2023-24

CARBON FOOTPRINT SUMMARY REPORT

PRASOL CHEMICALS LTD.

PREPARED BY CENTRE FOR ENVIRONMENTAL RESEARCH & EDUCATION (CERE)

This Report has been researched and prepared by the Centre for Environmental Research and Education (CERE) for Prasol Chemicals.

Document Name	**Carbon Footprint Summary Report**
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Prepared On Behalf Of	**Prasol Chemicals Ltd.** Prasol Chemicals Ltd. is among the leading forward integrated manufacturers of acetone derivatives and phosphorous derivatives in India. The company's products have end uses in four segments namely pharmaceuticals, agrochemicals, home and personal care and performance chemicals. Prasol's vision is to deliver business excellence for customers by establishing distinction across their core drivers – innovation, environmental sustainability, production, procurement, supply chain and people.
Prepared By	**Centre for Environmental Research & Education (CERE)** CERE is a Mumbai-based not-for-profit organization that works to promote environmental sustainability through action-oriented education, awareness, and advocacy. CERE has completed projects in urban and rural India having worked closely with different government departments, educational institutions, multinational companies, and civil society organizations. CERE is also a pioneer in the field of corporate sustainability and carbon management systems.
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Disclaimer

CERE has taken all reasonable care to ensure that the information shared as a part of this report is accurate in all material aspects as of the date of preparation and as per the information and data supplied by Prasol Chemicals Ltd. Clarifications on the data shared by Prasol Chemicals Ltd. were considered final and all assumptions were incorporated only after discussions with the Prasol team. The report will remain secure and confidential unless Prasol Chemicals Ltd. provides explicit permission for its release. CERE does not assume liability for any inaccuracies or errors in the data provided or any decisions made based on the report's contents.

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BACKGROUND

The chemical sector is increasingly facing significant climate risks that threaten both its operations and overall sustainability. As global temperatures rise and extreme weather events become more frequent, the industry must grapple with the potential impacts on supply chains, raw material availability, and regulatory pressures aimed at reducing carbon emissions. Additionally, the transition towards a low-carbon economy introduces both challenges and opportunities, requiring chemical companies to innovate in terms of production processes, materials, and energy sources. Failure to adapt to these climate risks could not only jeopardize financial stability but also undermine the sector's social license to operate amid growing public and investor scrutiny regarding environmental performance.

India's chemicals market, valued at USD 220 billion in 2023, is projected to grow to USD 383 billion by 2030. The chemical industry has been consistently addressing the needs of a growing market. It has strong backward and forward linkages and is crucial for agricultural and industrial development. With a growing focus on decarbonisation and circularity, this sector also has the potential to introduce innovative climate and energy strategies throughout the industrial manufacturing value chain, thereby reducing its carbon footprint.

Consequently, today's leading companies realize that what's good for the environment is also good for business. With the call to reduce GHG emissions, there is an immediate need to measure and monitor activities that contribute to global warming.

CLIMATE DISCLOSURES

Measuring and disclosing a company's GHG emissions helps it target key hotspots for mitigation. Disclosure is beneficial from a business perspective as well and helps to gain trust and build a reputation. It is a way to demonstrate leadership in sustainability and thus provides a competitive edge by giving companies preferential access to capital earmarked for sustainable growth.

Furthermore, at the 2021 United Nations Climate Change Conference, India committed to limiting temperature rise to 1.5°C through mandatory sustainability disclosures and promotion of corporate accountability. In this context, the Securities and Exchanges Board of India (SEBI) extended mandatory carbon disclosures to the top 1000 listed companies by market capitalisation as part of its Business Responsibility & Sustainability Reporting (BRSR) framework, emphasising the importance of environment, social and governance (ESG) disclosures in emerging markets. Carbon disclosures are thus rapidly becoming a fundamental aspect of corporate reporting.

ABOUT THIS REPORT

This carbon footprint study has been undertaken by the Centre for Environmental Research & Education (CERE) on behalf of Prasol Chemicals (hereafter referred to as Prasol in this report) to create a GHG emissions inventory of its operations in India. The study accounts for emissions arising for the **Financial Year 2023-24** and provides a comparative analysis with the baseline year 2022-23.

