

Industrial Carbon Emissions Landscape in India

Analysis of 80 major industrial units across 18 Indian states, FY 2023–24

A baseline profile of carbon intensity across India's energy-intensive industries as they enter the Carbon Credit Trading Scheme.

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Abstract

This report examines carbon-emissions data from 80 major industrial facilities across 18 Indian states during FY 2023–24. Total output reached 103.43 million tonnes, with an analysis of greenhouse-gas emission intensities across the sectors transitioning to India's Carbon Credit Trading Scheme. Rajasthan dominates production volume, while Odisha exhibits the highest carbon intensity, owing to its heavy industrial composition. The Aluminium sector demonstrates significantly higher emission intensity than the Cement and Paper sectors.

1. Introduction and Policy Context

India's commitment to net-zero emissions by 2070 has accelerated the implementation of market-based carbon-reduction mechanisms. This analysis addresses two regulatory frameworks.

1.1 Perform, Achieve and Trade (PAT) Scheme

The PAT scheme, administered by the Bureau of Energy Efficiency, requires "Designated Consumers" in energy-intensive industries to achieve specific energy-consumption reductions. The firms analysed span the Aluminium, Cement, Chlor-Alkali, and Pulp & Paper sectors historically regulated under PAT cycles.

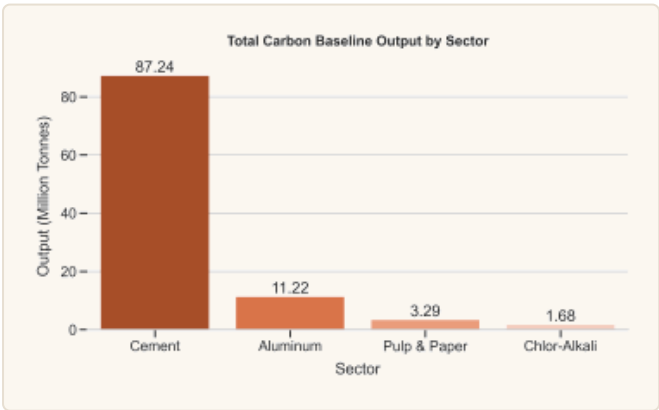
1.2 Transition to the Carbon Credit Trading Scheme (CCTS)

The Energy Conservation (Amendment) Act, 2022 established the Indian Carbon Market framework. This report aligns with the Greenhouse Gas Emission Intensity Target Rules, 2025 (notified 8 October 2025). Under CCTS, entities transition from energy-savings targets to GHG emission-intensity targets measured in tCO₂e per unit of output.

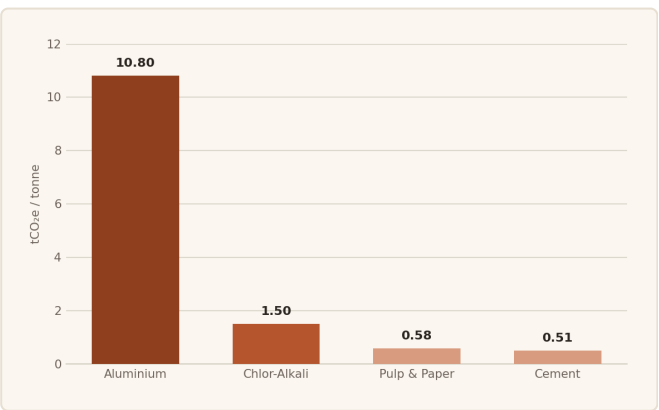
- **Pro-rata targets (2025–26):** targets are calculated on a pro-rata basis for seven months, from September 2025 to March 2026.
- **Banked certificates:** obligated entities may bank surplus carbon-credit certificates for future compliance or trading within the Indian Carbon Market.

2. Sectoral Analysis

The analysis identifies four primary sectors based on registration prefixes: Aluminium (ALM), Cement (CMT), Chlor-Alkali (CNA), and Pulp & Paper (PNP). The Cement sector is the largest contributor to total output volume, driven by nationwide infrastructure demand, while emission intensity varies substantially by industrial process — Aluminium smelting requires energy-intensive electrolytic processing, resulting in the highest per-unit carbon footprint.



(a) Output by sector



(b) Emission intensity by sector

Figure 1. Sectoral profile: (a) total baseline output (million tonnes, 2023–24); (b) average GHG emission intensity (tCO₂e / tonne).

