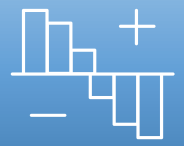
2021 Greenhouse Gas Emissions Inventory

Institutional

Methodology



Results

Recommendations

Madem

With over 70 years of history, the Madem Group is a world leader in the manufacturing of wood reels for electric cable industries and is among the 15 largest forestry groups in Brazil, with exports to over 150 customers in 40 countries.

Madem has seven production units in six countries: Brazil, Spain, Bahrain, United States, Mexico and Colombia, where about 700 employees work.

Committed with the environment, the group has ISO 14.001 certification, which was obtained with the implementation in the company of an environmental management system with sustainable practices.

Our Numbers

9,600
hectares of own forest

100%
of the wood used is renewable

700
collaborators

Units in
6
countries

Export to
40
countries

Methodology

The inventory is prepared based on the concepts, principles and guidelines established by the GHG Protocol methodology, using its specifications for accounting, quantification and publication of Corporate Inventories of Greenhouse Gas Emissions.

Equations provided by the Intergovernmental Panel on Climate Change (IPCC) are also used to calculate emissions from certain sources and sinks (fertilizers, CO_2 removals by green areas).

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

Emissions Calculation

For Brazilian units, we used emission factors published by the Brazilian GHG Protocol Program (PBGHGP) through its most recent calculation tool: "ferramenta_ghg_protocol_v2022.1.1". For the other units, the emission factors specified in the following sources were used: "Emission Factors for Greenhouse Gas Inventories" (EPA, 2022), "UK Government GHG Conversion Factor for Company Reporting" (DEFRA, 2022) and "European Residual Mixes" (AIB, 2022).

The global warming potential used for the calculations is that released by the IPCC Fifth Assessment Report: Climate Change 2013 (AR5).

The values of Carbon Stock (t/ha) of the Brazilian phytophysiognomies for the calculation of emissions from Land Use Change were obtained in the Fourth National Inventory of Anthropogenic Greenhouse Gas Emissions and Removals.

Inventory Period

This inventory covers emissions from activities carried out by Madem in the year 2021, including all direct emissions and emissions from the purchase of electricity, including all enterprises in which the group has operational control.

Inventory Base Year

The base year for Madem's GHG emissions inventory is 2021, the year of the group's first GHG emissions inventory.

Organizational Boundaries

Madem's emission inventory follows the operational control accounting approach provided by the GHG Protocol methodology.

In the operational control approach, 100% of the emissions of the enterprises that the Group maintains control over the operation are accounted for, regardless of its equity interest in the source.

Operational Boundaries

Madem accounts for all of its scope 01 (direct) and scope 02 emissions.

In scope 01, the following sources are considered:

- Stationary: Stationary combustion to generate electricity, steam, heat, or power using equipment at a fixed location;
- Mobile: Mobile combustion for transport in general of company-owned or company-controlled vehicles;
- Fugitive: Unintentional releases of substances such as Hydrofluorocarbons (HFCs) during the use of refrigeration equipment and CO_2 in fire extinguishers;

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Operational Boundaries

In scope 02, the emissions resulting from the acquisition of electricity are accounted for.

The inventory also accounts for:

- Carbon stock: Amount of carbon not available in the atmosphere, being stored, for example, in the above and below ground biomass, dead organic matter, organic matter incorporated into the soil, among others.
- Biogenic emissions: CO_2 emissions generated in the combustion of biomass (such as biodiesel, ethanol, wood waste and sugarcane bagasse).

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Corporate

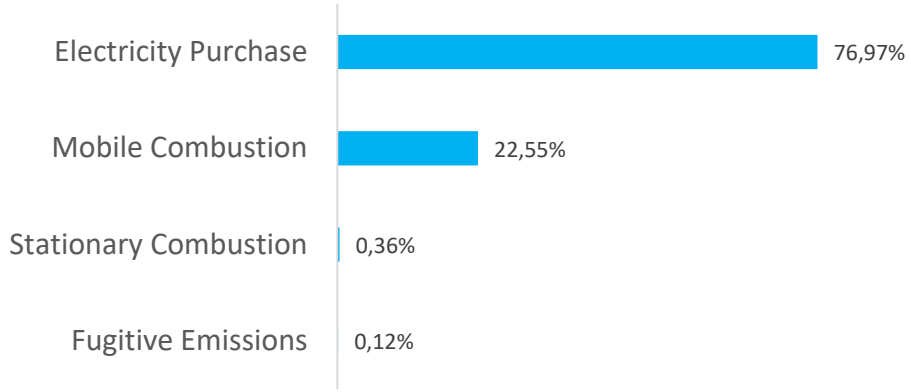
Business Units

Analysis

In 2021, 76.97% of the group's emissions resulted from the electricity purchase (scope 2). In turn, scope 1 emissions represented 23.03% of the emissions, with the main source being Mobile Combustion (22.55% of total emissions), especially due to the use of diesel oil in operational vehicles (12.4% of total emissions) and LPG in forklifts (9.3% of total emissions).

