Statkraft

Greenhouse Gas Emissions Inventory

Statkraft Brazil · 2023

Summary

Executive Summary

This report is divided into two parts:

Contextualization and relevance

GHG inventory for the year 2023

The GHG Inventory Report - 2022 summarized the challenges of climate change, starting from a global view of GHG emissions, going through the specific situation of Brazil, addressing public policies and private initiatives in Brazil, and finally, indicating the positioning of some companies in the power generation sector in Brazil.

This **GHG Inventory Report – 2023** presents how emission reduction targets are considered and how the electricity sector is taking a leading role in the face of climate challenges. Statkraft is an example in this regard.

The second part of this report presents the results of Statkraft's Greenhouse Gas Emissions Inventory for the year 2023, following the normative guidelines for results presentation. Then, **the results of this Inventory are evaluated, including the positive impacts of the company's activities** on climate change.

Climate change

Global warming is the process of increasing the average temperature of the Earth's oceans and atmosphere caused by massive emissions of greenhouse gases that originate from a range of human activities, especially the burning of fossil fuels and changes in land use, such as deforestation. **The greenhouse effect is a natural phenomenon, but it is being intensified by human activities.**

The United Nations Intergovernmental Panel on Climate Change (IPCC) has been warning the world to the rapid climate change and likely global warming trajectories by mid-century (AR6, 2023). **Considering current emissions projections, the planet is expected to exceed an average warming of 1.5 °C this decade.**

The effects of this warming may be important, especially in the regimes of precipitation, ocean acidification, sea level rise, melting of polar ice caps, extreme weather events and desertification of tropical regions, resulting in a **reduction in global Gross Domestic Product (GDP), irreversible loss of biodiversity and waves of mass migration (IPCC, 2018).**

These impacts become increasingly evident when we observe the natural disasters that have afflicted the populations of different Brazilian regions in recent months, such as the floods in Rio Grande do Sul, as well as the heat waves in the Southeast, the fires in the Pantanal and the severe drought that hit the Amazon. The intensity and, especially, the increase in the frequency of these extreme effects indicate a strong relationship with climate change.

In its latest report, the IPCC warned about rapid and far-reaching changes necessary to keep temperature rise to 1.5 °C above pre-industrial levels or face irreversible damage to our societies, economies, and natural systems (IPCC, 2018).

Limiting warming to 1.5 °C means that global GHG emissions need to be halved by 2030 and move closer to net zero by 2050 (Johan Rockstrom, 2017; UNEP, 2019). This requires a comprehensive transformation in virtually every economic sector.

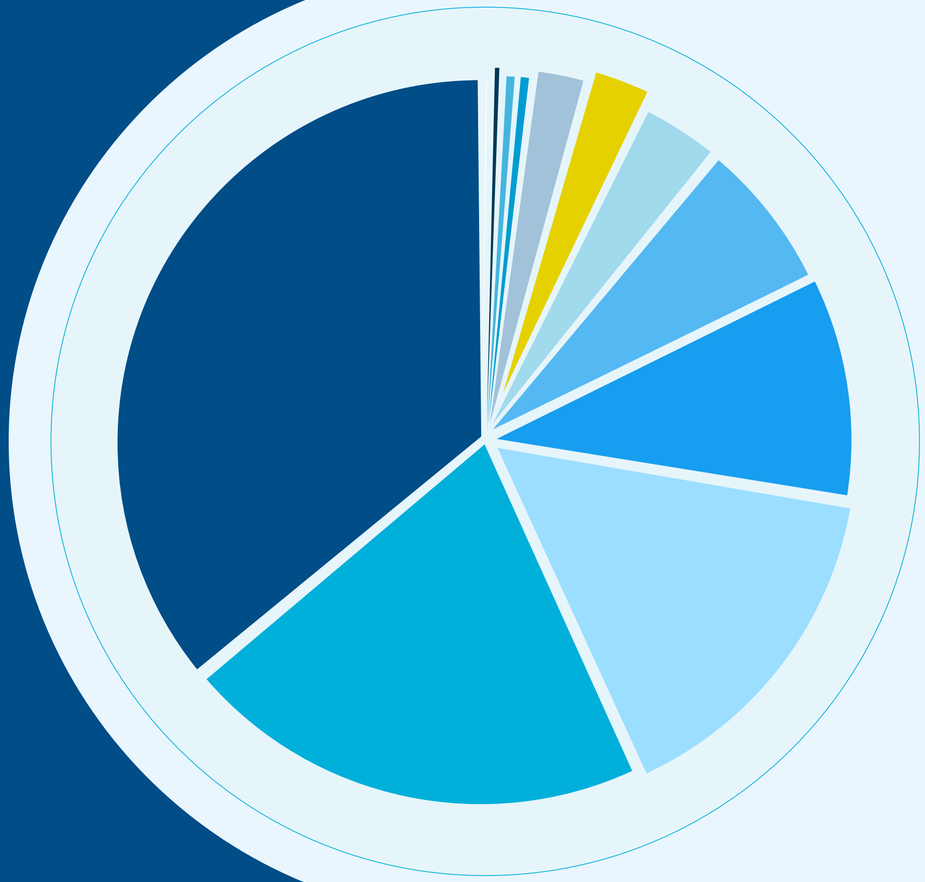
The Electric Power Sector

Electricity is fundamental to many aspects of life in modern societies and will become increasingly important as it gains greater relevance in transport and thermal power generation. In fact, efforts to address climate change are driving the rapid electrification of numerous end-uses, from transportation to industry, driving a massive increase in energy demand.

Electricity generation is currently the largest source of CO2 emissions globally, but also the sector leading the transition to net-zero emissions through the rapid deployment of renewable energy sources such as solar and wind.

The result is a drastic transformation of the world's energy systems, even though fossil fuels still account for more than 60% of total global electricity production (see graph).

