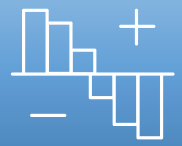
Greenhouse Gas Emissions Inventory 2022

Institutional

Methodology



Results

Future Actions

Madem

The Madem Group is a world leader in the manufacture of wooden reels, offering innovative and sustainable solutions for the industry. With 75 years of history, it is among the largest forestry groups in Brazil, with exports to more than 150 customers in 40 countries. With extensive experience in the sector, Madem stands out for the quality of its products and its commitment to environmental preservation.

The wood reels are manufactured with wood from renewable sources, following the highest standards of quality and socioenvironmental responsibility, thus ensuring customer satisfaction and contributing to a more sustainable world.

Madem operates 10 production units across six countries: Brazil, Spain, Bahrain, the United States, Mexico, and Colombia, with approximately 700 employees contributing to its operations globally.

Our Numbers

100%
Of the wood used is renewable

700
employees

75
years of history

Units in
6
countries

Exports 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, quantifying and publishing Corporate Greenhouse Gas Emission Inventories.

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

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

Emissions Calculation

For Brazilian units, emission factors published by the Brazilian GHG Protocol Program (PBGHGP) were used through its most recent calculation tool: "ferramenta_ghg_protocol_v2023.0.3". 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 published by IPCC Fifth Assessment Report: Climate Change 2013 (AR5).

Ecofinance Negócios is responsible for calculating GHG emissions and preparing this report. Madem is responsible for the activity data provided for the emissions calculation.

Reporting Period

This inventory covers emissions from activities carried out by Madem in 2022, covering all direct emissions (scope 1), emissions from the purchase of electricity (scope 2) and a portion of indirect emissions (scope 3), including all projects that the group has operational control.

Inventory Base Year

The base year for Madem's GHG emissions inventory is 2021, the year in which the group's first GHG emissions inventory was developed.

Organizational Boundaries

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

In the operational control approach, 100% of the GHG emissions from operations over which it has control.

Operational Boundaries

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

In **scope 01,** the following sources are considered:

- **Stationary**: Stationary combustion for generation of electricity, steam, heat or power using equipment in a fixed location;
- **Mobile**: Mobile combustion for general transportation of vehicles owned or controlled by the company;
- **Fugitive**: Unintentional releases of substances, such as hydrofluorocarbon (HFC) emissions during the use of refrigeration and air conditioning equipment and CO_2 in fire extinguishers;

Operational Boundaries

In scope 02, emissions resulting from the **acquisition of electrical energy** are accounted for.

In scope 03, the following are considered:

- **Transportion of raw materials**: Mobile sources used by third parties to transportation of raw materials;
- **Transportion of products**: Mobile sources used by third parties to transportation of products;
- **Wastewater**: Emissions from liquid effluent treatment outside the organization's boundaries;
- **Waste**: Waste disposed of in landfills, incinerated or composted, in locations not controlled by the company.

Operational Boundaries

The inventory also accounts for:

• **Carbon Stock**: Quantity of carbon not available in the atmosphere, being maintained, for example, in biomass above and below ground, in dead organic matter, in organic matter incorporated into the soil in areas controlled by the company.

• **Biogenic Emissions**: CO_2 emissions generated in the combustion of biomass (such as ethanol, biodiesel, wood residues) and in the suppression of planted forests, generating changes in the carbon stock. These emissions are not counted as GHG because they are neutralized in the growth process of the crop that originated the biomass.

• **Biogenic Removals**: Conversions in land use carried out by the company that resulted in an increase in carbon stocks (e.g., reforestation).

Corporate

Business units

Emissions by Source (tCO_2e)

Analysis

In 2022, Madem had a **total emission of 22.946,52 tCO_2e**, where **81,18%** of emissions originate from **scope 3**, mostly from transportation of raw materials and products carried out by third parties, totaling 17.341,03 tCO_2e (75,57% of total emissions).

In **scope 2**, emissions from the acquisition of electricity were 2.080,02 tCO_2e (representing **9,06%** of total emissions).

Direct emissions (**scope 1**) were responsible for 2.238,54 tCO_2e (**9,76%**). In this scope, stationary combustion stood out for being responsible for 1.295,54 tCO_2e, **where 1.280,58 tCO_2e** are emissions of CH_4 and N_2O due to the **use of vegetable residues in boilers.** Mobile combustion emitted 937,05 tCO_2e, mainly due to the use of diesel oil in mobile machines, tractors and operational vehicles.