The Aluminium sector averages 10.80 tCO₂e/tonne — over four times the Chlor-Alkali sector (1.50) and more than twenty times Cement (0.51). This disparity is exactly why the

3. Geographic Distribution Analysis

Industrial density. Gujarat leads with 14 industrial units, positioning it as a centre of industrial monitoring and carbon-market activity. **Output concentration.** Total output correlates with the presence of large integrated plants: Rajasthan accounts for 23.89 million tonnes of production, a significant portion of the national baseline. **Intensity.** Regional emission-intensity variation is driven primarily by the sectoral composition within each state.

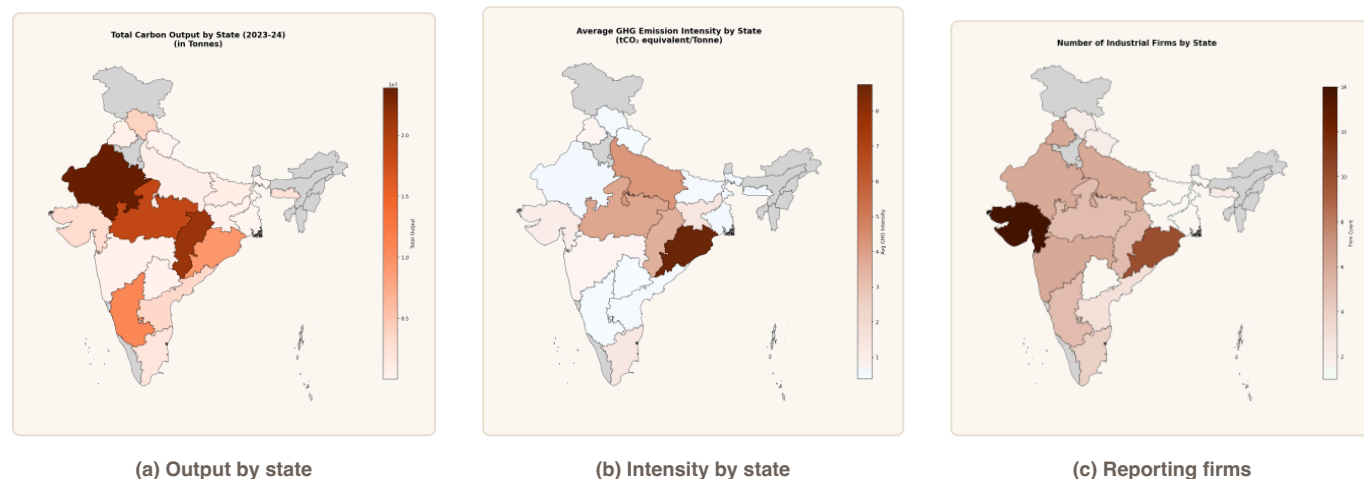


Figure 2. Geographic distribution: (a) total baseline output (tonnes) by state; (b) average GHG emission intensity (tCO₂e / tonne); (c) number of reporting firms by state.

While Rajasthan maintains high production, its average intensity is moderated by Cement-sector dominance, which has relatively low per-unit emissions. Conversely, Odisha has the highest state-wide average intensity (8.75), driven by the concentration of energy-intensive Aluminium smelters.

4. Conclusion

The CCTS transition represents a paradigm shift for Indian industry. Three findings stand out.

- **Pro-rata compliance urgency.** The seven-month compliance period (September–March) for FY 2025–26 necessitates timely data verification and internal alignment by obligated entities.
- **Sectoral differentiation is crucial.** The official circular confirms that uniform carbon targets are inadequate. The disparity between Aluminium (10.80) and Cement (0.51) intensities justifies the sector-specific benchmarks established in the 2025 Rules.
- **Regulatory precision.** The transition from draft rules (April 2025) to final notification (October 2025) involved notable baseline revisions for major integrated plants. These revised baselines should underpin corporate compliance planning.

References

1. Ministry of Environment, Forest and Climate Change (2025). *Greenhouse Gas Emission Intensity Target Rules, 2025*. Gazette Notification G.S.R. 739(E), New Delhi, 8 October 2025.
2. Bureau of Energy Efficiency, Ministry of Power. *Carbon Credit Trading Scheme (CCTS) Framework*.