The energy system will play a central role in the transition to a low-carbon economy, as almost three-quarters of current emissions are energy-related – mainly the combustion of fossil fuels. To avoid increasingly serious risks, **the decarbonization of the energy sector will require the rapid and sustainable growth of renewable energy sources** and significant reductions in coal and gas-fired power over the next 10 years (Grant & Coffin, 2019, pp. 38-41; Chang, 2020).



- Tidal 0,003%
- Solar Thermal 0,1%
- Geothermal 0,3%
- Waste 0,4%
- Biomass 2,2%
- Oil and Derivatives 2,5%
- Solar Photovoltaic 3,6%
- Wind 6,5%
- Nuclear 9,9%
- Hydraulic 15,5%
- Natural Gas 23%
- Coal 36%

Renewable Electric Power

According to the International Energy Agency's (IEA) Renewables Report, 2023, the global energy mix will be transformed by 2028. **The world is on track to add more renewable capacity in the next five years** than has been installed since the first commercial renewable energy power plant was built more than 100 years ago. Nearly 3,700 GW of new renewable capacity will come to work between 2023-2028, driven by supportive policies in more than 130 countries. Over the next five years, several milestones are expected to be achieved globally:

By 2024, wind and solar photovoltaic will together generate more electricity than hydropower.

Wind power and solar photovoltaic will each surpass nuclear electricity production in 2025 and 2026, respectively.

By 2025, renewable energy will overtake coal to become the largest source of electricity production.

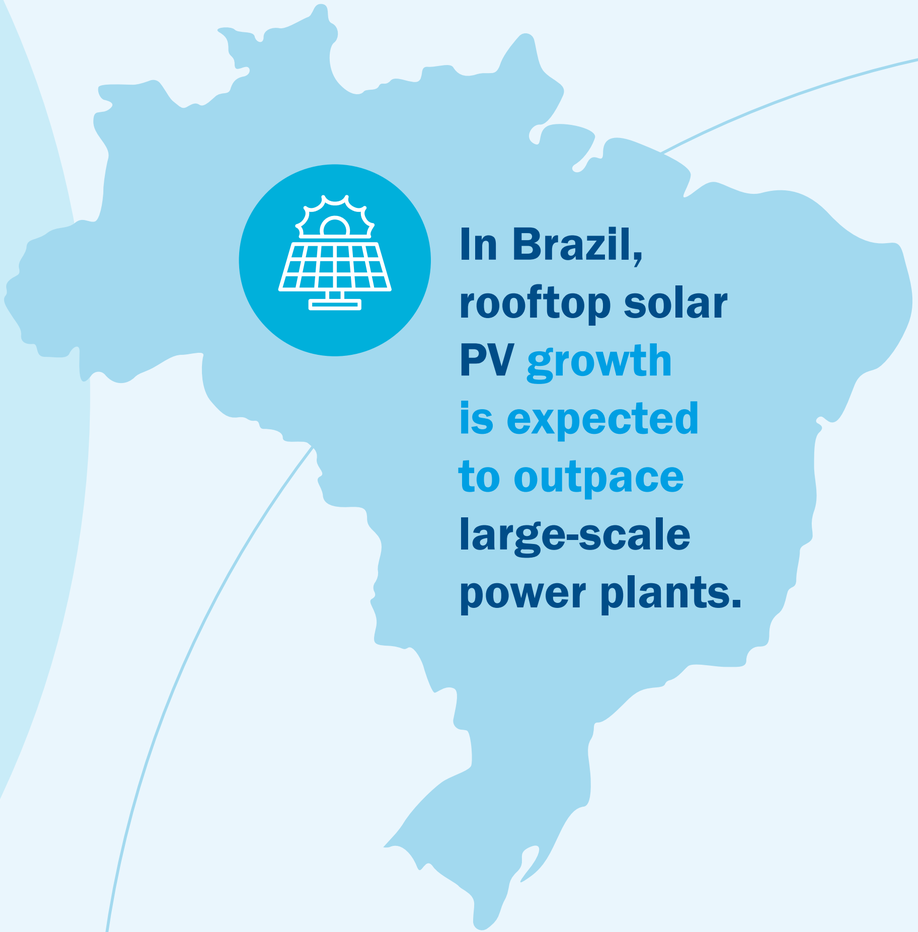
By 2028, renewable energy sources will account for more than 42% of the world's electricity production, with the share of wind and solar photovoltaic doubling to 25%.

By 2023, it is estimated that **96% of newly installed solar photovoltaic and onshore wind capacity at scale**, had lower generation costs than new coal and natural gas plants. In addition, three-quarters of new wind and solar PV plants offered cheaper energy than existing fossil fuel installations. Photovoltaic and wind systems will become more cost-competitive by 2028.

Electricity in Brazil

Brazil's energy policies are up to the world's climate challenges. **Renewables account for nearly 45% of primary energy demand, making Brazil's energy sector one of the least carbon-intensive in the world.** Total primary energy demand has doubled in Brazil since 1990, led by strong growth in electricity consumption.