Emission Sources	Total Emissions	
	tCO_2e	%
Scope 1	**2.238,67**	**9,76%**
Stationary Combustion	1.295,54	5,65%
Mobile Combustion	937,05	4,08%
Fugitivas	6,08	0,03%
Scope 2	**2.080,02**	**9,06%**
Electricity Purchase	2.080,02	9,06%
Scope 3	**18.627,83**	**81,18%**
Transportation of raw materials	4.136,45	18,03%
Transportation of products	13.204,58	57,55%
Wastewater	34,87	0,15%
Waste	1.251,93	5,46%
Total	**22.946,52**	**100%**

Emissions by Business Unit

Units	Total Emissions (tCO2e)									
	Scope 1			Scope 2	Scope 3				Total	%
	Mobile Combustion	Stationary Combustion	Fugitive Emissions	Electricity Purchase	Transportation of raw materials	Transportation of products	Wastewater	Waste		
Rio Negro	609,78	1.292,87	0,35	804,11	1.678,37	7.129,98	16,86	22,67	**11.555,00**	50,4%
Madem Gulf	85,57	0,00	0,40	653,98	1.895,46	2.160,46	2,89	1.087,16	**5.885,91**	25,7%
Madem MooreCraft Reels EUA	18,85	0,00	5,20	335,18	306,47	2.222,24	4,43	141,71	**3.034,09**	13,2%
EuroMadem Spain	47,38	0,00	0,03	278,67	256,15	1.535,03	3,52	0,00	**2.120,78**	9,2%
Sorocaba	35,09	0,00	0,00	1,93	0,00	155,54	1,38	0,00	**193,94**	0,8%
Garibaldi	8,85	1,58	0,04	3,00	0,00	0,00	1,55	0,39	**15,40**	0,1%
Mostardas Forestry	103,18	1,09	0,04	0,61	0,00	0,00	1,03	0,00	**105,94**	0,5%
Barcarena	22,10	0,00	0,00	0,56	0,00	1,33	0,32	0,00	**24,31**	0,1%
Madem Carretas de Colombia	6,25	0,00	0,02	1,98	0,00	0,00	0,33	0,00	**8,58**	0,0%
Madem Carretas de Mexico	0,00	0,00	0,00	0,00	0,00	0,00	2,55	0,00	**2,55**	0,0%
Total	**937,05**	**1.295,54**	**6,08**	**2.080,02**	**4.136,45**	**13.204,58**	**34,87**	**1.251,93**	**22.946,52**	**100,0%**
%	4,08%	5,65%	0,03%	9,06%	18,03%	57,55%	0,15%	5,46%	100%	

Emissions by Business Unit (tCO_2e)

Analysis

In 2022, the **Rio Negro** unit contributed the most to Madem Group's emissions, being responsible for emitting **11.555 tCO_2e** (equivalent to 50.4% of the group's total emissions), with its largest source of emissions coming from scope 3, more specifically from the **transportation of products**, responsible for emitting 7.129,98 tCO_2e.

Madem Gulf was the unit with the **second largest volume** of emissions in the company, responsible for a total of **5.885,91 tCO_2e**. Among the sources of emissions, those originating from the **transportation of products** also stand out, emitting a total of 2.160,46 tCO_2e.

In third place in terms of relevance is **Madem MooreCraft Reels EUA** (**3.034,09 tCO_2e**), with the **transportation of products (2.222,24,46 tCO_2e)** also being the most relevant source.

Biogenic Emissions (tCO_2e)

Units	Biogenic Emissions (tCO2e)							
	Scope 1			Scope 3			Total	%
	Stationary Combustion	Mobile Combustion	Land Use Change	Waste	Transportation of raw materials	Transportation of products		
Rio Negro	75.374,62	31,44	23.497,69	0,22	171,38	439,61	**99.514,96**	68,15%
Mostardas Forestry	0,00	11,80	46.466,42	0,00	0,00	0,00	**46.478,22**	31,83%
Madem MooreCraft Reels EUA	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**	0,00%
Madem Gulf	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**	0,00%
EuroMadem Spain	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**	0,00%
Barcarena	0,00	0,77	0,00	0,00	0,00	0,14	**0,91**	0,001%
Sorocaba	0,00	3,01	0,00	0,00	0,00	15,88	**18,89**	0,013%
Madem Carretas de Colômbia	0,00	0,00	0,00	11,00	0,00	0,00	**11,00**	0,01%
Garibaldi	0,00	2,00	0,00	0,00	0,00	0,00	**2,00**	0,001%
Madem Carretas de México	0,00	0,00	0,00	0,00	0,00	0,00	**0,00**	0,00%
Total	**75.374,62**	**49,03**	**69.964,11**	**11,22**	**171,38**	**455,62**	**146.025,98**	**100%**
%	51,62%	0,03%	47,91%	0,008%	0,117%	0,312%	**100%**	

