

# Analyzing Firespots and CO2 Emissions in the Brazilian Amazon

## A Study on Environmental Impacts from 1999 to 2019

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- *Methods of Advanced Data Engineering.*
- *January 2025.*

# How has rainforest degradation in the Brazilian Amazon contributed to carbon emissions (CO<sub>2</sub>) and climate change?

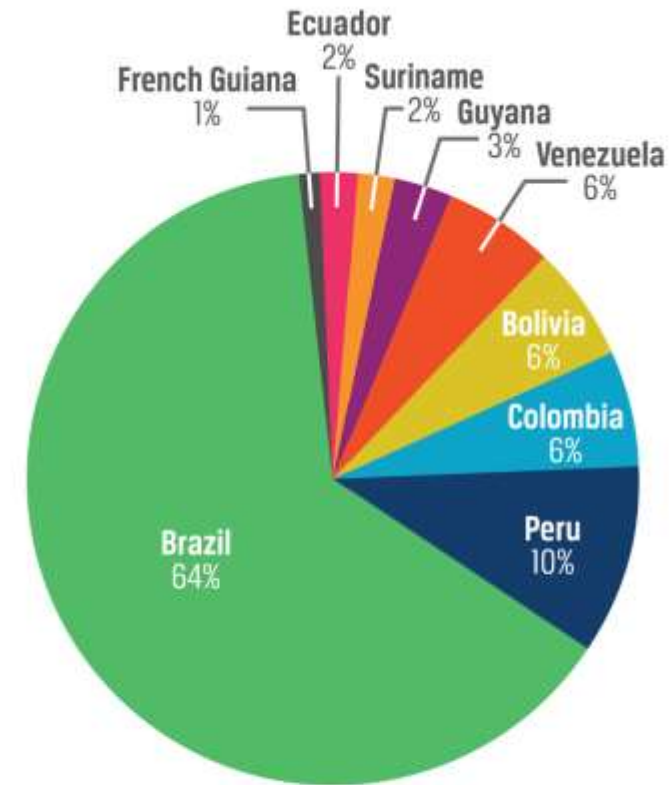
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- **Overview:**
- The Amazon Rainforest is important for keeping our planet's climate stable.
- Cutting down trees and fires release a lot of CO<sub>2</sub>, which harms the environment.
- This project looks at the connection between fires and CO<sub>2</sub> emissions from 1999 to 2019 to help make better policies.



## Importance of the Brazilian Amazon

- Brazil has **64% of the Amazon rainforest**, key to the Earth's climate.
- The Amazon stores **a lot of carbon** but is threatened by fires and tree cutting.
- Saving the rainforest helps fight **climate change** and protect animals and plants.



Percentage of the Amazon Rainforest in Each Country

Total Amazon: 7.76 m sq km (2012)