Emissions by Source (tCO_2e)

Emission Source	Total Emission	
	tCO_2e	%
Scope 1	**1,062.84**	**23.03%**
Mobile Combustion	1,040.49	22.55%
Stationary Combustion	16.70	0.36%
Fugitive Emissions	5.65	0.12%
Scope 2	**3,551.61**	**76.97%**
Electricity Purchase	3,551.61	76.97%
Total	**4,614.45**	**100%**



Analysis

In 2021, the Rio Negro/PR was the unit that most contributed to the Madem Group's emissions (53.5%), mainly due to the purchase of electricity (73.8% of the unit's emissions), the use of LPG in forklifts (13.1% of the unit's emissions) and diesel oil in material handling equipment, such as wheel loaders (10.0% of the unit's emissions).

The second most relevant unit in the group's emissions was the Madem Gulf unit (27.5%), in Bahrain, due to the purchase of electricity (92.7% of the unit's emissions), which in the country is produced almost entirely by fossil fuels.

Total Emissions (tCO_2e)

Units	Total Emissions (tCO_2e)					
	Scope 1			Scope 2		
	Mobile Combustion	Stationary Combustion	Fugitive Emissions	Electricity Purchase	Total	%
Rio Negro	631.49	13.94	0.34	1,822.17	**2,467.94**	53.5%
Madem Gulf	89.19	-	-	1,179.04	**1,268.24**	27.5%
EuroMadem Espanha	118.84	-	0.03	237.21	**356.07**	7.7%
Madem MooreCraft Reels EUA	13.70	-	5.20	290.66	**309.56**	6.7%
Florestal Mostardas	137.46	1.06	0.04	2.88	**141.43**	3.1%
Garibaldi	12.54	1.70	0.03	9.69	**23.96**	0.5%
Barcarena	18.60	-	-	1.90	**20.50**	0.4%
Sorocaba	13.05	-	-	5.86	**18.91**	0.4%
Madem Carretas de Colômbia	5.62	-	0.01	2.20	**7.84**	0.2%
Total	**1,040.49**	**16.70**	**5.65**	**3,551.61**	**4,614.45**	**100%**
%	22.5%	0.4%	0.1%	77.0%		

Analysis

The group has the equivalent of 2,239,545.3 tCO_2e of carbon stock in areas of conserved native forest (54.3%) and planted areas (45.7%).

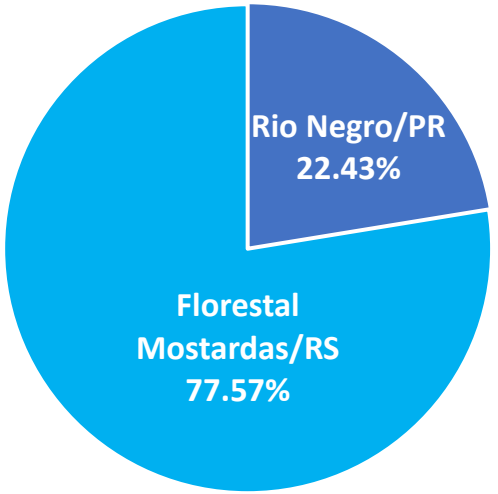
The Mostardas/RS forestry unit comprises 77.57% of the group's carbon stock, with 3,138.3 hectares of conserved forests and 4,549.1 hectares of planted forests.

The Rio Negro/PR unit, on the other hand, holds 22.43% of the group's carbon stock, with 828.2 hectares of conserved forests and 1,087.9 hectares of planted forests.

No stock variation was identified between the beginning and the end of the year.

Carbon Stock (tCO_2e)

Enterprise Unit	Conserved Area	Planted Area	Total
	tCO_2e	tCO_2e	tCO_2e
Rio Negro/PR	259,330.76	242,925.84	502,256.60
Florestal Mostardas/RS	955,664.66	781,624.04	1,737,288.70
Total Stock	**1,214,995.42**	**1,024,549.88**	**2,239,545.30**



Analysis

In 2021, Madem's biogenic emissions were concentrated in mobile combustion activities (58.8 tCO_2e), due to the consumption of diesel and gasoline in the company's operational vehicles, and in stationary combustion (57.2 tCO_2e), resulting from the use of vegetable waste in boilers.

