Electricity, Gas and Water. Finally, the primary sector grew by an average of 2.9%, and contributed 9% to GDP (INE – DCN, 2017).

STP has limited resources. Its export base is not diversified and consists mainly of cocoa and a nascent tourism industry.

In terms of participation of activities in GDP, the tertiary sector, largely informal, represents almost 60% of GDP, and employs 60% of the active population, while the primary and secondary sectors each contribute with approximately 20% of GDP, according to the most recent data (D. Planning, 2017).(See figure 2).

Figure 2- Contribution of sectors to GDP



Source: Planning Directorate, 2017. Adapted

The weak diversification of the São Tomé's economy and its strong sensitivity to demand and world prices for cocoa, the main export product, means that the current account balance, with exports of official transfers, is structurally deficient, even though there has been a progressive improvement since 2012. Thus, Table 1 shows that from 39.4% of GDP in 2012, it increased to 36.6% in 2014, and from 25.2% in 2015 and 20.5% in 2016 (Directorate of Planning, 2017).

Table 1- Evolution of the main macroeconomic indicators between 2012 and 2016

	2012	2013	2014	2015	2016
Growth rate (%)	4.5	4	4.5	4	4.1
Inflation rate (%)	6	8.4	5.9	5.3	4.6
Overall budget balance (% of GDP)	-10.9	1.9	-5.5	-6.3	-2.8
Current account balance (official transfers excluded, % of GDP)	-39.4	-38.3	-36.6	-25.2	-20.5
VAN external debt (% of GDP)	30.7	27	30.1	39.7	36.2
External debt service (% of exports)	7.3	9.5	5	3.8	3.2
International change reserves (in months of imports)	3.5	3.4	3.9	5.2	4.2

Source: MFI Estimate, World Bank Database and MFCEB, cited by DP (PND, 2017 – 2022).

Despite being a low-middle income country, STP still has the characteristics of a poor country, due to the fragility of its economic fabric and the reduced internal capacity to produce wealth and create jobs capable of guaranteeing better living conditions for its population. The country is considered vulnerable essentially due to its reduced territorial dimension, insularity, the fragility of ecosystems and its exposure to strong human pressure on natural resources and global financial crises, as it is largely dependent on foreign aid.

The challenges that STP faces highlight the need for the country to continue with efforts to meet the Sustainable Development Goals (SDGs), mainly those that the country has undertaken to comply with, namely:

i. SDG1: End poverty in all its forms, everywhere in the country;
ii. SDG8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all;
iii. SDG9: Build resilient infrastructures, promote inclusive and sustainable industrialization and foster innovation;

iv. SDG14: Conservation and sustainable use of oceans, seas and marine resources for sustainable development;
v. SDG16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels;
vi. SDG13: Take urgent action to combat climate change and its impacts;
vii. SDG15: Protect, restore, and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt the loss of biodiversity.

The agricultural sector is characterized by the production of cocoa, the main export product produced in large agricultural holdings, called *swiddens*. Since the redistribution of large cocoa plantations in the early 1990s, most agricultural production has been carried out by smallholders. As cocoa alone does not guarantee a livelihood, many smallholders find additional income growing vegetables, fruits, vanilla, and pepper for export. Despite the immense importance of cocoa in the economy of STP, the country's export share on the world market was estimated at only 0.11% between 2000 and 2005 by the International Cocoa Organization (ICCO). However, São Tomé's cocoa is appreciated for its high quality and is often mixed with lower quality cocoa to improve the final product, which is chocolate. There is also an expanding "organic" cocoa sector, whose exports in 2015 were around 1,020 tons (CECAB, 2015).

Table 2 indicates the main export crops in STP:

Table 2- Summary of Agricultural Production 2013-2017.

Designation	2013	2014	2015	2016	2017
Cocoa	2617.0	3193.0	2794.2	3000.8	3501.1
Coconut	540.5	799.1	714.8	785.7	798,705
Coffee	3.9	12.0	4.4	1.2	5.9
Pepper	3.5	12.0	7.7	14.0	14.3
Palm oil	66.0	67.0	68	70.0	165.9
Others	904.6	866.9	851.3	816.3	874.5

Source: INE, 2017.

The agricultural sector employs 60% of the active population but represented only 17% of GDP in 2017. It is characterized by poor infrastructure, almost non-existent public support services, and a reduced number of farmers, which explains its low productivity. With a very fragile and poorly organized subsistence agriculture, the country imports a large part of its food consumption.

Regarding the livestock sector, everything indicates that the food deficit in terms of animal protein is being reduced, although the production parameters must still be improved and the intervention of the Livestock Directorate must be continuous to allow an increase in meat production, as the population tends to increase.

Nevertheless, this direction has shown efforts in technical and economic terms to fight the food deficit.

1.7.3. Food Safety

At the national level, about 36,000 people are threatened by food insecurity, of which 16,000 (10.2% of households) have low food consumption and 20,000 people (12.6% of households) have limited food consumption.

The country has made progress in terms of infant nutrition (children under 5 years old), but recent data show that considerable challenges remain. Chronic malnutrition (slow growth) affects 17.2% of children with 4.5% severely. Acute malnutrition (stunting) affects 4% of children, including 0.8% severely. Underweight affects 8.8% of children, of which 1.8% are severely affected.

1.7.4. Fisheries

The continental platform around the islands of São Tomé and Príncipe is characterized as being very narrow and limited to 5 – 10 km. Despite the relatively small continental platform due to its volcanic origin, fishing is a relatively important sector for the São Tomé's economy, being a source of employment and foreign exchange, which contributes around 3.7% of the national GDP and represents 22 to 35% of non-tax revenue from the state budget during the last five years (EU, 2017).

Table 3- Composition of non-tax revenues in the State Budget from 2013 to 2017.

In percentage	2013	2014	2015	2016	2017
Fisheries Recipes	22%	35%	32%	23%	22%
Other recipes natural resources	0	0	0	41%	6%
Other equity income	68%	29%	29%	15%	28%

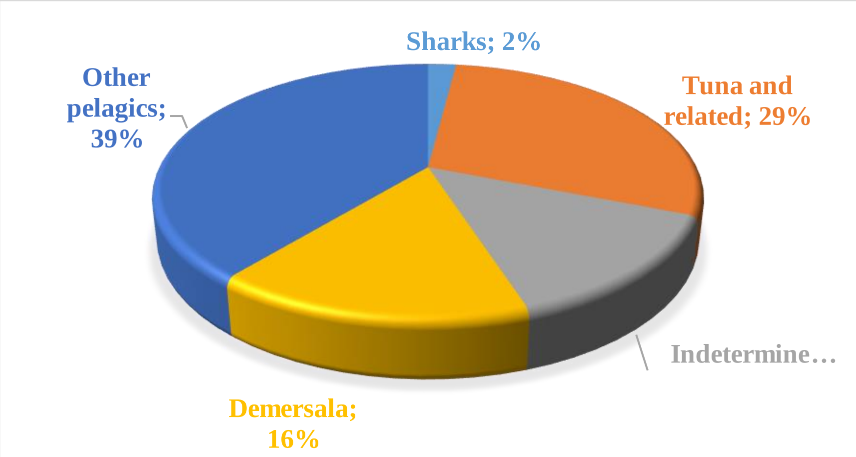
In percentage	2013	2014	2015	2016	2017
Other non-tax income	10%	36%	39%	21%	44%

Fisheries in São Tomé and Príncipe are explored with two types of fishing fleets: traditional fishing and semi-industrial fishing. Industrial fishing is practiced in the Santomean sea by foreign fishing fleets through bilateral fishing agreements.

The artisanal fishing sector absorbs 25% of the country's workforce, made up of men who work in catching activities and women (*palaiês*, street vendors) who sell the product, mainly in markets. Around 3,051 artisanal fishermen operate in the 44 landing sites, 29 of which are in São Tomé and 15 in Príncipe.

The potential for catches was estimated at around 11 to 12 thousand tons per year in 2016/2017. These catches are composed of 16% of demersal species and about 70% of diverse pelagic species, of which about 29% of tuna and other tuna species.

Figure 3– Composition of Artisanal Fisheries catches in STP 2015.



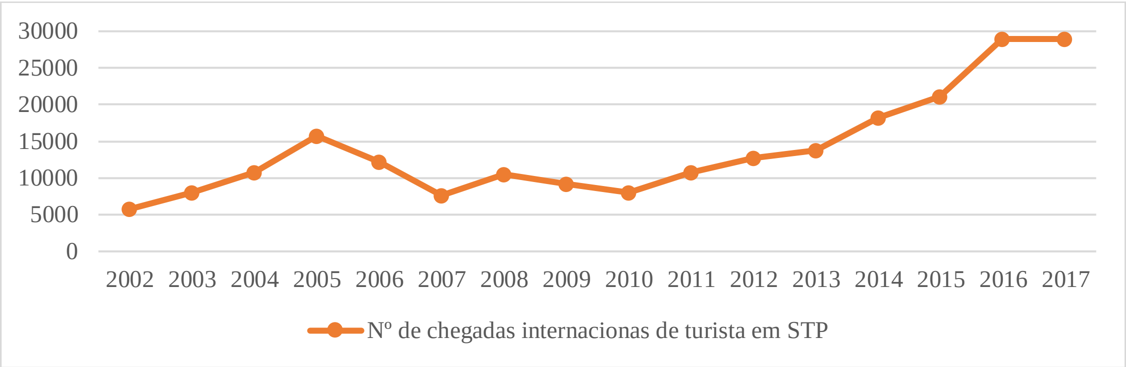
1.8. Services Sector

1.8.1. Tourism

According to the Strategic and Marketing Plan for Tourism of São Tomé and Príncipe (2017), the strategic vision foresees STP in 2025 as "the most preserved island tourist destination in Equatorial Africa, with unique nature and biodiversity, paradisiacal beaches, where São Tomé's hospitality, based on its historical-cultural legacy of coffee and cocoa plantations, shares its way of life and the warm way of receiving".

Tourism has the potential to be one of the main drivers for the country's sustainable development. As it can be seen in the graph below, the flow of tourists in the last 16 years has a constant and consolidated increasing trend, but is subject to significant fluctuations, mainly due to air transport and international factors, such as the crisis that particularly hit Europe, which constitutes the greatest area of origin of the national tourist flow.

Figure 4– Flow of tourists in the last 10 years



Source: Directorate of Tourism, 2018.

1.8.2. Energy and Transport

In terms of energy, the electricity production sector of São Tomé and Príncipe is in a highly deficit state, as the country currently needs 31 MW of power to meet its basic operating needs, while it only produces 15 MW. However, 30% of STP's energy production park is inoperative and most of it is obsolete, according to a report by Castália Advisory Group (2010).

The hydroelectric energy currently produced in the small power plant located on the Contador River to the north of the island of São Tomé represents a very small part of the country's actual needs. Thermal energy is obtained mainly through the use of imported fuel, i.e. diesel. This gives rise to a high production cost in thermal power plants, a high price to the consumer, combined with a small and obsolete energy production and distribution network with technical and non-technical losses amounting to approximately 34.5% in the electrical system.

Until December 31, 2017, the total installed power in the national electricity sector was 35 MW and comprised a hydroelectric plant and five interconnected thermoelectric plants, in addition to the Príncipe Region plant and isolated systems in Porto Alegre, Malanza, Ribeira Peixe and Santa Luzia.

EMAE's own production in 2019 was 107.9GWh. The total production of electricity from thermoelectric sources was 102.1 GWh and contributed with 93.5%, while the hydroelectric system in service corresponded to a production of 5.8GWh. Electricity purchases totalled 31.3 GWh, entirely of thermoelectric origin. In 2019, the energy injected into the transmission and distribution networks reached 102.3GWh.

The electrical energy produced and injected into the interconnected grid in S. Tomé in 2019 was 107,883.85 MWh, corresponding to 5,833 MWh to hydroelectric plants and the remaining 102,050.85 MWh to diesel-based thermoelectric plants. As can be seen in the table below, in relation to 2015, in 2019 there was an increase in production in the order of 6,465.58 MWh, corresponding to about 6.4% in production. The total volume of electricity billed was 58GWh, so it can be concluded that there was a volume of electricity losses, both technical and non-technical, corresponding to around 342.9%.

Table 4- Evolution of STP energy data from 2015-2019

Energy Data Summary						
YEAR	**Electricity Production**			**Gasoil Consumption**		**Lubricating Oil (liters)**
	Thermal (MWH)	**Hydro (MWH)**	**TOTAL (MWH)**	**Central (liters)**	**TOTAL (liters)**	
2015	94,771.00	6,647.26	101,418.27	23,497,348.00	23,497,348.00	58,533.00
2016	99,955.25	5,800.25	105,755.50	26,884 374.00	26,884 374.00	104,182.00
2017	104,026.97	5,045.61	109,072.57	29,657 375.00	29,657 375.00	105,506.00
2018	92,839.28	5,125.00	97,955.28	27,672,088.00	27,672,088.00	91,900.00
2019	102,050.85	5,833.00	107,883.85	28,207,511.00	28,207,511.00	108,364.00

Source: EMAE, 2018 and 2019.

1.1.8.3. Industry and Buildings

The secondary sector is not very significant in the national economy, contributing only about 20% to the formation of the GDP, of which 6.4% is due to the civil construction sector.

Currently, this branch is very active due to the large projects of recovery, maintenance, and construction of new economic and social infrastructures.

In addition to civil construction, the other areas are the food industry (beer and bakery), wood processing, shipbuilding, energy production, clothing, furniture production and some artisanal production of alcoholic beverages.

It should also be noted that, although incipient, this branch of activity is responsible for the emission of greenhouse gases, mainly in the bakery and artisanal production of alcoholic beverages, as they generally use firewood as a source of energy.

As far as buildings are concerned, considering the traditional habits of building houses, cooking food and lighting, it is urgent to seek alternative solutions that replace the use of wood and sand and other inert materials from beaches in constructions, to that soon we can begin to take safer steps towards mitigation in this sector.

1.9. Social context

According to the PND (2017 – 2022), São Tomé and Príncipe has made some progress in improving some social indicators, it has a gross schooling rate of 118%, with 114% being the gross female enrolment rate and 122% the gross enrolment rate. male schooling (MECCC, 2017 – Statistical Bulletin); a life expectancy of 68.6 years for women and 64.5 years for men according to the 2017 UNDP HDR; an infant mortality rate for children under 5 of 51 per 1,000 live births, access to an improved water source for 97% of the population and access to electricity for 80% of the population.

The poverty prevalence rate is estimated at 62.6% in 2015, according to the 2010 Family Income Survey (IOF). Poverty affects more women (71.3%) than men (61.4%) and is related to the level of education. In the same way, it is related to the employment situation, where its predominance is more modest in the active employed than in the unemployed inactive who constitute the poorest socioeconomic group. The average size of poor families is 5.3 individuals, while that of non-poor families is only 3.3%. Finally, the analysis of inequality indices shows that the poorest 20% accumulate only 7.9% of the total national income, while the richest 20% possesses 41% of this income.

1.9.1. Health

The epidemiological profile of São Tomé and Príncipe is marked by the predominance of non-transmissible diseases whose tendency is increasing. Transmissible diseases continue to be a public health problem, with a high incidence of acute respiratory diseases, diarrheal diseases and other communicable or environment-related diseases. These constitute the main causes of morbidity and mortality. The country has been vulnerable to epidemics, with an outbreak of rubella in 2015, an outbreak of rotavirus diarrhea in 2016 and an outbreak of necrotizing cellulitis in 2016/2017.

Non-transmissible diseases (NTDs) are an emerging problem in STP, as in many developing countries. The non-transmissible diseases program includes cardiovascular diseases, endocrine diseases (such as diabetes mellitus), chronic respiratory diseases, tumor diseases, musculoskeletal diseases, as well as oral health and eye diseases. The increase in NTDs is due to multiple factors, such as the adoption of unhealthy lifestyles and the increase in the average life expectancy of the population.

In the 1980s, malaria was responsible for 40% of infant mortality. The first National Action Plan " Roll Back Malaria 2001-2010" was oriented towards prevention and early treatment in health centres. Its application led to a harmonization of the actions of the various Development Partners, thus producing a reduction in mortality caused by malaria by 90%.

The country is currently considered hypo-endemic (with low transmission). However, according to the WHO, despite progress in reducing prevalence, the disease still has a high epidemic potential.

The success of malaria control in São Tomé and Príncipe has been internationally recognized because of strong ownership, leadership, and vision by the country, as well as a coordinated partnership aligned with the priorities and needs of successive governments.

The Strategic Plan for the Fight against Malaria aims to eliminate this disease throughout the country by 2025 and prevent its reintroduction. The Strategic Plan also aims to strengthen and expand prevention and control interventions, such as universal coverage of long-lasting insecticide nets, indoor spraying and correct and immediate treatment with rapid diagnosis at the community level, integrated management of cases in the community. and malaria in pregnancy.

On January 30, 2020, the World Health Organization (WHO) declared the novel corona virus (nCOV), later named the COVID-19 virus outbreak, a public health emergency of international concern. In March 2020, the outbreak was characterized as a pandemic. According to the WHO, corona viruses are a large family of viruses ranging from the common cold to the most serious illness. In São Tomé and Príncipe, from January 19, 2021, to January 14, 2022, there were 5,458 accumulated cases of COVID-19 and a total of 65 deaths recorded, with community transmission indicated as the reason for the spread.

1.9.2. Access to drinking water

Access to adequate water sources and sanitation conditions for families are two factors that have a major influence on the health and well-being of the population. Diarrhea is the second leading cause of mortality in children aged 0 to 5 years, and this is a disease directly related to drinking water and environment sanitation.

The prevalence of diarrhea in São Tomé and Príncipe is higher than in all West and Central Africa. Most of the Sao Tome population has access to improved sources of water (93.9%). However, it should be noted that an improved water source does not mean that it is necessarily potable. According to officials from the Directorate-General for Natural Resources and Energy, most of the water available in São Tomé and Príncipe is contaminated with faecal coliforms.

1.9.3. Sanitation

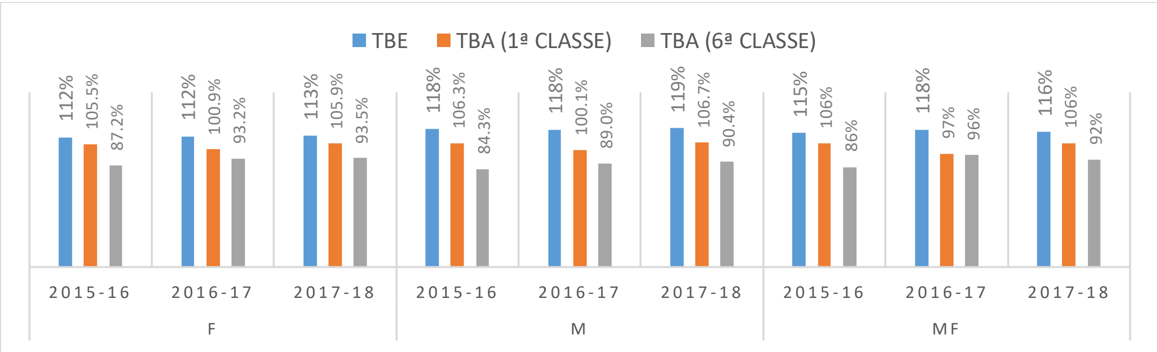
The sanitation situation in São Tomé and Príncipe shows very slow progress over time and a serious general shortage of infrastructure. About 48.4% of the population defecates in the open, a fact that has improved compared to 2009 (57.7%). Only 4.3% use unimproved facilities, with the most important determinant being the level of income.

1.9.4. Education

School education is the central axis of the National Education System, which is organized and governed by the Basic Law of the Educational System (Law nº 2/2003) and comprises in its structure the following levels of education: i) Pre-school Education (0-6 years): Nurseries and Kindergartens; ii) Basic Education: 1st cycle: 1st to 4th grade and 2nd cycle: 5th to 6th grade; iii) Secondary Education : 1st cycle: 7th to 9th grade and 2nd cycle: 10th to 12th grade; iv) Professional Technical Education and v) Higher Education.

The Santomean education system has made notable progress in recent years, particularly in the areas of access and gender equity. The gross enrolment rate (TBE) in basic education is above 100% between the academic year 2015/16 and the academic year 2017/18, and the ratio of girls/boys (IPS) is around of 1% according to the following table.

Figure 5- Evolution of gross enrolment (TBE), admission (TBA) and Access (TBA) and IPS rates



Source: MECCC/DGPIE/DEP

Higher Education has made progress in recent years, namely with the creation of the Public University of São Tomé and Príncipe (USTP) composed of three departments: Faculty of Sciences and Technologies (FCT), High Institute of Health Victor Sá Machado (ISCVSM) and Higher Institute of Education and Communication (ISEC) and the existence of three private higher education establishments operating in the country, namely the University Institute of Accounting and Informatics (IUCAI), Lusíada University of São Tomé and Príncipe and University of Évora (UÉvora).

1.9.5. Evolution of the main education indicators

In general, school coverage has shown some improvement from the academic year 2001-2002 to the year 2014-2015, at all levels of education. Meanwhile, there was a decline in the number of pre-school students in 2012-2013 (Gross Rate 23.6%), but a positive recovery in successive years (Gross Rate 26.5% and 27.3%), more specifically in the years 2013-2014 and 2014-2015.

Table 5- Evolution of the main education indicators.

Teaching	indicators	2014/2015	2015/2016	2016/2017	2017/2018	Goal 2018
Pre-School	Coverage Fee for 4 years old	49%	60%	57%	82%	**82%**
	Coverage Fee for 5 years old	52%	59%	63%	75%	**82%**
	Number of children per professionals	40	32	17	17	**30**
	Teachers in pedagogical training	31%	19.7%	19%	18%	**90%**
Primary	Number of students with six classes (1st to 6th grade)	33%	36%	39%	25%	**40%**
	Number of students per class in the 1st cycle	34	35	33	35	**30**
	Number of students per class in the 5th grade	49	51	49	46	**43**
	Number of students per class in the 6th grade	50	49	47	43	**43%**
	Schooling rate	117%	115%	118.1%	119%	**116%**
	Promotion rate	85%	85%	86.9%	88%	**89%**
	Repetition rate	13%	14%	11.6%	10%	**9%**
	Drop rate	two%	1%	1.5%	two%	**two%**
	Teachers with pedagogical training	36%	29.2	26%	31%	**70%**
Secondary	Number of students per class in the 1st cycle	63	54	50	47	**45**
	Number of students per class in the 2nd cycle	75	54	51	49	**45**
	Gross enrolment rate in the 1st cycle	111%	114%	122.5%	107%	**120%**
	Gross enrolment rate in the 2nd secondary cycle via general	62%	63.40%	77.8%	86.3%	**61%**
	1st cycle access rate	85%	95%	90.4%	80.3%	**107%**
	Promotion rate	79%	75%	68%	63%	**84%**
	Repetition rate	13%	20%	29%	23%	**11%**
	Drop rate	8%	5%	3%	14%	**5%**
	1st cycle repetition rate	22%	27%	27.6%	25.4%	**17%**
	2nd cycle repetition rate	two%	13%	29.7%	20.5%	**two%**
	12th grade repetition rate	21%	48%	41.9%	44.7%	**25%**
	Teachers with pedagogical training	40%	44%	44%	40%	**70%**

MECCC, 2018

1.9.5.1 Literacy

São Tomé and Príncipe's literacy level is already quite high when compared to some similar countries (3). The current literacy rate is 90.1%, a small increase compared to the 2001 rate, which was 83.1% (INE, 2012).

3Comparable countries: Cabo Verde: 84.9%, Angola: 70.4%, Guinea-Bissau: 55.3%, Gabon: 88.4%, Mozambique: 56.1%, Ivory Coast: 56.2%;Seychelles: 91.8%

This high-rate hides, however, the differences between urban and rural areas, where there is a rate of 91.4% in urban areas and 87.6% in rural areas. Likewise, the differences between the sexes are significant, being 94.9% for men and 85.5% for women. Hence, it can be inferred that the issue of illiteracy essentially affects the older sections of the population, among the female population and in rural areas, which means that future policies should aim to reduce these disparities.

Aware of this situation and the weight it represents for the Santomean economy, the country has set itself as an objective, within the horizon of 2022, its eradication, through the expansion of the access network, the improvement of the quality and efficiency of learning and the fight against return illiteracy, taking care to strengthen the institutional capacities of the Directorate for Technical and Professional Education and Youth and Adult Education (DETPEJA).

2. POLICIES RELEVANT TO CLIMATE CHANGE

Concerned with global environmental issues, STP signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, a convention that it would ratify in 1998 through Presidential Decree No. 6/98. Internally, through Presidential Decree nº 2/2007, the country created in 2007 the General Directorate for the Environment (DGA), under the supervision of the Ministry of Infrastructure, Natural Resources and Environment, as the institution responsible for the execution and coordination of all policies and government strategies on the environment. In parallel, the National Institute of Meteorology was defined as the institution responsible for recording and disseminating climate data, housing the UNFCCC Focal Point.

Taking into account the country's vulnerabilities to climate change and the need to address and integrate Climate Change issues into national and sectoral development policies, the Government created in May 2012, through Decree nº 13/2012, the National Committee for Climate Change (CNMC), with the aim of coordinating, managing, training and raising awareness among the various stakeholders in São Tomé and Príncipe in matters related to climate change, including policies and measures that promote or result in the reduction of greenhouse gas emissions (GHG), as well as measures that reduce the vulnerability of the economy and populations of STP, adapting them to the diverse impacts of climate change.

In terms of policies and strategies, STP prepared in 2005 the National Strategy for the Implementation of the UNFCCC (ENI), and in 2008 the NAPA (National Action Plan for Adaptation to Climate Change), as a guiding document to address the issues of climate change at the national level. In 2004, the First National Communication (INC) on climate change was prepared, in 2012 the Second National Communication (SNC) and in 2019 the Third National Communication (TNC).

In July 2014, the Proposed Measures for the State of Preparedness (R-PP) was prepared while it was presented by the participating countries of the Program for the Reduction of GHG Emissions from Deforestation and Forest Degradation and Forest Conservation (REDD+). In 2010, the country prepared its National Strategy for Disaster Risk Management and the National Strategy for Poverty Reduction in 2002, revised in 2012 with some focus on the issue of climate change.

In terms of strategic documents on climate change, the country also prepared in 2015 the Contingency Plan for Natural Disasters (2016-2020), in 2016 the National Strategy for Disaster Risk Management and in 2017 the Multisectoral Plan for investments by São Tomé and Príncipe to integrate climate change resilience and disaster risk into coastal zone management with the aim of informing all coastal activities in STP and ensuring resilient development.

In September 2015, the country submitted its INDC (Intended Nationally Determined Contributions) and signed the Paris Agreement in April 2016. In response to its accession to the Paris Agreement, STP prepared its NDC in 2016 (DeterminedNationally Contributions) as a way of engaging in the international effort to reduce CO_2 emissions with the intention of reducing emissions from emitting sectors such as forestry, energy, transport, and industrial development by 2030.

While executing the NDC Implementation Plan, the country joined the NDC Partnership in November 2016. With the support of this organization, the National NDC Implementation Plan was prepared, based on existing national processes, such as the National Development Strategy, the NDC, the National Adaptation Plan, the Multi-sectoral Investment Plan to integrate resilience to climate change and disaster risk in coastal zone management, the Sectoral Plans, as well as broad consultation with the various actors across the whole society.

3. INSTITUTIONAL ARRANGEMENTS

São Tomé and Príncipe established an institutional arrangement for the elaboration of its National Communication and the Biennial Update Report (Figure 6).

The Ministry of Public Works, Infrastructure, Natural Resources and Environment (MOPIRNA) is the entity that leads the activities related to the implementation of the UNFCCC at the national level, through the General Directorate for the Environment and the National Institute of Meteorology (INM). The INM is the institution that leads the elaboration of the National Communications, the Biennial Update Report (BURs) and the Inventory of Greenhouse Gases, through a project management entity (UGP). The UGP is supported by the National Committee for Climate Change (CNMC), working groups (WG) composed of independent national consultants and relevant national institutions responsible for collecting and processing data, calculating emissions, and preparing sectorial reports.

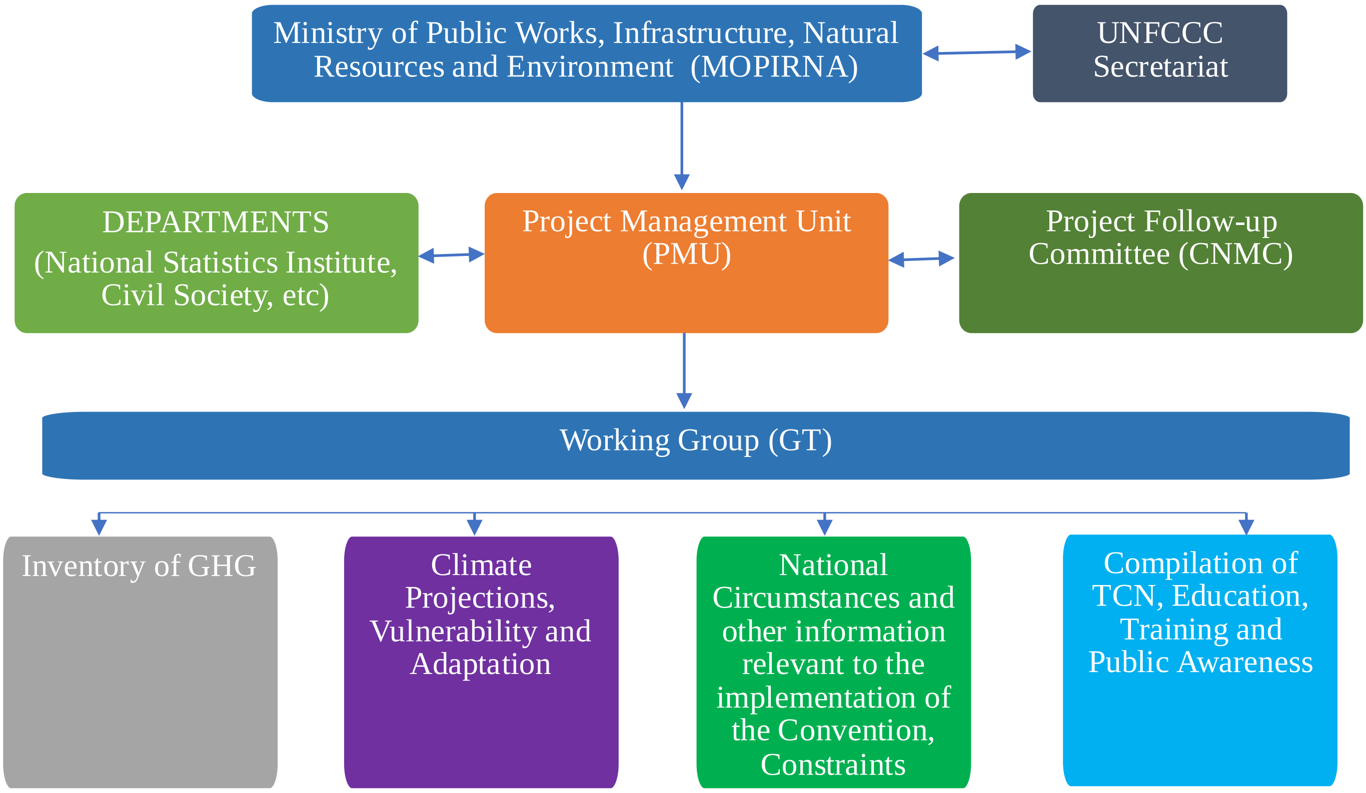


Figure 6-Current National InstitutionalArrangement

4. GREENHOUSE GAS INVENTORY - GHG

The present inventory of greenhouse gas emissions and removal (IGEE) for STP, referring to the year 2018, is the fourth of the country and was prepared based on the methodology established by the guidelines of the Intergovernmental Panel on Climate Change in 2006 (IPCC) and the Good Practice Guide (GBP) for calculating GHG emissions. To calculate the emission and removal estimates, the IPCC *software*, 2006, Ver. 2.69 and the standard emission factors incorporated therein.