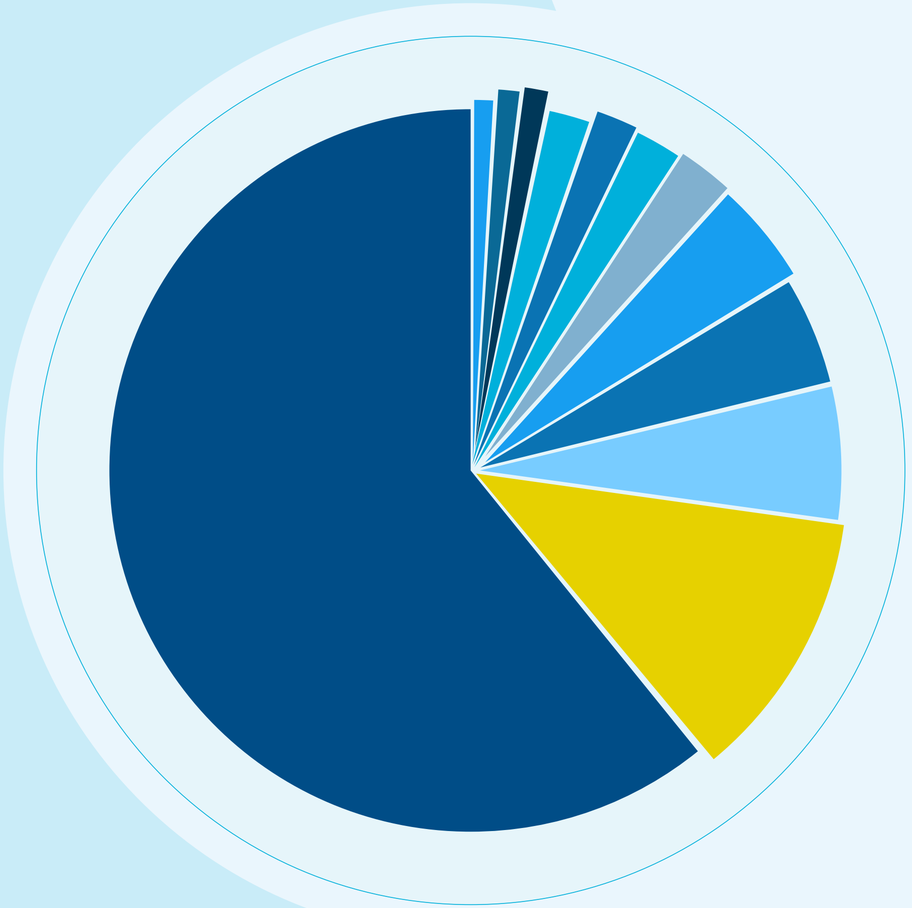
Large hydroelectric plants account for about 80% of domestic electricity generation, making Brazil's electricity matrix one of the cleanest in the world. However, the expansion of hydropower is increasingly limited by the distance to much of the remaining resources and the environmental impacts that the development of these assets would entail.



In Brazil, rooftop solar PV growth is expected to outpace large-scale power plants.

Photovoltaic projects will account for nearly 70% of all additions in the coming years (IEA, 2023). Dependence on other sources for energy production is also growing, specifically natural gas, wind power (on-shore and off-shore), and bioenergy. In Brazil, rooftop solar PV growth is expected to outpace large-scale power plants as residential and commercial consumers look to reduce their electricity bills amid higher prices.

Brazil announced at COP26 the long-term goal to achieve net-zero emissions by 2050 and a plan to reduce carbon emissions by 50% along with a goal of zero illegal deforestation by 2030. This is supported by an announced climate action plan for 2030 and a national hydrogen plan, a strategy that is being developed.



- Diesel 0,9%
- Other Renewables 0,8%
- Coal 1,2%
- Other Non-Renewables 1,8%
- Net Import 1,9%
- Nuclear 2,1%
- Lye Water or Black Liquor 2,5%
- Solar 4,4%
- Sugarcane Bagasse 4,7%
- Natural Gas 6, 1%
- Wind 11,8%
- Hydraulic 61,9%

Decarbonization in practice

The reduction of Greenhouse Gas (GHG) emissions is the central objective for humanity to limit global warming to 1.5 °C, so the understanding of the concept of decarbonization, generically used as the set of efforts to reduce the carbon intensity of the economy, is essential.

In the business context, decarbonization is associated with **investments in process improvements, energy efficiency, fuel exchange, waste treatment, and renewable electricity generation.**

To support organizations in the **challenge of measuring, monitoring emissions, and setting targets, several international initiatives have been launched.** Statkraft is actively involved in many of these initiatives, underpinning the impact the company has on the global challenge.

The environmental crisis brings a series of changes in the business landscape, whether due to regulatory issues, market realities, in addition to climate change itself.

The first step in effective carbon management is to properly determine the company's impact and its entire value chain. Once the company's current situation has been assessed, it is possible to draw up an action plan that adds value. This includes evaluating sustainability projects, offsetting emissions, and communicating with different stakeholders.

Statkraft in Brasil

Statkraft has been in Brazil since 2009 and started operations in 2011 as an electricity trader. In the following year, it established its activities in renewable energy generation as Statkraft Energias Renováveis S.A. (SKER), a holding company of Special Purpose Entities - SPEs that concentrate renewable energy generation assets.

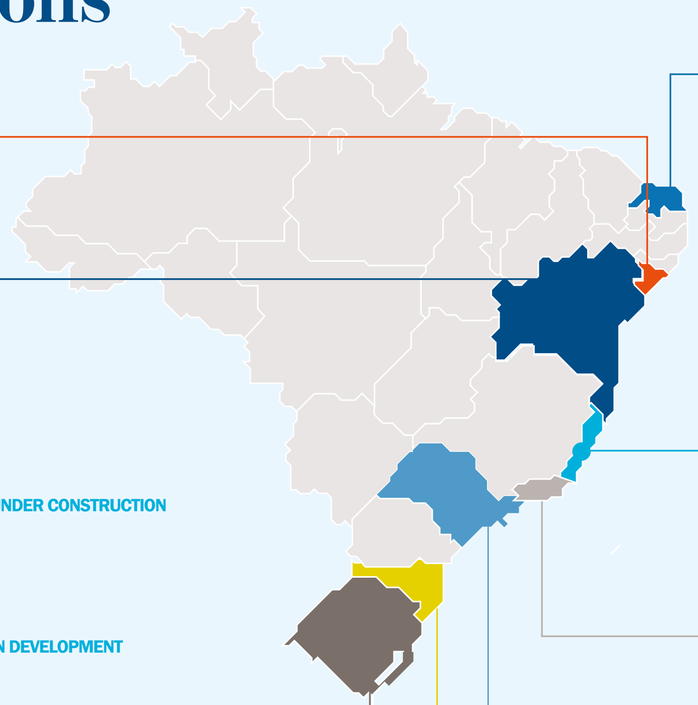
Its trading company, Statkraft Energia do Brasil Ltda (SKEB), is 100% controlled by the Group through Statkraft Investimentos Ltda (SKIN).