# DATA SOURCES AND FEATURES

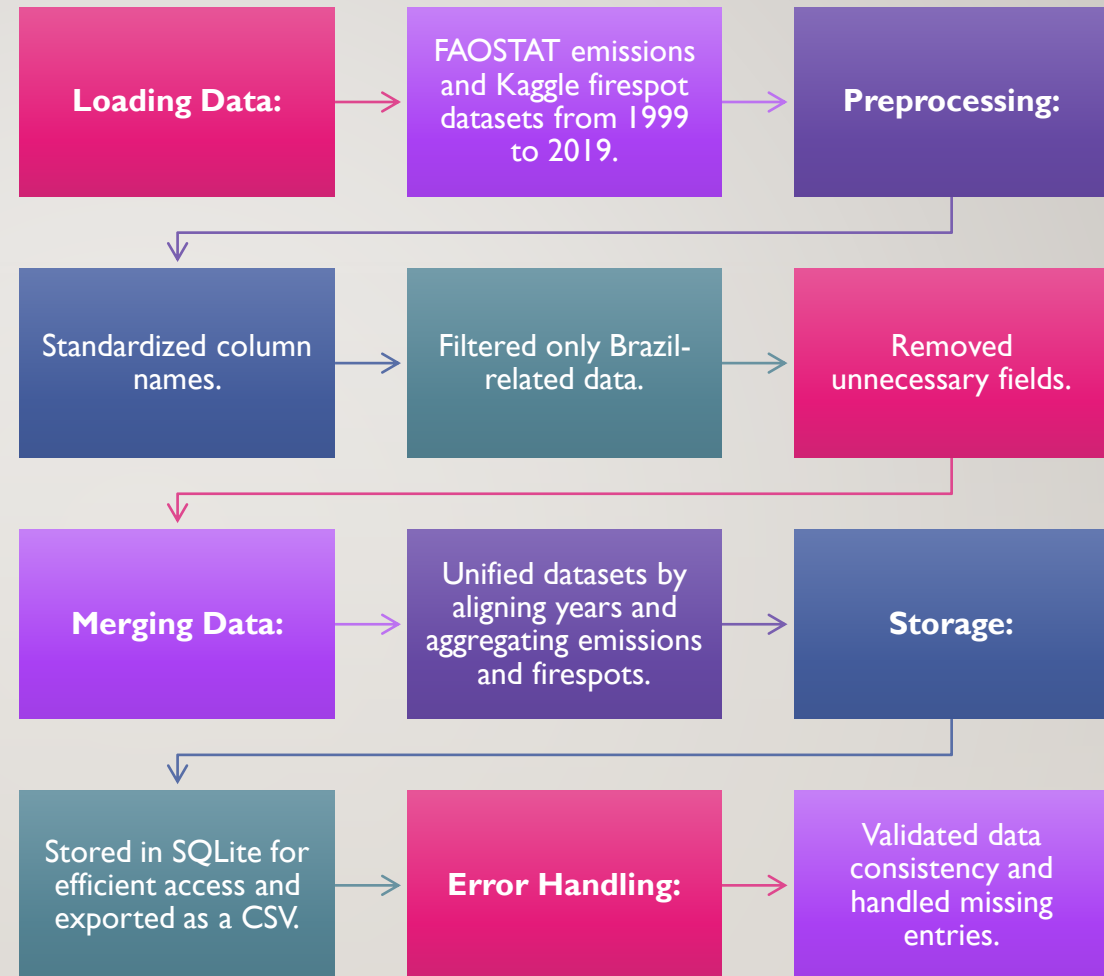
- We merged data from two datasets spanning 1999 to 2019, including features such as:
- **Year**
- **Emission Reasons** (e.g., forest fires, crop residue burning)
- **Source** (e.g., FAO Tier I, UNFCCC)
- **Licenses** Openly available under CC0 1.0 Universal and CC BY 4.0 International licenses.
- **Firespot Counts**

1	Reasons of Emission	Element	Source	Year	Emissions	firespots
2	Burning - Crop residues	Emissions (CO2eq) from CH4 (AR5)	FAO TIER 1	1999	1314.905	17.2043
3	Burning - Crop residues	Emissions (CO2eq) from CH4 (AR5)	UNFCCC	1999	3172.4	41.507875
4	Burning - Crop residues	Emissions (CO2eq) from N2O (AR5)	FAO TIER 1	1999	322.6375	4.2214087
5	Burning - Crop residues	Emissions (CO2eq) from N2O (AR5)	UNFCCC	1999	779.1	10.193792
6	Burning - Crop residues	Emissions (CO2eq) (AR5)	FAO TIER 1	1999	1637.543	21.425708
7	Burning - Crop residues	Emissions (CO2eq) (AR5)	UNFCCC	1999	3951.5	51.701666
8	Drained organic soils	Emissions (CO2eq) (AR5)	FAO TIER 1	1999	420.4324	5.5009631
9	Net Forest conversion	Emissions (CO2)	FAO TIER 1	1999	1385209	18124.155
10	Net Forest conversion	Emissions (CO2)	UNFCCC	1999	979523.6	12816.147
11	Net Forest conversion	Emissions (CO2eq) (AR5)	FAO TIER 1	1999	1385209	18124.155
12	Net Forest conversion	Emissions (CO2eq) (AR5)	UNFCCC	1999	979523.6	12816.147
13	Savanna fires	Emissions (CO2eq) from CH4 (AR5)	FAO TIER 1	1999	5578.219	72.985754
14	Savanna fires	Emissions (CO2eq) from N2O (AR5)	FAO TIER 1	1999	4820.297	63.069059
15	Savanna fires	Emissions (CO2eq) (AR5)	FAO TIER 1	1999	10398.52	136.05481
16	Forest fires	Emissions (CO2eq) from CH4 (AR5)	FAO TIER 1	1999	16533.94	216.33109
17	Forest fires	Emissions (CO2eq) from N2O (AR5)	FAO TIER 1	1999	4618.977	60.43497
18	Forest fires	Emissions (CO2eq) (AR5)	FAO TIER 1	1999	21152.92	276.76606
19	Burning - Crop residues	Emissions (CO2eq) from CH4 (AR5)	FAO TIER 1	2000	1321.821	13.389696