According to these guidelines, STP's IGEE covers the following sectors: (i) Energy, (ii) Industrial Processes and Product Use, (iii) Agriculture, Forestry and Other Land Uses (AFOLU) and (iv) Waste.

To calculate the GHG emissions, the following gases were considered: Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O) and Hydrofluorocarbons (HFC).

An assessment of the level and trend of emissions and removals was also carried out, which made it possible to identify the main sources and sinks of GHGs that comprise 95% of the country's total emissions, thus identifying the key categories.

The IGEE 2018 covers the years 2012, 2016 and 2018, so when comparing the values presented in the TCN (IGEE 2012), it shows some change in the results compared to 2012, due to the change in the calculation methodology, that is, from the IPCC, 1996, it was transferred to the IPCC, 2006, with emissions being recalculated from 2012 onwards, in accordance with the recommendations of the Convention, due to the need to improve the quality of the IGEE.

Regarding the previous IGEEs of 1998 and 2005, and to comply with the Convention's Guidelines, STP will review them, recalculating GHG emissions using the IPCC2006 methodology, as well as recalculating emissions for the entire time series from the first IGEE. This implies that STP will need financial, technical, and capacity support to complete such activities, making our commitments to the Convention more transparent, consistent, comparable, complete, and more accurate than they are currently informed at the time of submission. of its next Biennial Update Report.

The 2018 IGEE report can be seen in Annex I, which will serve as a reference for future analysis of the country's emissions.

5. MITIGATION MEASURES

5.1. General vision

São Tomé and Príncipe is part of the “Non-Annex I” group of countries, due to its low level of economic and social development and low level of GHG emissions. As for STP, the countries in this group are not committed to reducing or limiting their anthropogenic emissions.

Despite this, STP has been preparing GHG emissions mitigation studies and proposing a set of mitigation measures, within the scope of National Communications on Climate Change, Nationally Determined Contributions, and the Biennial Update Report.

The process of elaborating Mitigation Measures and Actions and their Effects at the national level was prepared based on the existing national data on the mitigation options identified at the national level, the information collected at the sectoral level, the data and the methodology provided by the Guide of Good Practices of the IPCCC and in the 2nd and 3rd National Communications, as well as in the Nationally Determined Contribution prepared by the country.

This process took place in two phases:

- In the first phase, the gathering and analysis of the studies of mitigation options prepared to date, the identification of possible mitigation options based on the document of the Second (2012) and Third National Communication (2019) and the Determined National Contribution (NDC);

- In the second phase, the analysis of aggregate impacts of mitigation actions proposed by the country was carried out.

The results of the four Greenhouse Gas inventories prepared in the country in 2021, with the reference year 2018, indicate that São Tomé and Príncipe is a carbon dioxide (CO_2) sequestering country, as a resultof the Forestry and Change of Land Use (AFOLU) sectors, although the sequestration data tend to decrease due to the revision of the calculations and due to the country's own socio-economic development and growth, as indicated in in the IGHG report 2018, in annex.

However, despite the country not being a global GHG emitter, there are some emitting sectors such as the Energy sector (Energy Industry – Liquid Fuels, Road Transport, Maritime Shipping, Biomass); the Industrial Processes and Product Use sector, and the AFOLU sector (Direct N_2O Emissions from Managed Soils, Enteric Fermentation and Manure Management) and the waste sector are considered as the main sources of GHG emissions, as indicated in the IGHG in annex.

Bearing in mind that emission from these sectors tends to increase and the trend towards reduction of sequestration in the FOLU sector, the country should make efforts to reduce emissions to achieve the common objective of mitigation.

In this context, in recent years the country has identified measures of a varied nature, incorporating public policies and regulatory actions, national and sectoral plans and programs, as well as related actions, directly or indirectly, with a view to mitigating Greenhouse Gases produced in various sectors mentioned above.

As a country very vulnerable to Climate Change, and with the aim of reducing GHG emissions from these sectors, the country outlined a program of mitigation actions, embodied in its NDC submitted in Paris in 2016, in which it was updated and submitted in 2021.

In the global context, our commitments may seem modest; however, at the national level, they are quite ambitious about mitigation, as, once implemented, they would allow the transition to clean energy and the substitution of fossil fuels, - until now the only primary source for energy production in the country - in addition to meeting one of the country's biggest challenges: sustainable energy production.

5.2. Information on actions to mitigate climate change

As mentioned in the 2021 updated NDC, the mitigation measures that São Tomé and Príncipe identified as a priority to reduce GHG emissions come from the energy sector, namely:

1. **Increase in the share of renewable energy (RE);**
2. **Reduction of losses in the network and improvement of energy efficiency;**
3. **Reduction of carbon intensity in mobility.**

With the implementation of these measures, STP will be able to contribute to the reduction of GHG by around 109 ktCO_2eq, which corresponds to approximately 27% of emission reductions in 2030 and with an estimated total cost of around 150 million US dollars.

The emission reduction target is conditional on receiving external support to reduce projected emissions in the BAU Scenario by 2030. Projected emissions cover the entire national territory and all sectors of the economy, excluding the LULUCF sector, since the country has been climate neutral since the beginning of the calculations of the national inventory of GHG emissions.

The updated STP NDC is more ambitious and presents improvements in relation to the 2015 NDC (the GHG reduction presented was 57 ktCO_2eq) as the mitigation contributions with a total target of 109 ktCO_2eq of GHG reduction represent an additional reduction of around of 90% (equivalent to about 52 ktCO_2eq). This increase in ambition is also illustrated by the increase in the number of specific mitigation, adaptation and transversal measures retained, which rose from 18 to 29, with greater emphasis on the prospect of increasing renewable energy production from 26 MW to 47 MW, as well as in the increase in energy efficiency. (See table 6).

Table 6- Contribution measures with cost valuation and the respective contribution to GHG reduction.

Mitigation contributions		GHG Reduction ktCO_2/yr	Invest. MUS$	Status [Idea, planification phase, in implementation]	Interval ofanual growth in GHG reduction (2020 -2030)
1– Increase in Renewable Energies:		**63,0**	**117,0**		
1.1.	Solar PV (30 MW)	26,6	30,0	In implementation (Piloto of 0,5 MW) Financing (2,5MW Guaranteed) Remaining MW without financing	3-27 ktCO_2e
1.2.	Solar PV Residential (800x3kW)	1,9	3,6	Idea	1 – 4 ktCO_2e
1.3	Isolated Mini Hydro (13 MW)	25,2	71,5	Idea	2 – 25 ktCO_2e
1.4	Mini Hydro (13 MW)	3,2	4,5	Idea	1 – 4 ktCO_2e
1.5	Energy from biomass residues (2,5 MW)	6,1	7,4	Idea	1 - 7 ktCO_2e
2 –Losses reduction and Energy efficiency:		**39,3**	**15,1**		
2.1.	2.1- Efficient residential lighting (300,000 LEDs)	30,5	3,9	Ongoing since 2020. Launched in 2023.	3 -30 ktCO_2e
2.2	Efficient public lighting (10,000)	3,9	1,6	Idea	1 – 4 ktCO_2e
2.3	Rehabilitation of electric network to more efficiency to reduce losses (10 GWh)	4,9	9,6	Idea	1 – 5 ktCO_2e
3. Carbon intensity reduction in mobility		**6,0**	**18,6**		
3.1.	Electric vehicles (5,000)	4,5	4,5	Idea	1 – 5 ktCO_2e
3.2	Electric motorcycles (1,000)	0,2	1,6	Idea	0 – 1 ktCO_2e
3.3	Public transports with 12 seats (100)	1,4	12,5	Idea	1 - 2 ktCO_2e

Mitigation contributions	GHG Reduction $ktCO_2/yr$	Invest. MUS$	Status [Idea, planification phase, in implementation]	Interval ofanual growth in GHG reduction (2020 -2030)
Total GHGreduced	**108,4**	**150,8**		

Source: Adapted from NDC-STP, 2021

The mitigation contributions proposed in the updated NDC-STP aim to accelerate efforts made by the international community to combat climate change in a context of sustainable development. São Tomé and Príncipe's 2030 commitments will also contribute to meeting the 2050 emissions neutrality target.

The table below provides an overview of the mitigation measures and actions identified under this chapter, in line with the 2021 updated NDC, as well as the impact on socio-economic and sustainable development for the country; environmental benefits they may bring, as well as their feasibility according to the realities of the country.

Table7 -Overview of actions to mitigate climate change

Name of the mitigation action	Short description	Nature of action (type instrument: regulation, economic incentive, planning, etc.)	Sector(s)	Gases	Quantitative objectives	Progress indicators	Information on methodologies and assumptions	Objectives and measures taken or planned to carry out the action	Status (implementation progress and implementation start year)	Estimates of expected and achieved GHG emission reductions	Co-benefits of non-GHG mitigation (sustainable development)	Information on international market mechanisms
1.Increased share of renewable energy (RE)	With adequate support, São Tomé and Príncipe intends to make a major shift towards a low carbon economy, increasing the participation of REs in the supply of electricity.	Reduce the import of fossil fuels,improve the financial aspects of the energy sector, Implement your Least Cost Development Plan (LCDP),	Energy (Energy industry)	CH_4, N_2O, CO_2	•Installation of solar PV plants (30 MW) •Installation of domestic solar PV (800 residences / 3 KW); •Construction of an isolated mini-hydro plant (1 MW); •Construction of hydro plants connected to the main grid (13 MW); •Energy from biomass residues (2.5 MW)	Increase the share of renewable energy in the energy mix to around 50% by 2030 Reduce the Sector's GHG emissions	All information on methodology and assumptions can be consulted in the updated NDC2021 and submitted to the convention	Increase the participation of REs in the supply of electricity, ensuring the reduction of GHG emissions.	In implementation since 2020, the 0.5 MW Solar PV Plant pilot project	Solar PV: 3 to 27 ktCO_2e by 2030; Hydro: 2 to 25 k tCO_2e by 2030; Biomass: 1 to 6 k tCO_2e by 2030;	Promote employment opportunities for youth and women in the RE field.	N/A

Name of the mitigation action	Short description	Nature of action (type instrument: regulation, economic incentive, planning, etc.)	Sector(s)	Gases	Quantitative objectives	Progress indicators	Information on methodologies and assumptions	Objectives and measures taken or planned to carry out the action	Status (implementation progress and implementation start year)	Estimates of expected and achieved GHG emission reductions	Co-benefits of non-GHG mitigation (sustainable development)	Information on international market mechanisms
2 Loss reduction and Energy Efficiency:	With adequate support, São Tomé and Príncipe intends to increase energy efficiency, through EE policies and reduction of technical losses in the network.	Introduction of incentive mechanisms to improve energy efficiency in the electricity sector, as well as the sector's capacity building and infrastructure needs	Energy (residential, Services)	CH_4, N_2O, CO_2	Home lighting with LED (393 thousand units); public lighting with LED (10 thousand units); Modernization and strengthening of transmission and distribution networks	Annual emission reduction, smart meters installed, Energy consumption reduction reduction of technical losses (10 GWh);	All information on methodology and assumptions can be consulted in the updated NDC2021 and submitted to the convention	Reduction of electricity consumption The main objective is to intervene in 60,000 homes by replacing conventional light bulbs with LEDs and smart meters.	2021 Home lighting with LED (USD 504,454) Other measures in search of financing	Expected to reduce by 5 – 40 $ktCO_2eq$ by the year 2030	Expected to reduce by 5 – 40 $ktCO_2eq$ by the year 2030	N/A

Name of the mitigation action	Short description	Nature of action (type instrument: regulation, economic incentive, planning, etc.)	Sector(s)	Gases	Quantitative objectives	Progress indicators	Information on methodologies and assumptions	Objectives and measures taken or planned to carry out the action	Status (implementation progress and implementation start year)	Estimates of expected and achieved GHG emission reductions	Co-benefits of non-GHG mitigation (sustainable development)	Information on international market mechanisms
3. Reduction of carbon intensity in mobility	With adequate support, São Tomé and Príncipe plans to introduce electric vehicles	Introduction of electric vehicles and incentive mechanisms for their importation, as well as capacity building needs	Energy (Transport)	CH_4, N_2O, CO_2	5 thousand light electric vehicles, thousand motorcycles 100 buses for public transport and the installation of about 2 thousand points or charging stations	Reduction of fossil fuel consumption. Reduction of GHG emissions Reduction of noise pollution Improved air quality	All information on methodology and assumptions can be consulted in the updated NDC2021 and submitted to the convention	Fossil fuel reduction, Looking for funding		Expected to reduce by 1 – 6 $ktCO_2eq$ by the year 2030	Transport is a transversal element to all areas of social development. job creation Direct improvement in the health of the population.	N/A

Source: Adapted from NDC-STP 2021 detailled

5.3. Other information on mitigation actions

With the support of the NDC Partnership, STP developed the NDC Implementation Plan[4] in 2018 to advance the mitigation and adaptation components of its NDC. The NDC Implementation Plan is based on national and sectoral priorities and has been developed through a society-wide and economy-wide approach, including government institutions, NGOs, the private sector, international partners, and academia. The Plan serves as a planning, coordination, transparency, and resource mobilization tool for the Government and is being implemented with the support of national and international stakeholders.

STP updated said plan after the 2021 NDC update, in which other and new measures were included that cover other sectors not considered in the NDC, some of them with direct mitigation benefits and others with co-benefit of adaptation, making it even more ambitious in terms of reducing GHG emissions, and moving towards sustainable development, if the plan is implemented in its entirety within the period 2022-2030.

With the inclusion of these new measures, there is every need to be able to account for their contributions in terms of reducing CO_2e emissions, to be reported later, as financial support will be needed to better understand their potential, above all, supporting training in the areas of mitigation in causes.

[4]https://ndcpartnershipplans.com/public/view/3c060d50-3b75-4fc2-8ee4-633325761650?fbclid=IwAR01QtqYPGoq7Z8cZ3yApJOR-5QgV7TDpOy6oqCamjz5ZpeYajzjscSMA-U

6. INFORMATION ON THE NATIONAL MONITORING, REPORTING AND VERIFICATION SYSTEM (SN-MRV)

The SN-MRV system in São Tomé and Príncipe is based on the institutional mechanism created for the process of elaborating the NCs, IGEE and BURs. This system is structured as follows:

- The National Institute of Meteorology (INM) in coordination with the Directorate General for the Environment (DGA): It is responsible for coordinating at national level the preparation of National Communications on Climate Change (CNCC); Greenhouse Gas Inventory (IGEE) and Biennial Update Reports (BURs) through a Project Management Unit (UGP) based at INM.

    - The Coordinating Entity is directly supported by the multisectoral National Committee for Climate Change (CNMC), by the Working Groups (WG) composed of independent national consultants and by the relevant national institutions (Involved Institutions).

- **Six (6) working groups:** responsible for collecting, processing data and calculating emissions and preparing sectoral reports.
    - The **National Circumstances Working Group:** is responsible for the collection and analysis of national data on the different sectors that have a direct or indirect relationship with the changes and preparation of the chapter on National Circumstances.
    - **The IGEE Working Group:**is responsible for data collection activities on greenhouse gas (GHG) emissions for all potential emitting sectors and for preparing national GE inventories. Based on calculations of anthropogenic emissions Based on the Intergovernmental Panel on Climate Change (IPCC) Guidelines, inventories are prepared.
    - **The Mitigation Information Working Group:** is responsible for providing information on the impact of the mitigation actions developed and institutionalized, as well as for the preparation of the respective chapter.

- **The Adaptation Information Working Group:** is responsible for providing information on the impact of the adaptation actions developed and institutionalized, as well as for the preparation of the respective chapter.
- The **Working Group on constraints and gaps associated with the need for technical and financial capacity building to strengthen the different thematic areas (Education, Training, and public awareness):** is responsible for identifying the main constraints and gaps associated with technical, technological, and financial needs.

The STP MRV System is not yet properly structured, as the country still does not have an institutional arrangement that includes legal or official agreements defined to implement the MRV system and that support the process of elaborating NCs, IGHG and BURs on a regular basis. For the system to work continuously and consistently, it is essential to establish adequate communication mechanisms between key institutions, maintaining clarity and understanding of their obligations by all those involved.

To facilitate the data collection process in the future, the country should adopt a mechanism that involves all the involved parties, in the form of a coordination device of the MRV system where all the data for the realization of NCs, IGHG, BURs are stored.

- **Data and Metadata Collection**

The data collection process should involve all the main stakeholders from the different sectors covered by the IGEE, Mitigation, Adaptation, as well as support for Technology Transfer, Capacity Building and Financing.

- **Data processing and management**

This task is organized into three levels:

1. **Data storage and archiving:** the first level of data management treatment of the national MRV system should be a virtual platform for the backup and recovery of all data from the national MRV system (SN-MRV) through a server for this purpose. A geo-portal should be developed that will contain all the information related to the activities of implementation of the convention (UNFCCC) in general and the activities of the SN-MRV in particular. The storage platform will house three types of data namely: (i) raw data and metadata provided by the stakeholders holding the data, (ii) data processed and validated by experts, and (iii) reports and

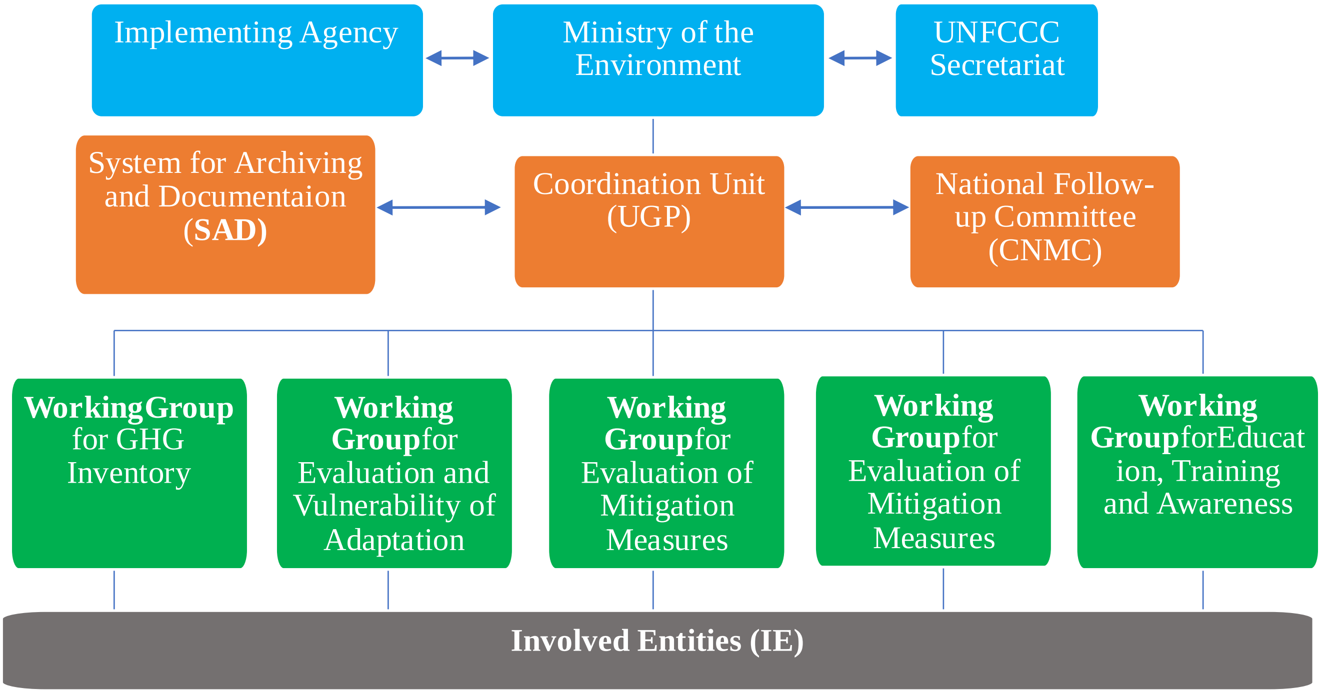
data published by SN-MRV. This platform should be led by a group of technicians to guarantee the good quality/quality control of data from the SN-MRV team.

2. **Processing, analysis, and interpretation of data:** this stage will be ensured by the different structures in charge of the IGEE, Mitigation, Vulnerability and Adaptation studies, according to the competences and areas of intervention, as well as by the individual technicians responsible for carrying out support studies. These institutions and technicians will be represented in the data quality/quality control working group to ensure the good quality of data in the different sectors involved.
3. **Monitoring of indicators:** this activity should be led by a working group responsible for proposing appropriate, relevant, measurable, and necessary indicators to measure the impacts of mitigation, adaptation, and development actions. It should also collect and analyse progress data from the baseline (baseline) and monitor emissions avoided by different mitigation, adaptation (co-benefits) and development projects. The indicator monitoring working group will establish a register of national indicators which will be regularly updated. It should also develop indicators to monitor the performance of the SN-MRV itself. This will make it possible to verify the proper functioning and its effectiveness.
4. **Notification**: Notification concerns the publication of processed and interpreted data and made available to national decision-makers and/or international climate partners. This notification will take the form of technical reports (e.g.inventories, project-by-project mitigation results, etc.), to be published at a frequency to be determined by the National Committee for Climate Change (CNMC). This will help in decision-making in terms of planning a low-carbon and climate- resilient development.

The proposed new institutional arrangement is described in Figure 9, being broader. It encompasses the coordinating entity that will coordinate all activities, from archiving all GHG inventory inputs, such as software compilation reports and databases, with a copy in duplicate or kept in the clouds, the inter-ministerial committee (CNMC), the working groups.

Data collection, reporting, quality control, assurance and archiving procedures are also part of this system.

Figure 7. Proposed Institutional Arrangement



Source: Quaresma, Sulissa2019

It is proposed (5) national coordination support working groups, according to Figure 19:

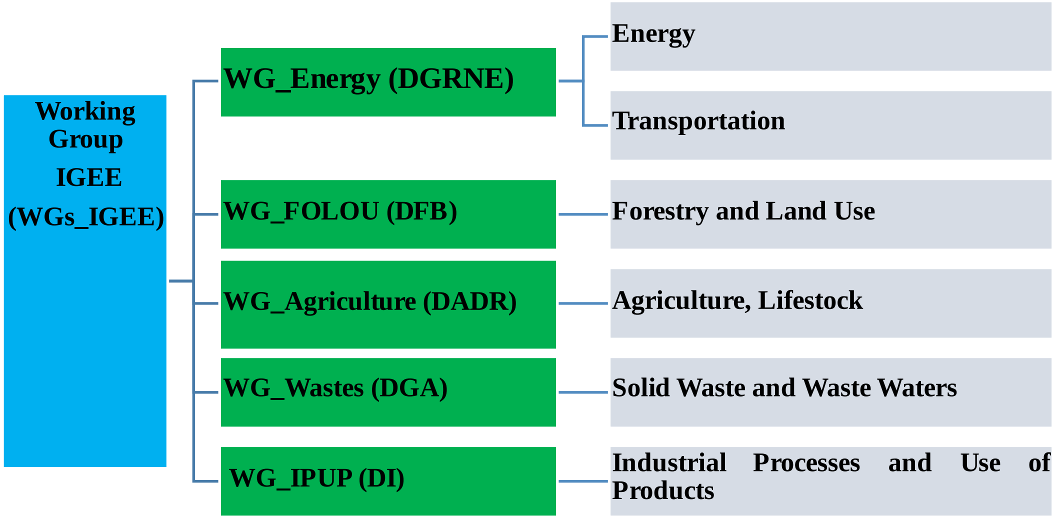
- Working Groups for GHG Inventories (**WG_ Inventory**);
- Working Group for Evaluation of Mitigation Measures (**WG_ Mitigation**);
- Working Group for Adaptation Vulnerability and Assessment (**WG_ Adaptation**);
- Working Group for QA/QC Quality Control and Assurance (**WG_QA/QC**);
- Working Group on Education, Training and Public Awareness (**WG_EFS**).

With the change in the current institutional arrangement, it will be necessary, mainly, to designate the official points of contact in the aforementioned institutions.

The GT_IGEE will carry out the collection and calculation of emissions through the preparation of sectoral reports. Each subgroup (WG) will have an IR that coordinates the work inherent to them and will work in close collaboration with other institutions as shown in figure 7.

Regarding the Working Group (WG) on Greenhouse Inventory (IGEE) defines the Responsible Institutions (RI) directly involved in the process of drawing up inventories and will be responsible for each sector of the IPCC, namely:

Figura 8 – Working Groups for theelaboration of the Inventories



Source: Quaresma, 2019

A greater involvement of Government Institutions/Directions with sectoral responsibility or supervision is recommended. Public institutions will be responsible for the activities of collecting and calculating emissions:

- ✓ **WG - Energy:** compile data on electricity production and mobile combustion as in transport. The entity responsible for thisWG is the ***Directorate General for Natural Resources and Energy***.
- ✓ **WG - IPPU:** compile data on GHG emissions from the industrial sector and use of products. The entity responsible for thisWG is the ***Industry Directorate.***
- ✓ **WG - FOLU**: compile data on the emission and removal of GHGs from the forest sector and other land uses. The entity responsible for thisWG is the ***Directorate of Forests and Biodiversity***.
- ✓ **WG - Agriculture:** compile data on the emission and removal of GHGs from the agriculture sector. The entity responsible for thisWG is the ***Director of Agriculture and Rural Development***.
- ✓ **WG -Waste** to compile data on GHG emissions from the waste and wastewater sector. The entity responsible for thiWG is **the *Director General for the Environment***.

This proposed model will make it possible to build a robust, transparent, accurate, complete, comparable, and consistent basis to commit to preparing robust climate reports (NCs and BURs) in a systematic way in order to meet the reporting requirements under the UNFCCC, as well as how to measure the evolution of emissions and historical GHG reductions, and report and verify domestically and internationally.

7. CONSTRAINTS AND GAPS, AND RELATED FINANCIAL, TECHNICAL AND CAPACITY NEEDS

In the development of the Biennial Update Reports of Parties not included in Annex I to the Convention, in Annex III, Decision 2/CP17 establishes that countries not included in Annex I to the Convention must provide updated information on: Needs for financial resources, training and assistance technique and technology transfer, including the analysis of their gaps and barriers. As well as the support received in the form of financial resources, training and technical assistance and technology transfer, which the country received from the Global Environment Fund, the Green Climate Fund, and other bilateral and multilateral institutions.

7.1. Barriers and gaps, financial, technological and capability needs

During the process of preparing this BUR, as it was the first time, aided by the restrictions of the pandemic period (COVID-19) and the limitations of our capacities, we encountered several constraints that prevented the fulfilment of the initially proposed deadline, or that is, it took more than two years to complete. Not with standing this, the same difficulties and gaps reported in the previous NCs persist, which relate to the development of reports of the main chapters required by the convention, especially in GHG inventories and in the mitigation component, regarding the availability, collection and treatment of activity data, emission factors, projections, and implementation of measures.

However, with the support received in terms of technical assistance, it is clear that there has been significant progress in terms of the level of technical knowledge of the specialists involved, in the improvement and production of these reports in general.

The table below presents the main constraints found when preparing the different chapters of the BUR, most of which also arise from the previous NCs.

Table8. Barriers and Gaps

Type of Barriers and Gaps	Description
Capacity Barriers	Difficulties encountered in terms of accessing and mobilizing support for capacity development related to: - Availability of demand-driven capacity development - The breadth and depth of training - The ability to plan, design, implement and execute development objectives
	Constraints related to the collection, compilation, classification, documentation and archiving of information related to the development of available capacities to implement activities, measures and programs with multiple uses or co-benefits related to climate change: - Availability of disaggregated information on capacity building - Institutional challenges related to the coordination of support for capacity building
	- Challenges in developing and maintaining capabilities
Technical Barriers	Difficulties encountered in terms of accessing and mobilizing technical support
	Constraints related to the collection and processing of data, compilation, classification, documentation and archiving of information related to climate change: - Availability of disaggregated information on technical support - Institutional challenges related to the coordination of technical support
Financial and Economic Barriers	Constraints related to the collection and processing of data, compilation, classification, documentation and archiving of information related to climate change: - Availability of disaggregated information on technical support - Institutional challenges related to the coordination of technical support
	Collection and compilation of information on available financial resources to implement activities, measures, and programs in multiple uses or with co-benefits related to climate change
	Level of transparency related to financing the fight against climate change, including non-cash transfers for technical assistance and training
	Technical constraints on how to collect, use, compile and store data related to climate change finance
	Institutional challenges related to coordinating the financing of climate change actions
Linguistic Barriers	Most national technicians have difficulties in terms of language, since most of the documents made available by the convention are not available in Portuguese, namely: - Technical documents - Methodologies - Some guidelines - Climate models - Software

It is very important to point out that STP, is a small island and developing state, of lower middle income, with a fragile economy. It is highly vulnerable to exogenous shocks, according to the World Bank, which limits access to international cooperation financing funds for the development of infrastructure projects with lenient conditions. This is a transcendental limitation, as it poses a major obstacle to the development of technology that is difficult to achieve without external cooperation.

In this first Biennial Report, some of the barriers and financial, technical and capacity needs are presented, it is not an exhaustive study of them, but it is an indication that the country needs to overcome important obstacles and there is a need to improve and expand cooperation in some specific areas, and promote the exchange of knowledge, tools and technologies to increase the effectiveness of the actions proposed in the sectoral plans.

These barriers and gaps identified above also constitute a handicap in the implementation of mitigation and adaptation actions presented by the country through its NDC to the Convention.

Reducing limitations and mitigating gaps will only be possible in the medium and long term through country-planned improvement efforts. But this will require permanent and sustained support from the country, bilateral and multilateral partners, and donors.

7.2. Information on received support

Climate support is critical to achieving high climate ambition. As a result, São Tomé and Príncipe has been consistent in mobilizing indispensable financial resources and technical assistance from various sources to help offset the additional cost that the economy has in combating climate change and having managed to obtain these resources to prepare its reports (NCs and BUR), and for the implementation of several linked projects related to climate change that include financial, technical assistance and technology and capacity transfer.

From the information collected from the responsible entity and national and international partners, it was found that the information on support received is not concentrated in a single institution and is not disaggregated or detailed enough in accordance with the guidelines of the convention, that is, there is every need to do an exhaustive work that meets what is required as minimum requirements by the convention, with a view to being reported in the next reports.

In this sense, STP requests support to overcome the gaps found in the resources received, in terms of data collection and disaggregation and concentration of information in a responsible institution that can respond to the required requirements.