OUR VISION:
Renew the way the world is powered

The Statkraft Group is a Norwegian government owned company with over **127 years of existence.**

Present in **21 countries in Europe, South America and Asia**, it is an international leader in hydroelectric power production and the largest generator of renewable energy in Europe.

Map of operations



Barra dos Coqueiros Wind Park
34,5 MW | 99,99%

Brotas de Macaúbas Wind Complex
95,19 MW | 100%

Ventos de Santa Eugênia Wind Complex
518,7 MW | 100%

Morro do Cruzeiro Wind Complex
79,8 MW | 100%
UNDER CONSTRUCTION

Solar Santa Eugênia
228 MW | 100%

Solar Morro do Cruzeiro
100%
IN DEVELOPMENT

SHP Moinho
13,7 MW | 100%

SHP Esmeralda
22,2 MW | 100%

HPP Monel Monjolinho
74 MW | 100%

HPP Dona Francisca
125 MW | 2%

Rio das Antas Energy Complex
360 MW | 5%

Wind Park Jerusalém
260,4 MW | 100%

Boqueirão Wind Park
100%

SHP Francisco Gros
29 MW | 100%

SHP Rio Bonito
22,5 MW | 100%

SHP Jucu
4,84 MW | 100%

SHP Fruteiras
8,74 MW | 100%

SHP Alegre
2,06 MW | 100%

SHP Viçosa
4,5 MW | 100%

SHP São João
25 MW | 100%

HPP Suíça
35,34 MW | 100%

SHP Santa Rosa II
30 MW | 100%

Office Rio de Janeiro
Commercial

Office São Paulo
Commercial

SHP Santa Laura
15 MW | 100%

SHP Victor Baptista Adami
25 MW | 50%

Office Florianópolis
Headquarters

Installed Capacity **Statkraft Share**

The Rio das Antas Complex and HPP Dona Francisca, which are part of Statkraft's portfolio in Brazil, were not included due to the methodological choice for the operational control approach outlined in the GHG Protocol.

Statkraft's Greenhouse Gas Emissions Inventory

Year 2023

Next, we will present Statkraft Brasil's inventory, prepared based on the concepts, principles, and guidelines established by the GHG Protocol methodology, disclosed by the Brazilian GHG Protocol Program (PBGHGP), using its specifications for accounting, quantifying, and publishing Corporate Inventories of Greenhouse Gas Emissions.

To measure the inventory, we used equations provided by the Intergovernmental Panel on Climate Change (IPCC) to calculate emissions from certain sources and sinks.

The structure of the report follows the ISO 14.064:2007 - Greenhouse Gas Management System specifications - International Standardization Organization, 2007.

Inventory Period

This inventory covers emissions from activities carried out by Statkraft in 2023, including direct and indirect emissions, **including all projects that the group has operational control over.**

Statkraft conducted its first inventory in 2021. In 2022, however, there were changes concerning the scope of emitting sources considered. The company sees that carbon management is going through a maturing process, in this sense, the base year of Statkraft's GHG emissions inventory is not defined, and 2021, 2022, or a future date may be adopted.

Organizational Boundaries

This inventory includes Statkraft's activities in Brazil. The inventory follows the accounting operational control approach provided by the GHG Protocol methodology. In this approach, 100% of the emissions of the projects that the Group maintains control over are accounted for, regardless of its shareholding.

Operational Limits

Statkraft's GHG Inventory is intended to include the company's main emitting sources of scope 1, 2, and 3. The definition of these emitting sources was guided by the principles of the relevant standards, specifically considering the relevance, consistency, precision, transparency, and completeness of the inventory.

The following are the emitting sources considered in this inventory:

Scope 1

Stationary

Stationary combustion emissions refer to the release of greenhouse gases resulting from the combustion of fuels for electricity, steam, heat, or energy generation using equipment located at a fixed site.

Mobile

Mobile combustion emissions refer to the greenhouse gas emissions resulting from the combustion of fuels for transportation in general, including company-owned or controlled vehicles.

Fugitive

Unintentional releases of substances such as hydrofluorocarbons (HFCs) during the use of refrigeration and air conditioning equipment, as well as CO2 from cylinders.

Land-use Change

Vegetation suppression emissions refer to the greenhouse gas emissions resulting from the authorized removal of native forest vegetation.

Agricultural Activities

Emissions resulting from the use of fertilizers in agricultural activities.

Effluents

Emissions from the anaerobic treatment of liquid effluents treated within the boundaries of the organization.

Scope 2

Energy Purchase

Emissions resulting from the purchase of electricity.

Scope 3

Purchased Goods and Services

Emissions that occur throughout the life cycle (extraction, production, and transportation) of purchased products. This kind of emission must be especially present at the construction of VSE and MdC.

Capital Goods

Emissions that occur throughout the life cycle (extraction, production, and transportation) of purchased capital goods.

Upstream Transportation and Distribution

Emissions from transportation of purchased goods in vehicles not owned or operated by the organization.

Waste sent to landfills

Emissions from waste treatment of the organization's operations

Business trips

Emissions from employee commuting for business activities of the reporting organization

Employees' commuting *(home-work)*

Emissions from employees' commuting from home to their workplace

This inventory also includes the following data on Statkraft's carbon management activities:

Avoided emissions

Emissions avoided due to Statkarft's activities. Considering the company produces renewable energy, the company's activities result in the reduction of Interconnected National System consumer's emissions.

Carbon stock

Carbon stocked in assets managed by Statkraft. In Statfraft's case, the carbon stock is related to the preservation of forest assets.