METHODOLOGY

ASSESSMENT FRAMEWORK

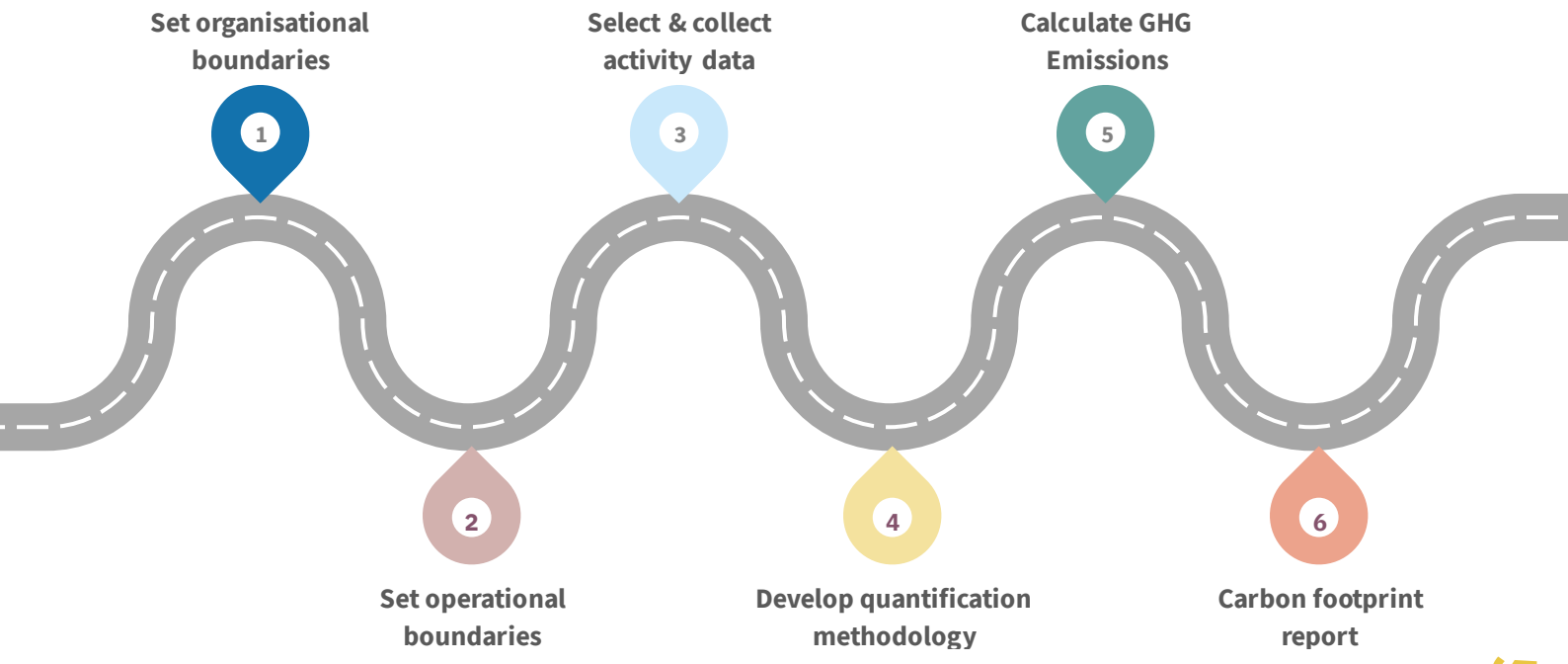
This carbon footprint assessment was undertaken based on the guidelines provided by the **GreenhouseGas Protocol** (GHG Protocol), published by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). Accordingly, the GHG Protocol's **Corporate Accounting and Reporting Standard** and its **Corporate Value Chain (Scope 3) Standard** were referenced.

The standards cover the accounting and reporting of seven greenhouse gases covered by the Kyoto Protocol – carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PCFs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). For the purposes of this study, the emissions for the following greenhouse gases are relevant and have been calculated in terms of metric tonnes (MT) or kilograms (kg) of carbon dioxide equivalents (CO_2e).