Biogenic Emissions (tCO_2e)

Analysis

In 2022, Madem's **Biogenic Emissions** totaled **146.025,98 tCO_2e** and are concentrated in stationary combustion activities and land use change. The unit with the highest volume of biogenic emissions was **Rio Negro**, with **99.514,96 tCO_2e**, which represented 67,67% of the group's emissions.

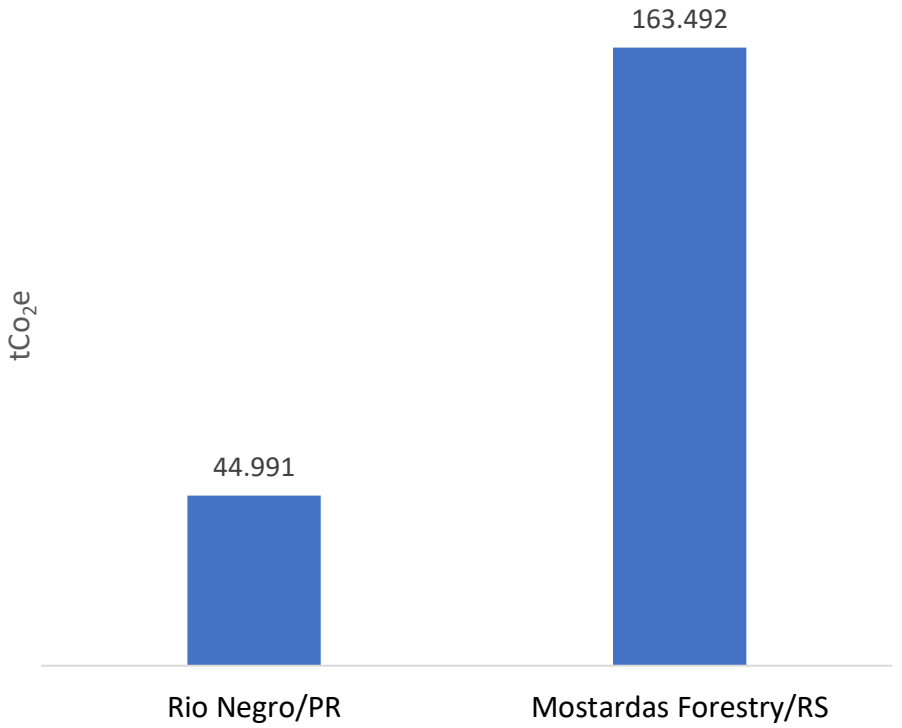
Stationary combustion was the activity that emitted the most biogenic CO_2, 75.374,62 tCO_2, and originated exclusively from the Rio Negro unit, due to the use of vegetable residues in the boiler.

The **land use change**, resulting from the suppression of Pinus spp from planted forests, was the second most emitting activity, being responsible for 69.964,11 tCO_2e, where 46.466,42 tCO_2e of this total came from the **Mostardas Forestry** unit and 23.497,69 tCO_2e from the **Rio Negro** unit.

Carbon Removal (tCO_2e)

Analysis

In 2022, the growth of Pinus spp forests planted by the company provided carbon removal from the atmosphere. This removal was most relevant in the Mostardas Forestry unit, representing 78% of carbon removal, while the Rio Negro unit represented 22%.