7.3. Information on the support received for the preparation and delivery of the BUR

The financial cooperation that STP receives through bilateral and multilateral organizations is essential to fulfil the commitments assumed, not only with the ratification of the Convention, but also with the commitments assumed in the future.

Regarding the support received under the BUR1 scheduled for 2017 to 2019, the funding received from the Global Environment Fund (GEF) was USD 342,000.00 and the contribution in kind from the Government of S. Tomé and Príncipe was equivalent to the USD 20,000.00. The budget for the components, including the contribution in kind, is presented as follows:

Table 9. Project Financing and Budget by BUR Components1: breakdown of GEF funds and Government in-kind co-financing

Components	GEF concession proposal	Co-financing in kind	Total Project Financing
1. National circumstances and institutional arrangements of the BUR	14,000		14,000
2. National Inventory of Anthropogenic Emissions by Sources and Removals by Sinks	108,000		108,000
3. Mitigation actions and their effects, including associated methodologies and principles	83,500		83,500
4. Constraints and gaps, and related financial, technical and capacity needs, including support needed and received	8,000		8,000

5. Information on National Measures, Reporting and Verification	42,500		42,500
6. Any other information relevant to the BUR process	5,000		5,000
7. Technical Assistance	15,000		15,000
8.Publication and presentation of the Biennial Update Report	15,000		15,000
9. Financial monitoring, evaluation, and auditing	19,000		19,000
10. Project management	32,000	20,000	52,000
TOTAL	**342,000**	**20,000**	**362,000**

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ANNEX

STP GHG INVENTORY

DEMOCRATIC REPUBLIC OF SAO TOME AND PRINCIPE

IV

NATIONAL GREENHOUSE GASES INVENTORY

2018

SAO TOME, SEPTEMBER 2021

NATIONAL GREENHOUSE GASES INVENTORY TEAM OF S. TOME AND PRINCIPE - 2018

NATIONAL ENTITY : National Institute of Meteorology / Ministry of Infrastructure, Natural Resources and Environment

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Edition/Publication
São Tome and Principe, 24 September 2021.

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ACRONYMS AND ABBREVIATIONS

AFOLU - Agriculture, Forestry and Other Land Uses
CADR - Rural Development Support Center
BOD - Biochemical Oxygen Demand
CIAT - Center for Agronomic and Technological Research
CH_4 - Methane
CO - Carbon Monoxide
CO_2 - Carbon Dioxide
CO_2 eq - Carbon Dioxide Equivalent
UNFCCC - United Nations Framework Convention on Climate Change
COD - Chemical Oxygen Demand
DA – Customs Directorate
BOD_5 - Degraded Organic Component
DFB - Directorate of Forestsand Biodiversity
DGA – General Directorate of Environment
DGP – General Directorate of Fisheries
DGRNE – General Directorate of Natural Resources and Energy
DI - Directorate of Industries
DIm – Tax Directorate
DP – Livestock Department
DPs – General Directorate of Fisheries
COD_5 - Chemical Oxygen Demand
DTT – Land Transport Directorate
EMAE - Water and Electricity Company
ENAPORT – National Port Administration Company
ENASA – National Airport and Air Safety Company
ENCO - National Fuel and Oil Company
ENRP - National Poverty Reduction Strategy
PPE - Personal Protective Equipment
WWTPs - Wastewater Treatment Stations
FAO – Food and Agriculture Organization of the United Nations
FAOSTAT - FAO Statistics
FCM – Methane Correction Factor
EF - Emission Factor
FSN - Synthetic Nitrogen Fertilizer
COD - Degradable Organic Carbon
GBP - Good Practice Guides
GHG - Greenhouse Gases
Gg – Gigagram
GWP - Global Warming Potential
ha – hectare
FDI – Foreign Direct Investment
IGEE - National Inventory of Greenhouse Gases
INAE - National Institute of Roads
INE - National Institute of Statistics
INM - National Institute of Meteorology
IPCC – Intergovernmental Panel on Climate Change
IPPU - Industrial Processes and Product Uses
kg - Kilogram
kha – Kilohectare (1 000 ha)

km – Kilometer
kt – Kiloton
kt ms - Kilotons of dry matter
kW – Kilo Watt
MAPDR – Ministry of Agriculture, Fisheries and Rural Development
MC - Climate Change
CDM – Clean Development Mechanism
Mg – Megagram (1 000 000 g)
MIRNA - Ministry of Infrastructure Natural Resources and Environment
MW – Mega Watt
MWh – Mega Watt hour
N_2O - Nitrous Oxide
NA - Not Applicable
NAI - Non-Annex 1
ND - Not Determined
NE - Not Estimated
NH3 - Ammonia
NPK - Nitrogen, Phosphorus and Potassium
NMVOC -Methane Volatile Organic Compounds
NO - Does not occur
NO_X - Oxides of Nitrogen
O - Occurs
SDGs – Sustainable Development Goals
GWP - Global Warming Potential
PAGIRSU – Action Plan for Integrated Management of Urban Solid Waste
GDP - Gross Domestic Product
Obo Natural Park
POP - Persistent Organic Pollutants
MSW - Urban Solid Waste
SAR - Second Assessment Report (Second Assessment report)
SCN - Second National Communication
SO_2 - Sulfur Dioxide
STP – São Tome and Principe
t – ton
t-20 – Time corresponding to the 20 years prior to the current year of the inventory
TCN - Third National Communication
TEP – Equivalent Tonne of Oil
TJ – Tera Joule
tms / ha – Tons of dry matter per hectare
tms /m^3 - Tonne of dry matter per cubic meter
UNFCCC – United Nations Framework Convention on Climate Change
VOA – Voice of America

Executive Summary

São Tomé and Príncipe (STP) ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 27 October 1998, thus becoming a Party to the Convention, undertaking to develop, update , publish and communicate to the Conference of the Parties (COP) national inventories of emissions and removals of Greenhouse Gases (GHG) as an integral part of their National Communication, whenever appropriate.

Therefore, this document isthe fourth inventory of emission and removal of greenhouse gases (IGEE) of STP, referring to the year 2018 and was prepared based on the methodology established by the guidelines of the Intergovernmental Panel on Climate Change in 2006 (IPCC) and the Good Practice Guide (GPG) for calculating GHG emissions. To calculate the emission and removal estimates, the IPCC *software*, 2006, Ver. 2.69 and the standard emission factors incorporated therein.

According to these guidelines, the IGEE of STP covers the following sectors: Energy, Industrial Processes and Product Use, Agriculture, Forestry and Other Land Uses (AFOLU) and Waste.

To calculate the GHG emissions, the following gases were considered: Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O) and hydrofluorocarbons (HFC).

An assessment of the level and trend of emissions and removals was also carried out, which made it possible to identify the main sources and sinks of GHGs that comprise 95% of the country's total emissions, thus identifying the key categories.

GREENHOUSE GAS EMISSIONS

This summary contains emissions, by source categories and by gas type, expressed in gigagrams of carbon dioxide equivalent (Gg CO_2 eq), representing the sum of all gases converted according to their respective global warming potentials (GWP -SAR): CO_2 =1, CH_4 = 21 and N_2O=310.

After collecting, processing data and performing the calculations, the results of GHG emissions from STP were obtained for the reference year of 2018, as well as for the intermediate year of 2016, with respect to the last inventory of 2012, as if presented in Table 1.

Table 1 shows the evolution of CO_2eq emissions with some change in the results in relation to previous inventories, since the methodology was changed in their calculations, that is, from the IPCC,1996 to IPCC,2006, where it was recalculated emissions from 2012, in accordance with the recommendations of the Convention, with a view to improving the IGEE.

It is expected that for the next inventory, the remaining emissions from previous years (1998 and 2005) will be recalculated, as well as the estimation of GHG emissions for a time series of the first inventory that reflects annual emissions.

Table 1- Evolution of CO_2 eq. by Sector, 2012 -2018

Year	2012		2016		2018		
sector	CO_2 eq emissions. (Gg)	CO_2 eq removals. (Gg)	CO_2 eq emissions . (Gg)	CO_2 eq removals. (Gg)	CO_2 eq emissions . (Gg)	CO_2 eq removals. (Gg)	HFC emissions in CO_2 eq .
1 Energy	118.18		155.81		160.95		
2 Proc. industrial	---		---		---		7.52
3 AFOLU:							
- AgricultureandLivestock	*21.39*		*23.45*		*24.41*		
- FOLU		*-418.86*		*-523.26*		*-516.01*	
4 Waste	16.57		18.68		19.62		
TOTAL (excl FOLU)	**156.14**		**197.94**		**204.98**		7.52
TOTAL (incl FOLU)		**-262.71**		**-325.32**		**-311.04**	-303.52

Source: Ownelaboration

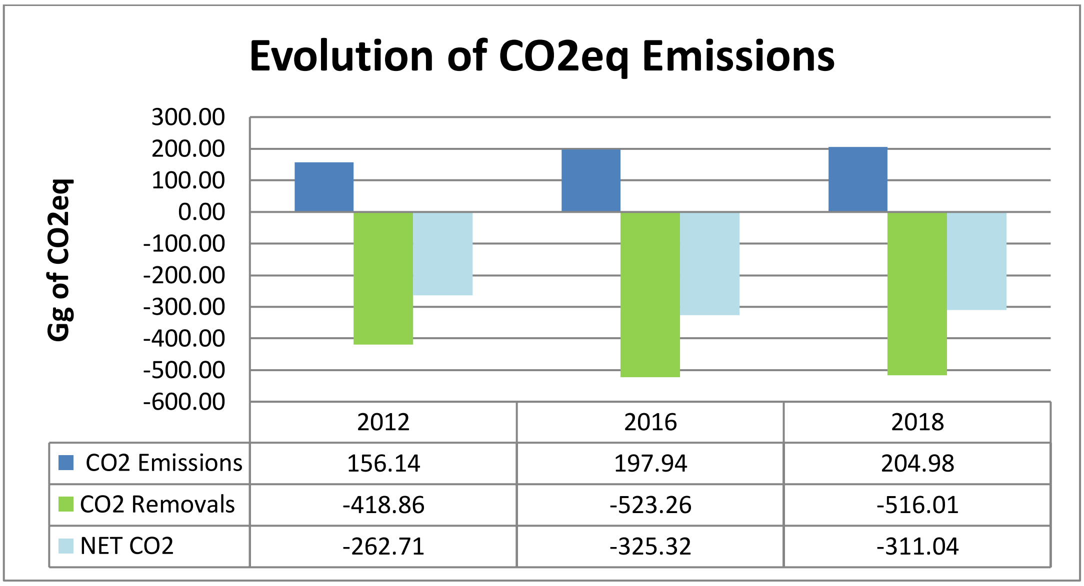
In STP, GHG emissions (for the main gases) in 2018 were estimated at 204.98 Gg of CO_2 eq. (excluding FOLU), which represents an increase of 31% compared to the value of the last inventory carried out in 2012, while removals increased by 23%, as shown in the following table.

Table 2- Evolution of CO_2 eq. by type of gas.

Gas	**CO_2eq . (Gg**		**Variation**
Year/	**2012**	**2018**	
CO_2	111.01	153.09	38%
CH_4	26.46	30.44	15%
N_2O	18.67	21.44	15%
CO_2eq emissions	**156.14**	**204.98**	31%
CO_2eq removals	**-418.86**	**-516.01**	23%
BALANCE	**-262.71**	**-311.04**	18%

Source: Own elaboration

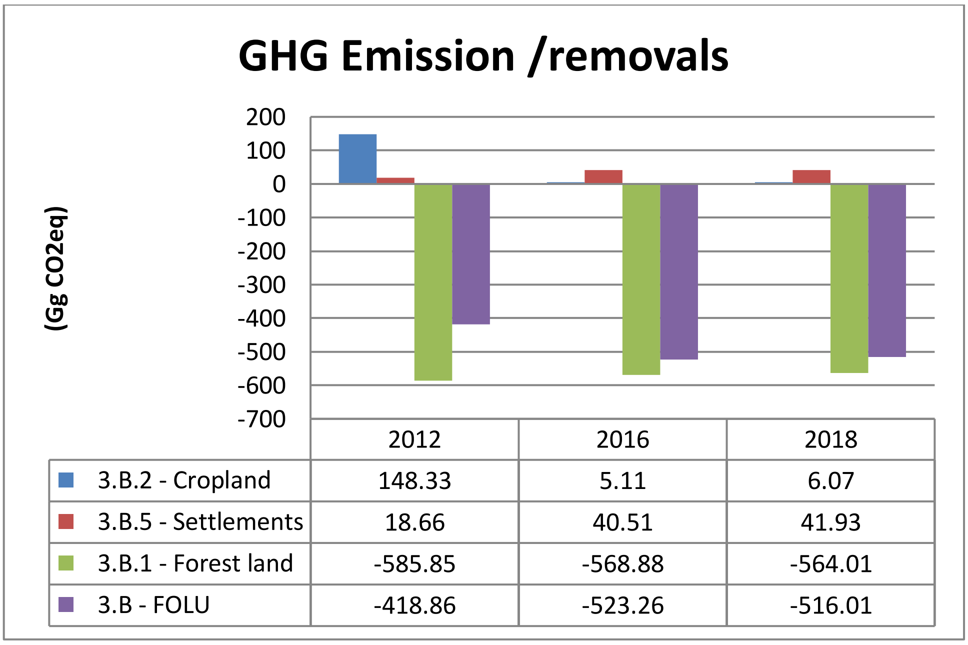
STP, due to its history of emissions since the first inventory, continues to be a GHG sink country, as illustrated in the following figure.



	2012	2016	2018
CO2 Emissions	156.14	197.94	204.98
CO2 Removals	-418.86	-523.26	-516.01
NET CO2	-262.71	-325.32	-311.04

Figure 1- Evolution of GHG Emissions

If we compare with the last inventory of 2012, there was an increase in the order of 23% in CO2 removals, as shown in table 1. The positive balance of emissions in the Forests and Other Land Uses (FOLU) sector is due to due to the fact that in recent years there have not been major conversions of forests into other types of land use. Nevertheless, as shown in Figure 2, the carbon sequestration capacity by forests has been gradually decreasing over the years.



	2012	2016	2018
3.B.2 - Cropland	148.33	5.11	6.07
3.B.5 - Settlements	18.66	40.51	41.93
3.B.1 - Forest land	-585.85	-568.88	-564.01
3.B - FOLU	-418.86	-523.26	-516.01

Figure 2- Evolution of GHG Emissions in the FOLU Category

Concerning the emissions of HFCs, they were estimated for the first time at 7.52 Gg of CO_2eq.

1 INTRODUCTION

São Tomé and Príncipe (STP) ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 27 October 1998, thus becoming a contracting party to the Convention, undertaking to develop, update, publish national inventories of GHG emissions and removals as an integral part of their National Communication, to be submitted when appropriate, and participate in the Conference of the Parties (COP).

This document presents the fourth Inventory of Greenhouse Gases (IGEE) of STP, referring to the year 2018 and is the result of the compilation of the various sectoral inventories.

According to the Guidelines of the Intergovernmental Panel on Climate Change (IPCC 2006), the IGEE of STP covers the following sectors: Energy; Industrial Processes and Product Use (IPPU); Agriculture, Forestry and Other Land Uses (AFOLU) and Waste.

In order to calculate GHG emissions and removals, due to the change in methodology from IPCC, 1996 to IPCC, 2006, the main gases were considered: Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), and as well as hydrofluorocarbons (HFCs). On the other hand, anthropogenic emissions from sources of other greenhouse gases, such as: CO, Nox and NMVOC, this time, were not estimated, taking into account that the IPCC Software used does not allow calculations of these gases, as well as the levels of emissions recorded in previous inventories are very insignificant .

Regarding PCFCs and SF_6 gases,they were not inventoried due to the unavailability of statistical data and reports that could mention their situation at the national level.

1.1 Methodology

The UNFCCC makes available to member countries, through the IPCC, various tools that guide the preparation of IGEE.

In order to comply with article 4, item 1, subparagraph "a" of the UNFCCC, the IPCC made available, in 1995, a methodology to be adopted for the elaboration of national inventories of greenhouse gas emissions. This methodology was first revised in 1996 (*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*) and a second review in 2006 (*2006 IPCC Guidelines for National Greenhouse Gas Inventories , Prepared by the national Greenhouse Gas inventories Program*).

To prepare this inventory, the country carefully chose to change the methodology used in the first 3 inventories, which was the IPCC 1996 Guidelines for those of the IPCC 2006, both with Tier 1 level.

The IPCC2000 Manual of Good Practices was used, being one of the instruments recommended by the IPCC, to guide member countries with regard to the reliability of the processed data, in relation to the emission sources.

As there are no national emission factors , the default values or default values were used , most of them expressed in the IPCC manuals, 2006. In some cases, factors from other countries or from the sub-region were used. inserted STP, through bibliographic consultations of documents that served as support for the preparation of inventories.

The *software* made available by the UNFCCC Secretariat, *IPCC Inventory Software Ver. 2.69* , the IPCC2006 Guidelines and the Good Practice Guide (IPCC2000). In the Annex, the main tables recommended by the convention can be consulted, extracted from the Software, with the results of GHG emissions and the corresponding activity data (Sectorial Background Table).

In order to compare, add and arrive at a common unit, the equivalent of carbon dioxide (CO_2eq), the usual metric of the Global Warming Potential was used, according to the Second Assessment Report of the IPCC. These assume the value of: CO_2 =1, CH_4 =21 and N_2O=310 .

1.2 Data sources

Table 3 presents a summary of the main sources of information used by each sector in the IGEE of STP. More details on these sources can be found in each sectoral chapter and in the Bibliographic References section.

Table 3- Data sources

Sectors	Data sources
1 Energy	EMAE, ENCO, DGRNE, VOA, HBD, ENAPORT , ENASA, DGP, DTT, INE, TAP, Customs, Forestry Directorate , Industries Directorate , Tax Directorate, STP AirWays ,
2 Industrial Processes and Product Use (IPPU)	National Institute of Statistics, General Directorate for the Environment, Livestock Directorate, Fisheries Directorate, National Road Institute, CervejeiraRosema .
3 Agriculture, Forestry and Other Land Uses (AFOLU)	Ministry of Agriculture, National Institute of Statistics, Directorate General for Agriculture, Directorate for Livestock, Directorate for Forests, Association of Agricultural Producers, FAO, Directorate General for the Environment, etc.
4 Waste	National Statistics Institute, General Directorate for the Environment, Livestock Directorate, Fisheries Directorate, CervejeiraRosema, artisanal producers of alcoholic beverages, NGO TESE, etc.

Source: Ownelaboration

1.3 Quality control / quality assurance

The quality control and assurance process includes the following procedures: data documentation, archiving process of data sources as well as the results. In the latter, it was verified whether the values presented in the spreadsheets coincided with the values reported in the report, as well as in the tables and tables.

For the quality control of activity data, a data collection procedure was previously elaborated in order to guarantee their reliability and, in cases where possible, a cross-control of the values provided by the differences was carried out. close to institutions.

The quality control and assurance procedure also includes:

- Verification of the inventory by the international expert, within the scope of the Lusophone Partnership, from the initial stage of its preparation;
- Observation of the considerations and recommendations issued during the review of the sectoral IGEE, in a judicious way, in order to improve the quality of this inventory;
- Verification of the inventory by the monitoring and evaluation committee;
- Correction of the inventory based on the reviewers' recommendations;
- Official validation of the inventory.

1.4 Archives

All information regarding the data and results of the GHG inventories carried out for the year 2018 is kept in written and electronic format, recorded on an external disk and archived at the National Institute of Meteorology, as well as copies are saved in cloud computing systems.

1.5 Institutionalarrangements

The institution involved in the implementation of the UNFCCC is the Ministry of Infrastructure , Natural Resources and Environment, through the Directorate General for the Environment, with the collaboration of the National Institute of Meteorology (INM) which is responsible for issues related to the climate and its environmental implications. and is therefore home to the Convention's Focal Point.

The Environmental Framework Law, Law nº 10/99, of 15 April , creates the legal framework for the environment in São Tomé and Príncipe. This law defines the bases of policy for sustainable development.

In addition to the Basic Environmental Law, there is a legal framework that includes the following legislation: Law for the conservation of fauna, flora and protected areas; Forest Law; Decree-law on STP's Obô National Parks ; Fisheries and Fisheries Resources Act;

Regulation on Environmental Impact Assessment; Decree on the Extraction of Inerts in Coastal and River Areas.

Based on the previous proposals contained in the documents "Strategy for Implementation of the United Nations Framework Convention on Climate Change" and "Thematic Profile on Climate Change" for the implementation, coordination, follow-up and evaluation of the United Nations Framework Convention on Climate Change, through Decree No. 13/2012, published in Diário da República No. 81, of 11 July 2012, the National Committee for Climate Change was created, with the objective and mandate of consolidating ongoing actions in the context of climate change.

Therefore, a structure of institutional arrangements was created to prepare the GHG inventory of the Democratic Republic of São Tomé and Príncipe, as shown in Figure 3.

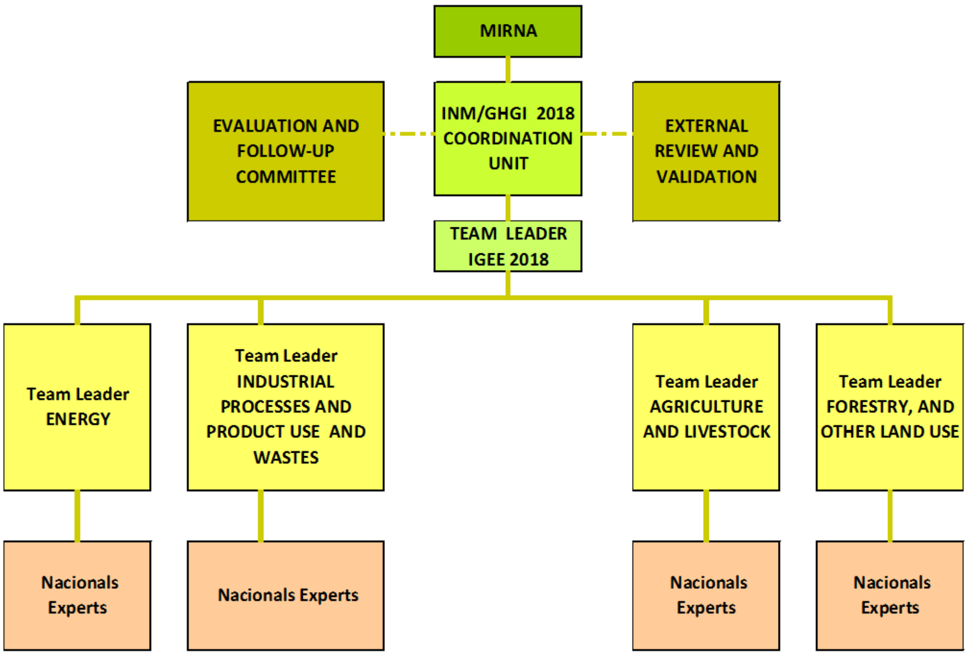


Figure 3- Structure of institutional arrangements for preparing the inventory

1.6 Main key categories

The main categories of sources of GHG emissions identified in STP are presented in Table 4, as being the most important and representing 95% of national emissions – key categories. These were identified strictly following the IPCC2006 Guidelines, and *software* provided by the UNFCCC Secretariat was used. Table 4 presents the analysis of the main key categories with the inclusion of FOLU and Table 5, FOLU was excluded from the analysis.

Table 4- Main categories of sources of CO_2 eq Emission (Incl FOLU)

B	Ç	D	AND	F	G
IPCC Category	Greenhouse gas	2018 Ex,t (Gg CO2 Eq)	| Ex,t | (Gg CO2 Eq)	Lx,t	Cumulative Total of Column F
Forest and Remaining Forest land	CARBON DIOXIDE (CO_2)	-564.01	564.01	68%	68%
Energy Industries - Liquid fuels	CARBON DIOXIDE (CO_2)	83.92	83.92	10%	79%
Land Converted to Settlements	CARBON DIOXIDE (CO_2)	41.93	41.93	5%	84%
Road transportation	CARBON DIOXIDE (CO_2)	33.33	33.33	4%	88%
OtherSectors - Liquid fuels	CARBON DIOXIDE (CO_2)	23.03	23.03	3%	90%
Direct N_2O Emissions from managed soils	NITROUS OXIDE (N_2O)	9.16	9.16	1%	92%
Solid Waste Disposal	METHANE (CH_4)	8.98	8.98	1%	93%
Wastewater treatment and Discharge	METHANE (CH_4)	8.23	8.23	1%	94%
Refrigeration and air conditioning	HFCs ,PFCs	7.52	7.52	1%	95%
Waterborne Navigation - Liquid Fuels	CARBON DIOXIDE (CO_2)	6.95	6.95	1%	95%

Source: Ownelaboration, IPCC Software

Table 5- Main categories of sources of CO_2 eq emission (Excl. FOLU)

B	Ç	D	AND	F	G
IPCC Category	Greenhousegas	2018 Ex,t (Gg CO2 Eq)	| Ex,t | (Gg CO2 Eq)	Lx,t	Cumulative Total of Column F
Energy Industries - Liquidfuels	CARBON DIOXIDE (CO_2)	83.92	83.92	39%	39%
Road transportation	CARBON DIOXIDE (CO_2)	33.33	33.33	16%	55%
OtherSectors - Liquidfuels	CARBON DIOXIDE (CO_2)	23.03	23.03	11%	66%
Direct N_2O Emissions from managed soils	NITROUS OXIDE (N_2O)	9.16	9.16	4%	70%
Solid Waste Disposal	METHANE (CH_4)	8.98	8.98	4%	74%
Wastewater treatment and Discharge	METHANE (CH_4)	8.23	8.23	4%	78%
Refrigeration and air conditioning	HFCs ,PFCs	7.52	7.52	4%	82%
Waterborne Navigation - Liquid Fuels	CARBON DIOXIDE (CO_2)	6.95	6.95	3%	85%
Other Sectors - Biomass	METHANE (CH_4)	5.70	5.70	3%	88%
EntericFermentation	METHANE (CH_4)	5.36	5.36	3%	90%
Manure Management	NITROUS OXIDE (N_2O)	4.98	4.98	2%	93%
Civil Aviation	CARBON DIOXIDE (CO_2)	3.80	3.80	2%	94%

Source: Own elaboration, IPCC Software

1.7 Other additional information

Based on best practices for IGEE reporting, Parties not included in Annex I are encouraged to provide additional information that would be useful to clearly and transparently show to the international community the effort and actions taken to address climate change, as well as to understand current levels of greenhouse gas (GHG) emissions.

On the other hand, they are also encouraged to identify gaps in data or other information and to suggest improvements for the preparation of future reports that overcome these challenges, including specifying the type of support needed to develop the capacities to achieve this end.

1.7.1 Improvement of Activity Data and Emission Factors

STP prepared 4 GHG inventories, the first 3 of which were within the scope of the NCs and the last one within the scope of BUR1. Despite the evolution of improvements in the presentation of their reports, however, there are gaps regarding the collection and processing of data by the national team, as well as, it needs to improve its capacity with regard to the definition of specific emission factors from the country.

National consultants often resort to data estimation, using extrapolation methods, expert judgment and external sources, such as international organizations that have data, many of them in the form of estimates or projections , in addition, some sectors such as In the case of forests, due to their nature, the correspondence of data entries according to the IPCC Guidelines (software) has constituted gaps for national consultants.

The same happens with the use of emission factors , that is, as there are no specific emission factors for the country, in all four inventories we used factors for defects provided by the IPCC, and as mentioned above, the forest sector has its unique specificity (see description in Chapter AFOLU), the constraints are greater.

These gaps, arising from the collection and processing of data such as the use of factors for defects, can have implications for the uncertainties of the country's emissions, so it is necessary to improve these topics, with a view to eliminating these gaps in the future, empowering national staff and not only.

1.7.2 Uncertainties

According to the 2006 IPCC Guidelines, uncertainty estimates are an essential element of a comprehensive emissions inventory. The estimation and reporting of uncertainties allows prioritizing efforts to improve the accuracy of inventories in the future and defining the specific topics where research is needed to enrich the attributes of the inventory and guide decisions on the choice of methodology.

Decision 17/CP.8, in its paragraph 24, establishes that Parties not included in Annex I are encouraged to provide information on the level of uncertainty associated with the inventory data and its underlying assumptions, as well as to describe the methodologies used, if any, to estimate these uncertainties.

Although the IPCC guidelines guide how to estimate these uncertainties associated with the IGEE, STP, since the first inventory has not been able to provide this information due, above all, to its ability limitations to assess the aforementioned uncertainties, taking into account the unavailability of reliable and accurate data.

Not with standing this, even though it is not obligated to provide this information, STP recognizes that it will do everything in its power to comply with this guidance in future inventories and contribute to the improvement of its inventories with the greatest possible rigor and transparency.

1.7.3 Need for support and improvement of future inventories

In view of the above, STP requests training support in improving the preparation of its inventories, especially in the uncertainty chapter, as well as in the collection and processing of data on activities and definition of specific national factors , also aiming at the migration of the Tier1 methodology for higher levels (Tier2) .

Regarding the forest sector as being important in the negative balance in net GHG emissions, it becomes necessary to provide technological financial meansit's from institutional capacity strengthening , to update the last forest inventory prepared in 1991.

Others areas, such as Transport, Waste and IPPU, need to improve data collection and processing through capacity building.

Since emissions from previous inventories (1998 and 2005) were not presented in this report due to the change in calculation methodology as mentioned above and in order to comply with the minimum requirements under the Paris Agreement, STP undertakes that it will do everything to that in the next inventory, the remaining emissions from the missing years will be recalculated and thus present the estimates of GHG emissions for a time series since the first inventory, reflecting all annual emissions.

STP, within the scope of the UNDP Climate Promisse Project, is designing an MRV structure that can respond more quickly to the commitments assumed under the Paris Convention and Agreement, and with the implementation of this system, improvements are expected to be obtained, regarding the institutional arrangements, that allow the preparation of complete inventories every 2 years.

2 ENERGY

2.1 Sourcecategories

According to the IPCC, 2006 guidelines , this module is divided into two main categories, the burning of fuel in fixed and mobile sources and the fugitive emissions.

In the case of STP, only the Fuel Burning category (1A) applies, having considered the following subsectors:

- Energyindustry (1.A.1)
- Manufacturing and construction industries (1.A.2)
- Transport (1.A.3) :
  - Terrestrial
  - Civil aviation
  - Maritime navigation
- Other Sectors (1.A.4)
  - Commercial/Institutional
  - Residential,
  - Agriculture/Forest/Fishing and Self-generation)
- Non-Specified (1.A.5)

The activities considered as sources of fugitive emissions according to the IPCC, are: Exploration and Handling of Mineral Coal and those Related to Petroleum and Natural Gas and Petroleum Refining. These activities are not developed in the country, therefore they are not considered in this inventory.

As for Biomass consumption, according to the same guidelines , biomass should be considered a special case, therefore, it is good practice to take into account the following recommendations:

- CO_2 emissions from biomass are estimated and reported in the AFOLU sector, as part of the AFOLU methodology.
- For biomass, only the part that is burned for energy purposes should be estimated for inclusion as an information element in the Energy sector.
- Emissions, however, are estimated and included in the energy sector and national totals.