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- R-32 (HFC-32, CH_2F_2)

As per the GHG Protocol, carbon foot-printing involves several key steps (Figure 1). First, clear operational and organizational boundaries are set to define the scope of assessment. Next, activity data such as energy consumption and transportation distances are collected to quantify carbon-releasing activities. This data is then utilized to calculate emissions and a comprehensive inventory is prepared to guide sustainability efforts and inform stakeholders about the organization's environmental impact. CERE followed a similar roadmap to measure Prasol's GHG emissions.

Figure 1: Steps in carbon foot-printing



SCOPE OF ASSESSMENT

ORGANISATIONAL BOUNDARY

The scope of Prasol's carbon footprint assessment includes the plants at Khopoli and Mahad, and the Head Office in Mumbai. The product verticals at the two plants have been listed in Table 1. As per the GHG Protocol, for corporate reporting, two distinct approaches can be used to consolidate GHG emissions: the equity share and the control approaches. CERE has opted for **Control Approach** in determining the company's organisational boundary as it forms the basis for a more comprehensive assessment.

Table 1 | Product verticals at Khopoli & Mahad

Sr. No.	Product Vertical	Location
1	PPS (Phosphorus penta sulphide)	Khopoli & Mahad
2	DAA (Di acetone alcohol)	Khopoli
3	ZDDP (Zinc dithiophosphate)	Khopoli
4	IPH (Isophorone)	Khopoli
5	MO (Mesityl oxide)	Khopoli
6	HG (Hexylene glycol)	Khopoli
7	MIBC (Methyl isobutyl carbinol)	Khopoli
8	MX (Meta Xylenol)	Khopoli
9	TMC Nol (3,3,5-Trimethylcyclohexanol)	Khopoli
10	TMC None (2,2,6-Trimethylcyclohexanone)	Khopoli
11	MPPS	Khopoli
12	DETC (Diethyl thiophosphoryl chloride)	Mahad

OPERATIONAL BOUNDARY

Developing an operational boundary is a crucial step towards assessing a company's GHG activities. It helps in identifying the sources of emissions as well as sinks that sequester emissions from the company's activities. According to the GHG protocol, the emissions are categorized into Scope 1 (direct), Scope 2 (indirect) and Scope 3 (indirect) emissions based on the emission sources.

CERE has undertaken a comprehensive assessment of material sources of emissions within Prasol's organisational boundary. This includes the methodical collation and validation of activity data, analysis and reporting.

Table 2 details the emission sources and the activity data considered for the assessment along with the methodology for assessment based on the GHG Protocol. For Scope 3 sources, the relevant categories as per the GHG Protocol have also been mentioned for reference.

Table 2 | Emission sources and activity data

Scope	Emission Source	Methodology as per GHG Protocol	Activity Data	Available Locations
1	Cogen Plant - Fuel Consumption (incl. process steam boilers)	Average data method	Coal, LSHS consumption (MT)	Khopoli, Mahad

Table 2 | Emission sources and activity data				
Scope	**Emission Source**	**Methodology as per GHG Protocol**	**Activity Data**	**Available Locations**
1	Diesel Generator Sets	Average data method	Diesel consumption (L)	Khopoli, Mahad, Head Office
1	Pantry - Fuel Consumption	Average data method	LPG consumption (kg)	Khopoli, Head Office
1	Company-owned Vehicles	Average data method	Petrol, CNG, diesel consumption (L/kg)	Khopoli, Mahad, Head Office
1	Heating, Ventilation and Air Conditioning (HVAC) Leaks – Fugitive Emissions	Sales based method (service records)	Number of AC carriers & refrigerant refills (kg)	Khopoli, Mahad, Head Office
1	Process Fugitive Emissions	Mass balance method	Mass balance and quantity produced (MT)	Khopoli
2	Purchased Electricity	Location based approach	Electricity consumption (kWh)	Khopoli, Mahad, Head Office
3	Embedded Emissions *(Category 1: Purchased Goods & Services)*	Average data method	Raw material & packaging material consumption (MT)	Khopoli, Mahad
3	Upstream Transportation (Materials) *(Category 4: Upstream Transportation & Distribution)*	Distance based method	Quantity transported (MT) & source pin code	Khopoli, Mahad
3	Downstream Logistics (Products & Waste) *(Category 9: Downstream Transportation & Distribution)*	Distance based method	Quantity transported (MT) & destination pin code	Khopoli, Mahad
3	Employee Commute *(Category 7: Employee Commute)*	Distance based method (employee survey)	Passenger-kilometre / kilometre (km)	Khopoli, Mahad, Head Office
3	Waste Generation *(Category 5: Waste Generated in Operations)*	Average data method	Weight (MT)	Khopoli, Mahad