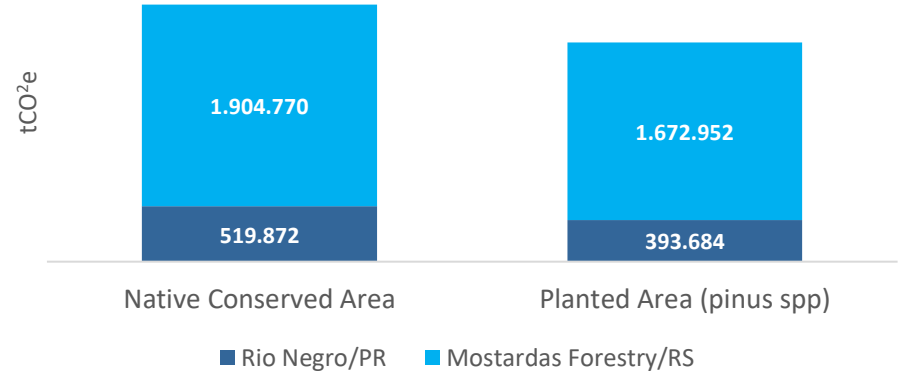
Carbon Stock (em tC e tCO_2e)

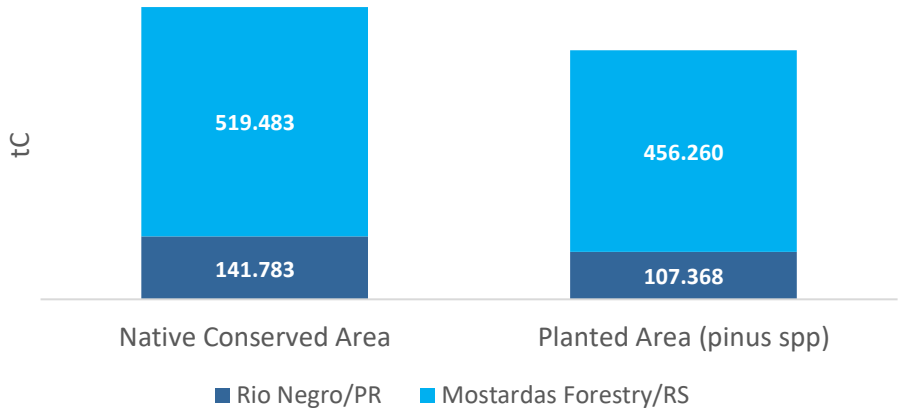
Analysis

The group has the equivalent of 1.224.894 tons of carbon stock (C) in conserved native forest areas (53,2%) and planted areas (46,8%), which corresponds to 4.491.278 tCO_2.

The Mostardas/RS Forestry unit comprises 79,7% of the group's carbon stock, with 3.138,3 hectares of preserved Atlantic Forest and 4.549,1 hectares of planted forests.

The Rio Negro/PR unit has 20,3% of the group's carbon stock with 1.087,9 hectares of preserved Atlantic Forest and 1.290,89 hectares of planted forests.





Emissions by Source, in tGHG

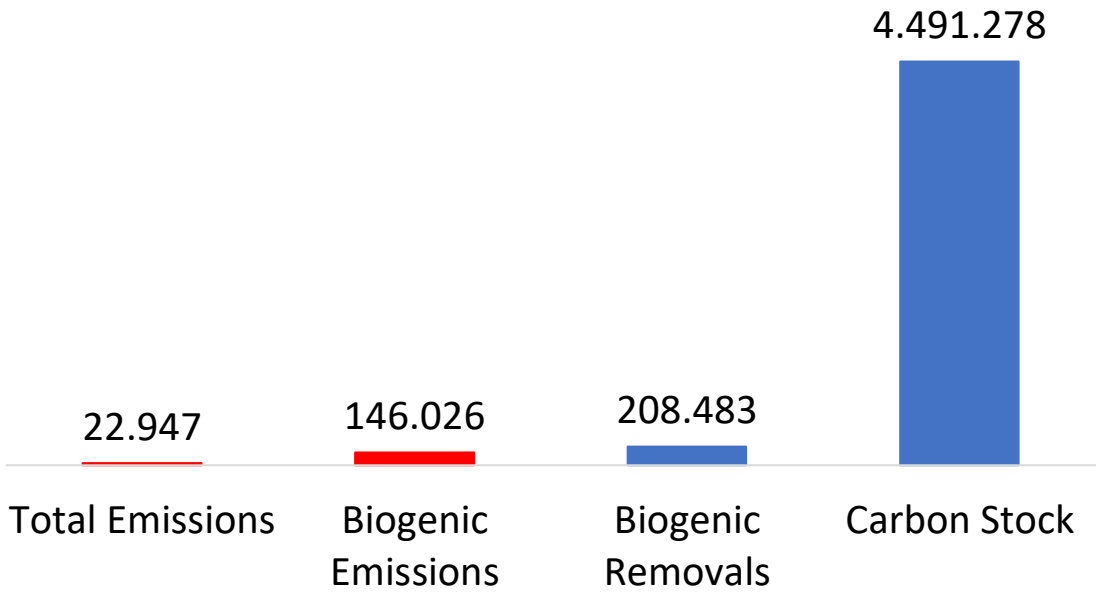
Emission Source	Emission by GHG (metric tons)			
	CO_2 (t)	CH_4 (t)	N_2O (t)	HFCs (t)
Scope 1	**932,26**	**20,61**	**2,73**	**0,00**
Mobile Combustion	916,44	0,39	0,04	0,00
Stationary Combustion	14,94	20,22	2,70	0,00
Fugitive Emissions	0,88	0,00	0,00	0,004
Scope 2	**2.080,02**	**0,00**	**0,00**	**0,00**
Electricity Purchase	2.080,02	0,00	0,00	0,00
Scope 3	**18.332,39**	**2,74**	**0,83**	**0,00**
Transportation of raw materials	4.079,85	0,16	0,20	0,00
Transportation of products	13.023,67	0,53	0,63	0,00
Wastewater	0,00	1,25	0,00	0,00
Waste	1.228,87	0,80	0,00	0,00
Total	21.344,67	23,35	3,56	0,004