Predominance of biogenic emissions in the units in Brazil, due to the presence of a relevant percentage of ethanol in gasoline and biodiesel in diesel.

Biogenic Emissions (tCO_2e)

Enterprise Unit	Mobile Combustion	Stationary Combustion	Total	%
Rio Negro	36.85	57.19	**94.04**	**81.1%**
Florestal Mostardas	17.55	-	**17.55**	**15.1%**
Garibaldi	2.62	-	**2.62**	**2.3%**
Sorocaba	1.39	-	**1.39**	**1.2%**
Barcarena	0.42	-	**0.42**	**0.4%**
Madem MooreCraft Reels EUA	-	-	-	-
Madem Gulf	-	-	-	-
Madem Carretas de Colômbia	-	-	-	-
EuroMadem Espanha	-	-	-	-
Total	**58.83**	**57.19**	**116.02**	**100%**
%	**50.7%**	**49.3%**	**100%**	

Emissions by Source, in tGHG

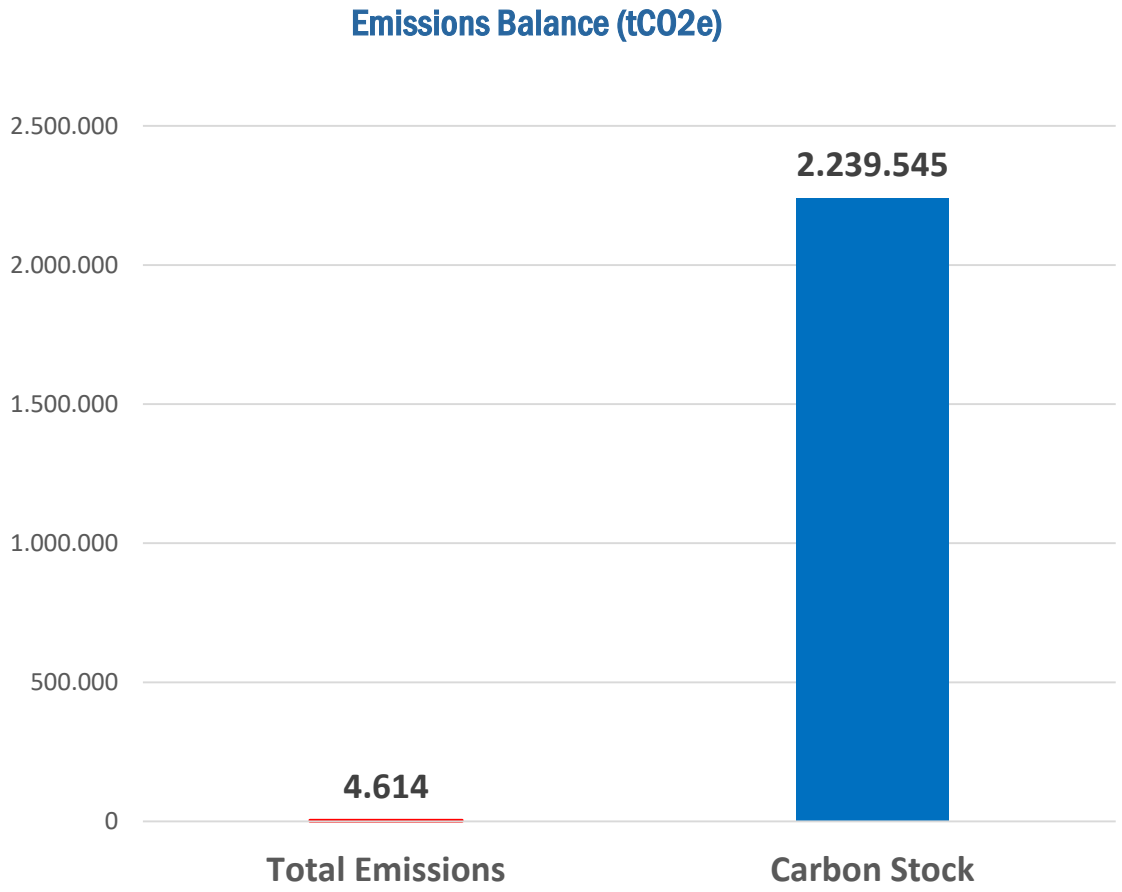
Emission Source	Emission by GHG (metric tons)			
	CO2 (t)	CH4 (t)	N2O (t)	HFCs (t)
Scope 1	**1,034.78**	**0.41**	**0.04**	**0.004**
Mobile Combustion	1,018.73	0.39	0.04	-
Stationary Combustion	15.60	0.02	0.00	-
Fugitive Emissions	0.45	-	-	0.004
Scope 2	**3,551.61**	**-**		
Electricity Purchase	3,551.61	-	-	-
Total	**4,586.39**	**0.41**	**0.04**	**0.004**