DATA & EMISSION FACTORS

Following discussions with Prasol, CERE created tailored data collection sheets to effectively capture information from the identified emission sources. Excel was primarily utilized for this data collection process.

Activity data has been captured and shared by Prasol through coordination and discussion with different internal teams. The methodology for GHG calculations adopted by CERE is **GHG activity data multiplied by relevant emission or removal factors (EFs)**.

Most of Prasol's emission sources consume fossil fuels such as coal or diesel or arise indirectly from the use of grid-based electricity and other resources and services. Credible local emission factors were sourced wherever possible. Appropriate international emission factors were identified where local factors were unavailable. A summary of the emission factor sources is provided in the Appendix.

Wherever the information was incomplete, CERE has applied reasonable assumptions or has approximated values from the available data using relevant conversion factors. The various assumptions and extrapolations taken during the study can be found in the report's Appendix.

Table 3 | Scope 3 categories – inclusions & exclusions

Sr. No.	Category	Related Emission Sources / Reasons for Exclusion
1	Purchased goods & services	Embedded emissions from raw materials & packaging
2	Capital goods	Capital goods were not considered as part of the assessment because they typically have a longer lifecycle and are not procured or replaced as often as other types of goods.
3	Fuel and energy related activities (not included in Scope 1 & 2)	This category is not relevant as Prasol is not in the business of processing fuels. ▶ Emissions from the combustion of fuels and electricity consumed by the company are already included in scope 1 and scope 2 emissions. ▶ Moreover, calculating emissions from this source presents challenges due to several factors, including the limited availability or access to the suppliers' data pertaining to the extraction, production, and transportation of fuels and electricity.
4	Upstream transportation & distribution	Upstream transportation of raw materials
5	Waste generated in operations	Waste generation
6	Business travel	While business travel did occur, it was found to be non-material as it accounted for less than 0.1% to total emissions in FY 2022-23.
7	Employee Commute	Employee commute
8	Upstream leased assets	No assets are taken on lease by Prasol Chemicals.
9	Downstream transportation & distribution	Downstream transportation of products & waste

Table 3 | Scope 3 categories – inclusions & exclusions		
Sr. No.	**Category**	**Related Emission Sources / Reasons for Exclusion**
10	Processing of sold products	▶ The operational boundary for the project was defined from cradle to the assigned point of delivery. ▶ Prasol Chemicals produces intermediate products with multiple potential downstream applications, for which the GHG emission profiles are uncertain. It is therefore challenging to reasonably estimate the downstream emissions (if any) associated with the various end uses of the intermediate products. *(Based on GHG Protocol Value Chain Standard - Section 5.6 & 6.4)*
11	Use of sold products	
12	End-of-life treatment of sold products	
13	Downstream leased assets	Prasol Chemicals does not lease any assets to third parties.
14	Franchises	There are no franchises operated by Prasol Chemicals.
15	Investments	Investments and financing services are not applicable to Prasol Chemicals.

Relevant, included in the study

Relevant, not included in the study

Not relevant

Note: The values in the subsequent sections have been rounded off to two decimal places.

GHG INVENTORY

SUMMARY

Based on CERE's assessment, Prasol's emissions as per the scope of work were **2,00,230.41 MTCO₂e** in FY 2023-24 which corresponds to a **2% increase** in emissions from FY 2022-23. The breakdown of emissions by source has been summarised in the table below for both years.