In STP, biomass data is much more uncertain compared to other data from national energy statistics. Most of the biomass used for energy is part of the informal economic sectors. Taking into account the good practices indicated by the 2006 IPCC Guidelines, the consumption data for firewood and charcoal presented in the 2018 Energy Balance were considered to present the results as an informative element within the energy sector.

2.2 CATEGORY 1.A- FUEL BURNING

2.2.1 CategoryDescription

Energy, in most countries, is obtained by burning fossil fuels. During combustion, the carbon and hydrogen in fossil fuels are mainly converted into carbon dioxide (CO_2) and water (H_2O), which release the chemical energy of the fuel as heat. In general, this heat is used directly (with some conversion loss) to produce mechanical energy, often to generate electricity or for transport (IPCC, 2006).

The amounts of carbon dioxide (CO_2) are calculated from the fuel consumption data and the carbon content of the fuels, taking into account the fraction of unoxidized carbon. The amounts of methane (CH_4) and nitrous oxide (N_2O) formed during fuel burning technology to accurately estimate non-CO_2 greenhouse gas emissions, however, in the absence of country-specific information on different combustion technologies, the calculation of Tier 1 emissions, it is recommended to use IPCC default values.

The energy sector of STP is mainly composed of fossil fuels (100% import), which represented around 62% of the primary energy balance in 2018, while biomass represented around 37%. Hydroelectricity is almost nil, with less than 1% (Table 11).

The main fuels imported and used in 2018 are: Diesel, Gasoline, Jet A1, lubricants and butane gas.

Biomass, which comprises firewood and charcoal, is a source of energy widely used by the majority of the population in kitchens, in the bakery industries and also in traditional restaurants.

2.2.1 Activity Data

The detailed Energy Balances (BENs) for the years 2012, 2016 and 2018 can be consulted in the annex, thus constituting the bases for carrying out the calculations of GHG emissions from the energy sector.

In 2018, total energy consumption in São Tomé and Príncipe was 76,529.52 TEP. The main source of energy consumed continues to be fossil fuels, with emphasis on diesel, with around 43% of consumption, followed by biomass with 37%, with 31% of consumption of firewood and 6% of charcoal, as shown in the figure below.

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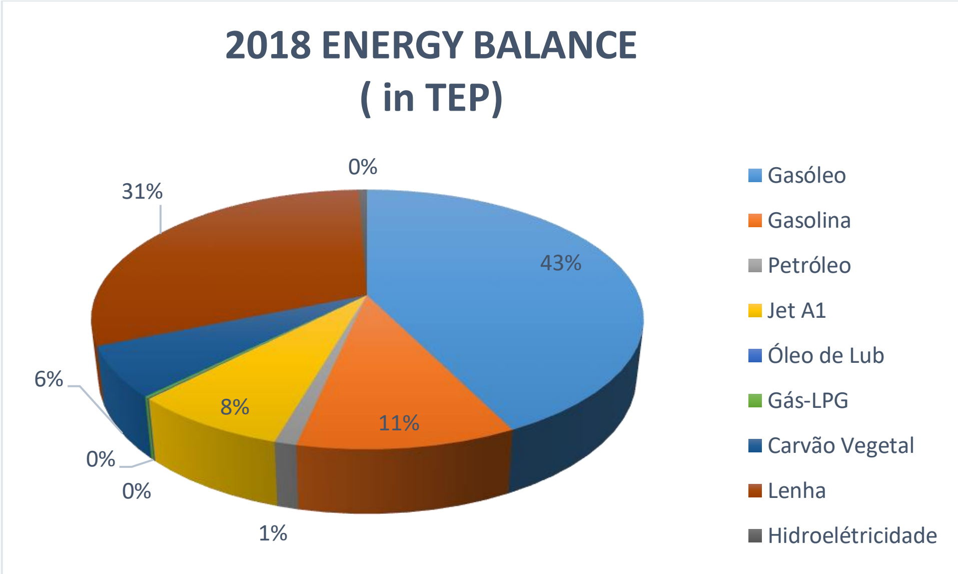
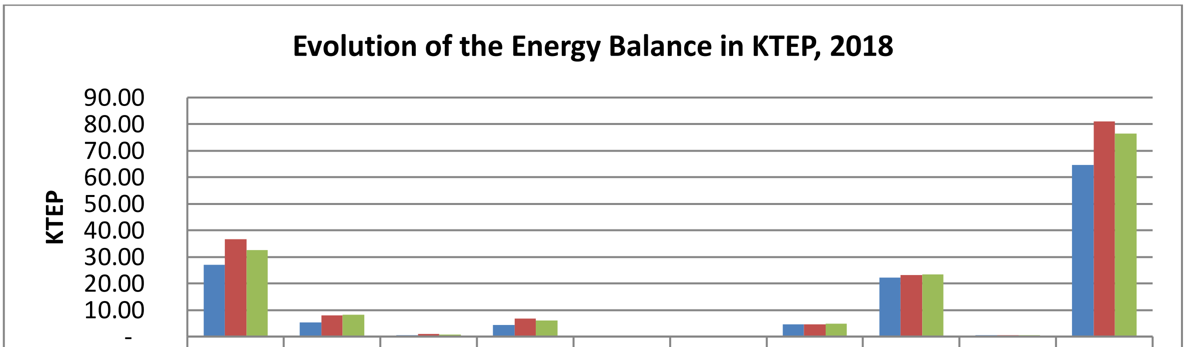


Figure 4- Energy balance in 2018

The figure below shows the evolution of the energy balance from 2012 to 2018.



	Gasóleo	Gasolina	Petróleo	Jet A1	Óleo de Lub	Gás-LPG	Carvão Vegetal	Lenha	Hidroelétricidade	TOTAL
2012	26.92	5.44	0.53	4.47	0.08	0.01	4.52	22.11	0.55	64.63
2016	36.70	7.96	0.92	6.78	0.19	0.06	4.72	23.13	0.50	80.97
2018	32.61	8.27	0.84	5.93	0.08	0.16	4.78	23.41	0.44	76.53

Figure 5- Evolution of the energy balance from 2012 to 2018

As can be seen in the figure above, in 2018 diesel consumption reduced, because in that year the large thermal power plants were having difficulties in generating energy due to several breakdowns throughout the year and which consecutively caused a drop in production and which generated the energy crisis.

The use of hydroelectricity, however, remains low, due to the low use of this renewable energy source in the country, representing only a consumption of 440.66 TEP in 2018.

Concerning the consumption of biomass for the years under analysis, there was a growth from 2012 to 2018, and from 2016 to 2018 there was a slow growth, taking into account the large growth of LPG in kitchens and the habits of the population, especially urban and peri-urban, passed to use more butane gas for cooking.

Other energy sources, namely gasoline, oil, Jet A-1, are consumed respectively by transport and some industrial and domestic activities. The consumption of butane gas, despite still being low compared to other sources, also grew from 12.15 TEP in 2012 to 162,981 TEP in 2018, as shown in the above charts.

Energy Industry

Production connected to the Sao Tome and Prncipe electricity grid is not very diversified, with the predominant presence of six diesel-fired thermoelectric plants, five of which are located in Sao Tome and one in the RAP, and only one hydroelectric plant, 2.4 MVA of installed power, of which only 1.8 MW are available.

According to the initial report for the elaboration of the Low Cost Master Plan for STP, 30% of thermoelectric production units are, on average, more than 15 years old, which justifies their deficiency in production performance. Currently, Contador Power Station is the only hydroelectric power station in the country and guarantees only 4.6% of the production injected into the grid on the island of São Tomé.

The following table shows the evolution of electricity production for the years 2012, 2016 and 2018.

Table 6- Evolution of electricity production in STP (2012-2018)

Year	Electricity Production		
	Thermal (MWh)	Hydro (MWh)	Total (MWh)
2012	70 470.87	6,386.00	76 856.87
2016	99 955.25	5 800.25	105 755.50
2018	97 814.15	5 125.00	102 939.15

Source: DGRNE

As can be seen from the table above, in 2018 the total production of energy in was 102,939.15 MWh , of which 97,814.15 MWh came from diesel thermal plants and 5.12 MWh from hydro sources, that is, only 5% of the total produced capacity.

The average energy consumption of the energy industry was 18367.25 TEP, 26564.24 TEP and 27037.36 TEP, respectively for the years 2012, 2016 and 2018.

Transport

The transport sector plays a fundamental role in the socio-economic development of any country, as it ensures the mobility of people and goods, thus allowing exchanges and commercial exchanges between peoples.

For the present study, the following means of transport were considered, taking into account the specificities of the country:

- Air
- Maritime
- Groundtransportation

In the air transport subcategory, there was an increase in the number of flights, both domestic, inter-island and international flights. The average energy consumption was 219.2655 TEP, 979.298 TEP and 1,268.798 TEP of Jet A1, respectively for the years 2012, 2016 and 2018.

With regard to international flights, the trend was decreasing, unlike domestic flights, having registered an annual consumption of 3,522.937 TEP, 1,725.905 TEP and 1,252.391 TEP, for the years 2012, 2016 and 2018 of Jet A1. However, the flaring of Jet A1, despite having been accounted for, was not reflected in the GHG emissions for the country, thus being considered as Bunkers and reported as a memo item.

Maritime transport is not very expressive in terms of GHG emissions, as only small passenger and cargo vessels that make inter-island connections , as well as small fishing boats and motor canoes, supply their fuel in STP, whose energy consumption was of 2,218.88 TEP, 2,266.65 TEP and 2,239.42 TEP for the years 2012, 2016 and 2018 respectively , and in 2018 there was a decrease in consumption due to the tragic accident of shipwreck that occurred in the largest inter vessel islands, causing loss of human lives, goods and materials.

Vessels that establish long-distance international connections and large fishing grounds are not supplied in the country and do not even dock at national ports. Therefore, there is no record of their fuel consumption.

The road transport subsector, represented by motorcycles, light and heavy passenger and cargo cars, grew until 2018, after which there was a decrease in imports, as shown in the figure below.

Light and heavy vehicles are generally imported from Europe, being essentially second-hand vehicles, with more than 5 years of life cycle. Most of these automobiles are used as taxis and private vehicles. However, motorcycles are new vehicles, generally imported from countries on the African coast.

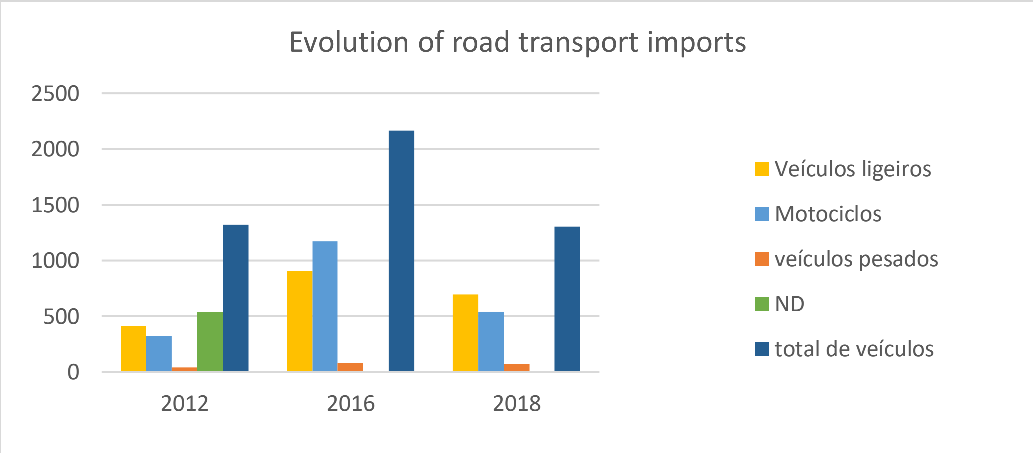


Figure 6– Evolution of motor vehicle imports by class.

Taking into account the lack of an operational system for the regular and mandatory inspection of vehicles, as well as the evasion of payment of vehicle tax, it was not possible to count the number of vehicles in circulation, using only the estimates made by the consultants, with based on information provided by the institutions involved.

The estimates were made by crossing data collected from the Land Transport Directorate, Tax and Customs Directorate, where the numbers of vehicles by class and also by type of fuel were obtained .

TheEnergy consumption for the road subsector was estimated at 8,544.71 TEP, 10,296.65 TEP and 11,188.26TEP for the years 2012, 2016 and 2018, respectively .

Others sectors

Regarding this category within the balance sheet, it is subdivided into three subsectors, Commercial/Institutional (1A4a), Residential (1A4b) and Agriculture/Forestry/Fisheries (1A4c), which consume primary and secondary energy and which are finally also accounted for in the emission.

The predominant sources in this category are: firewood, butane gas, gasoline, petroleum, electricity and charcoal, as reflected in the National Energy Balances (BEN).

The fuels used in the residential sector, in the kitchens are LPG (butane), kerosene and biomass (charcoal). The latter accounts for most of the fuel consumption in the residential sector, followed by common kerosene. The fuel used in the Agriculture/Forestry/Fisheries sector is gasoline for locomotion and the use of utility machines in this area.

The average energy consumption of other sectors was 5,453.83 TEP, 6,688.40 TEP and 6,314.37 TEP, respectively for the years 2012, 2016 and 2018.

Unspecified Sectors

The unspecified category groups all consumptions that are not specified in activities of the aforementioned categories, namely energy industry , transport and as well as in the Commercial/Institutional, Residential and Agriculture/Forestry/Fishing subsectors.

For the present study, the following predominant sources were considered: butane gas, gasoline, oil, electricity , as reflected in the National Energy Balances (BEN). However, it is important to emphasize that it has a very important representation in terms of energy consumption in the workshops, and some extra services linked to chainsaws scattered across the country, as well as some festive actions on the beaches and woods.

The average energy consumption of the Unspecified sector was 541.70 TEP, 539.31 TEP and 544.09 TEP, respectively for the years 2012, 2016 and 2018.

2.2.2 Emission factors

For the calculation of the GHG emission estimate, the standard emission factors according to the IPCC 2006 guidelines were considered , for all the corresponding subcategories, according to the table below .

Table7- Emissionfactors

Categories	Fuel	Default emission factors (kg of GHG/TJ)		
		CO_2	CH_4	N_2O
EnergyIndustry	Diesel	74100	3	0.6
Transport				
Aviation	Jet A1	71500	0.5	two
Road	Diesel	74 100	3.9	3.9
	Gasoline	69300	33	3.2
	Charcoal	112000	300	1
	Firewood	112000	200	4
Navigation	Diesel	71500	0.5	two
OtherSectors				
Institutional Commercial	LPG	63100	5	0.1
	Gasoline	69300	10	0.6
	Charcoal	112000	300	1
	Firewood	112000	200	4
	Charcoal	112000	300	1

Residential	Firewood	112000	200	4
	LPG	63100	5	0.1
	Gasoline	69300	10	0.6
	Kerosene	71900	10	0.6
Agriculture/forest/fishing and Self-generation	Gasoline	69300	10	0.6

Source: Own elaboration, Adapted from IPCC2006

2.3 Total GHG Emissions for the Energy Sector, 2018

After using the IPCC 2006 Software, CO_2 , CH_4 and N_2O emissions from the Energy sector were estimated for the inventory year 2018. Table 8 illustrates the GHG emissions for the Energy Sector. According to the results, it can be seen that the energy industry and transport sectors represent almost all of the emissions.

Table 8- Results of the GHG calculation of the energy sector, 2018

	Year 218 Issue(Gg)			
Categories	CO2	CH4	N2O	CO2eq
1 - Energy	152.96	0.29	0.01	**160.95**
1.A - Fuel use activities (Sectoral Approach)	152.96	0.29	0.01	**160.95**
1.A.1 - EnergyIndustry	83.92	0.00	0.00	**84.20**
1.A.3 - Transport	**44.08**	**0.01**	**0.00**	**45.15**
1.A.3.a - Civil Aviation	3.80	0.00	0.00	3.83
1.A.3.b - Roadtransport	33.33	0.01	0.00	34.3
1.A.3.d - Maritimetransport	6.95	0.00	0.00	7.02
1.A.4 - OtherSectors	**23.03**	**0.27**	**0.00**	**26.15**
1.A.4.a - Commercial/Institutional	0.28	0.17	0	4.44
1.A.4.b - Residentiall	15.04	0.11	0	17.7
1.A.4.c - Agriculture/Forest/Fishing	3.99	0	0	4.01
1.A.5 - Unspecified	**1.94**	**0.00**	**0.00**	**5.49**
1.A.5.a - Stationary	1.94	0.00	0.00	5.49
	Emissions (Gg)			
Categories	CO2	CH4	N2O	SO2
MemoItems (3)				
international bunkers	**3.75**	**0**	**0**	**3.78**
1.A.3.ai – InternationalAviation(International Bunkers)	3.75	0	0	3.78
1.A.3.di - InternationalNavigation(International bunkers)				0
Informationitems				
BiomassCombustion	**110.27**			

Source: Own elaboration

It should be noted that emissions from biomass and *bunkers* were calculated in the energy sector for information purposes, and emissions from biomass, in order to avoid double counting, are considered only in the forestry sector, while *bunkers* are not are part of the country's net issuance.

In terms of emissions for the energy sector, a total of around 161.00 Gg CO2eq was recorded, in which the energy industry subsector contributed with 52%, the transport subsector with 28%, followed by other and unspecified sectors with 16% and 4% respectively, as shown in Figure 7.

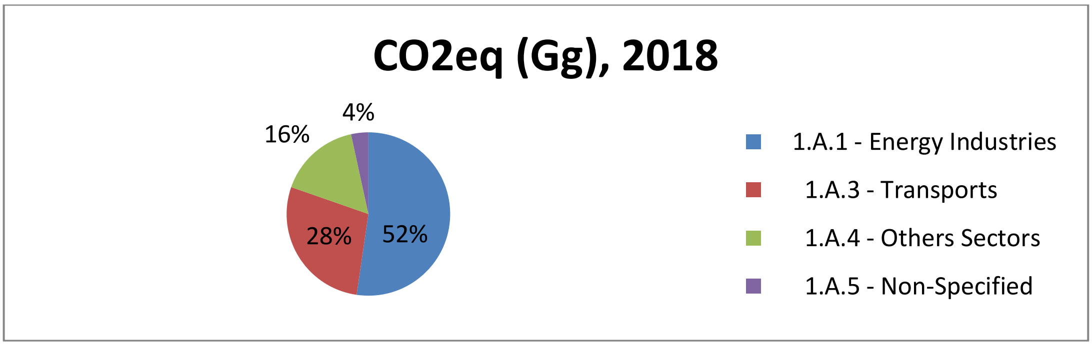


Figure 7– Distribution of CO_2eq emission from the energy sector

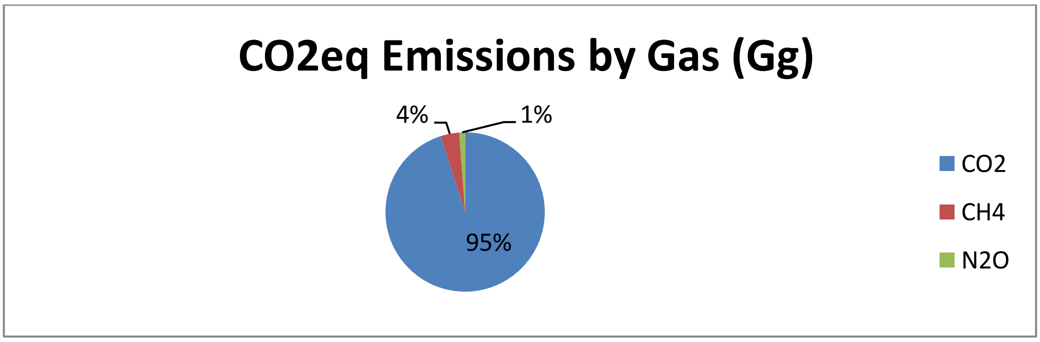


Figure 8- Distribution of CO_2eq emission by type of gas.

2.4 Comparison between the sectoral method and the reference method

The comparison of the results of CO_2 emissionsobtained using the reference method and the sectoral method makes it possible to verify the validity of the calculations performed. The reference method uses total values from national energy statistics, while the sectoral method uses partial values for each source category, which together add up to the total for the Energy sector. In both cases, the source of information was BEN.

As can be seen in Table 9, there are differences in CO_2 emissions between the two methods, ranging between -6% and 6%. These differences are partly due to the fact that at the time of conversion, from unit of volume to unit of energy, in the reference method, the default data of net caloric values are used according to the fuel accounted and in the sectoral method it is used the data converted directly into energy units.

Table 9- Fuel combustion: CO_2 emissions (Gg) using the reference and sectoral methods

Sector	Method	2012	2016	2018
Energy	Reference	113.14	158.55	144.43
	sector	110.92	148.94	152.96
DIFFERENCE (%)		2.00%	6.45%	-5.58%

Source: Ownelaboration

Note that GHG emissions between the two methods do not show significant differences (Table 9), in the order of +/-6% of CO_2 emissions . This is a difference within the range accepted by the IPCC Guidelines.

2.5 Evolution of emissions from the Energy sector , 2012-2018

Table 10 shows the evolution of total GHG emissions from 2012 to 2018. As can be seen, there was a general increase in emissions from 2012 to 2018 , with a variation of 42.5 CO_2eq, compared to 2012 , corresponding to an increase of 36 %.

Table10- Evolutionof GHG emissions

Category	Year			2018-2012	
	2012	2016	2018	Difference	Variation
1.A.1 - EnergyIndustry	57.18	82.77	84.20	27.02	47%
1.A.3 - Transport	33.76	41.46	44.90	11.14	33%
1.A.4 - OtherSectors	25.58	29.64	29.89	4.31	17%
1.A.5 - Unspecified	1.66	1.95	1.96	0.30	18%
TOTAL GHG (Gg CO_2eq)	118.18	155.81	160.95	42.77	36%

Source: Calculated by the team

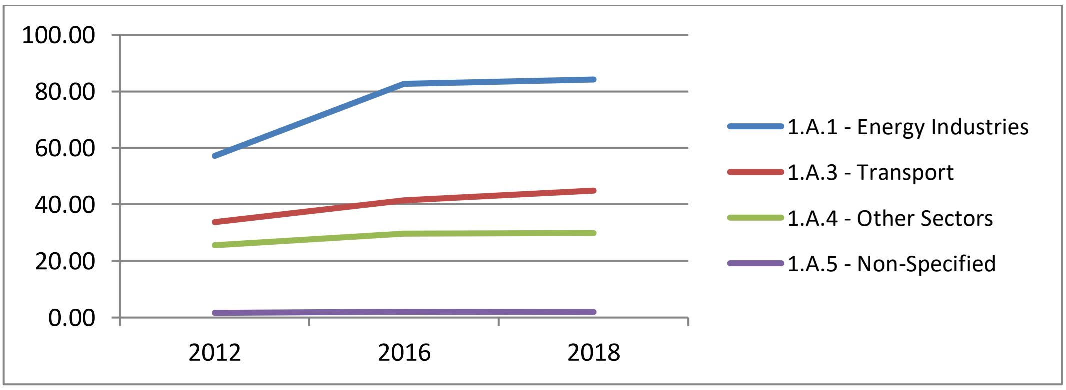


Figure 9- Evolution of emissions from the Energy sector in t CO_2eq

3 INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)

3.1 Source categories

The categories of sources traditionally considered as GHG emitters in the industrial process sector are the following: Chemical industry, Mineral production, Metal production, Production and consumption of fluorinated gases, etc.

In the national context, the GHG emission source categories for the industrial process sector are not very important. Indeed, the lime and cement, metallurgical and steel industries are not represented here.

In STP, industrial activity is not significant in the country's economy, since the industrial park is very incipient. It is characterized by low diversification, low production and a limited number of small and medium-sized companies, with a negligible contribution to GHG emissions.

The main industrial establishments are the following: food industry (beer, bakery, fish and palm oil), saponification industry, wood processing, furniture construction, shipbuilding and metalworking. Other light industries such as the manufacture of blocks, clothing and even the printing sector are also of some importance.

These industries are not considered sources of direct GHG emissions (CO_2, CH_4, N_2O), that is, they can emit other gases, especially non-methane volatile organic compounds (NMVOCs), as is the case of road paving. with asphalt and Food and Beverage Production.

Bearing in mind that for the present inventory, only the main GHGs (CO_2 , CH_4 , N_2O) were considered, which is why the emission of NMVOC was excluded from this compilation due to the fact that the evolution of emissions of this gas be very insignificant in the country. However, the calculation of HFC from Refrigeration and Air conditioning was made for the first time.

Table 11- Main sources of GHG emissions for IPPU in STP.

Categories	Subcategories	GASES (Gg)	GHG emission
Mineral Production:	Use of asphalt for paving roads	**NMVOC[1]**	**0**
OtherProductions:	Food production	**NMVOC**	**0**
	Productionofalcoholicbeverages	**NMVOC**	**0**
Consumption of (HFC, PFC and SF $_6$)	Refrigerationandairconditioning	**HFC, (PCFCsand SF 6)***	**0**

*NE

[1]Excluded from this compilation is the issuance of NMVOC

It should be noted that PCFCs and SF_6 gaseswere also not inventoried due to the unavailability of statistical data and reports that could mention their situation at the national level.

Regarding the industrial production of soap, animal feed and the production of vegetable palm oil, it is currently not applied in the country, with the forecast again for palm oil production scheduled for 2019/2020. Therefore, they did not serve as a basis for calculating emissions in this inventory.

For this compilation, only category 2.F - Use of the product as a substitute for ODS was considered.

3.2 CATEGORY 2.F- USE OF THE PRODUCT AS A SUBSTITUTE FOR ODS

3.2.1 CategoryDescription

Hydrofluorocarbons (HFCs) and, to a very limited extent, perfluorocarbons (PFCs), serve as alternatives to Ozone Depleting Substances (ODS) being withdrawn from circulation under the Montreal Protocol. Current and foreseeable application areas for HFCs and PFCs include (IPCC/TEAP, 2005):

- Refrigeration and air conditioning;
- Fire fighting and explosion protection ;
- Aerosol sprays;
- Solventcleaning;
- Foamingagents;
- Other apps.

For the present inventory, the subcategory Refrigeration and air conditioning (2.F.1) was considered as the only one that obtained data for estimating GHG emissions.

- **Refrigeration and air conditioning (2.F.1)**

Refrigeration and air conditioning systems can be classified into up to six domains or sub-application categories (UNEP-RTOC, 2003). These categories correspond to sub-applications that may differ by location and purpose and are listed below:

- Commercial refrigeration: use food and beverage storage and display systems in supermarkets, stores, restaurants and hotels.
- Domestic refrigeration: refrigerators, freezers and mixed equipment.
- Industrial refrigeration: food and beverage refrigeration, agribusiness, fisheries, pharmaceuticals, petrochemicals, airports and heating systems.
- Refrigerated transport: trucks, trailers, containers and ship refrigeration.

- Fixed air conditioning: small split systems, large air conditioners, water coolers, heat pumps. They are used in various spaces such as shopping centers, offices and service areas, among others.
- Mobile air conditioning: air systems in land transport.

All of these applications store the refrigerant gas and emissions occur due to leaks during use and during maintenance when the equipment is refilled. Emissions also occur at the end of the equipment's life, where the remaining refrigerant is usually released into the atmosphere.

The use of fluorinated compounds for refrigeration and air conditioning is provided 100% by imports, since these compounds are not produced in STP.

3.2.2 Activity Data

HFC emissions , thanks to the availability of official data provided by the Directorate General for the Environment, through the report of an international consultancy regarding the consumption/import of ODS (substances that deplete the ozone layer) . However, there are gaps in disaggregated data statistics for each of the sub-applications.

In the absence of disaggregated data for each of the sub-applications, the TIER1a method was used as the simplest way of estimating emissions.

It should be noted that there is no production or elimination of HFCs at the national level, therefore, consumption is centered only on the import of these gases, as shown in the following table.

Table 12- Consumption/import of HFCs in tons, 2013-2019

Year/Mix	R-134a	R-404a	R-407c	R-410a
2013	0.56	1.00	0.20	1.00
2014	0.80	1.00	0.32	1.20
2015	1.00	1.50	0.44	1.50
2016	1.20	2.00	0.53	1.60
2017	1.30	2.10	0.58	2.00
2018	2.00	3.00	0.60	2.50
2019	2.00	3.20	0.70	2.70

Source: DGA - SAO TOMÉ & PRINCIPE VERIFICATION REPORT, 2020

The table below presents the composition of the main mixtures used in STP containing and HFCs.

Table 13 - Composition of the main mixtures used in STP that contain HFCs.

Mixture	HFC-32	HFC-125	HFC-134 a	HFC-143 to
R-404 a		44%	4%	52%
R-407 c	23%	25%	52%	
R-410 a	50%			50%

Source: Extracted from table 7.8 of vol.3 of the IPCC, 2006

Based on the information in tables 12 and 13, the amount of each gas present in these mixtures was calculated according to the following table.

Table 14- Data obtained for the calculations in Tons

Gases/Year	2013	2014	2015	2016	2017	2018	2019
HFC-32	0.55	0.67	0.85	0.92	1.13	1.39	1.51
HFC-125	0.99	1.12	1.52	1.81	2.07	2.72	2.93
HFC-134 to	0.70	1.01	1.29	1.56	1.69	2.43	2.49
HFC-143 to	0.52	0.52	0.78	1.04	1.09	1.56	1.66

Source: own elaboration

3.2.3 Emission Factors

As mentioned before, there are no activity data disaggregated at the sub-application level (the 6 RAC areas) but at the application level, and as it is not a main category, emission factors composed by default of the IPCC2006, according to the Tier 1a method used to estimate HFC emissions. The table below presents these factors as well as some assumptions used in the calculations.

Table 15- Emission factors and assumptions used in calculations

Level 1 bydefault	HFC-32	HFC-125	HFC-134 a	HFC-143 to
Assumed useful life of the equipment (years)	15	15	15	15
Installed base emission factor	15%	15%	15%	15%
Destroyed at the end of life	0%	0%	0%	0%
Year of introduction	2013	2013	2013	2013
Growth rate in sales of new equipment	2.0%	2.0%	2.0%	2.0%

Source: own elaboration

3.2.1 Subsector Emissions

After using the IPCC 2006 Software, the emissions of substances that deplete the ozone layer (ODS) were estimated for the inventory year 2018, as shown in the following table.

Table 16- GHG emissions of category 2.F - ODS

Yearofinventory: 2018					
Categories	HFC-32	HFC-125	HFC-134a	HFC-143a	Total HFCs
SAR GWPs (100 year time horizon) Conversion factor	650	2800	3800	3800	
Emissions in the original unit of mass (ton)					
2.F - Use of the product as a substitute for ODS	0.63	1.19	0.65	0.65	
2.F.1 - Refrigeration and Air Conditioning	0.63	1.19	0.65	0.65	
2.F.1.a - Refrigeration and Stationary Air Conditioning	0.63	1.19	0.65	0.65	
Emissions in CO_2 equivalent unit (Gg CO_2eq)					
2.F - Use of the product as a substitute for substances that deplete the ozone layer	0.41	3.33	1.32	2.46	7.52
2.F.1 - Refrigeration and Air Conditioning	0.41	3.33	1.32	2.46	7.52
2.F.1.a - Refrigeration and Stationary Air Conditioning	0.41	3.33	1.32	2.46	7.52

As can be seen in the table above, the emission of total HFCs converted into Gigagrams of CO_2eq was 7.52 for the year 2018.