Summary 2022

Analysis

In 2022, the scope 1 and 2 emissions added to some of the scope 3 emissions were equivalent to **22.946,5** tCO_2e, while the biogenic emissions were **146.026 tCO_2e**. In turn, the biogenic removal from planted forest corresponded to **208.482 tCO_2e.** The carbon stock in the company's native forest and planted forest areas totaled **4.491.278 tCO_2e**.

Summary: Emissions, Removals and Stock (tCO_2e)



2021 x 2022

Analysis

In 2022, the Madem Group's volume of emissions increased by **293,7%**, mainly **due to the accounting of scope 3 emissions**, included in the 2022 inventory. **If only scope 1 and 2 emissions are considered, the reduction would have been of 1.509,24 tCO_2e (-32,7%).**

The main reduction occurred in scope 2 – purchase of electricity, due to the 66,3% reduction in the emission factor of Brazil's National Interconnected System, resulting in a reduction of 1.032,3 tCO_2e in Brazil's energy acquisition emissions (-56,0%), country responsible for 52% of scope 2 emissions in 2021. The variation in Bahrain's emission factor (-33% of scope 2 emissions in 2021) also led to a reduction in emissions, resulting in 525,06 fewer tCO_2e emitted (-44,5%).

Emission Sources	Total Emissions				Variation	
	2021		2022		2022x2021	
	tCO2e	%	tCO2e	%	tCO2e	%
Scope 1	**2.276,3**	**23,0%**	**2.238,7**	**9,8%**	**-37,6**	**-1,7%**
Mobile Combustion	1.040,5	22,6%	937,1	4,1%	-103,4	-9,9%
Stationary Combustion	1.230,2	0,4%	1.295,5	5,6%	65,4	5,3%
Fugitive Emissions	5,7	0,1%	6,1	0,0%	0,4	7,6%
Scope 2	**3.551,6**	**77,0%**	**2.080,0**	**9,1%**	**-1.471,6**	**-41,4%**
Electricity Purchase	3.551,6	77,0%	2.080,0	9,1%	-1.471,6	-41,4%
Scope 3	**N.A.**		**18.627,8**	**81,2%**	**-**	**-**
Transportation of raw materials	N.A.	-	4.136,5	18,0%	-	-
Transportation of products	N.A.	-	13.204,6	57,5%	-	-
Wastewater	N.A.	-	34,9	0,2%	-	-
Waste	N.A.	-	1.251,9	5,5%	-	-
Total	**5.827,93**	**100%**	**22.946,52**	**100%**	**17.118,6**	**293,7%**

Rio Negro
Brazil

Floresta Mostardas
Brazil

Garibaldi
Brazil

Barcarena
Brazil

Sorocaba
Brazil

Madem Gulf
Bahrain

EuroMadem
Spain

Madem MooreCraft Reels
USA

Madem Carretas
Colombia

Madem Carretas
Mexico

Rio Negro - Brazil

Analysis

The Rio Negro unit is the one that has the greatest influence on the Madem group's GHG emissions, responsible for **11.555,00 tCO_2e**. The unit's most relevant emission source was **the transportation of products (61,70% of the unit's emissions)** and **transportation of raw materials (14,53% of the unit's emissions)**, followed by stationary combustion of the scope 1 (**1.292,87 tCO_2e – 11,19% of the unit's emissions**), due to the use of **vegetable residues in the boiler**.