Biogenic removals

Carbon sequestered from the atmosphere by biological mechanisms, such as tree planting.

Quantitative results

Emissions by category and type of greenhouse gas:

	CO_2 emissions (in t)	CH_4 emissions (in t)	N_2O emissions (in t)	SF_6 gas emissions (in t)	Non-renewable CO_2e emissions (in t)	Renewable CO_2e emissions (in t)
SCOPE 1						
Stationary Combustion	19,43	0,00	0,00	-	19,55	2,88
Mobile Combustion	153,53	0,01	0,00	-	154,49	21,29
Fugitive Emissions	1,80	-	-	0,04	942,89	-
Agricultural activities	-	-	-	-	-	-
Land-use change	-	-	-	-	30,67	0,01
SCOPE 2						
Energy Purchase	-	-	-	-	123,53	-
SCOPE 3						
Purchased Goods and services	13.252,16	0,24	0,06	-	13.277,19	518,45
Capital goods	-	-	-	-	42.388,94	-
Upstream Transportation and Distribution	91,64	0,00	0,00		91,95	11,55
Waste sent to landfills	-	0,01	-	-	0,42	-
Business trips	162,03	0,00	0,01	-	335,79	0,03
Employees' commuting (home-work)	4,02	0,00	0,00	-	4,27	1,00

Other carbon indicators related to the company's activity:

Avoided emissions 80.482,97

Carbon stock 3.073.590

Biogenic removals 278,36

Biogenic emissions 49,23

(in tCO_2e)

Also, Statkraft is in the process of retiring 3,100 I-RECs for the offsetting of the company's scope 2 emissions between 01/01/2023 and 12/31/2023.

Emissions by type of greenhouse gas and by operating unit:

	Scope 1 Emissions - in kg						Scope 2 Emissions - in kg	Scope 3 Emissions - in kg					Total	
	CO_2	CH_4	N_2O	SF_6	fossil CO_2e	Renewable CO_2e	fossil CO_2e	CO_2	CH_4	N_2O	fossil CO_2e	Renewable CO_2e	tCO_2e	%
HPP Monjolinho	10.355,13	0,62	0,18	-	**10.450,79**	**1.352,23**	2.713,10	280,36	0,03	0,01	**1.783,67**	-	**14,95**	**0,03%**
SHP Esmeralda	4.559,90	0,29	0,07	-	**4.587,76**	**646,10**	6.488,99	12,32	0,01	0,00	**1.062,54**	-	**12,14**	**0,02%**
SHP Santa Laura	10.371,90	0,60	0,18	-	**10.481,91**	**1.310,56**	5.789,41	73,93	0,01	0,00	**2.624,88**	-	**18,90**	**0,03%**
SHP Santa Rosa II	11.611,09	0,68	0,20	-	**11.683,92**	**1.499,81**	6.032,06	504,29	0,02	0,02	**3.809,30**	-	**21,53**	**0,04%**
SHP Moinho	6.819,12	0,40	0,12	-	**6.861,61**	**882,76**	9.086,00	-	0,00	-	**1.050,07**	-	**17,00**	**0,03%**
SHP Passos Maia	15.366,40	0,89	0,27	-	**15.463,18**	**1.946,83**	5.144,60	207,73	0,01	0,01	**809,82**	-	**21,42**	**0,04%**
SHP Viçosa	6.992,23	0,41	0,12	-	**7.036,18**	**892,81**	8.885,49	-	0,00	-	**0,04**	-	**15,92**	**0,03%**
SHP São João	8.554,02	0,49	0,15	-	**8.633,69**	**1.073,40**	21.003,98	262,12	0,01	0,01	**1.164,74**	-	**30,80**	**0,05%**
SHP Alegre	141,51	0,01	0,00	-	**187,13**	**26,04**	17,49	76,36	0,08	0,00	**77,35**	-	**0,28**	**0,00%**
SHP Fruteiras	8.028,29	0,47	0,14	-	**8.096,90**	**1.023,10**	316,66	147,38	0,00	0,00	**1.198,85**	-	**9,61**	**0,02%**
SHP Rio Bonito	4.944,29	0,29	0,08	-	**4.974,86**	**639,75**	5.538,66	-	0,11	-	**2,04**	-	**10,52**	**0,02%**
HPP Suiça	5.479,84	0,32	0,09	-	**5.513,68**	**696,36**	21.961,68	859,12	0,12	0,03	**13.619,04**	-	**41,09**	**0,07%**
SHP Jucu	4.115,51	0,24	0,07	-	**4.140,99**	**525,86**	2.381,46	-	0,03	-	**0,62**	-	**6,52**	**0,01%**
SHP Santa Fé	4.027,99	0,24	0,07	-	**4.097,50**	**521,67**	8.383,34	953,86	0,02	0,03	**22.607,65**	-	**35,09**	**0,06%**
Brotas de Macaúbas Complex	50.226,64	3,27	0,84	-	**50.497,52**	**7.200,22**	3.086,70	-	0,12	-	**3,09**	**7.200,22**	**53,59**	**0,09%**
Ventos Santa Eugênia	7.293,00	0,60	0,10	-	**7.337,46**	**1.345,12**	-	12.091,54	84,27	17,52	**29.939.999,63**	**7,92**	**29.947,34**	**52,00%**
Barra Coqueiros Wind Farm	22.431,55	1,70	0,33	40,00	**962.567,16**	**3.763,62**	366,94	-	0,05	-	**1,46**	-	**962,94**	**1,67%**
Morro do Cruzeiro	-	-	-	-	**-0,69**	**-**	0,69	2.909.521,65	179,23	46,85	**26.141.274,49**	**42.009,39**	**26.141,27**	**45,39%**
Florianópolis (headquarters)	32,00	-	-	-	**824,00**	**-**	6.575,18	104.585,97	2,72	3,98	**171.864,52**	**11,02**	**179,26**	**0,31%**
Rio de Janeiro (commercial)	39,20	-	-	-	**161,24**	**-**	8.411,48	34.206,39	0,23	1,09	**37.535,84**	-	**46,11**	**0,08%**
Total in tons	**181,39**	**0,01**	**0,00**	**0,04**	**1.123,60**	**25,35**	**122,18**	**3.063,78**	**0,27**	**0,07**	**56.340,49**	**49,23**	**57.586,27**	**100%**

Evaluation of results

As expected, scope 3 emissions continue to represent a very relevant part of **Statkraft's emissions in Brazil, as observed in the 2022 inventory.** The company's emissions profile in the country is similar to that of real estate developers, whose emissions are closely associated with the construction of new projects. In these cases, **the emissions are almost entirely scope 3.** If we compare Statkraft's emissions with other renewable energy generating companies, we find a similar profile. The difference is in the number of new assets under construction.