3.3 Total GHG Emissions for the IPPU Sector

As mentioned before, the IPPU sector of STP, its sources of emissions from industrial production and asphalt paving, does not emit the main greenhouse gases (CO_2, CH_4, N_2O), which is why emissions of NMVOC in the present build. However, for the first time, HFC emissions from the Refrigeration and Air Conditioning subcategory were calculated.

In 2018, GHG emissions from the IPPU sector of STP amounted to 7.52 Gg of CO_2eq, coming from the only source, i.e. from the Refrigeration and Air Conditioning subcategory .The figure below shows the evolution of emissions from 2012 onwards.

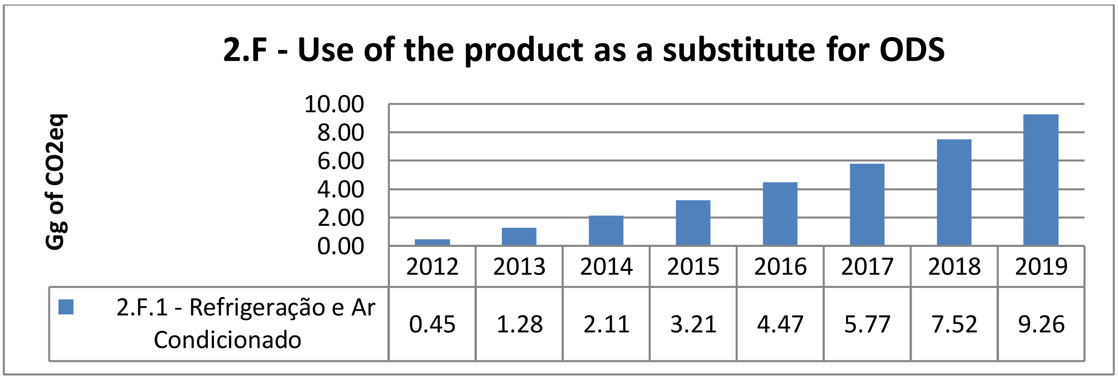


Figure 10-Evolution of HFCs emissions in CO_2eq, 2012 -2019

According to figure 10 , there is an increasing trend in emissions of Total HFCs (32, 125, 134a and 143a) over the years.

4 AGRICULTURE, FOREST AND OTHER LAND USES (AFOLU)

This sector presents the estimate of the variation of carbon stocks produced by biomass, as well as the emissions produced by fire. GHG emissions from livestock activities and emissions from adding nitrogen to land are also accounted for. Everything that corresponds to this sector is cataloged with the name: Agriculture, Forestry and Other Land Uses (AFOLU, acronym in English).

4.1 Sourcecategories

In accordance with the IPCC (2006), this section will assess GHG emissions and removals from the following activities, subdivided into 3 subsectors, which contain various emission categories and subcategories as shown in the table below.

Table 17- Main categories of the AFOLU sector.

Categories	Subcategories	Gases	STATUS
3.A- Livestock	Entericfermentation (3.A.1)	CH_4	O
	Management of animal manure (3.A.2)	CH_4, N_2O	O
3.B- Forests and Other Land Use	ForestLands(3.B.1)	CH_4, N_2O	O
	Agriculture or Agricultural Lands(3.B.2)	CO_2	O
	Pasture(3.B.3)	CO_2	O
	Wetlands(3.B.4)	CO_2	NE
	Settlements(3.B.5)	CO_2	O
	OtherLands(3.B.6)	CO_2	NO
3.C- Aggregate sources and sources of non-CO_2 emissions in the soil:	Emissions from burning biomass (3.C.1)	CH_4, N_2O	O
	Liming (3.C.1)	CO_2	NO
	Application of Urea in the soil (3.C.3)	CO_2	O
	Direct emission of N2O from the Managed Soil (3.C.4)	N_2O	
	Indirect Emission of N2O from the Managed Soil (3.C.5)	N_2O	
	Indirect N2O Emission from Animal Manure Management (3.C.6)	N_2O	HUH

4.2 CATEGORY 3.A- LIVESTOCK

4.2.1 Category Description

Livestock production generates methane (CH_4) emissions from enteric fermentation and methane (CH_4) and nitrous oxide (N_2O) emissions resulting from animal waste management systems . The digestive system of cattle ruminants is an important source of CH4. Manure management tends to produce less methane emissions than enteric. The most significant emissions are associated with confined animal handling operations, in which manure is handled through liquid systems. N_2O emissions from manure management vary between the types of management systems used, and may also cause indirect emissions due to other forms of nitrogen loss from the system (IPCC, 2006).

In the context of São Tomé and Príncipe, it is clear that nowadays the number of farmers who use animal manure to fertilize their soils is increasing, thanks to numerous awareness-raising and training actions carried out by the Ministry of Agriculture, Fisheries and Development. Rural as well as some environmental NGOs have carried out to farmers at the level of rural communities. It is worth mentioning that of animal manure, that of birds (laying hens) are more used by farmers due to greater ease of access (there are more of them).

4.2.2 Activity Data

In the livestock sector, the dominant species in STP are: Cattle, goats, sheep, pigs and chickens. These species are developed in the system of small family farms. The table below shows the evolution of existing staff in the country.

Table 18- Evolution of livestock in head in STP (2012-2018)

Species	2012	2013	2014	2015	2016	2017	2018
Bovine	1274	1382	1501	1349	1362	1400	1407
Goat	28931	31954	33911	30825	30643	30821	30830
Sheep	2855	3270	3462	3395	3404	3994	4000
Cwine	31826	31854	32683	32105	35319	37200	37300
Chickens	226250	242439	307220	279185	280215	294215	315497

Source: Directorate of Livestock of STP/ MAPDR

4.2.3 Emission Factors

To calculate the methane (CH4) emissions from enteric fermentation and manure management, data on the number of animals of different species were used, provided by the Livestock Directorate and the Default Emission Factors contemplated in the IPCC Guidelines for 2006 (regions with characteristics similar to STP), according to the following tables.

Table 19- Emission Factors (EF)

Nº	Categoryof Animal Species	EntericFermentation	Animal Manure Management
		EF (Kg/CH_4/year)	EF (Kg/CH_4/year)
1	Beefcattle (non-dairy)	31	1
2	Sheep	5	0.2
3	Goats	5	0.22
4	Swine	1	1
5	Chickens	-	0.02

Source: Team calculation

Regarding the calculations of nitrous oxide (N2O) emissions from manure management, data on the number of animals of different species were used (table 18), provided by the Directorate of Livestock and the average weight of animals (TAM) and the emission factor , both by default according to the IPCC 2006 Guidelines , as shown in the table below.

Table 20- Other default factors

Nº	Categoryof Animal Species	Averageweight	Animal Manure Management
		SIZE (Kg)	Excretion rate (Kg N/1000Kg animal weight/day)
1	Beefcattle (non-dairy)	275	0.63
two	sheep	28	1.17
3	goats	30	1.37
4	swine	28	1.64
5	chickens	0.9	0.82

Source: Team calculation

According to interviews carried out with CADR agents, as well as some qualified technicians from the Livestock Directorate , and with some breeders, the different types of manure management systems were defined for each species, as well as the proportion of each system in the management of manure of each species. Regarding the N loss fraction , the existing data for defects was used, and the remaining data were estimated by comparing the existing data by default for some systems. This can be seen more clearly in the following table:

Table 21- Different types of manure management systems for each species

AT THE	Species	Typesofmanuremanagementsystem	Fraction of each system in management	N loss fraction (Directemission)	Fraction of N that volatilizes (indirect emission)
1	Beefcattle	Pasture	0.35 (estimate)	50 % (by default)	45 % (by default)
		Solidstorage	0		
		Drylot	0.6 (estimate)	40 % (by default)	30 % (by default)
		Anaerobic digester	0.05 (estimate)	0%	0%
two	Sheep	Pasture	0.2 (estimate)	15 % (by default)	12 % (by default)
		Solid storage	0.2 (estimate)	0%	0%
		Dry lot	0.6 (estimate)	0%	0%
		Anaerobic digester	0	0%	0%
3	Goats	Pasture	0.2 (estimate)	0%	0%
		Solid storage	0.2 (estimate)	0%	0%
		Dry lot	0.6 (estimate)	0%	0%
		Anaerobic digester	0	0%	0%
4	Swine	Pasture	0.75 (estimate)	0%	0%
		Solid storage	0		
		Anaerobic digester	0.05 (estimate)	0%	0%
		Dry lot	0.2 (estimate)	0%	0%
5	Chickens	Pasture	0.8 (estimate)	0%	0%
		Solid storage	0	0%	0%
		Manure with sawdust	0.2 (estimate)	50% (by default)	40 % (by default)

Source: Ownelaboration

4.2.4 Subsector Emissions

In 2018, GHG emissions from the Livestock category were 11.44 Gg of CO_2eq. The Subcategory of Manure Management was the one that most contributed with about 53% of GHG emissions, as shown in the table below.

Table 22- Livestock: GHG emissions by subcategory, years 2012-2018

Category 3A - Livestock	CO_2	CH_4	N_2O	CO2eq	%
3.A.1 – Enteric Fermentation	NO	0.26	0.00	5.36	47%
3.A.2 - Manure Management	NO	0.05	0.02	6.08	53%
TOTAL GHG (Gg)	**NO**	**0.31**	**0.02**	**11.44**	**100%**

Source: Froma uthors

4.3 CATEGORY 3.B- FOLU

São Tomé and Príncipe has a diversified plant heritage, with different forest formations, which play an important role in the country's economic, ecological and social life. Even though the forest economy is not properly structured in the country, it is believed that the use of forest resources involves more than five thousand São Toméans, including about three thousand five hundred loggers or chainsaw operators. In the absence of a public housing policy, the growing population has managed to find accommodation, resorting to constructions in a disorderly manner, using mainly wood, whether legally or illegally.

Timber and non-timber forest resources have experienced a growth in their exploitation, resulting from increasingly dominant informal exploitations and a growing series of threats (overexploitation of resources, agro-industrial interventions, exploitation of aggregates, construction of infrastructure: roads, housing, energy transport, etc.), which have led to forest and landscape degradation. We can point out as the main factors of this degradation:

- The expansion of large-scale agriculture;
- The uncontrolled exploitation of forests and the illegal felling of trees;
- The uncontrolled urbanization and construction of infrastructure.

Despite this constant degradation of forest ecosystems and the constant change in land use, the composition of the country's forest surface remains the same, consisting of the following plant formations shown in Table 23 :

- **Obô**- Includes forest areas never cultivated, with little or no human intervention, constituted by natural vegetation, with the sporadic presence of introduced species;
- **Secondary Forest** - Lands where agriculture was abandoned and natural forest regeneration took place and where it is still possible to identify traces of previous uses, namely due to the existence of a large proportion of introduced species;
- **Shade Forest** – Forest typology characterized by the presence of cocoa or coffee plants with a more or less dense cover of shade trees composed of natural and introduced species;
- **Savanna** - Vegetation formation that occupies a strip along the northern coast of the island of São Tomé, characterized by the absence of a continuous tree cover and by a herbaceous mosaic.

4.3.1 Category Description

The IPCC, 2006 guidelines define the following land use categories for inventory calculation in the Land sector: Forest Land, Agriculture, Grassland, Wetlands, Settlements and Other Lands. For the purposes of this inventory, the typologies of forests and other land uses in the country were adapted, according to the categories presented in table 23.

Table 23- . Categories and subcategories used for sector inventory

IPCC Category	STP Category
ForestLands	Obo
	SecondaryForest
	ShadowForest
Agriculture or Agricultural Lands	Sugar cane
	Food Cultures
	PerennialCulture
Pasture	UnmanagedSavanna
	Savanna
Wetlands[2]	Wetlands
Settlements	Urbanareas
OtherLands	OtherLands

For each of these categories, the following subcategories were considered:

- Forest Lands (forest lands that remain forest lands);
- Agriculture (Agriculture that remains as such, land converted to agriculture – forest land converted to agriculture, grassland converted to agriculture, urban areas converted to agriculture);
- Pasture (pasture that remain as such, land converted to pasture);
- Urban Zones (urban zones that remain as such, land converted to urban zones – forest land converted to urban zones).

ForestLands

This category includes all woody vegetation lands according to the national greenhouse gas inventory classification. The results exclude forest lands from protected areas and unmanaged savannah in accordance with IPCC 2006 guidelines .

Agriculture or Agricultural Lands

Agricultural land comprises arable land used for agricultural production and agro-forestry systems that are not included in the category of forest land. These lands comprise the annual and perennial crops, but also the agricultural domain lands that have recently been abandoned or have been laid down. The data for Agriculture can befound in table 4.

[2]Because they have negligible surfaces and in the absence of data that can support their classification, wetland areas and other lands were not considered for this inventory.

Settlements or urban areas

Residential infrastructure, transport infrastructure, commercial infrastructure and other infrastructure occupied by human activities are considered as Settlements or Urban Areas, unless they are not classified as another category of land. This subcategory includes green areas and gardens within the urbanization and urban afforestation.

4.3.2 Activity Data

The table below presents the estimated forest area of São Tomé and Príncipe in 2012-2018

Table 24- Estimate of the forest area of STP (2012-2018)

Land occupation topology	Surface (ha /year)						
	2012	2013	2014	2015	2016	2017	2018
Obo	28,000	28,000	28,000	28,000	28,000	28,000	28,000
Secondary Forest	28,740	27,800	26,900	27,000	27,000	27,000	27,000
Shadow Forest	31,950	31,940	31,930	31,695	31,677	31,651	31,624
Savanna	4,000	4,000	4,000	4,000	3,999	3,999	3,999
OtherAreas	7,310	8,260	9,170	9,305	9,324	9,350	9,377
Total	**100,000**	**100,000**	**100,000**	**100,000**	**100,000**	**100,000**	**100,000**

Source: Directorate of Forests and Biodiversity (DFB), 2021

In the absence of data disaggregated in terms of areas by crops, for the present work, the area data were used separately only for the sugarcane crop, however, for the others, the area data were used. by group: Group of food crops that includes crops, both maize and vegetables; Perennial crop group – grouping together palm plantations and pepper crops.

Another activity that has an influence on gas emissions in the forestry and land use sector is the timber industry, although it does not imply a change in land use, especially when it comes to illegal activities . According to DFB projections , more than 90% of logging in São Tomé is illegal.

Table 25 illustrates the evolution of forest exploitation in the last 7 years. Logging data results from the combination of legal felling (10%) and illegal felling (90%). Although illegal logging has not led to a change in land use, it has contributed to forest degradation and , consequently, to a decrease in the stock of standing wood and the capacity to sequester carbon in forest areas.

Table 25-Evolution of forest exploitation in STP between 2012-2018

Year	2012	2013	2014	2015	2016	2017	2018
Total timberexploitation in STP (m^3)	**42,072.48**	**55,269.60**	**17,817.00**	**91,261.30**	**92,238.00**	**76,571.70**	**49,411.00**
Shadowforestexploration (65%)	27,347.11	35,925.24	11,581.05	59,319.85	59,954.70	49,771.61	32,117.15
Secondaryforestexploitation (35%)	14,725.37	19,344.36	6,235.95	31,941.46	32,283.30	26,800.10	17,293.85

Source: Directorate of Forests and Biodiversity (DFB), 2021

Concerning the use of wood as a source of fuel for housing, data are also estimated based on the percentage (%) of the population that uses firewood and charcoal in the last census (INE, 2012) and on FAO estimates for the consumption of these products by inhabitant of the Central African sub-region. Table 26 shows how the consumption of firewood and charcoal has been growing, based on population growth.

Table 26- Estimated consumption of firewood and charcoal in STP between 2012-2018

Year	2012	2013	2014	2015	2016	2017	2018
Population	178,739	182,328	186,024	189,819	193,712	197,700	201,784
Population that uses firewood/coal	102,953.66	105,020.93	107,149.82	109,335.74	111,578.11	113,875.20	116,227.58
Consumption of firewood/coal (m^3)	101,924.13	103,970.72	106,078.33	108,242.39	110,462.33	112,736.45	115,065.31

Source: Directorate of Forests and Biodiversity (DFB), 2021

Forest conversion and land use changes

According to the São Tomé and Príncipe NDT report (António, 2018), the country has a trend of land degradation, taking as a reference the interval between the years 2000 and 2015. In this period the country lost about 2.5% of the forest surface, corresponding to about 2,492 ha , which have been converted mainly into agricultural land, settlements and savannahs or pastures. In this same phase, that is, from 2010 to 2015, only in land use changes, it can be considered that the country has about 1,395 ha of degraded land surfaces.

The latest DFB and FAO estimates (FRA, 2020) indicate that land conversion is resisted almost exclusively on forest land (Tables 27 and 28), mainly in the conversion of secondary and shade forests to other land uses, namely for pepper crops, food crops, for constructions/urbanizations and extension of the electrical network. The urbanization sector has grown the most, after the agriculture sector in terms of gains in land use conversion.

Table 27- Land use conversion matrix in 2018

		ForestLands (in ha)			Agriculture (in ha)			Pasture (in ha)		ZU (in ha)	Final Area 2018 (in ha)
		FdS	FS	Obo	CoA	HERE	CP	Sav	NMS		
ForestLands	**Shadow Forest(FdS)**	31624	0		0	0	0	0		0	**31624**
	Secondary Forest (FS)	0	27000.0		0	0	0	0		0	**27000**
	obo			28000.0							**28000**
Agriculture	**Sugar cane(CdA)**	0	0		235.0	0	0	0		0	**235**
	Food Cultures (CA)	6	0		0	3526.7	0	0		0	**3532.7**
	Perennial Crops (PC)	10.9	0		0	0	2183.7	0		0	**2194.6**
Pasture	**Savanna(Sava)**	0	0		0	0	0	1651.2		0	**1651.2**
	Unmanaged savanna (SNM)								2348.0		**2348**
Settlements	**Urban Areas (ZU)**	10	0		0	0	0	0		3504.5	**3514.5**
	InitialArea 2018	31650.9	27000.0	28000.0	235.0	3526.7	2183.7	1651.2	2348.0	3504.5	**100100**
	net change	-26.9	0	0	0	6	10.9	0	0	10	**0**

Table 28- Land use conversion matrix in 2012 and 2016

	ForestLands (in ha)			Agriculture (in ha)			Pasture (in ha)		ZU (in ha)
	FdS	FS	Obo	CoA	HERE	CP	Sav	NMS	
year 2016									
HomeArea	31695.4	27000.0	28000.0	234	3517.0	2163.9	1652.2	2348.0	3489.5
Final Area	31677.0	27000.0	28000.0	235	3520.7	2173.6	1651.2	2348.0	3494.5
Net change	-18.4	0	0	1	3.7	9.7	-1.0	0	5.0
year 2012									
HomeArea	31950.0	29120.0	28000.0	234	2741.7	948.0	1652.2	2348.0	3106.1
Final Area	31950.0	28740.0	28000.0	234	2764.7	1239.0	1652.2	2348.0	3172.1
Net change	0	-380.0	0	0	23.0	291.0	0	0	66.0

4.3.3 Emission factors

For the calculation of the GHG emissions estimate, the standard emission and removal factors were considered according to the IPCC 2006 guidelines , for all the corresponding subcategories, as shown in the tables below.

Table 29- Emission and removal factors applied in forest classifications

factors	foresttypology	
	SecondaryForest	ShadowForest
Climate Region	Humid tropical, short dry season	Humid tropical, short dry season
Soil type	Volcanic	Volcanic
Ecosystem type	tropical forest	tropical forest
Age class	undefined	undefined
C stock growth	Less than 10	Less than 10
C proportion of above ground biomass	0.47	0.47
Ratio of C from below ground biomass to above ground biomass	0.20	0.20
Biomass conversion and expansion fact for fire wood and fire wood removal	0.00	0.00
Above ground biomass	260.00	150.00
Above ground biomass growth	1.30	9.00
C proportion of dry matter	2.10	2.10
Average annual growth of above and below ground biomass	1.56	10.80
Basic wooddensity	0.70	0.70

Source: Own elaboration, Adapted from IPCC2006

Concerning the other land uses, all were classified in the humid tropical climate region, short dry season and under volcanic mineral soil. The factors shown in the table below were used for the calculations .

Table 30- Emission and removal factors applied to other land uses

Savanna		Factors	Agricultural lands		
			Sugar cane	food cultures	perennialcr ops
Management	0.67	Above ground biomass	10.00	10.00	--
Herbaceous biomass stocks present on land	16.10	Land use	0.58	0.48	0.48
Woody biomass stocks present on earth	6.00	Tilage	1.09	1.00	1.00
Herbaceous biomass stocks after conversion from other land use	16.10	Input	0.95	0.92	0.92
Woody biomass stocks after conversion from other land use	5.50	Harvest / maturity --	--	--	8.00
Fraction of dry matter for herbaceous biomass	0.47	C loss from biomass	--	--	21.00
Fraction of dry matter for woody biomass	0.49	Biomass accumulation rate	--	--	2.60
--	--	Fraction of C in dry matter	0.50	0.50	0.50

Source: Own elaboration, Adapted from IPCC2006

4.3.4 Subsector Emissions

During 2018, the forestry and other land uses sector, in its Land category, presented an emission of 48.00 Gg of CO_2eq, with the forest land conversion subsector in urban areas the one that contributed the most to the emissions. Removals were in the order of -564.01Gg of CO_2 resulting from the absorption capacity of forest lands. Thus, the absorption is higher than the emissions in the sector and the balance results in -516.72 Gg of CO_2eq (table 31).

Table 31- Results of emissions/removals in the FOLU sector in 2018

Category 3B - Lands	Net CO_2	CH_4	N_2O	CO2eq
3.B.1- ForestLands	-564.01			-564.01
3.B.2 – AgricultureorAgriculturalLands	6.07			6.07
3.B.3 - Pastures	0.00			0.00
3.B.5 - Settlements	41.93			41.93
TOTAL GHG (Gg)	**-516.01**			**-516.01**

Source: Ownelaboration

4.4 CATEGORY 3.C- AGGREGATE SOURCES AND SOURCES OF NON-CO2 EMISSIONS IN THE GROUND

4.4.1 Category Description

According to the IPCC Guidelines for the elaboration of National Inventories of Greenhouse Gases in this category, emissions of nitrous oxide (N_2O) from managed soils are considered, including indirect emissions of N_2O from N aggregates to land, due to volatilization and leaching, as well as emissions of carbon dioxide (CO_2) produced by aggregates of liming materials and fertilizers with urea content, as well as emissions from biomass burning .

In the context of STP for this category, the following subcategories were considered:

- Emissions from burning biomass (3.C.1):
  - Biomass burning in the fields (3.C.1.b) and
  - Biomass burning in the savanna (3.C.1.c);
- Application of Urea in the soil (3.C.3);
- Direct emission of N2O from the Managed Soil (3.C.4);
- Indirect Emission of N2O from Managed Soil (3.C.5);
- Indirect N2O Emissionsfrom Animal Manure Management (3.C.6);

4.4.2 Activity Data

São Tomé and Príncipe in general faces many challenges in terms of availability of statistical data, and the agriculture sector is one of the most affected due to budgetary limitations for carrying out statistical data collection. The last agricultural census in the country dates from the 1990s. Therefore, most of the statistical data used in the country are mere estimates made by the sector. However, consultations were also made with some commercial stores, FAOSTAT, some bibliographies that allowed the compilation of information and organization of a database.

Regarding the burning of agricultural crop residues, the main crops in which the practice of burning is more visible are corn and sugar cane crops. To a lesser extent comes some crops from the vegetable group.

In the absence of data disaggregated in terms of areas by crops, for the present work, the area data were used separately only for the sugarcane crop, however, for the others, the area data by group were used (food crops group), which includes both maize and vegetable crops. Thus, a total area of 3,532.7 ha was considered for food crops and 235 ha for sugarcane cultivation.

To calculate the emissions caused by the burning of agricultural residues, for both crops, it was estimated that about 10% of the area was burned in 2018, and for the sugarcane crop, an area of approximately 23.5 ha and for food crops, about 353.3 ha.

In STP, forest fires occur in the agroecological zone of Savanna, which occupies the north and northeast regions of the island of São Tomé. For this inventory, it was estimated that about 70% of our managed savannah area, ie 1,155.84 ha, was affected by fires.

As for the estimation of emissions from synthetic nitrogen fertilizers, it was based on import data from 2018, provided by the INE (table 32), where the net consumption of nitrogen (N) was calculated, by type of fertilizer, multiplying the consumption of fertilizer by the percentage of N of each type, while for the organic nitrogen fertilizers from animal manures and organic compost, except urine and feces of animals in the pasture, it was made on the basis of the sum of N of the whole management system of manure and organic compost applied to the soil.

Table 32- Imports of Nitrogen Synthetic Fertilizers in 2018

Nº	Fertilizer	Quantity imported in 2018 - kg
1	Urea	32,703.0
2	Ammonium sulfate	81,442.0
3	NKP (15-15-15)	12,640.0

Source: INE, 2019

As a result of these estimates, 33.43 ton of N were obtained from synthetic nitrogen fertilizers and 608.1 ton of N derived from organic fertilizers, for the year 2018.

The amount of N from urine and manure deposited by animals on pasture was about 670 tons.

The amount of manure nitrogen that is lost due to volatilization of NH_3 and NO_x was 24.0 Tons.

With regard to organic compost production data, due to the absence of statistical data, and considering that in 2018, the number of farmers who produced organic compost is insignificant, the organic compost data was disregarded in the calculations. For the same reasons, the generation of N from crop residues (FCR) or from soils that are mineralized was not considered.

The application of urea as a fertilizer, INE data were collected , in which a total of 32.7 tons of urea consumed in the country in 2018 was recorded .

4.4.3 Emission factors

For the calculation of the emission estimate of this category, both for fertilization, forest fires and urea application, the default factors contemplated in the 2006 IPCC Guidelines were used and the necessary information was available to approach their estimate.

In relation to fires (Savannah), the default mass factor of fuel available for combustion was used, which is 14.3 presented in the IPCC (2006). While the combustion factor is 1 and the emission factor is 2.3 grams of GHG per kg of dry matter burned).

The emission factor used in terms of direct emissions from N addition to soils was 0.01 kg N_2O-N / kg applied N, presented as a standard factor in the IPCC (2006).

indirect emissions by leaching and N volatilization, data by defects were used, namely: the fraction of N that volatilizes and that leaches, for each of these fertilizers as well as the emission factors. These data are found in the following table.

Table 33-Fraction of N that volatilizes and leaches and the emission factors

Typeoffertilizers	Volatilization		leaching	
	Fraction of N that volatilizes kg N2O-N / kg NH3-N + Nox -N	Emission Factor kg N2O-N / kg NH3-N + Nox -N	Fraction of the N that leaches kg N / kg N	Emission Factor kg N2O-N / kg N
Synthetic nitrogen fertilizers	0.1	0.01	0.3	0.0075
Nitrogen organic fertilizers	0.2	0.01		

Source: Calculations by team

In order to obtain the CO_2 emissions from the application of urea, the standard emission factor (0.2 tons of C per ton of urea applied) was used.

4.4.4 Subsector Emissions

In 2018, category (3C) emitted 12.97 Gg of CO2eq. The subcategory of direct N2O emissions from soil management was the one that emitted the most with around 71%, followed by indirect N2O emissions from soil management with 21%. The remaining subcategories with less expressive emissions, as shown in the table below.

Table 34- GHG emissions by category 3.C

Category 3C - Aggregate sources and sources of non-CO_2 emissions on land	CO_2	CH_4	N_2O	CO_2eq	%
3.C.1 - Emission from the Burning of Biomass		0.02	0.00	0.97	7%
3.C.3 – Urea Application	0.02			0.02	0%
3.C.4 – Direct N2O Emissions from Land Management			0.03	9.16	71%
3.C.5 - Indirect N2O Emissions from Land Management			0.01	2.70	21%
3.C.6 - IndirectN2O Emissions from Manure Management			0.00	0.12	1%
TOTAL GHG (Gg CO_2)	**0.02**	**0.02**	**0.04**	**12.97**	**100%**

Source: Own elaboration

4.5 Total GHG Emissions from the AFOLU Sector, 2018

The table below presents the sectoral report for agriculture, forestry and other land uses (AFOLU).

Table 35- GHG emissions from the AFOLU sector, 201 8

Categories	(Gg)		
	Net CO_2emissions / removals	Emissions	
		CH_4	N_2O
3 - Agriculture, Forestry , and Other Land Use	-516,038	0.331	0.056
3.A - Livestock	NO	0.308	0.016
3.A.1 - Entericfermentation	NO	0.255	AT THE
3.A.1.a - Cattle	NO	0.044	AT THE
3.A.1.ai - Dairy Cows		0	
3.A.1.a.ii - Other Cattle		0.044	
3.A.1.b - Buffalo		0	
3.A.1.c - Sheep		0.020	
3.A.1.d - Goats		0.154	
3.A.1.e - Camels		0	
3.A.1.f - Horses		0	
3.A.1.g - Mules and Asses		0	
3.A.1.h - Swine		0.037	
3.A.1.j - Other (please specify)		0	
3.A.2 - Manure Management (1)	NO	0.053	0.016
3.A.2.a - Cattle	NO	0.001	0.002
3.A.2.ai - Dairy cows		0	0
3.A.2.a.ii - Other cattle		1.4E-03	1.7E-03
3.A.2.b - Buffalo		0	0
3.A.2.c - Sheep		8.0E-04	9.8E-04
3.A.2.d - Goats		6.8E-03	9.4E-03
3.A.2.e - Camels		0	0
3.A.2.f - Horses		0	0
3.A.2.g - Mules and Asses		0	0
3.A.2.h - Swine		3.7E-02	3.9E-03
3.A.2.i - Poultry		6.3E-03	2.7E-05
3.A.2.j - Other (please specify)		0	0

Categories	(Gg)		
	Net CO_2 emissions / removals	Emissions	
		CH_4	N_2O
3.B - Land	-516.011	NO	NO
3.B.1 - Forestland	-564.008	NO	NO
3.B.1.a - Forest land Remaining Forest land	-564.008		
3.B.1.b - Land Converted to Forest land	0	NO	NO
3.B.2 - Cropland	6.072	NO	NO
3.B.2.a - Cropland remaining cropland	0.161		
3.B.2.b - Land Converted to Cropland	5,911	NO	NO
3.B.2.bi - Forest Land converted to Cropland	5,304		
3.B.2.b.ii - Grassland converted to cropland	0.405		
3.B.2.b.iii - Wetlands converted to cropland	0		
3.B.2.b.iv - Settlements converted to cropland	0.202		
3.B.2.bv - Other Land converted to Cropland	0		
3.B.3 - Grassland	0	NO	NO

3.B.4 - Wetlands	0	NO	NO
3.B.5 - Settlements	41,925	NO	NO
3.B.5.a - Settlements remaining Settlements	0		
3.B.5.b - Land Converted to Settlements	41,925	NO	NO
3.B.5.bi - Forest Land converted to Settlements	41,925		
3.B.5.b.ii - Cropland converted to Settlements	0		
3.B.5.b.iii - Grassland converted to Settlements	0		
3.B.5.b.iv - Wetlands converted to Settlements	0		
3.B.5.bv - Other Land converted to Settlements	0		
3.B.6 - Other Land	0	NO	NO

Categories	(Gg)		
	Net CO_2emissions / removals	Emissions	
		CH_4	N_2O
3.C - Aggregate sources and non-CO2 emissions sources on land (2)	0.024	0.024	0.040
3.C.1 - Emissions from biomass burning	0	0.024	0.002
3.C.1.a - Biomass burning in forest lands		0	0
3.C.1.b - Biomass burning in croplands		0.010	0.000
3.C.1.c - Biomass burning in grasslands		0.014	0.001
3.C.1.d - Biomass burning in all other land		0	0
3.C.2 - Liming	0		
3.C.3 - Ureaapplication	0.024		
3.C.4 - Direct N2O Emissions from managed soils (3)			0.030
3.C.5 - Indirect N2O Emissions from managed soils			0.009
3.C.6 - Indirect N2O Emissionsfrommanure management			0.000
3.C.7 - Rice cultivation		0	
3.C.8 - Other(pleasespecify)			
3.D - Other	-0.051	0	0
3.D.1 - HarvestedWoodproducts	-0.051		
3.D.2 - Other(pleasespecify)			

Table 36- CO_2eq emissions from the AFOLU sector, 2018

Sector - Agriculture , Forestry and Other Land Uses (AFOLU)	CO_2	CH_4	N_2O	CO_2eq
3.A - Livestock		0.31	0.02	11.44
3.B - Forests and Other Land Uses (FOLU)	-516.01			-516.01
3.C. – Aggregate sources and non-CO2 soil emission sources	0.02	0.02	0.04	12.97
TOTAL GHG (Gg) (incl . FOLU)	**-515.99**	**0.33**	**0.06**	**-491.60**
TOTAL GHG (Gg) (excl . FOLU)	**0.02**	**0.33**	**0.06**	**24.41**

Source: Calculations by the team

4.6 Evolution of GHG Emissions from the AFOLU sector

The first IGEE for São Tomé and Príncipe were calculated using the IPCC 1996 Guidelines . However, the UNFCCC recommends countries to use the new IPCC 2006 guidelines for the calculation of national inventories. In this way, to allow a comparison between the current inventory and that of 2012, the 2012 inventory was recalculated with the IPCC 2006 Guidelines. Likewise, the emissions of the year 2016 were calculated to allow seeing the evolution of emissions and fine-tuning the methodology.