The unit was also the largest contributor to biogenic emissions, emitting a total of 99.514,96 tCO_2e. This value is mainly the result of stationary combustion activity (75,74% of the unit's emissions), exclusively due to the burning of vegetable residues in the boiler. The suppression of pinus spp emitted a total of 23.497,69 tCO_2e, representing 23,61% of the unit's biogenic emissions.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**1.903,00**	**16,47%**	**98.903,75**	**99,39%**
Stationary Combustion	1.292,87	11,19%	75.374,62	75,74%
Mobile Combustion	609,78	5,28%	31,44	0,03%
Fugitive Emissions	0,35	0,00%	-	0,00%
Land Use Change	-	0,00%	23.497,69	23,61%
Scope 2	**804,11**	**6,96%**	**-**	**0,00%**
Electricity Purchase	804,11	6,96%	-	0,00%
Scope 3	**8.847,89**	**76,57%**	**611,21**	**0,61%**
Transportation of raw materials	1.678,37	14,53%	171,38	**0,17%**
Transportation of products	7.129,98	61,70%	439,61	**0,44%**
Wastewater	16,86	0,15%	-	**0,00%**
Waste	22,67	0,20%	0,22	0,00%
Total	**11.555,00**	**100%**	**99.514,96**	**100%**

Emissions by Source (tCO_2e)

Mostardas Forestry - Brazil

Analysis

The Mostardas Forestry unit issued 105,94 tCO_2e. Its largest emission source is **mobile combustion**, which was responsible for 103,18 tCO_2e (**97,39% of the unit's total emissions**), especially due to the use of diesel oil in tractors.

The largest biogenic emitting activity was the land use change, resulting from the suppression of pinus spp, emitting a total of 46.466,42 tCO_2e. Mobile combustion emitted 11,80 tCO_2e due to the use of diesel oil in tractors and gasoline in operational vehicles.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**104,30**	**98,45%**	**46.478,22**	**100,00%**
Mobile Combustion	103,18	97,39%	11,80	0,03%
Stationary Combustion	1,09	1,02%	-	0,00%
Fugitive Emissions	0,04	0,03%	-	0,00%
Land Use Change	-	0,00%	46.466,42	99,97%
Scope 2	**0,61**	**0,58%**	**-**	**0,00%**
Electricity Purchase	0,61	0,58%	-	0,00%
Scope 3	**1,03**	**0,97%**	**-**	**0,00%**
Transportation of raw materials	-	0,00%	-	0,00%
Transportation of products	-	0,00%	-	0,00%
Wastewater	1,03	0,97%	-	0,00%
Waste	-	0,00%	-	0,00%
Total	**105,94**	**100%**	**46.478,22**	**100%**

Emissions by Source (tCO_2e)

Garibaldi - Brazil

Analysis

The Garibaldi unit had a total emission of 15,40 tCO_2e and its main emission source was **mobile combustion**, responsible for emitting 8,85 tCO_2e (**57,46% unit emissions**) due to the use of diesel oil and gasoline in operational vehicles. The second main source of emissions from the unit was the acquisition of electrical energy, with an emission of 3,00 tCO_2e.

The only biogenic emission source in the unit was the combustion of ethanol and biodiesel present in gasoline and diesel oil, respectively, used in operational vehicles.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**10,47**	**68,01%**	**2,00**	**100,00%**
Stationary Combustion	1,58	10,28%	-	0,00%
Mobile Combustion	8,85	57,46%	2,00	100,00%
Fugitive Emissions	0,04	0,26%	-	0,00%
Land Use Change	-	0,00%	-	0,00%
Scope 2	**3,00**	**19,45%**	**-**	**0,00%**
Electricity Purchase	3,00	19,45%	-	0,00%
Scope 3	**1,93**	**12,54%**	**-**	**0,00%**
Transportation of raw materials	-	**0,00%**	**-**	**0,00%**
Transportation of products	-	**0,00%**	**-**	**0,00%**
Wastewater	1,55	**10,03%**	**-**	**0,00%**
Waste	0,39	2,51%	-	0,00%
Total	**15,40**	**100%**	**2,00**	**100%**

Barcarena - Brazil

Analysis

The Barcarena unit emitted 24,31 tCO_2e, and its largest emission source was **mobile combustion**, which was responsible for **90,90%** (22,10 tCO_2e) **of the unit's total emissions,** due to **the use of LPG and diesel oil** in operational vehicles. Transportation of products emitted indirectly 1,33 tCO_2e, representing 5,45% of the unit's total emissions.