## Data Preprocessing and Pipeline Workflow

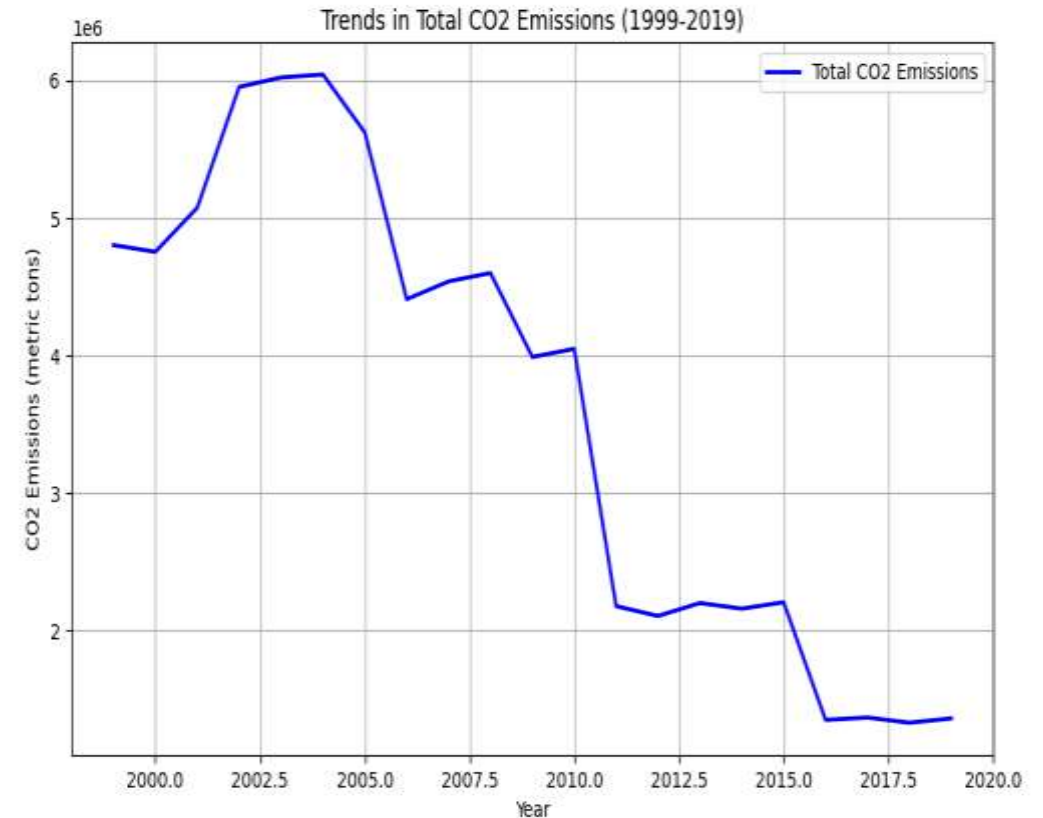
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## Trends in Total CO2 Emissions