GHG EMISSIONS - BY SCOPE

SCOPE 1	SCOPE 2	SCOPE 3
2%	0%*	98%

* Scope 2 emissions represent 0.2% of Statkraft Brazil's inventory, taking into account the energy consumed from the national interconnected system (SIN).

Large non-renewable scope 1 emissions occur exclusively in generators that utilize fossil fuels, such as coal, natural gas, or other petroleum derivatives in boilers. However, a renewable energy generator may still have significant scope 1 emissions during the early stages of construction, where vegetation suppression typically takes place in the project areas. This activity results in the release of carbon stored in the removed vegetation into the atmosphere and is accounted for as part of Land Use Change emissions, which falls under scope 1. In these cases, even renewable energy generators can have high scope 1 emissions, while other sources of scope 1 emissions tend to be low.

Statkraft is the leader in renewable energy internationally. **In Brazil, there are 40 generation assets, including wind and hydroelectric plants, with 2.2 GW of installed capacity, including operations, acquisitions, and projects under construction.** Working exclusively with renewable energy generation, Statkraft's purpose in Brazil is to provide clean energy, contributing to a more sustainable future that brings renewable energy to the country's communities, companies, industries, and homes.

As we see from Statkraft's GHG inventories, the company's emissions tend to be higher when new assets are developed. However, this increase in emissions is directly linked to a benefit for the **climate challenge of Brazil and the world,** so that the impacts caused in the short term by the construction of **new assets are largely surpassed by the benefits generated by their operations in the medium and long term,** through the decarbonization of the Brazilian energy matrix. As presented in the opening chapters of this report, **investment in the expansion of renewable energy sources in Brazil and the world** is essential for the objectives of limiting global warming to be achieved. **Given this, we understand Statkraft's role** in acting with social and environmental responsibility in the operation of its assets and the development of new ventures. We also understand that the company's good practices can have impacts on the value chain, bringing benefits beyond the power generation sector.

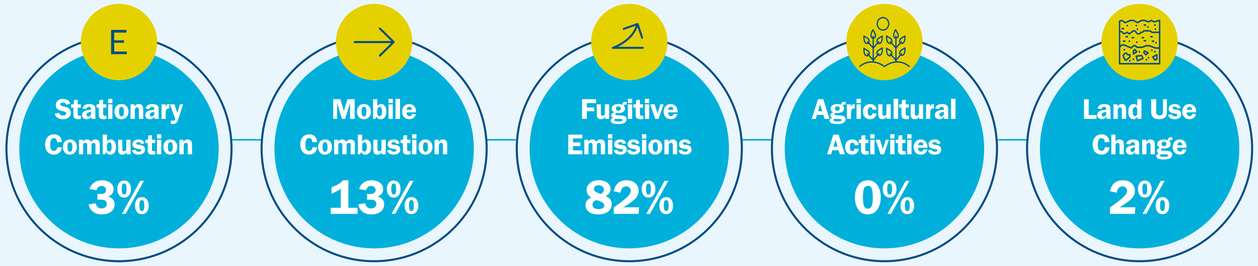
Regarding scope 1, there is a discrepancy between the values generated in the 2021, 2022, and 2023 inventories.

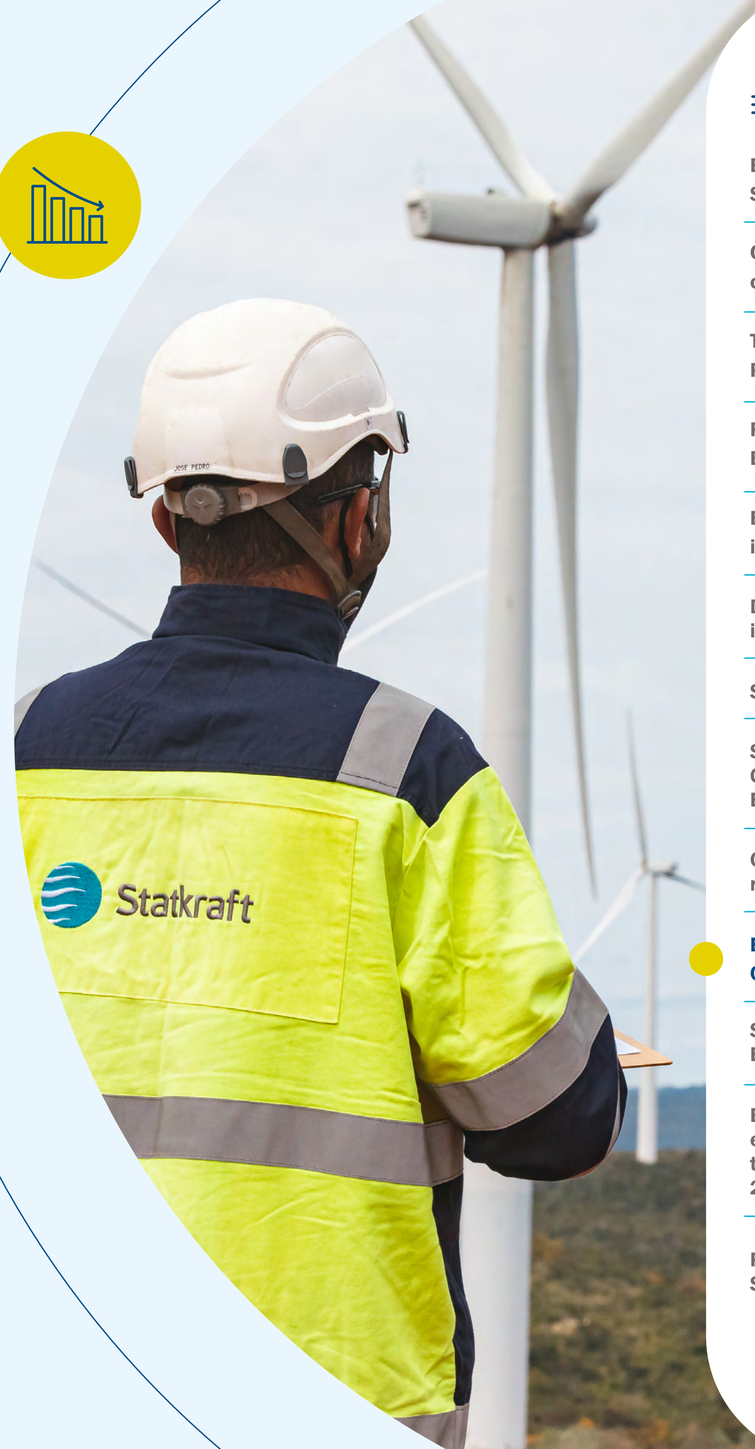
In 2021, scope 1 emissions were the highest, due to the occurrence of the vegetation suppression phase for the construction of the Ventos Santa Eugênia Wind Farm, resulting in a great relevance of the Land Use Change category.