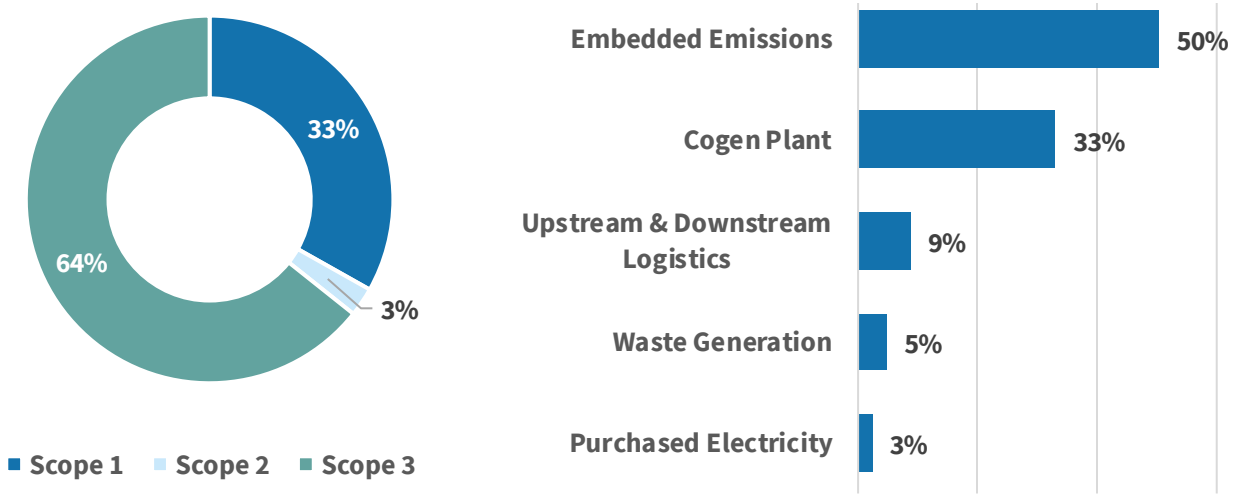
Table 4: Emission summary

Sr. No.	Scope	Source	FY 2023-24		FY 2022-23	
			Emissions ($MTCO_2e$)	% Share	Emissions ($MTCO_2e$)	% Share
1	**1**	Cogen Plant - Fuel Consumption (incl. process steam boilers)	66,043.14	32.98%	70,741.61	35.99%
2	**1**	DG Sets	66.20	0.03%	87.27	0.04%
3	**1**	Pantry LPG Consumption	1.36	<0.01%	1.36	<0.01%
4	**1**	Company-owned Vehicles	30.17	0.02%	28.66	0.01%
5	**1**	HVAC Systems - Fugitive Emissions	77.18	0.04%	82.64	0.04%
6	**1**	Process Fugitive Emissions	180.15	0.09%	503.76	0.26%
7	**2**	Purchased Electricity	5,077.61	2.54%	5,746.08	2.92%
8	**3**	Embedded Emissions *(Category 1: Purchased Goods & Services)*	1,00,645.96	50.27%	90,232.08	45.91%
9	**3**	Upstream Logistics (Materials) *(Category 4: Upstream Transportation & Distribution)*	11,184.34	5.59%	10,415.94	5.30%
10	**3**	Downstream Logistics (Products & Waste) *(Category 9: Downstream Transportation & Distribution)*	6,671.34	3.33%	6,167.77	3.14%
11	**3**	Employee Commute *(Category 7: Employee Commute)*	255.07	0.13%	333.11	0.17%
12	**3**	Waste Generation *(Category 5: Waste Generated in Operations)*	9,997.88	4.99%	12,192.37	6.20%
Total Emissions			**2,00,230.41**		**1,96,532.64**	

High Emission Share — *Low Emission Share*

The highest contributor to total emissions is the embedded carbon in raw materials & packaging (**50%**) followed by fuel consumption in the cogeneration plant & steam boiler (**33%**). Scope 3 has the highest share of emissions (**64%**) for Prasol.