Thus, compared to previous inventories, the data in table 35 shows that there was an increase of about 23% in the absorption capacity of CO_2 emissions, that is, there was an increase of 97.15 Gg of CO_2 in the absorption capacity , if we compare the inventory values of 2012 with those of 2018.The positive balance of emissions in the Forests and Other Land Uses (FOLU) sector is due to the fact that in recent years there have not been major conversions of forests into other types of land use. Nevertheless, as shown in Figure 12, the carbon sequestration capacity by forests has been gradually decreasing over the years.

Regarding the evolution of GHG emissions from the remaining categories, Livestock and Aggregate sources and non-CO_2 emissions in the soil, they show a slight growth over the years, in the order of 12% and 21%, respectively, if we compare the variation of emissions of 2018 with the last inventory from 2012.

Table 37- Evolution of total GHG emissions in Gg of CO2eq

Category 3 - Agriculture , Forestry and Other Land Uses (AFOLU)	2012	2016	2018	2018-2012	
				Difference	Variation
3.A - Livestock	10.25	11.08	11.44	1.19	12%
3.B - Forests and Other Land Uses (FOLU)	-418.86	-523.26	-516.01	-97.15	23%
3.C. – Aggregatesourcesand non-CO2 soilemissionsources	10.75	12.37	12.97	2.21	21%
TOTAL GHG (Ggof CO_2eq) (incl . FOLU)	**-397.85**	**-499.82**	**-491.60**	**-93.75**	**24%**
TOTAL GHG (Ggof CO_2eq) (excl . FOLU)	**21.00**	**23.45**	**24.41**	**2,293**	**11%**

Source: Calculations by the team

According to table 36, it can be said that the trend of CO_2eq emissions (egFOLU) is increasing over the years. Compared to the last inventory in 2012, there was an increase of around 11% in 2018.

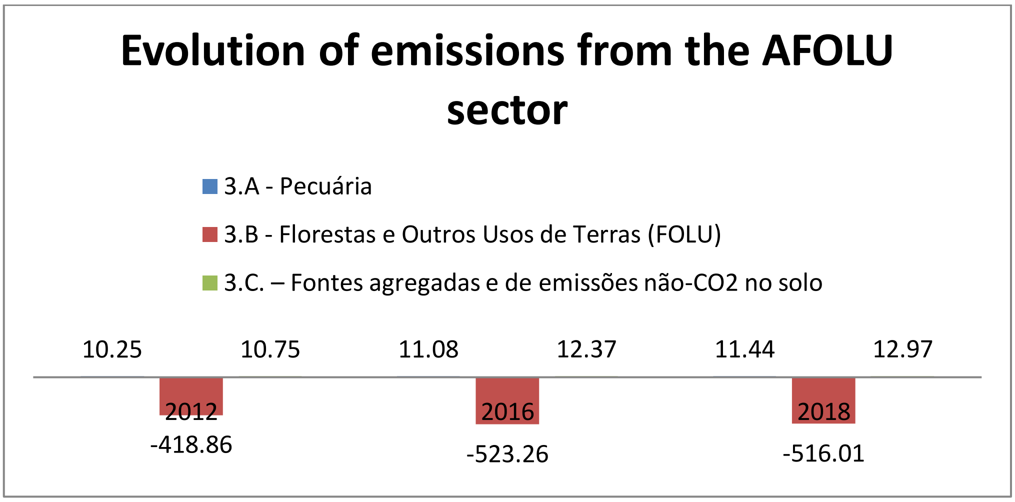
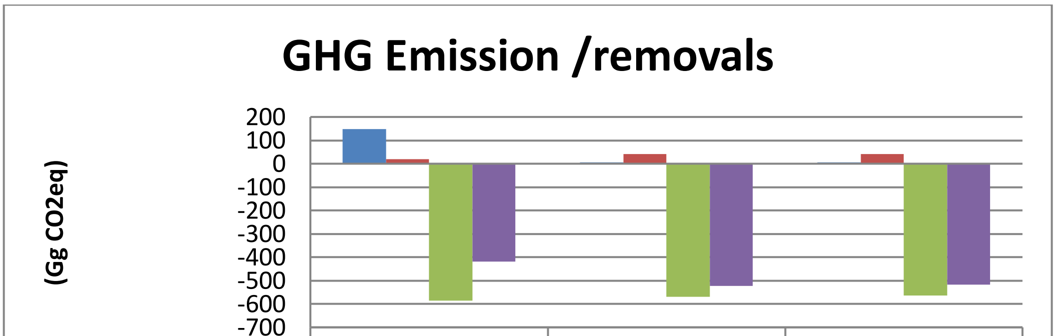


Figure 11-Evolution of CO_2eq emissions and removals



	2012	2016	2018
3.B.2 - Cropland	148.33	5.11	6.07
3.B.5 - Settlements	18.66	40.51	41.93
3.B.1 - Forest land	-585.85	-568.88	-564.01
3.B - FOLU	-418.86	-523.26	-516.01

Figure 12- Evolution of GHG Emissions in the FOLU Category

5 WASTES

5.1 SourceCategories

According to the 3rd Greenhouse Gas Inventory of the Third National Communication (TCN), the waste sector in São Tomé continues to have a share of GHG emissions at the country level. It is urgent to provide this sector with means and investments in the short, medium and long term in the prevention of waste production. Investment in separation, recycling and recovery becoming a strong point in reducing GHG emissions.

This fourth inventory estimates carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emissions for the main categories, as shown in the table below.

Table 38-Main categories of the waste sector, used in the GHG Inventory.

Categories	**Subcategories**	**gases**	**STATUS**
4.A- Disposal of solid waste	Urban solid waste	CH_4	O
	Industrial Waste	CH_4	O
4.B- Biological treatment of solid waste	Compost	CH_4, N_2O	NE
	Anaerobic digestion	CH_4, N_2O	NE
	Biological Mechanical Treatment	CH_4, N_2O	NO
4.C- Incineration and open burning of waste	WasteIncineration	CO_2, CH_4, N_2O	N9
	Outdoor burning	CO_2, CH_4, N_2O	O
	Incineration of Fossil Liquid waste	CO_2	NE
4.D- Treatment and disposal of wastewater	Domestic Effluents	CH_4, N_2O	O
	Industrial Effluents	CH_4, N_2O	O

5.2 CATEGORY 4.A- SOLID WASTE DISPOSAL

5.2.1 CategoryDescription

The treatment and disposal of domestic, industrial and other solid wastes produce significant amounts of methane (CH_4). In addition to CH_4, solid waste disposal sites also produce biogenic carbon dioxide (CO_2) and Non-Methane Volatile Organic Compounds (NMVOC).

In São Tomé e Príncipe (STP), from an environmental point of view, there is still no adequate practice of solid waste treatment, they are deposited in an undifferentiated way, carrying out the burning in the open air, which contributes greatly to the emission of CO_2 for atmosphere, in addition to local polluting gases, with possible damage to the health of the population.

In urban centers there is a deficient collection of waste at the level of all districts and the Autonomous Region of Príncipe . There is a lack of adequate treatment structures, thus hindering good waste management. Local authorities are responsible for the collection and treatment of Urban Solid Waste (MSW). And in rural areas there is no collection of MSW by the local authorities, the disposal is done directly in wasteland without having any type of treatment, thus constituting sources of environmental pollution and risks to the health of the surrounding population.

5.2.2 Activity Data

The data were provided by the National Statistics Institute (INE), the General Directorate of Customs, the General Environment Directorate (DGA), and the population statistical data were obtained from the National Statistics Institute (INE), the data on the generation of waste and rate of waste collected were obtained from the Action Plan for Integrated Management of Urban Solid Waste (PAGIRSU-2011-2018), as well as data on climatic conditions, key factors for determining emissions.

For the last 20 years the country does not have available data on MSW for most treatment systems, including data on waste production quantities, final disposal and, to a lesser extent, waste composition.

Waste is not collected regularly and the information used to calculate emissions from this sector is available in the 2018 National Plan for the Integrated Management of Urban Solid Waste (PNGIRSU, 2018).

Based on the composition of waste presented in said plan, as well as the value of the daily generation rate per inhabitant of 141 kg/inhabitant/year in 2017, the aforementioned value was considered for all years of the time series, that is , 2000 to 2018.

According to the latest census (INE-STP), in 2012, São Tomé and Príncipe had 178,739 inhabitants. Considering INE projections , the population in 2018 was 201,785 inhabitants, with the urban population being 136,775 inhabitants (68%) and the rural population of 65,010 inhabitants (32%).

Regarding statistics on the quantification and production of industrial waste, the country does not have a precise inventory of these data. The calculations of methane emissions resulting from the disposal of industrial waste were based on the value of the country's gross domestic product in the time series from 2001 to 2018, according to the following table.

Table 39- Country's Gross Domestic Product data from 2001 -2018.

	2001	2010	2014	2015	2016	2017	2018
GDP ($)	71,630,586	196,652,197	324.292768	314,119,904	352,406,149	372,083,488	399,865,877

Source: INE, 2020

Data on the composition of waste and its physicochemical characterization (percentage by dry weight) are not available for the years of the time series. However, from the information for the year 2017 reflected in the PNGIRSU,2018, estimates could be made for the remaining years considered in the history.

According to PNGIRSU, 2018 the physical characterization of waste in order to determine the representative composition of the six (6) Districts and the Autonomous Region of Príncipe considering two distinct seasons, dry season (months of July and August) and rainy season (months of October and November) the various classes are presented below:

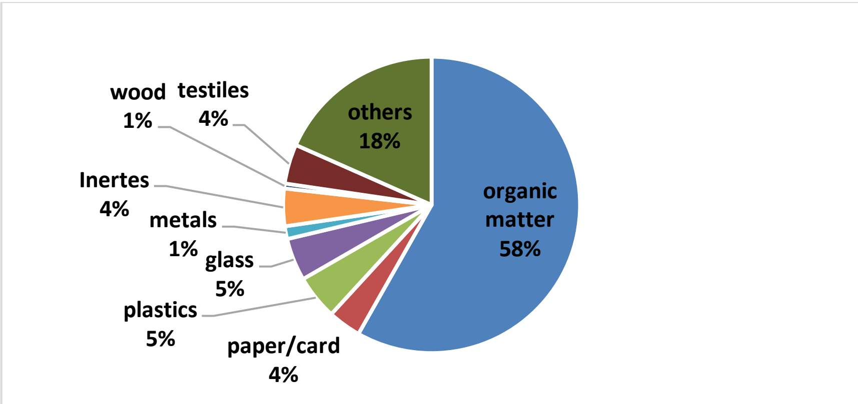


Figure 13-Composition of waste in São Tomé and Príncipe

According to PNGIRSU 2018, only 38% of the population benefited from waste collection services.

There are no statistical data on the amount of hazardous waste (oils, lubricants, waste electrical and electronic equipment, etc.) and hospital waste. They do not undergo adequate treatment, most of them are mixed with urban solid waste, ending up having the same final destination, which is deposition in the dump and subsequent burning in the open. Therefore , emissions from this source were not estimated .

The estimate of Degradable Organic Carbon (DOC), presented in the following table, was based on information available in the IPCC 2006 manual, and the composition of waste by dry weight was based on national data on the composition of waste disposed of in the SER (dumpsters or vacant lots), due to the fact that the country does not have detailed information about the fractions .

Table 40- Physical composition of waste in STP - Adapted from PNGIRSU (2017-2023)

Fraction of Waste	DOC Content[3]	% dry weight 2017
Paper	90	3.61
Left over food	40	18.28
GardenWaste	40	39.91
Glass	100	4.64
Plastic	100	4.85
Wood	85	0.54
Metal	100	1.39
Textile	80	4.31
Rubber	84	0.04
Others and inert	90	22.43

Source: From authors, adapted from the IPCC 2006

5.2.3 Emission factors

For the calculation of the estimated CH_4 emissions in this inventory, the standard emission factors were considered and were used according to the IPCC 2006 guidelines , for all the corresponding subcategories, as shown in the following table.

Table 41- Default parameters used in CH_4 emissions calculations.

CH_4 correction factor_ MCF	Fraction of DOC_F	COD fraction degraded	Fraction of CH_4 recovered in the landfill	Oxidation factor
Uncategorized =0.6	0.5	0.4	0	0

Source: From authors, adapted from the IPCC 2006 and PNGIRSU (2017-2023).

The default emission factor was considered for the unclassified disposal equal to 0.6 since the country does not have a sanitary landfill infrastructure for the final destination of waste. Which means the dumps are all out in the open air on the surface.

The factor of recovered methane was considered equal to zero, since there is no sanitary landfill that can recover the methane. The same was attributed to Oxidation Factor taking into account SEDS is not managed .

5.2.4 Subsector GHG emissions

In 2018, GHG emissions from the solid waste disposal category were around 26.79 Gg CO2eq, which represents 33% within the sector (Table 49).

[3]Table 2.4 of the IPCC 2006 Manual

5.3 CATEGORY 4.C- WASTE INCINERATION OR WASTE BURNING IN THE OPEN SKY

5.3.1 Category Description

According to the IPCC (2006), the incineration of solid waste can emit CO_2, CH_4 and N_2O. These wastes, according to the IPCC, are divided into the following types: Urban Solid Waste (MSW), Hazardous Industrial Solid Waste (RP), Health Services Waste (RSS) and Sewage Sludge (LE).

The waste incineration process is not applied in the country, but the practice of uncontrolled open-air burning of undifferentiated waste, that is, urban, hospital, industrial solid waste is deposited and burned in the open in different dumps scattered throughout the country. country.

Relevant gases emitted in this subsector include CO_2, CH_4 and N_2O. GHG emissions largely depend on the amount of fossil carbon in the burned waste.

For this inventory, GHG emissions from the incineration process were not calculated due to the fact that in the reference year of the inventory, the country did not have an incinerator, but due to the burning of waste in the open. Emissions from the biogenic CO_2 component are accounted for in the Agriculture, Forestry and Land Use (AFOLU) sector.

5.3.2 Activity Data

The data by type of material are the same as those presented in the waste disposal section, taken from the 2018 PNGIRSU, as well as the percentage of the population that benefits from waste collection.

considered that about 58% of waste is biodegradable, in which it contains a lot of moisture, so it does not have the calorific value to have a complete burning.

It was considered that 20% of the population of São Tomé burns the waste in the open and the other fraction deposits it in vacant land, bury it or deposit it in containers that are later burned or disposed of in open dumps.

5.3.3 Emission factors

For the calculation of the estimated CO_2 emissions, the IPCC-2006 default factors were used, as indicated below.

Table 42- Factors used to calculate GHG emissions .

Type of Waste	% of Municipal Solid Waste Content	Dry matter content -dm	Fraction -CF	Fraction -FCF	Factor -OF
Paper	3.8%	0.9	0.46	0.01	0.58
Textile	4.5%	0.8	0.5	0.16	0.58
Leftover food	19.3%	0.4	0.38	0	0.58
Wood	0.5%	0.85	0.5	0	0.58
GardenWaste	42.4%	0.4	0.49	0	0.58
Diapers	0.0%	0	0	0	0
Rubber	0.4%	0.84	0.67	0.17	0.58
Plastic	5.2%	1	0.75	0.8	0.58
Others and inert	23.8%	0.9	0.03	0.03	0.58

Source: Own elaboration, Adapted from IPCC2006

Table 43- Factors used to calculate CH4 and N2O emissions .

Emission factor kg CH_4/Gg	Emissionfactor kg N_2O/Gg
6500	150

Source: IPCC-2006

5.3.4 Subsector GHG emissions

In 2018, GHG emissions from the waste incineration or open-air waste burning category was around 0.35 Gg CO_2eq, which represents less than 1% within the sector (Table 49).

5.4 CATEGORY 4.D- EFFLUENT TREATMENT AND DISPOSAL

5.4.1 Category Description

Domestic/commercial and industrial wastewater treatment processes can produce methane (CH_4) when treated or disposed of in an anaerobic environment and can also be a source of nitrous oxide (N_2O) emissions depending on the nitrogen content in human food. Emissions of carbon dioxide (CO_2) from wastewater are not considered as they are of biogenic origin and should not be included in total national emissions.

Wastewater produced in São Tomé and Príncipe originates from domestic, commercial and industrial sources and is not treated on site (not collected) and discharged untreated in the vicinity or through drains.

The country does not have a conventional treatment system normally used in developed countries, such as ponds, biological filters, anaerobic reactors and Wastewater Treatment Plants - WWTP. There exists alternative treatment systems such as septic tanks as derivatives of autonomous sanitation through latrines and conventional toilets with flushing and treatment in infiltration boxes and septic tanks with infiltration drain.

5.4.1 Activity Data

A. Domestic and Commercial Effluents

Studies carried out at the country level show that the vast majority of STP families both in urban and rural areas do not benefit from adequate sanitation facilities (even the most rudimentary ones) for the evacuation of excreta and used water (waste water).

Statistical data show that in 2012 only 26% of families had a complete bathroom. Other families use improved latrines and a large part of the population in rural areas therefore resorts to open defecation .

A smaller percentage of domestic and commercial wastewater is collected through a sewer system which is normally discharged directly into the sea, rivers and soil.

National population data were obtained from the National Statistics Institute (INE, 2012), and intermediate years estimated by interpolation.

N2O emissions were estimated from per capita protein consumption based on data from Food and Agriculture Organization (FAOSTAT, 2020). As there are no per capita protein values for the year 2018 , the per capita protein value for the nearest year 2013 was used, which was 52.13 g/person/day, which corresponds to 19.23 kg/person /year.

Table 44- Protein consumption at the national level.

Year	2012	2016	2018
Population	178739	193 712	201785
Protein	19.5	19.3	19.1

B. Industrial effluents

In São Tomé and Príncipe, industrial effluents come from industrial production in different sectors such as beverages and meat. There are no treatment systems for these types of effluents. They are discharged directly into bodies of water.

The Table below presents the calculations of the amount of effluents produced from the annual production of each industrial unit.

Table 45- COD value of the identified industries, 2018.

Typesof Industries	ProductionUnit ton/year	EffluentProduced (m^3/t) (Wi)	COD kg COD/m^3
Beerandmalt	4301.3	6.3	2.9
Chickenandpoultry	1020.0	13	4.1

Source: From the authors

For each identified industrial sector, the annual production value was taken as sources of statistical information, the National Statistics Institute, the Rosema factory and the Livestock Directorate .

5.4.1 Emission factors

For the calculation of the estimated CH4 emissions in this inventory, the Standard emission factors were used according to the IPCC 2006 guidelines, for all the corresponding subcategories, as follows:

A. Domestic and Commercial Effluents

The table below presents the MCF and EFi factors used for each wastewater treatment system considered and the dataset used.

Table 46- Types of treatments and disposal system or route used in the country.

Type of treatment system i	Methane Conversion Factor (MCF)	Emission Factor EF $_i$(kg CH_4 /Kg BOD)
Septic tank and sinks	0.5	0.3
Release into water courses without collection	0.1	0.06
Latrine	0.7	0.42

Source: From the authors. Adapted from IPCC 2006

The default value of the Degraded Organic component (BOD5) of 37g/BDO/day specific for Africa of the IPCC 2006 was used, since the country does not have official data. Taking into account the assessment of the fraction of sewage treated and the type of treatment in septic tank and discharge of water into the course without collection.

The IPCC default factors for nitrogen content and subsequent N2O emission were adopted .The default value for the nitrogen fraction in proteins according to IPCC-2006 guidelines is 0.16 kg N/kg protein.

B. industrial effluents

The IPCC (2006) default value for maximum production capacity of CH4 (Bo) used for industrial wastewater was 0.25 kg CH4/kg COD and for MCF - The following table presents the MCF factors for each system of wastewater treatment considered.

Table 47- Types of treatments used in the country.

Type of treatment	Methane Conversion[4] Factor (MCF)	Emission Factor EF $_j$(kg CH_4/Kg COD)
Release into water courses without collection	0.1	0.25

Source: From the authors. Adapted from IPCC 2006

5.4.2 Subsector GHG Emissions

In 2018, GHG emissions from the effluent treatment and disposal category were responsible for 17.42 Gg of CO_2eq, or about 65% in the sector (Table 49). The sector's GHG emissions increased by 13 % compared to 2012 .

At the subcategory level, domestic and commercial wastewater are the most important with around 99%, while industrial wastewater represented less than 1%.

5.5 Total GHG Emissions for the Waste Sector, 2018

After using the IPCC 2006 Software, CO2, CH4 and N2O emissions from the waste sector were estimated for the inventory year 2018, as shown in the following table.

Table 48- Total Emissions from the Waste Sector, 2018

inventoryYear : 2018

Categories	Emissions[Gg]			
	CO_2	CH_4	N_2O	CO_2eq
4 - Waste	0.1083	0.8288	0.0068	19,618
4.A - Solid Waste Disposal	0	0.4275	0	8,977
4.A.1 - Managed Waste Disposal Sites				
4.A.2 - Unmanaged Waste Disposal Sites				
4.A.3 - Uncategorized Waste Disposal Sites				
4.B - Biological Treatment of Solid Waste		0	0	0
4.C - Incineration and Open Burning of Waste	0.1083	0.0095	0.0001	0.3482
4.C.1 - Waste Incineration	0	0	0	0
4.C.2 - Open Burning of Waste	0.1083	0.0095	0.0001	0.35
4.D - Wastewater Treatment and Discharge	0	0.3918	0.0067	10.2934
4.D.1 - Domestic Wastewaster Treatment and Discharge		0.3885	0.0067	10.2236
4.D.2 - Industrial Wastewater Treatment and Discharge		0.0033		0.0698
4.E - Other(please specify)				

[4]Source IPCC 2006

Table 49- Summary of total emissions from the Waste Sector for the year 2018

Category 4 - Waste	Year 2018 Emissions[Gg]				
	CO_2	CH_4	N_2O	CO_2eq	%
4.A - Disposal of Solid Waste		0.4275		8.98	33.60%
4.C - Incineration or open-air burning	0.1083	0.0095	0.0001	0.35	1.30%
4.D - Effluent Treatment and Disposal		0.3918	0.0067	10.29	65.10%
TOTAL in Gg	**0.108**	**0.829**	**0.007**	**19.62**	**100%**

Source: From the authors

In 2018, GHG emissions from the waste sector accounted for around 19.62 Gg of CO2eq. At the category level, 65% of the sector's GHG emissions correspond to the category of Wastewater treatment and disposal, followed by a 34% of Solid waste disposal and about 1% corresponding to the Incineration or open-air burning of waste category. .

The main GHG emitted by the sector was CH4, responsible for 92% of GHG emissions, followed by N_2O with 8% and CO_2 with less than 1%, as shown in the figure below.

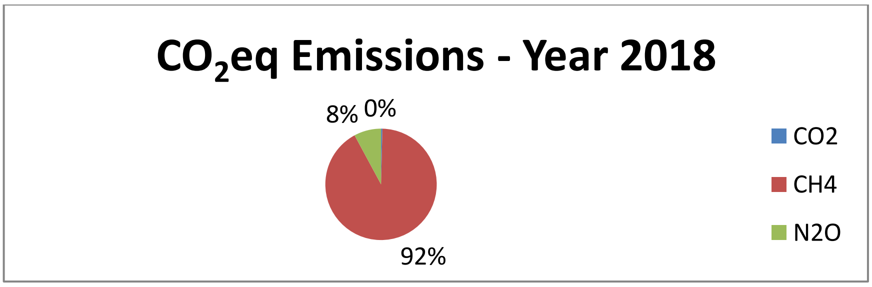


Figure 14-Share of GHG emissions by type of gas

5.6 Evolution of emissions for the Waste sector, 2012-2018

Table 50– Evolution of Waste Sector Emissions, 2012 – 201 8

Category 4 - Waste	Year			2018 -2012	
	2012	2016	2018	Difference	Variation
4.A - Disposal of Solid Waste	7.13	8.42	8.98	1.85	26%
4.C - Incineration or open-air burning	0.279	0.33	0.348	0.07	25%
4.D - Effluent Treatment and Disposal	9.17	9.92	10.29	1.13	12%
TOTAL GHG (Gg CO_2 eq)	**16.57**	**18.68**	**19.62**	**3.04**	**18%**

Source: Fromtheauthors

In comparison with 2012, it was found that GHG emissions for the Waste Sector had an increase of 18%, while for the categories, Solid Waste Disposal and Incineration or Open

Burning, both with a an increase of about 26% and in the last place the treatment and discharge of effluents with an increase of around 12%.

Table 51- Evolution of: GHG emissions from the Waste Sector, 2012-2018

GHG EmissionsbyGas	Year			2018 -2012	
	2012	2016	2018	Difference	Variation
CO_2	0.09	0.10	0.11	0.02	25%
CH_4	14,587	16,535	17,405	2.82	19%
N_2O	1.90	2.04	2.11	0.21	11%
TOTAL GHG (Gg CO_2eq)	**16.57**	**18.68**	**19.62**	**3.04**	**18%**

Source: From the authors

Compared to 2012 emissions from the Waste Sector, it was found that CO_2 emissions increased by around 25%, followed by CH_4 with 19% and finally N_2O which increased by 11%.

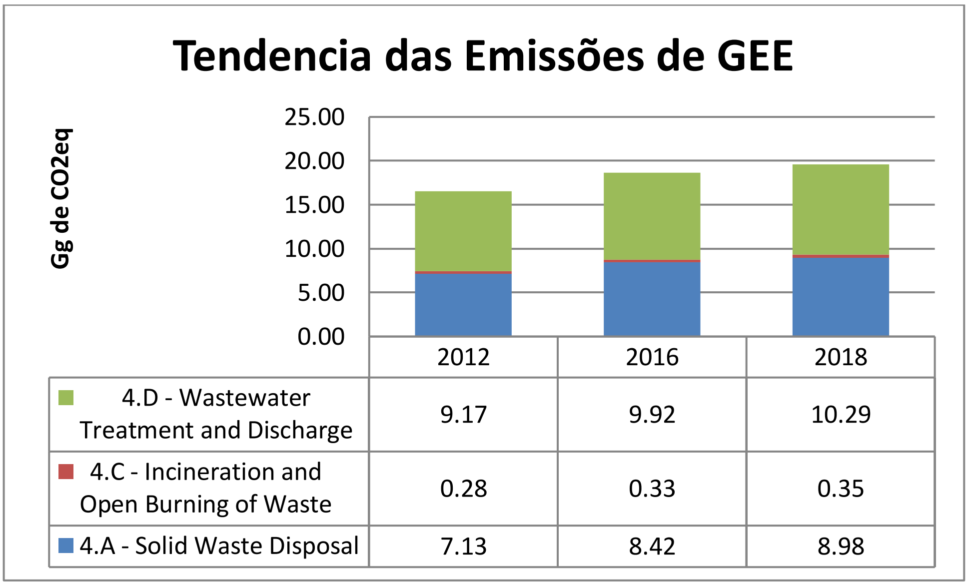


Figure 15-Waste: trend of emissions by category

6 TOTAL RESULTS OF STP GHG EMISSIONS

In accordance with decision 17/CP.8, NAI Parties are encouraged to use table 1 and table 2 of these guidelines to report their IGEE, taking into account paragraphs 14 to 17 thereof. In the annex, the referred tables are found.

Table 52 presents a summary of the emissions/removals of the main GHGs by sector in the country in 2018.

Table 52- Summary of GHG Emissions and Other Gases by Sector , 2018

Year	GHG (Gg)					
Sector	$_2$ emissions	CO_2 removals	CH_4	N_2O	CO_2 eqemissions .	HFC emissions in CO_2eq .
1 Energy	152.96		0.29	0.01	160.95	
2 Proc. industrial	---		---		---	7.52
3 AFOLU:						
- Agriculture and Livestock	*0.02*		*0.33*	*0.06*	*24.41*	
- FOLU		*-516.01*				
4 Waste	0.11		0.83	0.01	19.62	
TOTAL (excl FOLU)	**153.09**		**1.45**	**0.07**	**204.98**	7.52
TOTAL (incl FOLU)	**153.09**	**-516.01**	**1.45**	**0.07**	**-311.04**	**-303.52**

In STP, GHG emissions (for the main gases) in 2018 were estimated at around 205 Gg of CO_2eq. (excluding FOLU), which represents an increase of 31% compared to the value of the last inventory carried out in 2012, as shown in table 53.

From the analysis of the contribution of emissions from the different sectors inventoried in 2018, it appears that the energy sector is the largest emitter of CO_2eq in the country (161 Gg), followed by Agriculture and Waste, with about 24.41 Gg and 19.62 Gg , respectively .

As for the Land Use and Forestry sector, 516.01 Gg CO_2eq was sequestered.

Figure 19 illustrates the contribution of the main GHGs to national emissions in 2018, with carbon dioxide (CO_2) being the most expressive gas, representing about 75% of national GHG emissions (excluding FOLU). The second most important gas is methane (CH_4), followed by nitrous oxide (N_2O), representing, respectively, 15% and 10% of total emissions.