Emissions by Business Unit, in tGHG

Units	Emission by GHG (metric tons)			
	CO2 (t)	CH4 (t)	N2O (t)	HFCs (t)
Rio Negro	2,452.75	0.35	0.02	-
Madem Gulf	1,266.05	0.01	0.01	-
EuroMadem Espanha	355.19	0.002	0.003	-
Madem MooreCraft Reels EUA	303.94	0.001	0.001	0.004
Florestal Mostardas	138.90	0.01	0.01	-
Garibaldi	23.53	0.004	0.001	-
Barcarena	19.97	0.02	0.0002	-
Sorocaba	18.48	0.01	0.001	-
Madem Carretas de Colômbia	7.59	0.001	0.001	-
Total	**4,586.39**	**0.41**	**0.04**	**0.004**

Analysis

In 2021, the company's scope 1 and 2 emissions corresponded to 4,614.45 tCO2e. In this same period, the conserved native forest areas and planted areas controlled by the company totaled a biogenic carbon stock of 2,239,545.30 tCO2e.



Rio Negro
Brazil

Floresta Mostardas
Brazil

Garibaldi
Brazil

Barcarena
Brazil

Sorocaba
Brazil

Madem Gulf
Bahrain

EuroMadem
Spain

Madem MooreCraft Reels
USA

Madem Carretas
Colombia

Emissions by Source (tCO_2e)

Rio Negro - Brazil

Analysis

The Rio Negro/PR unit is the most relevant in terms of GHG emissions, totaling 2,467.9 tCO_2e (53.4% of total emissions). The unit's main sources were the purchase of electricity (1,822.2 tCO_2e - 73.8% of the unit's emissions) and mobile combustion (631.5 tCO_2e - 25.6% of the unit's emissions), resulting from the use of LPG in forklifts and diesel oil in material handling equipment, such as wheel loaders.

The main biogenic source of the unit was the use of vegetable waste in the boiler, totaling 57.2 tCO_2e (stationary combustion). Mobile combustion was also relevant in the biogenic emissions of the unit, whose main source was the portion of biofuel contained in diesel oil used in yard machinery (28.5 tCO_2e).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**645.77**	**26.17%**	**94.04**	**100%**
Mobile Combustion	631.49	25.59%	36.85	39.19%
Stationary Combustion	13.94	0.56%	57.19	60.81%
Fugitive Emissions	0.34	0.01%	-	0%
Scope 2	**1,822.17**	**73.83%**	**-**	**0%**
Electricity Purchase	1,822.17	73.83%	-	0%
Total	**2,467.94**	**100%**	**94.04**	**100%**

Florestal Mostardas - Brazil

Analysis

Among the Brazilian units, the Mostardas Forestry unit was the second unit with the highest volume of GHG emissions, totaling 141.4 tCO_2e. The unit's main emission source was diesel oil consumption in tractors, corresponding to 88.1% of the unit's emissions.

The unit's only biogenic emission sources were the biofuel portions contained in the diesel oil used in tractors (14.4 tCO_2e) and in the gasoline used in the company's operational vehicles (3.2 tCO_2e).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**138.55**	**97.97%**	**17.55**	**100%**
Mobile Combustion	137.46	97.19%	17.55	100.00%
Stationary Combustion	1.06	0.75%	-	0.00%
Fugitive Emissions	0.04	0.03%	-	0%
Scope 2	**2.88**	**2.03%**	**-**	**0%**
Electricity Purchase	2.88	2.03%	-	0%
Total	**141.43**	**100%**	**17.55**	**100%**

Garibaldi - Brazil

Analysis

In 2021, the Brazilian unit Garibaldi emitted 23.96 tCO_2e. The main emission source was mobile combustion (52.35% of the unit's emissions), especially the use of gasoline in operational vehicles (9 tCO_2e - 37.7% of the unit's emissions). The second main emission source for the unit was the electricity purchase (40.45% of the unit's emissions).