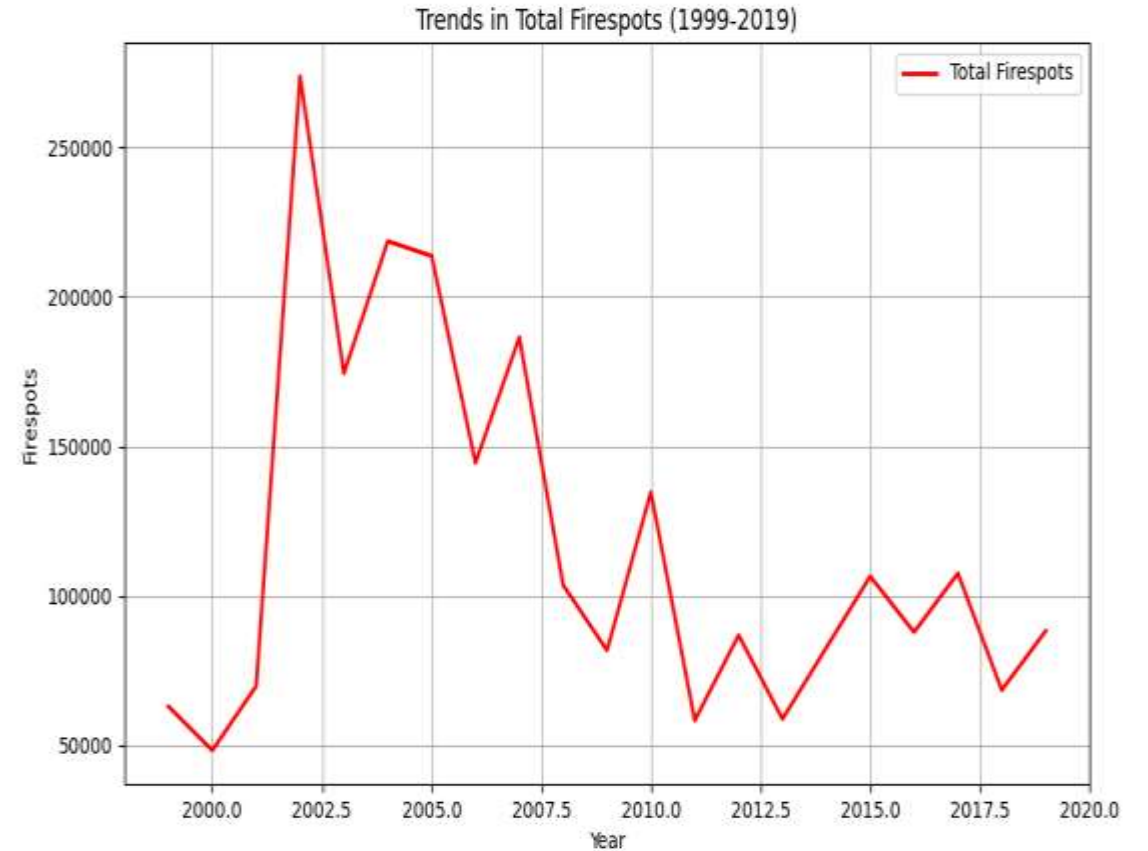
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- Total CO2 emissions showed fluctuations between 1999 and 2019.
- Emissions peaked around 2004 and then began to decline sharply after 2005.
- Reflects policies and activities impacting carbon output.



## **Trends in Total Firespots**

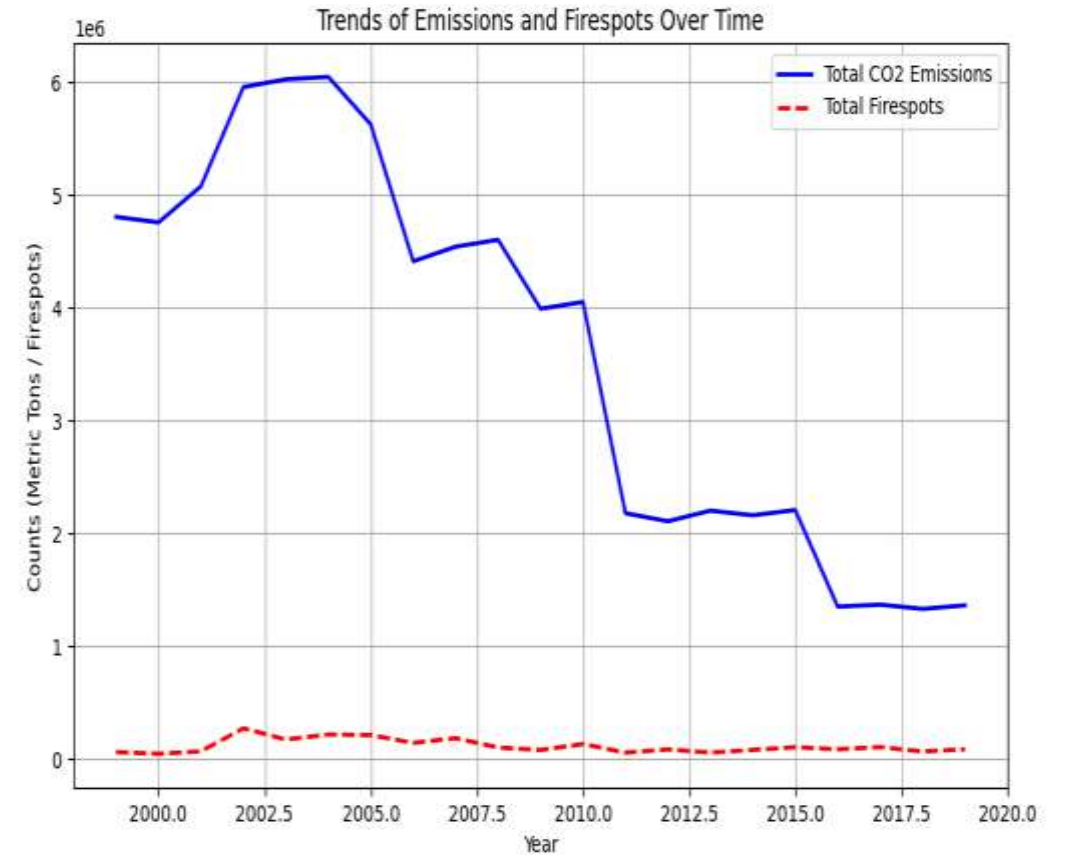
- Firespot activity varied significantly, with notable peaks around 2005 and 2010.
- Indicates the prevalence of fire-related activities contributing to forest degradation.
- Highlights the need for consistent monitoring.