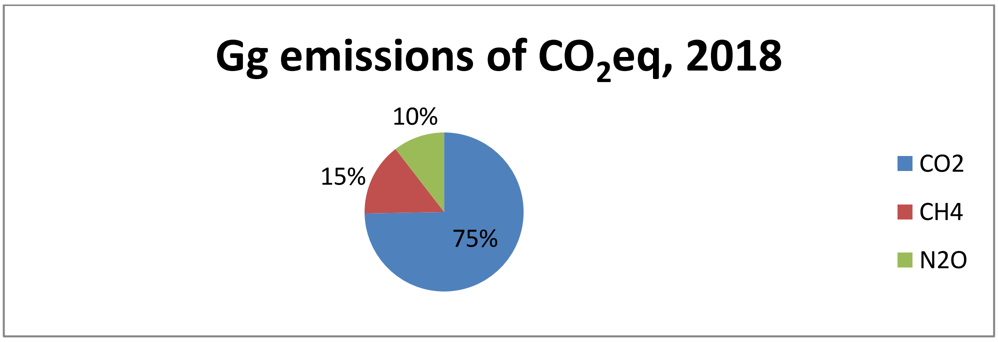


Figure 16-Contribution of CO2eq emissions by gas in 2018 (excl . FOLU)

The table below shows the evolution of emissions between 2012 and 2018, in CO_2 eq.

Table 53- Summary of Emissions (2012-2018)

Year	2012		2016		2018		
Sector	CO_2 eqemissions . (Gg)	CO_2 eqremovals. (Gg)	CO_2eq emissions . (Gg)	CO_2eq removals. (Gg)	CO_2 eqemissions . (Gg)	CO_2eq removals. (Gg)	HFC emissions in CO_2eq .
1 Energy	118.18		155.81		160.95		
2 Proc. industrial	---		---		---		7.52
3 AFOLU:							
- Agriculture and Livestock	*21.39*		*23.45*		*24.41*		
- FOLU		*-418.86*		*-523.26*		*-516.01*	
4 Waste	16.57		18.68		19.62		
TOTAL (excl FOLU)	**156.14**		**197.94**		**204.98**		7.52
TOTAL (incl FOLU)		**-262.71**		**-325.32**		**-311.04**	-303.52

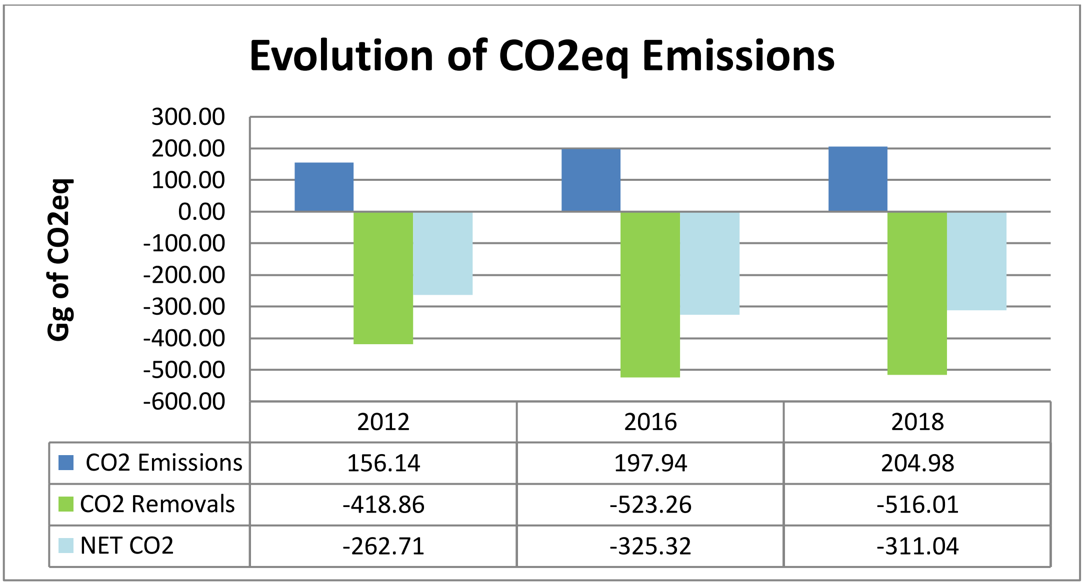
Source: From authors

Table 54- Evolution of CO_2 eq. by type of gas.

Gas	**CO_2eq .(Gg)**		**Variation**
Year/	**2012**	**2018**	
CO_2	111.01	153.09	38%
CH_4	26.46	30.44	15%
N_2O	18.67	21.44	15%
CO_2eq emissions	**156.14**	**204.98**	31%
CO_2eq removals	**-418.86**	**-516.01**	23%
BALANCE	**-262.71**	**-311.04**	18%

Source: From authors

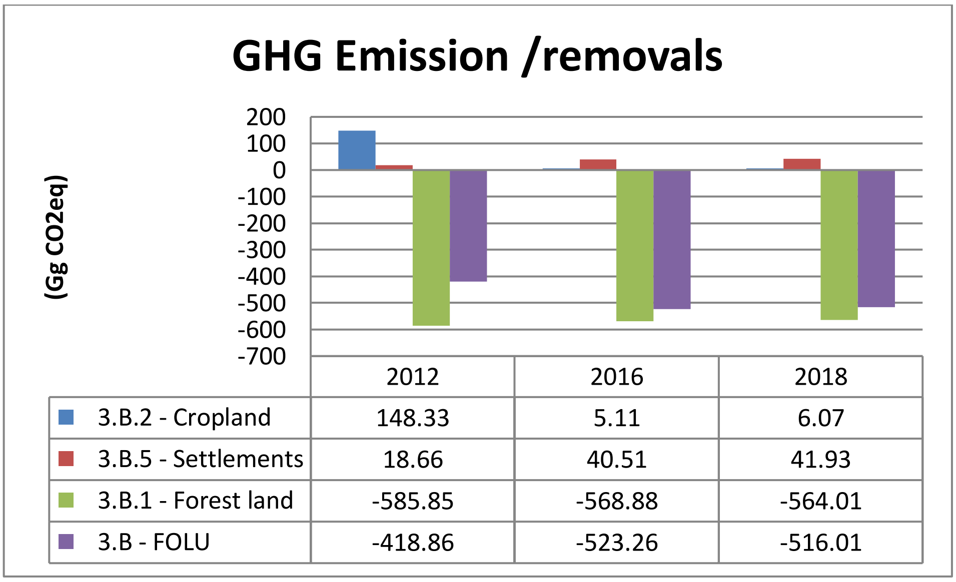
STP, due to its history of emissions since the first inventory, continues to be a GHG sink country, as illustrated in the following figure.



	2012	2016	2018
CO2 Emissions	156.14	197.94	204.98
CO2 Removals	-418.86	-523.26	-516.01
NET CO2	-262.71	-325.32	-311.04

Figure 17-Evolution of GHG Emissions

If we compare with the last inventory of 2012, there was an increase of around 23% in CO_2 removals , as shown in table 53. The positive balance of emissions in the Forests and Other Land Uses (FOLU) sector should The fact that in recent years there have been no major conversions of forests into other types of land use. Nevertheless, as shown in Figure 18, the carbon sequestration capacity by forests has been gradually decreasing over the years.



	2012	2016	2018
3.B.2 - Cropland	148.33	5.11	6.07
3.B.5 - Settlements	18.66	40.51	41.93
3.B.1 - Forest land	-585.85	-568.88	-564.01
3.B - FOLU	-418.86	-523.26	-516.01

Figure 18 - Evolution of GHG Emissions in the FOLU Category

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8 ANNEXES

Annex I

Table 55-Short Summary : Summary of GHG emissions from STP,2018

Inventory Year: 2018

Categories	Emissions (Gg)			Emissions CO2 Equivalents (Gg)			
	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)
Total National Emissions and Removals	-362,9691	1,4494	0,0692	7,5183	NO	NO	NO
1 - Energy	152,9604	0,2892	0,0062	NO	NO	NO	NO
1.A - Fuel Combustion Activities	152,9604	0,2892	0,0062				
1.B - Fugitive emissions from fuels	0	0	0				
1.C - Carbon dioxide Transport and Storage	0						
2 - Industrial Processes and Product Use	NO	NO	NO	7,5183	NO	NO	0
2.A - Mineral Industry	0	0	0				
2.B - Chemical Industry	0	0	0	0	0	0	0
2.C - Metal Industry	0	0	0	0	0	0	0
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0				
2.E - Electronics Industry	0	0	0	0	0	0	0
2.F - Product Uses as Substitutes for Ozone Depleting Substances				7,5183	0		
2.G - Other Product Manufacture and Use	0	0	0	0	0	0	0
2.H - Other	0	0	0				
3 - Agriculture, Forestry, and Other Land Use	-516,0378	0,3314	0,0562	NO	NO	NO	NO
3.A - Livestock		0,3077	0,0161				
3.B - Land	-516,0106		0				
3.C - Aggregate sources and non-CO2 emissions sources on land	0,0240	0,0238	0,0401				
3.D - Other	-0,0512	0	0				
4 - Waste	0,1083	0,8288	0,0068	NO	NO	NO	NO
4.A - Solid Waste Disposal		0,4275					
4.B - Biological Treatment of Solid Waste		0	0				
4.C - Incineration and Open Burning of Waste	0,1083	0,0095	0,0001				
4.D - Wastewater Treatment and Discharge		0,3918	0,0067				
4.E - Other (please specify)	0	0	0				
5 - Other	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3			0				
5.B - Other (please specify)	0	0	0	0	0	0	0
Memo Items (5)							
International Bunkers	3,7466	3E-05	0,0001	NO	NO	NO	NO
1.A.3.a.i - International Aviation (International Bunkers) (2)	3,7466	3E-05	0,0001				
1.A.3.d.i - International water-borne navigation (International bunkers) (2)	0	0	0				
1.A.5.c - Multilateral Operations (5)	NO	NO	NO	NO	NO	NO	NO

Table 56-Summary : Detailed summary of GHG emissions from STP, 2018

Inventory Year: 2018

Categories	Emissions (Gg)			Emissions CO2 Equivalents (Gg)			
	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)
Total National Emissions and Removals	-362,9691	1,4494	0,0692	7,5183	NO	NO	NO
1 - Energy	152,9604	0,2892	0,0062	NO	NO	NO	NO
1.A - Fuel Combustion Activities	152,9604	0,2892	0,0062	NO	NO	NO	NO
1.A.1 - Energy Industries	83,9205	0,0034	0,0007				
1.A.2 - Manufacturing Industries and Construction	0	0	0				
1.A.3 - Transport	44,0765	0,0109	0,0019				
1.A.4 - Other Sectors	23,0265	0,2746	0,0035				
1.A.5 - Non-Specified	1,9369	0,0003	6E-05				
1.B - Fugitive emissions from fuels	NO	NO	NO	NO	NO	NO	NO
1.B.1 - Solid Fuels	0	0	0				
1.B.2 - Oil and Natural Gas	0	0	0				
1.B.3 - Other emissions from Energy Production	0	0	0				
1.C - Carbon dioxide Transport and Storage	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0						
1.C.2 - Injection and Storage	0						
1.C.3 - Other	0						
2 - Industrial Processes and Product Use	NO	NO	NO	7,5183	NO	NO	NO
2.A - Mineral Industry	NO	NO	NO	NO	NO	NO	NO
2.A.1 - Cement production	0						
2.A.2 - Lime production	0						
2.A.3 - Glass Production	0						
2.A.4 - Other Process Uses of Carbonates	0						
2.A.5 - Other (please specify)	0	0	0				
2.B - Chemical Industry	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0						
2.B.2 - Nitric Acid Production			0				
2.B.3 - Adipic Acid Production			0				
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0				
2.B.5 - Carbide Production	0	0					
2.B.6 - Titanium Dioxide Production	0						
2.B.7 - Soda Ash Production	0						
2.B.8 - Petrochemical and Carbon Black Production	0	0					
2.B.9 - Fluorochemical Production				0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0	0	0
2.C - Metal Industry	NO	NO	NO	NO	NO	NO	NO
2.C.1 - Iron and Steel Production	0	0					
2.C.2 - Ferroalloys Production	0	0					
2.C.3 - Aluminium production	0				0		
2.C.4 - Magnesium production	0					0	
2.C.5 - Lead Production	0						
2.C.6 - Zinc Production	0						
2.C.7 - Other (please specify)	0	0	0	0	0	0	0
2.D - Non-Energy Products from Fuels and Solvent Use	NO	NO	NO	NO	NO	NO	NO
2.D.1 - Lubricant Use	0						
2.D.2 - Paraffin Wax Use	0						
2.D.3 - Solvent Use							
2.D.4 - Other (please specify)	0	0	0				
2.E - Electronics Industry	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	0	0
2.E.2 - TFT Flat Panel Display					0	0	0
2.E.3 - Photovoltaics					0		
2.E.4 - Heat Transfer Fluid					0		
2.E.5 - Other (please specify)	0	0	0	0	0	0	0
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NO	NO	NO	7,5183	NO	NO	NO
2.F.1 - Refrigeration and Air Conditioning				7,5183			
2.F.2 - Foam Blowing Agents				0			
2.F.3 - Fire Protection				0	0		
2.F.4 - Aerosols				0			
2.F.5 - Solvents				0	0		
2.F.6 - Other Applications (please specify)				0	0		
2.G - Other Product Manufacture and Use	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	0	
2.G.2 - SF6 and PFCs from Other Product Uses					0	0	
2.G.3 - N2O from Product Uses			0				
2.G.4 - Other (Please specify)	0	0	0	0	0	0	0
2.H - Other	NO	NO	NO	NO	NO	NO	NO

3 - Agriculture, Forestry, and Other Land Use	-516,0378	0,3314	0,0562	NO	NO	NO	NO
3.A - Livestock	0	0,3077	0,0161	NO	NO	NO	NO
3.A.1 - Enteric Fermentation		**0,2551**					
3.A.2 - Manure Management		**0,0526**	**0,0161**				
3.B - Land	-516,0106	NO	NO	NO	NO	NO	NO
3.B.1 - Forest land	**-564,0077**						
3.B.2 - Cropland	**6,0721**						
3.B.3 - Grassland	**0**						
3.B.4 - Wetlands	**0**		**0**				
3.B.5 - Settlements	**41,9250**						
3.B.6 - Other Land	**0**						
3.C - Aggregate sources and non-CO2 emissions sources on land	0,0240	0,0238	0,0401	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		**0,0238**	**0,0015**				
3.C.2 - Liming	**0**						
3.C.3 - Urea application	**0,0240**						
3.C.4 - Direct N2O Emissions from managed soils			**0,0295**				
3.C.5 - Indirect N2O Emissions from managed soils			**0,0087**				
3.C.6 - Indirect N2O Emissions from manure management			**0,0004**				
3.C.7 - Rice cultivation		**0**					
3.C.8 - Other (please specify)		**0**	**0**				
3.D - Other	-0,05118	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	**-0,05118**						
3.D.2 - Other (please specify)	**0**	**0**	**0**				
4 - Waste	0,1083	0,8288	0,0068	NO	NO	NO	NO
4.A - Solid Waste Disposal	NO	0,4275	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0,1083	0,0095	0,0001	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	0,3918	0,0067	NO	NO	NO	NO
4.E - Other (please specify)	NO	NO	NO	NO	NO	NO	NO
5 - Other	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)							
International Bunkers	3,7466	3E-05	0,0001	NO	NO	NO	NO
1.A.3.a.i - International Aviation (International Bunkers) (1)	**3,7466**	**3E-05**	**0,0001**				
1.A.3.d.i - International water-borne navigation (International bunkers) (1)	**0**	**0**	**0**				
1.A.5.c - Multilateral Operations (1)(2)	NO	NO	NO	NO	NO	NO	NO

Table 57-Summary : Detailed summary of GHG emissions from STP, 2016

Inventory Year: 2016

Categories	Emissions (Gg)			Emissions CO2 Equivalents (Gg)			
	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)
Total National Emissions and Removals	-386,6006	1,3620	0,0652	4,4795	NO	NO	NO
1 - Energy	136,5882	0,2534	0,0049	NO	NO	NO	NO
1.A - Fuel Combustion Activities	136,5882	0,2534	0,0049	NO	NO	NO	NO
1.A.1 - Energy Industries	70,1349	0,0028	0,0006				
1.A.2 - Manufacturing Industries and Construction	NO	NO	NO				
1.A.3 - Transport	40,7030	0,0098	0,0018				
1.A.4 - Other Sectors	23,8269	0,2405	0,0025				
1.A.5 - Non-Specified	1,9235	0,0003	0,0001				
1.B - Fugitive emissions from fuels	NO	NO	NO	NO	NO	NO	NO
1.B.1 - Solid Fuels	0	0	0				
1.B.2 - Oil and Natural Gas	0	0	0				
1.B.3 - Other emissions from Energy Production	0	0	0				
1.C - Carbon dioxide Transport and Storage	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0						
1.C.2 - Injection and Storage	0						
1.C.3 - Other	0						
2 - Industrial Processes and Product Use	NO	NO	NO	4,4795	NO	NO	NO
2.A - Mineral Industry	NO	NO	NO	NO	NO	NO	NO
2.A.1 - Cement production	0						
2.A.2 - Lime production	0						
2.A.3 - Glass Production	0						
2.A.4 - Other Process Uses of Carbonates	0						
2.A.5 - Other (please specify)	0	0	0				
2.B - Chemical Industry	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0						
2.B.2 - Nitric Acid Production			0				
2.B.3 - Adipic Acid Production			0				
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0				
2.B.5 - Carbide Production	0	0					
2.B.6 - Titanium Dioxide Production	0						
2.B.7 - Soda Ash Production	0						
2.B.8 - Petrochemical and Carbon Black Production	0	0					
2.B.9 - Fluorochemical Production				0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0	0	0
2.C - Metal Industry	0	0	0	0	0	0	0
2.C.1 - Iron and Steel Production	0	0					
2.C.2 - Ferroalloys Production	0	0					
2.C.3 - Aluminium production	0				0		
2.C.4 - Magnesium production	0					0	
2.C.5 - Lead Production	0						
2.C.6 - Zinc Production	0						
2.C.7 - Other (please specify)	0	0	0	0	0	0	0
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	0	0
2.D.1 - Lubricant Use	0						
2.D.2 - Paraffin Wax Use	0						
2.D.3 - Solvent Use							
2.D.4 - Other (please specify)	0	0	0				
2.E - Electronics Industry	0	0	0	0	0	0	0
2.E.1 - Integrated Circuit or Semiconductor				0	0	0	0
2.E.2 - TFT Flat Panel Display					0	0	0
2.E.3 - Photovoltaics					0		
2.E.4 - Heat Transfer Fluid					0		
2.E.5 - Other (please specify)	0	0	0	0	0	0	0
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NO	NO	NO	4,4795	NO	NO	NO
2.F.1 - Refrigeration and Air Conditioning				4,4795			
2.F.2 - Foam Blowing Agents				0			
2.F.3 - Fire Protection				0	0		
2.F.4 - Aerosols				0			
2.F.5 - Solvents				0	0		
2.F.6 - Other Applications (please specify)				0	0		
2.G - Other Product Manufacture and Use	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	0	
2.G.2 - SF6 and PFCs from Other Product Uses					0	0	
2.G.3 - N2O from Product Uses			0				
2.G.4 - Other (Please specify)	0	0	0	0	0	0	0
2.H - Other	NO	NO	NO	NO	NO	NO	NO

3 - Agriculture, Forestry, and Other Land Use	-523,2920	0,3212	0,0538	NO	NO	NO	NO
3.A - Livestock	0	0,2975	0,0156	NO	NO	NO	NO
3.A.1 - Enteric Fermentation		0,2478					
3.A.2 - Manure Management		0,0497	0,0156				
3.B - Land	-523,2629	0	0	0	0	0	0
3.B.1 - Forest land	-568,8811						
3.B.2 - Cropland	5,1066						
3.B.3 - Grassland	0						
3.B.4 - Wetlands	0		0				
3.B.5 - Settlements	40,5115						
3.B.6 - Other Land	0						
3.C - Aggregate sources and non-CO2 emissions sources on land	0,0200	0,0237	0,0382	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0,0237	0,0015				
3.C.2 - Liming	0						
3.C.3 - Urea application	0,0200						
3.C.4 - Direct N2O Emissions from managed soils			0,028				
3.C.5 - Indirect N2O Emissions from managed soils			0,0083				
3.C.6 - Indirect N2O Emissions from manure management			0,0004				
3.C.7 - Rice cultivation		0					
3.C.8 - Other (please specify)		0	0				
3.D - Other	-0,0491	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	-0,0491						
3.D.2 - Other (please specify)	0	0	0				
4 - Waste	0,1031	0,7874	0,0066	NO	NO	NO	NO
4.A - Solid Waste Disposal	NO	0,401	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0,1031	0,0091	0,0001	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	NO	0,3772	0,0065	NO	NO	NO	NO
4.E - Other (please specify)	NO	NO	NO	NO	NO	NO	NO
5 - Other	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)							
International Bunkers	5,1695	4E-05	0,0001	NO	NO	NO	NO
1.A.3.a.i - International Aviation (International Bunkers) (1)	5,1695	4E-05	0,0001				
1.A.3.d.i - International water-borne navigation (International bunkers) (1)	0	0	0				
1.A.5.c - Multilateral Operations (1)(2)	NO	NO	NO	NO	NO	NO	NO

Table 58-Summary : Detailed summary of GHG emissions from STP, 2012

Inventory Year: 2012

Categories	Emissions (Gg)			Emissions CO2 Equivalents (Gg)			
	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)
Total National Emissions and Removals	-307,8956	1,2602	0,0602	0,4409	NO	NO	NO
1 - Energy	110,9191	0,2691	0,0052	NO	NO	NO	NO
1.A - Fuel Combustion Activities	110,9191	0,2691	0,0052	NO	NO	NO	NO
1.A.1 - Energy Industries	56,9873	0,0023	0,0005				
1.A.2 - Manufacturing Industries and Construction	NO	NO	NO				
1.A.3 - Transport	33,1440	0,0075	0,0015				
1.A.4 - Other Sectors	19,1476	0,259	0,0032				
1.A.5 - Non-Specified	1,6401	0,0002	5E-05				
1.B - Fugitive emissions from fuels	NO	NO	NO	NO	NO	NO	NO
1.B.1 - Solid Fuels	0	0	0				
1.B.2 - Oil and Natural Gas	0	0	0				
1.B.3 - Other emissions from Energy Production	0	0	0				
1.C - Carbon dioxide Transport and Storage	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0						
1.C.2 - Injection and Storage	0						
1.C.3 - Other	0						
2 - Industrial Processes and Product Use	NO	NO	NO	0,4409	NO	NO	NO
2.A - Mineral Industry	NO	NO	NO	NO	NO	NO	NO
2.A.1 - Cement production	0						
2.A.2 - Lime production	0						
2.A.3 - Glass Production	0						
2.A.4 - Other Process Uses of Carbonates	0						
2.A.5 - Other (please specify)	0	0	0				
2.B - Chemical Industry	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0						
2.B.2 - Nitric Acid Production			0				
2.B.3 - Adipic Acid Production			0				
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0				
2.B.5 - Carbide Production	0	0					
2.B.6 - Titanium Dioxide Production	0						
2.B.7 - Soda Ash Production	0						
2.B.8 - Petrochemical and Carbon Black Production	0	0					
2.B.9 - Fluorochemical Production				0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0	0	0
2.C - Metal Industry	NO	NO	NO	NO	NO	NO	NO
2.C.1 - Iron and Steel Production	0	0					
2.C.2 - Ferroalloys Production	0	0					
2.C.3 - Aluminium production	0				0		
2.C.4 - Magnesium production	0					0	
2.C.5 - Lead Production	0						
2.C.6 - Zinc Production	0						
2.C.7 - Other (please specify)	0	0	0	0	0	0	0
2.D - Non-Energy Products from Fuels and Solvent Use	NO	NO	NO	NO	NO	NO	NO
2.D.1 - Lubricant Use	0						
2.D.2 - Paraffin Wax Use	0						
2.D.3 - Solvent Use							
2.D.4 - Other (please specify)	0	0	0				
2.E - Electronics Industry	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	0	0
2.E.2 - TFT Flat Panel Display					0	0	0
2.E.3 - Photovoltaics					0		
2.E.4 - Heat Transfer Fluid					0		
2.E.5 - Other (please specify)	0	0	0	0	0	0	0
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NO	NO	NO	0,4409	NO	NO	NO
2.F.1 - Refrigeration and Air Conditioning				0,4409			
2.F.2 - Foam Blowing Agents				0			
2.F.3 - Fire Protection				0	0		
2.F.4 - Aerosols				0			
2.F.5 - Solvents				0	0		
2.F.6 - Other Applications (please specify)				0	0		
2.G - Other Product Manufacture and Use	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	0	
2.G.2 - SF6 and PFCs from Other Product Uses					0	0	
2.G.3 - N2O from Product Uses			0				
2.G.4 - Other (Please specify)	0	0	0	0	0	0	0
2.H - Other	NO	NO	NO	NO	NO	NO	NO

3 - Agriculture, Forestry, and Other Land Use	-418,9017	0,2965	0,0489	NO	NO	NO	NO
3.A - Livestock	NO	0,2748	0,0145	NO	NO	NO	NO
3.A.1 - Enteric Fermentation		0,2303					
3.A.2 - Manure Management		0,0446	0,0145				
3.B - Land	-418,8586	NO	NO	NO	NO	NO	NO
3.B.1 - Forest land	-585,8499						
3.B.2 - Cropland	148,3331						
3.B.3 - Grassland	0						
3.B.4 - Wetlands	0		0				
3.B.5 - Settlements	18,6582						
3.B.6 - Other Land	0						
3.C - Aggregate sources and non-CO2 emissions sources on land	0,0022	0,0217	0,0345	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0,0217	0,0015				
3.C.2 - Liming	0						
3.C.3 - Urea application	0,0022						
3.C.4 - Direct N2O Emissions from managed soils			0,0252				
3.C.5 - Indirect N2O Emissions from managed soils			0,0075				
3.C.6 - Indirect N2O Emissions from manure management			0,0003				
3.C.7 - Rice cultivation		0					
3.C.8 - Other (please specify)		0	0				
3.D - Other	-0,0453	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	-0,0453						
3.D.2 - Other (please specify)	0	0	0				
4 - Waste	0,0869	0,6946	0,0061	NO	NO	NO	NO
4.A - Solid Waste Disposal	NO	0,3395	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0,0869	0,0076	0,0001	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	0,3475	0,006	NO	NO	NO	NO
4.E - Other (please specify)	NO	NO	NO	NO	NO	NO	NO
5 - Other	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)							
International Bunkers	10,5463	7E-05	0,0003	NO	NO	NO	NO
1.A.3.a.i - International Aviation (International Bunkers) (1)	10,5463	7E-05	0,0003				
1.A.3.d.i - International water-borne navigation (International bunkers) (1)	0	0	0				
1.A.5.c - Multilateral Operations (1)(2)	NO	NO	NO	NO	NO	NO	NO

Note: Shaded cells are not applicable. Cells to report NO_x, CO, NMVOC and SO_2 emissions were excluded.
Source: Adaptation of Table 1 and Table 2 in the annex to UNFCCC decision 17/CP.8, IPCC 2006 Summary Table according to the software.