The most representative source of biogenic emissions from the unit was the combustion of ethanol present in gasoline used in operational vehicles (0,77 tCO_2e).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**22,10**	**90,90%**	**0,77**	**85,12%**
Stationary Combustion	-	0,00%	-	0,00%
Mobile Combustion	22,10	90,90%	0,77	85,12%
Fugitive Emissions	-	0,00%	-	0,00%
Land Use Change	-	0,00%	-	0,00%
Scope 2	**0,56**	**2,32%**	**-**	**0,00%**
Electricity Purchase	0,56	2,32%	-	0,00%
Scope 3	**1,65**	**6,78%**	**0,14**	**14,88%**
Transportation of raw materials	-	**0,00%**	**-**	**0,00%**
Transportation of products	1,33	**5,45%**	**0,14**	**14,88%**
Wastewater	0,32	**1,32%**	**-**	**0,00%**
Waste	-	0,00%	-	0,00%
Total	**24,31**	**100%**	**0,91**	**100%**

Sorocaba - Brazil

Analysis

At the Sorocaba unit, the total emission was 193,94 tCO_2e. The main source of emissions was the **transportation of products (80,20% of the unit's emissions)**. In scope 1, the unit's only emission was mobile combustion (18,09% of emissions), which are linked to the consumption of LPG and gasoline in operational vehicles.

The biogenic emissions from this unit come mainly from the transportation of products (84,1%), resulting from the burning of biodiesel present in the diesel used by vehicles transporting wooden products.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO_2e	%
Scope 1	**35,09**	**18,09%**	**3,01**	**16%**
Mobile Combustion	35,09	18,09%	3,01	15,92%
Stationary Combustion	-	0,00%	-	0%
Fugitive Emissions	-	0,00%	-	0%
Land Use Change	-	0,00%	-	0%
Scope 2	**1,93**	**0,99%**	**-**	**0%**
Electricity Purchase	1,93	0,99%	-	0%
Scope 3	**156,92**	**80,91%**	**15,88**	**84%**
Transportation of raw materials	-	0,00%	-	0,0%
Transportation of products	155,54	80,20%	15,88	84,08%
Wastewater	1,38	0,71%	-	0,0%
Waste	-	0,00%	-	0%
Total	**193,94**	**100%**	**18,89**	**100%**

Madem Gulf - Bahrain

Analysis

The Madem Gulf unit, located in Bahrain, had a total emission of **5.8891 tCO_2e**, representing **25,7% of the group's total emissions**. The largest source of emissions from this unit is in scope 3, coming especially from the **transportation of products** manufactured by the unit **(36,71%)** and **the transportation of wood** (raw material) **(32,20%)**.

There were no biogenic emissions at the unit in 2023.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**85,97**	**1,46%**
Mobile Combustion	85,57	1,45%
Stationary Combustion	-	0,00%
Fugitive Emissions	0,40	0,01%
Land Use Change	-	0,00%
Scope 2	**653,98**	**11,11%**
Electricity Purchase	653,98	11,11%
Scope 3	**5.145,97**	**87,43%**
Transportation of raw materials	1.895,46	32,20%
Transportation of products	2.160,46	36,71%
Wastewater	2,89	0,05%
Waste	1.087,16	18,47%
Total	**5.885,91**	**100%**

EuroMadem - Spain

Analysis

In Spain, the EuroMadem unit emitted 2.120,78 tCO_2e, with its emissions mostly concentrated in **scope 3 (84,62%)**, arising especially from the **transportation of products (1.535,03 tCO_2e).**

The purchase of electrical energy, in scope 2, was responsible for 13,14% of the unit's total emissions, totaling 278,67 tCO_2e.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**47,41**	**2,24%**
Stationary Combustion	0,00	0,00%
Mobile Combustion	47,38	2,23%
Fugitive Emissions	0,03	0,00%
Land Use Change	0,00	0,00%
Scope 2	**278,67**	**13,14%**
Electricity Purchase	278,67	13,14%
Scope 3	**1.794,70**	**84,62%**
Transportation of raw materials	256,15	**12,08%**
Transportation of products	1.535,03	**72,38%**
Wastewater	3,52	**0,17%**
Waste	0,00	0,00%
Total	**2.120,78**	**100%**

Emissions by Source (tCO_2e)

Madem MooreCraft Reels - USA

Analysis

Madem MooreCraft Reels, in the United States, was the **second largest emitting unit** of the Madem group, with its total emission of 3.034,09 tCO_2e.