In 2022, vegetation suppression activities also took place, this time for the construction of the Morro do Cruzeiro Wind Farm, a project of much smaller dimensions than Ventos de Santa Eugênia, resulting in smaller-scale emissions.

In 2023, there were only final phases of vegetation suppression in the Morro do Cruzeiro Wind Farm region, resulting in the lowest relevance of the Land Use Changes category observed since Statkraft began to inventory its emissions. On the other hand, with the purchase and installation of wind turbine components, other scope 3 emitting sources started to gain relevance, such as the categories of Capital Goods and Purchased Goods and Services. In this sense, it is noted that Scope 1 emissions, which in 2021 accounted for most of GHG emissions, in 2023 were small.

SCOPE 1 EMISSIONS



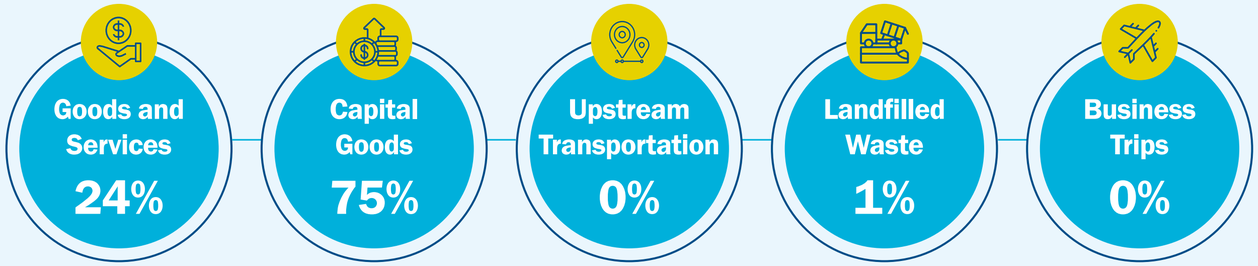


Another important difference is that the 2022 and 2023 inventory included SF6 emissions, a greenhouse gas with global warming power 23,500 times greater than carbon dioxide, from which emissions are accounted for in the Scope 1 Fugitive Emissions category, that gained relevance in 2023.

Scope 2 emissions, related to the purchase of energy, as expected for Statkraft's operations, represent less than 1% of the GHG inventory. The highest energy consumption is concentrated in the company's offices, located in the cities of Florianópolis and Rio de Janeiro.

In scope 3, the most relevant emissions are related to Capital Goods and Purchased Goods and Services.

SCOPE 3 EMISSIONS



In the case of Capital Goods, this category had not been included in the 2021 Inventory. These are emissions that are not constant during the operation of a generating unit, accounted for in the installation of this equipment.

In the case of the Ventos Santa Eugênia Wind Farm, the installation of wind turbines took place mainly throughout 2022 and to a lesser extent in 2023, therefore, these emissions are accounted for in these years. **Emissions of Purchased Goods and Services include activities related to the construction of new projects,** such as the application of cement, steel, and their respective transportation. The other emitting sources represent less than 1% of scope 3 in total.

Considering the emissions according to the operational units, it is noted that the two units under construction, **Ventos Santa Eugênia and Morro do Cruzeiro Wind Farms,** together represent more than 98% of the total emissions. The operation of power plants in general has very low emissions, as shown by the following table.

	CO2 Emissions (in t)	%
Ventos Santa Eugênia	29.947,34	52,0%
Morro do Cruzeiro	26.141,27	45,4%
EOL Barra Coqueiros	962,94	1,7%
Florianópolis (headquarters)	179,26	0,3%
Brotas de Macaúbas Complex	53,59	0,1%
Rio de Janeiro (commercial.)	46,11	0,1%
HPP Suiça	41,09	0,1%
SHP Santa Fé	35,09	0,1%
SHP São João	30,80	0,1%
SHP Santa Rosa II	21,53	0,0%
SHP Passos Maia	21,42	0,0%
SHP Santa Laura	18,90	0,0%
SHP Moinho	17,00	0,0%
SHP Viçosa	15,92	0,0%
HPP Monjolinho	14,95	0,0%
SHP Esmeralda	12,14	0,0%
SHP Rio Bonito	10,52	0,0%
SHP Fruteiras	9,61	0,0%
SHP Jucu	6,52	0,0%
SHP Alegre	0,28	0,0%
Total	**57.586,27**	**100%**

Statkraft's Emissions Pattern

As this is the company's third GHG inventory, it is possible to interpret some characteristics of the company's emissions profile, some of which have already been described above:

Emissions from operating renewable energy generators, specifically hydro, wind, and solar, are very low. On the other hand, **the construction of new assets has high emissions,** especially due to the suppression of vegetation, the use of Goods and Services, such as steel and cement, and Capital Goods, such as wind turbine components.