The unit's only sources of biogenic emissions were the biofuel portions contained in gasoline (2.2 tCO_2e) and diesel oil (0.4 tCO_2e) used in the company's operational vehicles.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**14.27**	**59.55%**	**2.62**	**100%**
Mobile Combustion	12.54	52.35%	2.62	100.00%
Stationary Combustion	1.70	7.09%	-	0.00%
Fugitive Emissions	0.03	0.12%	-	0%
Scope 2	**9.69**	**40.45%**	**-**	**0%**
Electricity Purchase	9.69	40.45%	-	0%
Total	**23.96**	**100%**	**2.62**	**100%**

Barcarena- Brazil

Analysis

The Barcarena unit provided 20.5 tCO_2e. The main source of emissions at the unit was mobile combustion, totaling 18.6 tCO_2e (90.7% of the unit's emissions), mainly due to LPG consumption in forklifts. The electricity purchase represented 9.3% of the unit's emissions.

The unit's only source of biogenic emissions was the portion of biofuel contained in gasoline (0.4 tCO_2e) used in the company's operational vehicles.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**18.60**	**90.73%**	**0.42**	**100%**
Mobile Combustion	18.60	90.73%	0.42	100.00%
Stationary Combustion	-	0.00%	-	0.00%
Fugitive Emissions	-	0.00%	-	0%
Scope 2	**1.90**	**9.27%**	**-**	**0%**
Electricity Purchase	1.90	9.27%	-	0%
Total	**20.50**	**100%**	**0.42**	**100%**

Sorocaba - Brazil

Analysis

At the Sorocaba unit, 18.91 tCO_2e were emitted, corresponding to the unit with the lowest Madem Group emissions in Brazil.

The emission resulting from mobile combustion was the main source of emission in the unit (69.0% of the unit's emissions), especially due to the consumption of LPG in forklifts (38.9% of the unit's emissions) and gasoline in operational vehicles (30.1% of the unit's emissions).

The unit's only biogenic emission source was the portion of biofuel contained in the gasoline used in the company's operational vehicles (1.4 tCO_2e).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**13.05**	**69.02%**	**1.39**	**100%**
Mobile Combustion	13.05	69.02%	1.39	100.00%
Stationary Combustion	-	0.00%	-	0.00%
Fugitive Emissions	-	0.00%	-	0%
Scope 2	**5.86**	**30.98%**	**-**	**0%**
Electricity Purchase	5.86	30.98%	-	0%
Total	**18.91**	**100%**	**1.39**	**100%**

Madem Gulf - Bahrain

Analysis

The main emissions source of the Madem Gulf unit was the electricity purchase (1,179.04 tCO_2e, 92.97% of the country's emissions), since electricity in the country is almost entirely produced by fossil sources.

The Bahrain unit also emitted 89.19 tCO_2e as a result of the consumption of diesel oil in the company's operational vehicles (mobile combustion).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**89.19**	**7.03%**
Mobile Combustion	89.19	7.03%
Stationary Combustion	-	-
Fugitive Emissions	-	-
Scope 2	**1,179.04**	**92.97%**
Electricity Purchase	1,179.04	92.97%
Total	**1,268.24**	**100%**

EuroMadem - Spain

Analysis

The main emissions source in the Spain unit was electricity purchase, totaling 237.2 tCO_2e, 66.6% of the unit's emissions.

The second most relevant source was mobile combustion through the consumption of LPG in forklifts (63.9 tCO_2e) and diesel oil in operational vehicles (54.9 tCO_2e).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**118.87**	**33.38%**
Mobile Combustion	118.84	33.37%
Stationary Combustion	-	-
Fugitive Emissions	0.03	0.01%
Scope 2	**237.21**	**66.62%**
Electricity Purchase	237.21	66.62%
Total	**356.07**	**100%**

Madem MooreCraft Reels - USA

Analysis

In the United States, the main emission source was the electricity purchase, totaling 290.7 tCO_2e (93.9% of the country's emissions).

The second most relevant source was mobile combustion (13.7 tCO_2e, 4.4% of the unit's emissions), mainly due to the consumption of liquefied petroleum gas in forklifts (13.2 tCO_2e).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**18.90**	**6.11%**
Mobile Combustion	13.70	4.42%
Stationary Combustion	-	-
Fugitive Emissions	5.20	1.68%
Scope 2	**290.66**	**93.89%**
Electricity Purchase	290.66	93.89%
Total	**309.56**	**100%**

Madem Carretas de Colombia

Analysis

Among the countries, Colombia had the lowest emission level, emitting only 7.8 tCO_2e (0.2% of Madem group emissions).

Its main emission source was mobile combustion (5.6 tCO_2e), due to LPG consumption in forklifts (2.9 tCO_2e) and gasoline consumption in operational vehicles (2.7 tCO_2e).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**5.63**	**71.88%**
Mobile Combustion	5.62	71.73%
Stationary Combustion	-	-
Fugitive Emissions	0.01	0.14%
Scope 2	**2.20**	**28.12%**
Electricity Purchase	2.20	28.12%
Total	**7.84**	**100%**