The most relevant emission source is **transportation of products**, in scope 3, responsible for **73,24% of the unit's total emissions**, which was equivalent to 2.222,24 tCO_2e. In this unit, the purchase of electricity generated 335,18 tCO_2e (11,05% of emissions).

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**24,05**	**0,79%**
Mobile Combustion	18,85	0,62%
Stationary Combustion	0,00	0,00%
Fugitive Emissions	5,20	0,17%
Land Use Change	0,00	0,00%
Scope 2	**335,18**	**11,05%**
Electricity Purchase	335,18	11,05%
Scope 3	**2.674,86**	**88,16%**
Transportation of raw materials	306,47	10,10%
Transportation of products	2.222,24	73,24%
Wastewater	4,43	0,15%
Waste	141,71	4,67%
Total	**3.034,09**	**100%**

Madem Carretas de Colombia

Analysis

Madem Carretas de Colombia was responsible for emitting **8,58 tCO_2e**, which represents only 0,02% of the Madem group's total emissions in 2022. Its largest emission source was **mobile combustion**, in scope 1, which **emitted 6,25 tCO_2e** due to the use of gasoline and LPG in operational vehicles.

The unit's biogenic emissions came exclusively from wood residues that were incinerated, 11,00 tCO_2e.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions		Biogenic Emissions	
	tCO_2e	%	tCO2e	%
Scope 1	**6,27**	**73,06%**	**-**	**0,00%**
Stationary Combustion	0,00	0,00%	-	0,00%
Mobile Combustion	6,25	72,86%	-	0,00%
Fugitive Emissions	0,02	0,20%	-	0,00%
Land Use Change	-	0,00%	-	0,00%
Scope 2	**1,98**	**23,03%**	**-**	**0,00%**
Electricity Purchase	1,98	23,03%	-	0,00%
Scope 3	**0,33**	**3,90%**	**11,00**	**100,00%**
Transportation of raw materials	-	**0,00%**	**-**	**0,00%**
Transportation of products	-	**0,00%**	**-**	**0,00%**
Wastewater	0,33	**3,90%**	**-**	**0,00%**
Waste	0,00	0,00%	11,00	100,00%
Total	**8,58**	**100%**	**11,00**	**100%**

Madem Carretas de México

Analysis

Madem Carretas de México was the unit with the lowest emission within the Madem group. Its only reported emission source stemmed from the wastewater treatment not controlled by the unit, which emitted a total of **2,55 tCO_2e**.

Emissions by Source (tCO_2e)

Emission Source	Total Emissions	
	tCO_2e	%
Scope 1	**0,00**	**0,00%**
Stationary Combustion	0,00	0,00%
Mobile Combustion	0,00	0,00%
Fugitive Emissions	0,00	0,00%
Land Use Change	0,00	0,00%
Scope 2	**0,00**	**0,00%**
Electricity Purchase	0,00	0,00%
Scope 3	**2,55**	**100,00%**
Transportation of raw materials	0,00	**0,00%**
Transportation of products	0,00	**0,00%**
Wastewater	2,55	**100,00%**
Waste	0,00	0,00%
Total	**2,55**	**100%**

Future Actions

- Evaluate the possibility of **changing the fuel** used in **mobile machines** to lower-emitting fuels (e.g., electric forklifts).
- In Brazilian units, **generate renewable energy for self-consumption** and/or purchase of renewable energy through the **incentivized free market** (with a guarantee of 100% renewable energy sources), instead of using energy from the National Interconnected System – SIN. Check similar alternatives for other countries.
- Regarding the fleet of vehicles used in operations, prioritize the use of **ethanol in flex-fuel vehicles** and explore the possibility of replacing the fleet with more efficient vehicles that are less intensive in GHG emissions, electric vehicles or hybrid vehicles.
- Develop actions with **transporters of raw materials and products**, aiming at carbon reduction and mitigation initiatives.
- Associate the collected data (e.g. liters of diesel consumed) with production data (by product) to create an indicator by product.
- Adherence to the Public Registry of the **GHG Protocol Brazil Program** and verification of the inventory by a third party to obtain the gold seal.
- Develop an **Action Plan**, in which reduction and compensation goals are established.