Figure 2: Scope breakdown & top 5 emission sources for FY 2023-24



SCOPE 1 EMISSIONS

Direct emissions are generally the result of fuel combustion in equipment (stationary combustion) or vehicles (mobile combustion) owned and controlled by the company. The preferred method of gathering activity data is from fuel purchase or fuel-use records since these are likely to be the most accurate. Direct emissions may also arise as fugitive emissions associated with other activities. The following major sources of Scope 1 emissions were assessed for Prasol:

- Fuel combustion in cogeneration plant & process steam boilers (Coal & LSHS)
- Fuel combustion in company-operated generator sets (Diesel)
- Fuel consumption in pantry (LPG)
- Fuel consumption by company cars (Petrol, Diesel & CNG)
- Refrigerant leaks from company-owned air-conditioning units (R-32)
- Fugitive emissions during production process (Methane)

Prasol's Scope 1 emissions in FY 2023-24 contributed around **33%** to the overall emissions.

Table 5: Scope 1 emission summary

Sr. No.	Source	FY 2023-24		FY 2022-23	
		Emissions ($MTCO_2e$)	% Share	Emissions ($MTCO_2e$)	% Share
1	Cogen Plant - Fuel Consumption (incl. process steam boilers)	66,043.14	99.5%	70,741.61	99.0%
2	DG Sets	66.20	0.1%	87.27	0.1%
3	Pantry LPG Consumption	1.36	<0.1%	1.36	<0.1%
4	Company-owned Vehicles	30.17	<0.1%	28.66	<0.1%

Table 5: Scope 1 emission summary					
Sr. No.	Source	FY 2023-24		FY 2022-23	
		Emissions ($MTCO_2e$)	% Share	Emissions ($MTCO_2e$)	% Share
5	HVAC Systems - Fugitive Emissions	77.18	0.1%	82.64	0.1%
6	Process Fugitive Emissions	180.15	0.3%	503.76	0.7%
Total Scope 1 Emissions		**66,398.21**		**71,445.29**	

SCOPE 2 EMISSIONS

Scope 2 emissions account for indirect GHG emissions arising from the consumption of purchased electricity by a company. Purchased electricity is electricity that is bought or otherwise brought into the organisational boundary of a company but is generated at another facility.

To calculate Scope 2 emissions, the activity data for electricity use was obtained from monthly electricity bills generated across Prasol's plants at Khopoli and Mahad, and the Head Office in Mumbai. Since electricity in India is primarily derived from coal, regional grid-based emission factors have been used. The emission factor for net effective injection into grid published by the Central Electricity Authority (CEA) has been used which also accounts for renewable energy in the grid. The factor is measured in tCO_2/MWh.

Table 6: Scope 2 emission summary			
Sr. No.	Source	FY 2023-24	FY 2022-23
		Emissions ($MTCO_2e$)	Emissions ($MTCO_2e$)
1	Purchased Electricity	5,077.61	5,746.08
Total Scope 2 Emissions		**5,077.61**	**5,746.08**

SCOPE 3 EMISSIONS

Scope 3 emissions are the consequence of activities by the company but occur from sources not owned or controlled by the company. Though reporting on scope 3 emissions can be challenging due to lack of data, there are considerable benefits associated with measuring their impact. Organisations can identify emission hotspots and engage with suppliers and employees to implement sustainability initiatives. Scope 3 emissions for Prasol have been calculated for the following sources:

- Embedded emissions in raw materials and packaging
- Upstream transportation of materials
- Downstream logistics for products and waste
- Employee commute
- Waste generation

Scope 3 emissions have increased by **8%** compared to FY 2022-23. This is primarily driven by an increase in embedded emissions from the use of raw materials and packaging. Table 7 indicates the emission values for each Scope 3 source along with the corresponding category as per the GHG Protocol.