## Combined Trends of Emissions and Firespots

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- Shows the relationship between CO2 emissions and firespot activity over time.
- While CO2 emissions generally declined post-2005, firespots fluctuated, indicating other influencing factors.

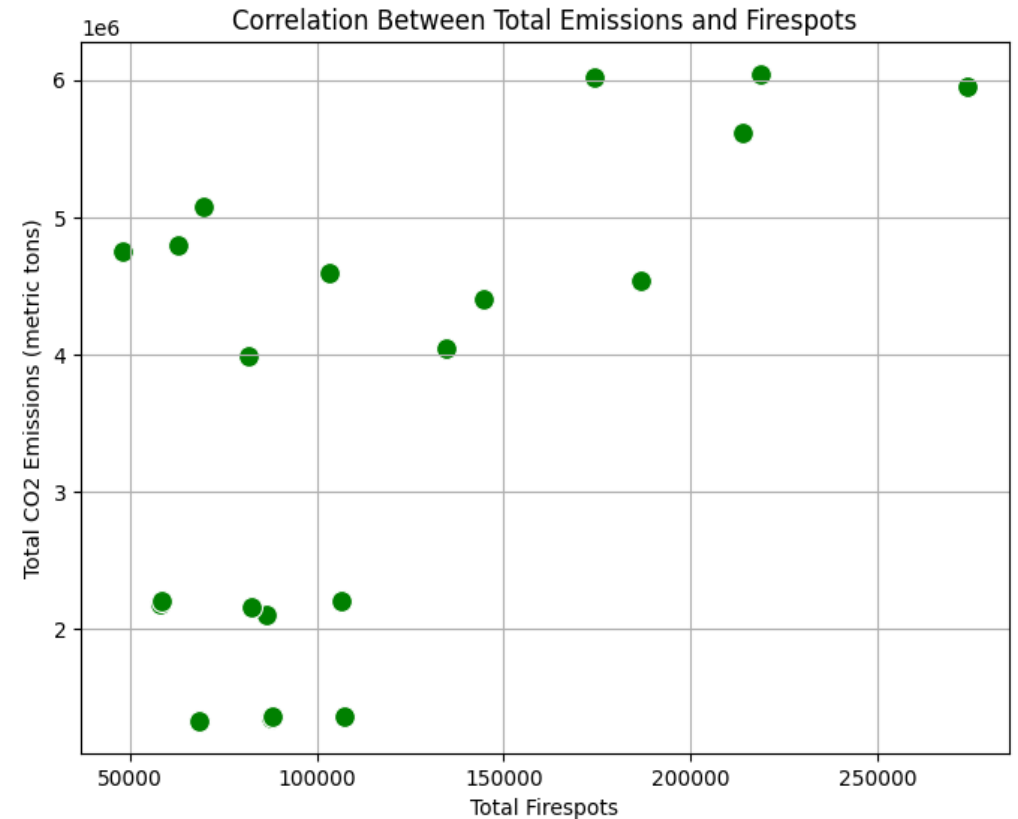




## Correlation Between Total Emissions and Firespots

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- Scatterplot reveals a weak positive correlation between firespots and CO2 emissions.
- Highlights the complexity of factors contributing to emissions beyond fire-related activities.
- Suggests a need for in-depth analysis of other variables.



## Conclusiones

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- CO<sub>2</sub> emissions declined after 2005 due to environmental policies.
- Firespot trends vary, requiring ongoing monitoring.
- Weak correlation between firespots and emissions ( $\sim 0.2$ ) suggests other factors like land use changes.
- Effective forest management reduces emissions, but further studies are needed to include industrial activities and biodiversity impacts.

# THANK YOU

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