In 2023, the VSE (Ventos de Santa Eugenia) construction entered the final phase of assembling the wind turbines. This explains **the lower consumption of construction inputs** when compared to 2022.

Different phases of construction of new assets imply emissions of different natures. Initially, a project typically has large emissions related to vegetation suppression. In later phases, the highest emissions tend to be related to Purchased Goods and Services, including cement, and steel, among others. Finally, emissions related to Capital Goods, such as blades, nacelles, and hubs, tend to be higher.

The construction site of VSE (Ventos de Santa Eugenia) is much larger than that of MDC (Morro do Cruzeiro). VSE generation has 91 wind turbines, while MDC has 14. This explains why, even in the final stages of construction, VSE received more wind turbine components than MDC.

The Morro do Cruzeiro Project received 100% of its wind turbines in 2023. During this period, the work for the foundation of the wind turbines also took place. Hence the increase in capital goods and purchased goods and services.

In VSE (Ventos de Santa Eugenia) there was no vegetation suppression activity in 2023. In **MDC** (Morro do Cruzeiro) there was little suppression, for most of it had already been suppressed in 2022. For this reason, there was a reduction in scope 1 between 2022 and 2023, once again highlighting the variability of Statkraft's emissions profile. In 2024, the construction of two solar projects that will be associated (hybrids) with the **MDC and VSE** wind farms is expected, with this, there is a forecast of an increase in vegetation suppression in the years 2024 and 2025.

SF_6 emissions are rare, but when they do happen, they have a major impact on the GHG inventory, given their high global warming power of **23,500 tCO_2e/tSF_6**. The management of SF_6 is a challenge especially for wind farms, since the quantity and dispersion of wind turbines makes it difficult to identify leaks. **This is a topic that has been gaining global relevance at Statkraft** and is among the mitigation actions lines mapped by Statkraft Brasil. At the beginning of 2024, several maintenance activities were carried out to remedy SF_6 leaks, mainly at the Barra dos Coqueiros plant in Sergipe. The expectation is that from the 2024 inventory we will see a significant reduction in this type of emission

Exclusion of emitting sources in the GHG Inventory - 2023

In this sense, here are some points of attention for the 2023 Inventory:

Throughout 2023 and the first half of 2024, the company took part in two M&A projects that resulted in the acquisition of 12 new assets, being 11 wind assets in operation, and 1 solar asset under construction. **The process of integrating these assets into Statkraft's portfolio** is underway and they will be incorporated into the inventory as operational control is taken over by Statkraft. These assets were not included in the 2023 Inventory but will be incorporated in part or in whole into future inventories.

At the end of 2023, Statkraft's office in São Paulo was opened. It will be accounted for in the carbon inventory from 2024 on. The office is the smallest in Brazil, after Rio de Janeiro and Florianópolis.

Statkraft's operations in Brazil are very dynamic, resulting in a series of organizational and operational changes that are reflected in **the company's GHG Inventories.**

Positive impacts of Statkraft's activity

The increase in renewable electricity production available in the **National Interconnected System (SIN)** displaces a certain demand for fossil energy sources on the margin. **The Ministry of Science, Technology, and Innovation** provides the calculation of the emission factor for the Interconnected System for carbon credit projects. This involves **a combination of the emission factor for the operational margin,** which reflects the CO_2 emissions intensity of the dispatched energy at the margin, with the **emission factor for the construction margin**, which reflects the CO_2 **emissions intensity** of the most recently built power plants.

This SIN emission factor is not constant.
It depends on different factors, such as:

- the production of hydroelectric power, which in turn depends on the amount and location of rainfall;
- the country's energy demand;
- the country's production of other renewable sources.

Below are the emission factors measured in tCO_2 per MWh over the last few years:

AVERAGE ANNUAL FACTOR

2019	2020	2021	2022	2023
0,0750	0,0617	0,1264	0,0426	0,0385

Thus, considering that Statkraft made 2,090,466.66 MWh of renewable electricity available in the interconnected system, it is safe to say that **the company avoided the emission of 80,482.97 tCO_2e in 2022** due to its operations.

Therefore, **despite the almost 10% increase in Statkraft's renewable energy production** in 2023 compared to 2022, the impact in terms of avoided emissions was only slightly higher. This is due to the Emission Factor of the National Interconnected System (SIN), **which in 2023 was much lower than in 2022.**

Another positive element of Statkraft in terms of GHG emissions is the fact that **the company maintains about 6,400 ha of forests and native areas.** Most of the company's hydro generation assets are located in the southern region of the country, where the predominant vegetation is the Atlantic Forest. These are areas required by law, in the vicinity of reservoirs or protected areas. In the Northeast region of the country, the company's wind farms are located where the legal reserves encompass areas of Caatinga. Considering the average density of the forests and the amount of carbon stored in these natural systems, we calculate that the carbon stock maintained by Statkraft through the conservation of these forests is **3,073,590 tCO_2e**.

Finally, we must also mention the impact that **the planting of 18,557** seedlings has in terms of the absorption of carbon from the atmosphere. In this sense, we calculate that the impact **in 2022 was 278 tCO_2e absorbed.**

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LAYOUT AND GRAPHIC PROJECT

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