Annex II - Sectoral GHG emissions inventory reports

Energy

Table 59 - Energy background table, 2018

Inventory Year: 2018

2006 IPCC Categories	Activity (TJ)				Emissions Solid Fuel (Gg)			Emissions Liquid Fuel (Gg)			Emissions Biomass		Emissions Total (Gg)			Information Items (Gg)	
	Solid Fuel	Liquid Fuel	Gas	Biomass	CO2	CH4	N2O	CO2	CH4	N2O	CH4	N2O	CO2	CH4	N2O	CO2 Amount Captured	Biomass CO2 emitted
1.A - Fuel Combustion Activities		2096,57		984,6				152,9604	0,0178	0,0028	0,2714	0,0033	152,9604	0,2892	0,0062	0	110,2707
1.A.1 - Energy Industries		1132,53						83,92047	0,0034	0,0007			83,92047	0,0034	0,0007	0	
1.A.1.a - Main Activity Electricity and Heat Production		1132,53						83,92047	0,0034	0,0007			83,92047	0,0034	0,0007	0	
1.A.1.a.i - Electricity Generation		1132,53						83,92047	0,0034	0,0007			83,92047	0,0034	0,0007	0	
1.A.2 - Manufacturing Industries and Construction													0	0	0		
1.A.3 - Transport		615,32						44,07655	0,0109	0,0019			44,07655	0,0109	0,0019		
1.A.3.a - Civil Aviation		53,13						3,798795	3E-05	0,0001			3,798795	3E-05	0,0001		
1.A.3.a.i - International Aviation (International Bunkers) (2)																	
1.A.3.a.ii - Domestic Aviation		53,13						3,798795	3E-05	0,0001			3,798795	3E-05	0,0001		
1.A.3.b - Road Transportation		468,43						33,33014	0,0102	0,0016			33,33014	0,0102	0,0016		
1.A.3.c - Railways													0	0	0		
1.A.3.d - Water-borne Navigation		93,76						6,947616	0,0007	0,0002			6,947616	0,0007	0,0002		
1.A.3.d.i - International water-borne navigation (International bunkers) (2)																	
1.A.3.d.ii - Domestic Water-borne Navigation		93,76						6,947616	0,0007	0,0002			6,947616	0,0007	0,0002		
1.A.4 - Other Sectors		321,89		984,6				23,02652	0,0032	0,0002	0,2714	0,0033	23,02652	0,2746	0,0035		
1.A.4.a - Commercial/Institutional		41,14		553				3,012224	0,0004	2E-05	0,1655	0,0022	3,012224	0,1659	0,0022		
1.A.4.b - Residential		223,23		431,5				16,02816	0,0022	0,0001	0,1059	0,0011	16,02816	0,1081	0,0013		
1.A.4.c - Agriculture/Forestry/Fishing/Fish Farms		57,52						3,986136	0,0006	3E-05			3,986136	0,0006	3E-05		
1.A.4.c.i - Stationary													0	0	0		
1.A.4.c.ii - Off-road Vehicles and Other Machinery		40,52						2,808036	0,0004	2E-05			2,808036	0,0004	2E-05		
1.A.4.c.iii - Fishing (mobile combustion)		17						1,1781	0,0002	1E-05			1,1781	0,0002	1E-05		
1.A.5 - Non-Specified		26,83						1,936899	0,0003	6E-05			1,936899	0,0003	6E-05		
1.A.5.a - Stationary		26,83						1,936899	0,0003	6E-05			1,936899	0,0003	6E-05		
1.A.5.b - Mobile													0	0	0		
1.A.5.c - Multilateral Operations (5)																	
Memo Items																	
International Bunkers		52,4						3,7466	3E-05	0,0001			3,7466	3E-05	0,0001		
1.A.3.a.i - International Aviation (International Bunkers) (2)		52,4						3,7466	3E-05	0,0001			3,7466	3E-05	0,0001		
1.A.3.d.i - International water-borne navigation (International bunkers) (2)													0	0	0		
1.A.5.c - Multilateral Operations (5)													0	0	0		

Table60 - Energy background table ,2016

Inventory Year: 2016

2006 IPCC Categories	Activity (TJ)				Emissions Solid Fuel (Gg)			Emissions Liquid Fuel (Gg)			Emissions Biomass		Emissions Total (Gg)			Information Items (Gg)	
	Solid Fuel	Liquid Fuel	Gas	Biomass	CO2	CH4	N2O	CO2	CH4	N2O	CH4	N2O	CO2	CH4	N2O	CO2 Amount Captured	Biomass CO2 emitted
1.A - Fuel Combustion Activities		2038,79		972,84				148,9451	0,0167	0,0027	0,2372	0,0023	148,9451	0,2539	0,005	0	108,95808
1.A.1 - Energy Industries		1113,25						82,49183	0,0033	0,0007			82,49183	0,0033	0,0007	0	
1.A.1.a - Main Activity Electricity and Heat Production		1113,25						82,49183	0,0033	0,0007			82,49183	0,0033	0,0007	0	
1.A.1.a.i - Electricity Generation		1113,25						82,49183	0,0033	0,0007			82,49183	0,0033	0,0007	0	
1.A.2 - Manufacturing Industries and Construction													0	0	0		
1.A.3 - Transport		567,3						40,70297	0,0098	0,0018			40,70297	0,0098	0,0018		
1.A.3.a - Civil Aviation		41						2,9315	2E-05	8E-05			2,9315	2E-05	8E-05		
1.A.3.a.i - International Aviation (International Bunkers) (2)																	
1.A.3.a.ii - Domestic Aviation		41						2,9315	2E-05	8E-05			2,9315	2E-05	8E-05		
1.A.3.b - Road Transportation		431,4						30,73938	0,0091	0,0015			30,73938	0,0091	0,0015		
1.A.3.c - Railways													0	0	0		
1.A.3.d - Water-borne Navigation		94,9						7,03209	0,0007	0,0002			7,03209	0,0007	0,0002		
1.A.3.d.i - International water-borne navigation (International bunkers) (2)																	
1.A.3.d.ii - Domestic Water-borne Navigation		94,9						7,03209	0,0007	0,0002			7,03209	0,0007	0,0002		
1.A.4 - Other Sectors		331,67		972,84				23,82685	0,0033	0,0002	0,2372	0,0023	23,82685	0,2405	0,0025		
1.A.4.a - Commercial/Institutional		55,15		236,46				4,069585	0,0005	3E-05	0,0705	0,0009	4,069585	0,0711	0,001		
1.A.4.b - Residential		225,38		736,38				16,21326	0,0022	0,0001	0,1667	0,0013	16,21326	0,1689	0,0015		
1.A.4.c - Agriculture/Forestry/Fishing/Fish Farms		51,14						3,544002	0,0005	3E-05			3,544002	0,0005	3E-05		
1.A.4.c.i - Stationary													0	0	0		
1.A.4.c.ii - Off-road Vehicles and Other Machinery		41,14						2,851002	0,0004	2E-05			2,851002	0,0004	2E-05		
1.A.4.c.iii - Fishing (mobile combustion)		10						0,693	0,0001	6E-06			0,693	0,0001	6E-06		
1.A.5 - Non-Specified		26,57						1,923491	0,0003	6E-05			1,923491	0,0003	6E-05		
1.A.5.a - Stationary		26,57						1,923491	0,0003	6E-05			1,923491	0,0003	6E-05		
1.A.5.b - Mobile													0	0	0		
1.A.5.c - Multilateral Operations (5)																	
Memo Items																	
International Bunkers		72,3						5,16945	4E-05	0,0001			5,16945	4E-05	0,0001		
1.A.3.a.i - International Aviation (International Bunkers) (2)		72,3						5,16945	4E-05	0,0001			5,16945	4E-05	0,0001		
1.A.3.d.i - International water-borne navigation (International bunkers) (2)													0	0	0		
1.A.5.c - Multilateral Operations (5)													0	0	0		

Table61 - Energy background table ,2012

Inventory Year: 2012

2006 IPCC Categories	Activity (TJ)				Emissions Solid Fuel (Gg)			Emissions Liquid Fuel (Gg)			Emissions Biomass		Emissions Total (Gg)			Information Items (Gg)	
	Solid Fuel	Liquid Fuel	Gas	Biomass	CO2	CH4	N2O	CO2	CH4	N2O	CH4	N2O	CO2	CH4	N2O	CO2 Amount Captured	Biomass CO2 emitted
1.A - Fuel Combustion Activities		1517,65		929,92				110,9191	0,0127	0,0021	0,2564	0,003	110,9191	0,2691	0,0052	0	104,15104
1.A.1 - Energy Industries		769,06						56,98735	0,0023	0,0005			56,98735	0,0023	0,0005	0	
1.A.1.a - Main Activity Electricity and Heat Production		769,06						56,98735	0,0023	0,0005			56,98735	0,0023	0,0005	0	
1.A.1.a.i - Electricity Generation		**769,06**						**56,98735**	**0,0023**	**0,0005**			56,98735	0,0023	0,0005	**0**	
1.A.2 - Manufacturing Industries and Construction													0	0	0		
1.A.3 - Transport		459,83						33,14402	0,0075	0,0015			33,14402	0,0075	0,0015		
1.A.3.a - Civil Aviation		9,18						0,65637	5E-06	2E-05			0,65637	5E-06	2E-05		
1.A.3.a.i - International Aviation (International Bunkers) (2)																	
1.A.3.a.ii - Domestic Aviation		**9,18**						**0,65637**	**5E-06**	**2E-05**			0,65637	5E-06	2E-05		
1.A.3.b - Road Transportation		357,75						25,60376	0,0069	0,0013			25,60376	0,0069	0,0013		
1.A.3.b.i - Cars													0	0	0		
1.A.3.b.i.1 - Passenger cars with 3-way catalysts													0	0	0		
1.A.3.b.i.2 - Passenger cars without 3-way catalysts													0	0	0		
1.A.3.b.ii - Light-duty trucks													0	0	0		
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts													0	0	0		
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts													0	0	0		
1.A.3.b.iii - Heavy-duty trucks and buses													0	0	0		
1.A.3.b.iv - Motorcycles													0	0	0		
1.A.3.b.v - Evaporative emissions from vehicles																	
1.A.3.b.vi - Urea-based catalysts (3)													0				
1.A.3.c - Railways													0	0	0		
1.A.3.d - Water-borne Navigation		92,9						6,88389	0,0007	0,0002			6,88389	0,0007	0,0002		
1.A.3.d.i - International water-borne navigation (International bunkers) (2)																	
1.A.3.d.ii - Domestic Water-borne Navigation		**92,9**						**6,88389**	**0,0007**	**0,0002**			6,88389	0,0007	0,0002		
1.A.3.e - Other Transportation													0	0	0		
1.A.3.e.i - Pipeline Transport													0	0	0		
1.A.3.e.ii - Off-road													0	0	0		
1.A.4 - Other Sectors		266,16		929,92				19,1476	0,0027	0,0002	0,2564	0,003	19,1476	0,259	0,0032		
1.A.4.a - Commercial/Institutional		**44,49**		**522,35**				**3,288735**	**0,0004**	**3E-05**	**0,1563**	**0,0021**	3,288735	0,1568	0,0021		
1.A.4.b - Residential		**183,94**		**407,57**				**13,24418**	**0,0018**	**0,0001**	**0,1**	**0,001**	13,24418	0,1019	0,0011		
1.A.4.c - Agriculture/Forestry/Fishing/Fish Farms		37,73						2,614689	0,0004	2E-05			2,614689	0,0004	2E-05		
1.A.4.c.i - Stationary													0	0	0		
1.A.4.c.ii - Off-road Vehicles and Other Machinery		**27,73**						**1,921689**	**0,0003**	**2E-05**			1,921689	0,0003	2E-05		
1.A.4.c.iii - Fishing (mobile combustion)		**10**						**0,693**	**0,0001**	**6E-06**			0,693	0,0001	6E-06		
1.A.5 - Non-Specified		22,6						1,640144	0,0002	5E-05			1,640144	0,0002	5E-05		
1.A.5.a - Stationary		**22,6**						**1,640144**	**0,0002**	**5E-05**			1,640144	0,0002	5E-05		
1.A.5.b - Mobile													0	0	0		
1.A.5.b.i - Mobile (aviation component)													0	0	0		
1.A.5.b.ii - Mobile (water-borne component)													0	0	0		
1.A.5.b.iii - Mobile (Other)													0	0	0		
1.A.5.c - Multilateral Operations (5)																	
Memo Items																	
International Bunkers		147,5						10,54625	7E-05	0,0003			10,54625	7E-05	0,0003		
1.A.3.a.i - International Aviation (International Bunkers) (2)		**147,5**						**10,54625**	**7E-05**	**0,0003**			10,54625	7E-05	0,0003		
1.A.3.d.i - International water-borne navigation (International bunkers) (2)													0	0	0		
1.A.5.c - Multilateral Operations (5)													0	0	0		

AFOLU

Table 62 - AFOLU background table ,2018

Inventory Year: 2018

Categories	Activity Data		Net carbon stock change and CO2 emissions										Net CO2 emissions (Gg CO2)
			Biomass				Dead organic matter			Soils		
	Total Area (ha)	Thereof: Area of organic soils (ha)	Increase (Gg C)	Decrease (Gg C)	Carbon emitted as CH4 and CO from fires (1) (Gg C)	Net carbon stock change (Gg C)	Carbon stock change (Gg C)	Carbon emitted as CH4 and CO from fires (1) (Gg C)	Net carbon stock change (Gg C)	Net carbon stock change in mineral soils (2) (Gg C)	Carbon loss from drained organic soils (Gg C)	
3.B - Land	69752	0	178,35	37,53	0	140,82	-0,06	0	-0,06	-0,03	0	-516,01
3.B.1 - Forest land	58624	0	180,32	26,50	0	153,82	0	0	0	0	0	-564,01
3.B.1.a - Forest land Remaining Forest land	58624	0	180,32	26,50		153,82			0		0	-564,01
3.B.1.b - Land Converted to Forest land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.1.b.i - Cropland converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.ii - Grassland converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.iii - Wetlands converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.iv - Settlements converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.v - Other Land converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.2 - Cropland	5962,3	0	-1,22	0,37	0	-1,59	-0,04	0	-0,04	-0,03	0	6,07
3.B.2.a - Cropland Remaining Cropland	5945,4	0	0,01	0,05		-0,04			0	0	0	0,16
3.B.2.b - Land Converted to Cropland	16,9	0	-1,23	0,32	0	-1,54	-0,04	0	-0,04	-0,03	0	5,91
3.B.2.b.i - Forest Land converted to Cropland	16,9	0	-1,25	0,13		-1,38	-0,04		-0,04	-0,03	0	5,30
3.B.2.b.ii - Grassland converted to Cropland	0	0	0,02	0,13		-0,11	0		0	0	0	0,40
3.B.2.b.iii - Wetlands converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.2.b.iv - Settlements converted to Cropland	0	0	0,0078	0,063		-0,06	0		0	0	0	0,20
3.B.2.b.v - Other Land converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.3 - Grassland	1651,2	0	0	0	0	0	0	0	0	0	0	0
3.B.3.a - Grassland Remaining Grassland	1651,2	0				0			0	0	0	0
3.B.3.b - Land Converted to Grassland	0	0	0	0	0	0	0	0	0	0	0	0
3.B.3.b.i - Forest Land converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.ii - Cropland converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.iii - Wetlands converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.iv - Settlements converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.v - Other Land converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.4 - Wetlands (3)	0	0	0	0	0	0	0	0	0	0	0	0
3.B.5 - Settlements	3514,5	0	-0,75	10,66	0	-11,41	-0,02	0	-0,02	0	0	41,93
3.B.5.a - Settlements Remaining Settlements	3504,5	0				0			0		0	0
3.B.5.b - Land Converted to Settlements	10	0	-0,75	10,66	0	-11,41	-0,02	0	-0,02	0	0	41,93
3.B.5.b.i - Forest Land converted to Settlements	10	0	-0,75	10,66		-11,41	-0,02		-0,02	0	0	41,93
3.B.5.b.ii - Cropland converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.iii - Grassland converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.iv - Wetlands converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.v - Other Land converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.6 - Other Land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.6.a - Other land Remaining Other land	0	0										
3.B.6.b - Land Converted to Other land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.6.b.i - Forest Land converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.ii - Cropland converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.iii - Grassland converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.iv - Wetlands converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.v - Settlements converted to Other Land	0	0	0	0		0			0	0	0	0

Table63 - AFOLU background table ,2016

Inventory Year: 2016

Categories	Activity Data		Net carbon stock change and CO2 emissions									
			Biomass				Dead organic matter			Soils		
	Total Area (ha)	Thereof: Area of organic soils (ha)	Increase (Gg C)	Decrease (Gg C)	Carbon emitted as CH4 and CO from fires (1) (Gg C)	Net carbon stock change (Gg C)	Carbon stock change (Gg C)	Carbon emitted as CH4 and CO from fires (1) (Gg C)	Net carbon stock change (Gg C)	Net carbon stock change in mineral soils (2) (Gg C)	Carbon loss from drained organic soils (Gg C)	Net CO2 emissions (Gg CO2)
3.B - Land	69752	0	179,24	36,47	0	142,78	-0,04	0	-0,04	-0,03	0	-523,26
3.B.1 - Forest land	58677	0	180,59	25,44	0	155,15	0	0	0	0	0	-568,88
3.B.1.a - Forest land Remaining Forest land	58677	0	180,59	25,44		155,15			0		0	-568,88
3.B.1.b - Land Converted to Forest land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.1.b.i - Cropland converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.ii - Grassland converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.iii - Wetlands converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.iv - Settlements converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.v - Other Land converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.2 - Cropland	5929	0	-0,97	0,37	0	-1,34	-0,03	0	-0,03	-0,03	0	5,11
3.B.2.a - Cropland Remaining Cropland	5915	0	0,01	0,05		-0,04			0	0	0	0,16
3.B.2.b - Land Converted to Cropland	14	0	-0,98	0,32	0	-1,29	-0,03	0	-0,03	-0,03	0	4,95
3.B.2.b.i - Forest Land converted to Cropland	13	0	-0,99	0,13		-1,12	-0,03		-0,03	-0,03	0	4,29
3.B.2.b.ii - Grassland converted to Cropland	1	0	0,00	0,13		-0,12	0,00		0,00	0,00	0	0,45
3.B.2.b.iii - Wetlands converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.2.b.iv - Settlements converted to Cropland	0	0	0,01	0,06		-0,06	0		0	0	0	0,20
3.B.2.b.v - Other Land converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.3 - Grassland	1651	0	0	0	0	0	0	0	0	0	0	0
3.B.3.a - Grassland Remaining Grassland	1651	0				0			0	0	0	0
3.B.3.b - Land Converted to Grassland	0	0	0	0	0	0	0	0	0	0	0	0
3.B.3.b.i - Forest Land converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.ii - Cropland converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.iii - Wetlands converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.iv - Settlements converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.v - Other Land converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.4 - Wetlands (3)	0	0	0	0	0	0	0	0	0	0	0	0
3.B.5 - Settlements	3495	0	-0,38	10,66	0	-11,04	-0,01	0	-0,01	0	0	40,51
3.B.5.a - Settlements Remaining Settlements	3490	0				0			0		0	0
3.B.5.b - Land Converted to Settlements	5	0	-0,38	10,66	0	-11,04	-0,01	0	-0,01	0	0	40,51
3.B.5.b.i - Forest Land converted to Settlements	5	0	-0,38	10,66		-11,04	-0,01		-0,01	0	0	40,51
3.B.5.b.ii - Cropland converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.iii - Grassland converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.iv - Wetlands converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.v - Other Land converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.6 - Other Land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.6.a - Other land Remaining Other land	0	0										
3.B.6.b - Land Converted to Other land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.6.b.i - Forest Land converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.ii - Cropland converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.iii - Grassland converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.iv - Wetlands converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.v - Settlements converted to Other Land	0	0	0	0		0			0	0	0	0

Table64 - AFOLU background table ,2012

Inventory Year: 2012

Categories	Activity Data		Net carbon stock change and CO2 emissions									Net CO2 emissions (Gg CO2)
			Biomass				Dead organic matter			Soils		
	Total Area (ha)	Thereof: Area of organic soils (ha)	Increase (Gg C)	Decrease (Gg C)	Carbon emitted as CH4 and CO from fires (1) (Gg C)	Net carbon stock change (Gg C)	Carbon stock change (Gg C)	Carbon emitted as CH4 and CO from fires (1) (Gg C)	Net carbon stock change (Gg C)	Net carbon stock change in mineral soils (2) (Gg C)	Carbon loss from drained organic soils (Gg C)	
3.B - Land	69752	0	139,30	23,65	0	115,65	-0,798	0	-0,798	-0,61	0	-418,86
3.B.1 - Forest land	60690	0	183,25	23,47	0	159,78	0	0	0	0	0	-585,85
3.B.1.a - Forest land Remaining Forest land	60690	0	183,25	23,47		159,78			0		0	-585,85
3.B.1.b - Land Converted to Forest land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.1.b.i - Cropland converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.ii - Grassland converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.iii - Wetlands converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.iv - Settlements converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.1.b.v - Other Land converted to Forest Land	0	0	0	0		0	0		0	0	0	0
3.B.2 - Cropland	4238	0	-39,00	0,18	0	-39,18	-0,66	0	-0,66	-0,61	0	148,33
3.B.2.a - Cropland Remaining Cropland	3924	0	0,007	0,051		-0,04			0	0	0	0,16
3.B.2.b - Land Converted to Cropland	314	0	-39,01	0,13	0	-39,14	-0,66	0	-0,66	-0,61	0	148,17
3.B.2.b.i - Forest Land converted to Cropland	314	0	-39,01	0,13		-39,14	-0,66		-0,66	-0,61	0	148,17
3.B.2.b.ii - Grassland converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.2.b.iii - Wetlands converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.2.b.iv - Settlements converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.2.b.v - Other Land converted to Cropland	0	0	0	0		0	0		0	0	0	0
3.B.3 - Grassland	1652	0	0	0	0	0	0	0	0	0	0	0
3.B.3.a - Grassland Remaining Grassland	1652	0				0			0	0	0	0
3.B.3.b - Land Converted to Grassland	0	0	0	0	0	0	0	0	0	0	0	0
3.B.3.b.i - Forest Land converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.ii - Cropland converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.iii - Wetlands converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.iv - Settlements converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.3.b.v - Other Land converted to Grassland	0	0	0	0		0	0		0	0	0	0
3.B.4 - Wetlands (3)	0	0	0	0	0	0	0	0	0	0	0	0
3.B.5 - Settlements	3172	0	-4,95	0	0	-4,95	-0,14	0	-0,14	0	0	18,66
3.B.5.a - Settlements Remaining Settlements	3106	0				0			0		0	0
3.B.5.b - Land Converted to Settlements	66	0	-4,95	0	0	-4,95	-0,14	0	-0,14	0	0	18,66
3.B.5.b.i - Forest Land converted to Settlements	66	0	-4,95	0		-4,95	-0,14		-0,14	0	0	18,66
3.B.5.b.ii - Cropland converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.iii - Grassland converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.iv - Wetlands converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.5.b.v - Other Land converted to Settlements	0	0	0	0		0	0		0	0	0	0
3.B.6 - Other Land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.6.a - Other land Remaining Other land	0	0										
3.B.6.b - Land Converted to Other land	0	0	0	0	0	0	0	0	0	0	0	0
3.B.6.b.i - Forest Land converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.ii - Cropland converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.iii - Grassland converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.iv - Wetlands converted to Other Land	0	0	0	0		0			0	0	0	0
3.B.6.b.v - Settlements converted to Other Land	0	0	0	0		0			0	0	0	0

Waste

Table 65 - Wastebackground table, 2018

Inventory Year: 2018

Categories	Type of Activity Data	Unit	Emissions [Gg]		
			CO2 (Gg)	CH4 (Gg)	N2O (Gg)
4.A - Solid Waste Disposal (1)			NA	0,427462428	NA
4.A.1 - Managed Waste Disposal Sites	NO	Gg		NO	
4.A.2 - Unmanaged Waste Disposal Sites	NO	Gg		NO	
4.A.3 - Uncategorised Waste Disposal Sites	19,63	Gg		0,4275	
4.B - Biological Treatment of Solid Waste				NO	NO
4.C - Incineration and Open Burning of Waste (2)			0,1083	0,0095	0,0001
4.C.1 - Waste Incineration	NO	Gg	NO	NO	NO
4.C.2 - Open Burning of Waste	1,46	Gg	0,1083	0,0095	0,0001
4.D - Wastewater Treatment and Discharge			0	0,3918	0,0067
4.D.1 - Domestic Wastewaster Treatment and Discharge			0	0,3885	0,0067
CH4 Emissions (3)	2725106,43	kg		0,3885	
N2O Emissions (4)	847900,57	kg			0,0067
4.D.2 - Industrial Wastewater Treatment and Discharge			NO	0,0033	NO
CH4 Emissions (3)	132950,75	kg		0,0033	
N2O Emissions (4)					
4.E - Other (please specify)			NO	NO	NO

Annex III

Table 66- BEN - National Energy Balance for the year 2018

Balanço Energético

2018	Energia primária: Energia Hidráulica	Energia primária: Lenha	Energia primária: total primária	Energia secundária: butano (GLP)	Energia secundária: gasolina	Energia secundária: gasóleo (diesel)	Energia secundária: Jet-A1 (querosene de aviação)	Energia secundária: Petróleo (querosene comum)	Energia secundária: lubrificantes	Energia secundária: eletricidade	Energia secundária: carvão vegetal	Energia secundária: total secundária	Total
Unidades >>>>	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ
Produção	18,5	980,4	998,9	-	-	-	-	-	-	-	-	-	998,9
Importação	-	-	-	7,6	398,5	1424,3	266,1	-	9,0	-	-	2 105,5	2 105,5
Exportação	-	-	-	-	-	-	-	-	-	-	-	-	-
Bunkes Internacionais	-	-	-	-	-	-	52,4	-	-	-	-	52,4	52,4
Variação de estoques	-	-	-	0,8	52,0	58,6	(34,9)	(35,0)	5,9	-	-	47,4	47,4
Consumo Aparente	18,45	980,43	998,89	6,83	346,46	1 365,70	248,52	35,00	3,14	-	-	2 005,64	3 004,5
Centrais elétricas	(18,45)	-	(18,45)	-	-	(1132,53)	-	-	-	371,85	-	(760,68)	(779,1)
Carvoarias Vegetal	-	(196,09)	(196,09)	-	-	-	-	-	-	-	200,22	200,22	4,1
Petróleo transformado	-	-	-	-	-	-	(159,18)	159,75	-	-	-	0,57	0,6
Perdas	-	-	-	-	-	-	-	-	-	(37,18)	-	(37,18)	(37,2)
Total de transformação	(18,45)	(196,09)	(214,54)	-	-	(1132,53)	(159,18)	159,75	-	334,66	200,22	(597,07)	(811,6)
Perdas de armazenagem/distribuição	-	-	-	0,56	(13,05)	(101,68)	36,20	(5,50)	-	79,66	-	(3,82)	(3,8)
Oferta Interna Líquida	-	784,35	784,35	6,27	359,51	334,84	53,13	210,27	3,14	255,00	200,22	1422,39	2 206,7
Consumo não-energético	-	-	-	-	-	-	-	-	(4,39)	-	-	(4,39)	(4,4)
Consumo energético	-	784,35	784,35	6,27	359,51	334,84	53,13	210,27	7,53	255,00	200,22	1426,78	2 211,1
Indústrias manufatureiras e construção	-	-	-	-	-	-	-	-	-	-	-	-	-
Transporte	-	-	-	-	287,61	274,57	53,13	-	6,78	-	-	622,09	622,1
Transporte rodoviário	-	-	-	-	287,61	180,82	-	-	5,27	-	-	473,70	473,7
Transporte marítimo	-	-	-	-	-	93,76	-	-	1,51	-	-	95,26	95,3
Transporte aéreo	-	-	-	-	-	-	53,13	-	-	-	-	53,13	53,1
Residencial	-	235,30	235,30	3,20	8,99	13,39	-	197,65	-	123,84	196,22	543,29	778,6
Comercial - Institucional	-	549,04	549,04	2,51	1,80	36,83	-	-	-	111,51	4,00	156,65	705,7
Agricultura/floresta/pesca	-	-	-	-	57,52	-	-	-	-	-	-	57,52	57,5
Outros	-	-	-	0,56	3,60	10,05	-	12,62	0,75	19,65	-	47,23	47,2
Diferenças	-	-	-	-	-	-	-	-	-	-	-	-	-

Balanço Energético

2016	Energia primária: Energia Hidráulica	Energia primária: Lenha	Energia primária: total primária	Energia secundária: butano (GLP)	Energia secundária: gasolina	Energia secundária: gasóleo (diesel)	Energia secundária: Jet-A1 (querosene de aviação)	Energia secundária: Petróleo (querosene comum)	Energia secundária: lubrificantes	Energia secundária: eletricidade	Energia secundária: carvão vegetal	Energia secundária: total secundária	Total
Unidades >>>>	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ
Produção	20,88	968,74	989,6	-	-	-	-	-	-	-	-	-	989,6
Importação	-	-	-	2,30	288,38	1389,73	317,73	-	7,21	-	-	2 005,35	2 005,3
Exportação	-	-	-	-	-	-	-	-	-	-	-	-	-
Bunkes Internacionais	-	-	-	-	-	-	72,27	-	-	-	-	72,27	72,3
Variação de estoques	-	-	-	(0,04)	(45,01)	(147,10)	(38,44)	(38,58)	(0,87)	-	-	(270,03)	(270,0)
Consumo Aparente	20,88	968,74	989,63	2,34	333,39	1 536,83	283,90	38,58	8,07	-	-	2 203,11	3 192,7
Centrais elétricas	(20,88)	-	(20,88)	-	-	(1 113,25)	-	-	-	400,09	-	(713,16)	(734,0)
Carvoarias Vegetal	-	(193,75)	(193,75)	-	-	-	-	-	-	-	197,84	197,84	4,1
Petróleo transformado	-	-	-	-	-	-	(188,56)	189,24	-	-	-	0,68	0,7
Perdas	-	-	-	-	-	-	-	-	-	(40,01)	-	(40,01)	(40,0)
Total de transformação	(20,88)	(193,75)	(214,63)	-	-	(1 113,25)	(188,56)	189,24	-	360,08	197,84	(554,65)	(769,3)
Perdas de armazenagem/distribuição	-	-	-	0,21	13,76	72,20	54,33	16,43	-	112,04	-	268,96	269,0
Oferta Interna Líquida	-	774,99	774,99	2,13	319,63	351,38	41,01	211,39	8,07	248,04	197,84	1 379,49	2 154,5
Consumo não-energético	-	-	-	-	-	-	-	-	2,08	-	-	2,08	2,1
Consumo energético	-	774,99	774,99	2,13	319,63	351,38	41,01	211,39	5,99	248,04	197,84	1 377,40	2 152,4
Indústrias manufatureiras e construção	-	-	-	-	-	-	-	-	-	-	-	-	-
Transporte	-	-	-	-	255,70	270,57	41,01	-	5,39	-	-	572,67	572,7
Transporte rodoviário	-	-	-	-	255,70	175,69	-	-	4,19	-	-	435,59	435,6
Transporte marítimo	-	-	-	-	-	94,87	-	-	1,20	-	-	96,07	96,1
Transporte aéreo	-	-	-	-	-	-	41,01	-	-	-	-	41,01	41,0
Residencial	-	542,50	542,50	1,08	7,99	17,57	-	198,71	-	125,32	193,88	544,55	1 087,0
Comercial - Institucional	-	232,50	232,50	0,85	1,60	52,71	-	-	-	103,42	3,96	162,54	395,0
Agricultura/floresta/pesca	-	-	-	-	51,14	-	-	-	-	-	-	51,14	51,1
Outros	-	-	-	0,19	3,20	10,54	-	12,68	0,60	19,30	-	46,51	46,5
Diferenças	-	-	-	-	-	-	-	-	-	-	-	-	-

Balanço Energético

2012	Energia primária			Energia secundária									
	Energia Hidráulica	Lenha	total primária	butano (GLP)	gasolina	gasóleo (diesel)	Jet-A1 (querosene de aviação)	Petróleo (querosene comum)	lubrificantes	eletricidade	carvão vegetal	total secundária	Total
Unidades >>>>	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ
Produção	23,0	926,0	949,0	-	-	-	-	-	-	-	-	-	949,0
Importação	-	-	-	1,1	246,0	1 004,0	312,8	-	4,4	-	-	1568,2	1 568,2
Exportação	-	-	-	-	-	-	-	-	-	-	-	-	-
Bunkes Internacionais	-	-	-	-	-	-	147,5	-	-	-	-	147,5	147,5
Variação de estoques	-	-	-	0,6	18,3	(123,3)	(22,0)	(22,0)	0,8	-	-	(147,6)	(147,6)
Consumo Aparente	22,99	926,02	949,01	0,51	227,66	1 127,32	187,27	22,04	3,51	-	-	1 568,31	2 517,3
Centrais elétricas	(22,99)	-	(22,99)	-	-	(769,06)	-	-	-	272,17	-	(496,89)	(519,9)
Carvoarias Vegetal	-	(185,20)	(185,20)	-	-	-	-	-	-	-	189,11	189,11	3,9
Petróleo transformado	-	-	-	-	-	-	(154,55)	155,11	-	-	-	0,55	0,6
Perdas	-	-	-	-	-	-	-	-	-	(27,22)	-	(27,22)	(27,2)
Total de transformação	(22,99)	(185,20)	(208,20)	-	-	(769,06)	(154,55)	155,11	-	244,95	189,11	(334,44)	(542,6)
Perdas de armazenagem/distribuição	-	-	-	(0,01)	(8,15)	26,61	23,54	5,68	-	51,95	-	99,62	99,6
Oferta Interna Líquida	-	740,81	740,81	0,52	235,81	331,65	9,18	171,47	3,51	193,00	189,11	1 134,25	1 875,1
Consumo não-energético	-	-	-	-	-	-	-	-	(0,30)	-	-	(0,30)	(0,3)
Consumo energético	-	740,81	740,81	0,52	235,81	331,65	9,18	171,47	3,81	193,00	189,11	1134,54	1875,4
Indústrias manufatureiras e construção	-	-	-	-	-	-	-	-	-	-	-	-	-
Transporte	-	-	-	-	188,65	262,01	9,18	-	3,43	-	-	463,27	463,3
Transporte rodoviário	-	-	-	-	188,65	169,14	-	-	2,67	-	-	360,46	360,5
Transporte marítimo	-	-	-	-	-	92,86	-	-	0,76	-	-	93,63	93,6
Transporte aéreo	-	-	-	-	-	-	9,18	-	-	-	-	9,18	9,2
Residencial	-	222,24	222,24	0,26	5,90	16,58	-	161,18	-	99,65	185,33	468,89	691,1
Comercial - Institucional	-	518,57	518,57	0,21	1,18	43,12	-	-	-	74,92	3,78	123,21	641,8
Agricultura/floresta/pesca	-	-	-	-	37,73	-	-	-	-	-	-	37,73	37,7
Outros	-	-	-	0,05	2,36	9,95	-	10,29	0,38	18,43	-	41,45	41,4
Diferenças	-	-	-	-	-	-	-	-	-	-	-	-	-