Table 7: Scope 3 emission summary					
Category*	Source	FY 2023-24		FY 2022-23	
		Emissions ($MTCO_2e$)	% Share	Emissions ($MTCO_2e$)	% Share
Category 1 Purchased Goods & Services	Embedded Emissions	1,00,645.96	78.2%	90,232.08	75.6%
Category 4 Upstream Transportation & Distribution	Upstream Transportation (Materials)	11,184.34	8.7%	10,415.94	8.7%
Category 5 Waste Generated in Operations	Waste Generation	9,997.88	7.8%	12,192.37	10.2%
Category 7 Employee Commute	Employee Commute	255.07	0.2%	333.11	0.3%
Category 9 Downstream Transportation & Distribution	Downstream Logistics (Products & Waste)	6,671.34	5.2%	6,167.77	5.2%
Total Scope 3 Emissions		**1,28,754.59**		**1,19,341.26**	

**The reasons for inclusion and exclusion of all 15 Scope 3 categories have been provided in Table 3 in the Methodology section.*

APPENDIX

EMISSION FACTOR SOURCES

Table 8 | Emission factor sources	
Emission Source	**Source of EF**
Scope 1	
Coal	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Vol 2, Chapter 1 & 2
LSHS	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Vol 2, Chapter 1 & 2
Diesel	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Vol 2, Chapter 1 & 2
Company-owned Cars	World Resources Institute (2015). GHG Protocol calculation tool for mobile combustion. Version 2.6
HVAC Leaks	IPCC Sixth Assessment Report (2021)
Process Fugitive Emissions	IPCC Sixth Assessment Report (2021)
Scope 2	
Purchased Electricity	Central Electricity Authority (CEA) - CO_2 Baseline Database for the Indian Power Sector, version 19
Scope 3	
Embedded Emissions – Raw Materials	1. SEWPCC Process Selection Report, Winnipeg. Appendix 7 2. Meshram et al. (2024). Evaluating the carbon footprint of sulphur recovery unit: A comprehensive analysis. GaBi Indian Database 3. Sasol Climate Change Report, 2023: https://www.sasol.com/sites/default/files/2023-09/SASOL%20Sustainability%20Report%202023%2020-09.pdf 4. Vietnam electricity grid emission factor 2018: https://ikinews.climatechange.vn/data-on-emissions-factor-of-the-vietnamese-electricity-grid-in-2018-now-available/#:~:text=Accordingly%2C%20the%20EF%20of%20the,(tCO2%2F%20MWh)
Embedded Emissions – Packaging Materials	1. Sarbring, A. (2014). A carbon footprint assessment on construction and maintenance operations for the port of Gothenburg. Chalmers University of Technology. 2. IPCC (2019). Metal Industry Emissions, Vol 3 Industrial Processes. 3. SEWPCC Process Selection Report, Winnipeg. Appendix 7

Table 8 | Emission factor sources	
Emission Source	**Source of EF**
Upstream & Downstream Transport	World Resources Institute (2015). GHG Protocol Transport Tool. Version 2.6
Employee Commute	Centre for Science and Environment (2021). India's Fuel Economy Benchmarks.
Waste Generation	IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (2000). Section 5.3

ASSUMPTIONS

Table 9 | List of assumptions		
#	**Emission Source**	**Assumptions**
1	Cogeneration Plant	▶ The emission factor for coal was taken from the trendline of available emission factors for different NCVs, referenced from the IPCC Guidelines Volume 2 and 3. This was done to match the emission factor to the NCV of coal sourced by Prasol.
2	Embedded Emissions	▶ Emission factors for raw materials and packaging materials have either been derived from supplier information or referenced from scientific papers and national/international databases.
3	Upstream Transportation	▶ Entries where weight details were available or could be derived from the item descriptions have been included in the study. Cancelled shipments have not been included.
4	Downstream Transportation	▶ Emissions were only assessed for transportation within Prasol's organisational and operational boundaries and excluded transport-related emissions where customers or vendors were responsible. Therefore, only entries indicated as 'Ex-Vashi', 'Ex-Bhiwandi' and 'Delivered' have been considered for the assessment. For 'Ex-Vashi' and 'Ex-Bhiwandi', emissions from factory to the collection hubs in Vashi and Bhiwandi have been considered since the customer is responsible for pick-ups from the hubs.
5	Waste Generation	▶ The waste disposal method has been taken based on the Consent To Operate (CTO) norms followed by Prasol. The disposal method for FY 2022-23 waste data has also been updated to reflect the CTO document.