TOXIC EMISSIONS AND ACCOUNTABILITY: WHO IS RESPONSIBLE FOR AUSTRALIA'S POLLUTION?

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EXECUTIVE SUMMARY

Understanding who is responsible for pollution is central to designing effective environmental policy and corporate accountability frameworks. This brief examines trends in toxic emissions using data from the National Pollution Inventory (NPI), with a specific focus on ASX200-listed organisations. By combining descriptive analysis with panel regression techniques, I evaluate both cross-sectional differences in emissions intensity and changes over time. The objective is not only to assess whether emissions are rising or falling, but to determine where responsibility is concentrated and whether the largest contributors are reducing their environmental footprint.

In doing so, the analysis contributes to the broader debate on corporate accountability in Australia, asking a central question: who is responsible for pollution, and are those firms meaningfully changing their behaviour?

Highlights

- Aggregate emissions have stagnated over the past decade, despite a substantial increase in the number of reporting facilities.
- The Mining, Manufacturing and Electricity, Gas, Water and Waste Services sectors dominate emissions at both the firm and facility levels.
- The share of total emissions attributable to the 59 ASX200 firms has declined from a peak of approximately 35% in 2015/2016 to 29.5% in 2023/2024.
- High (low) emitting firms show no evidence of meaningful reductions in emissions intensity, while moderate-emitting firms exhibit only a modest decline. Overall, emissions intensity remains highly persistent across firms, with little evidence of convergence.

DATA AND METHODOLOGY

I collect toxic emissions data from the National Pollution Inventory (NPI) dataset which provides the registered business name of each facility that reports their pollution.[1] This enables linkage with ASX200 listed companies. This approach successfully links approximately 11% of NPI facilities to ASX-listed firms. All matched records are subsequently manually reviewed, and incorrect matches are removed. The final matched dataset comprises of 84,832 observations spanning the period from 1999 to 2024, covering 59 ASX-listed firms and 46 pollutant substances.

Aggregating emissions across different pollutants can be misleading, as toxicity levels vary substantially between substances. In particular, relatively small quantities of highly toxic pollutants may pose greater risks than larger quantities of less harmful pollutants. To address this issue, I adopt the weighting approach used in the South Australian NPI Summary Report (Ellson & Sauerland, 2008) in which NPI toxicity scores are linearly scaled from their original range to a broader weighting scale. While the South Australian report applies this method to the environmental hazard score along (ranging from 0-3), this study instead uses the overall NPI risk score, which ranges from 0 to 18. Detailed method is presented in Appendix A. The resulting toxicity-weighted emissions are therefore comparable across substances serve as the primary metric for evaluating firms and sectors.

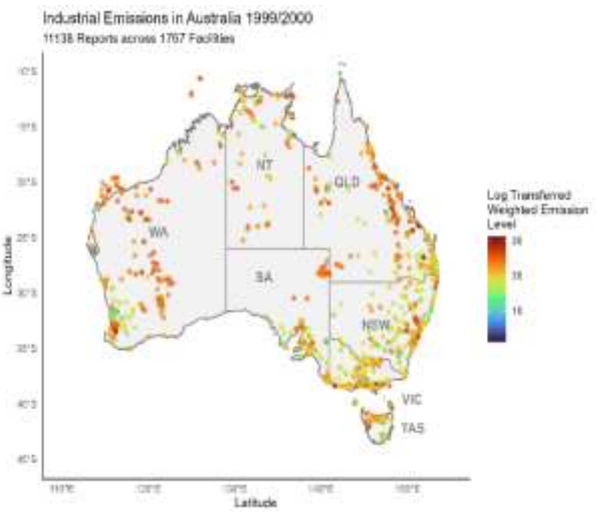
FINDINGS

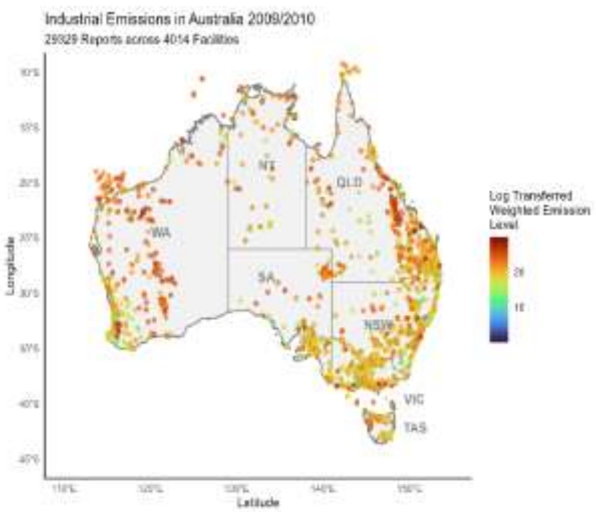
Nation-wide big picture

A national overview of pollution recorded in the NPI over time provides a broad perspective on toxic emissions trends in Australia. The number of reporting facilities has increased steadily as the Australian Government has expanded and refined the NPI program. It reflects improvements in reporting coverage rather than a deterioration in Australia's underlying emissions performance.

In 1999/2000, the NPI recorded only 11,138 reports, with emissions concentrated in major population centres, particularly capital cities. By 2009/2010 and 2023/2024, emissions remained closely aligned with population hubs—especially along Australia's east coast—but reporting had expanded geographically. Regional and rural areas, notably in Western and South Australia, showed substantial growth in reported emissions, reflecting broader industrial coverage, including mining.

Despite the rise in reporting over time, emissions per facility generally remained stable, if not declined. For instance, Victoria and Tasmania were major hotspots in 2009/2010 and remained so in 2023/2024, but with lower emissions intensity. Western Australia showed a similar trend, with areas around Perth recording reduced emissions in later years. In other regions, such as northeast Western Australia, emissions remained relatively constant. Overall, the evidence suggests a modest decline in facility-level emissions over time, consistent with improved environmental management and regulatory compliance.





[1] The NPI is an Australian Government initiative that requires industrial facilities to report emissions when pollutant releases exceed specified thresholds. The primary objectives of the NPI are to enhance public awareness of pollution, promote improved environmental practices among industry participants, and support government decision-making in environmental policy. The NPI currently monitors 93 pollutants that are known to pose risks to human health and the environment.

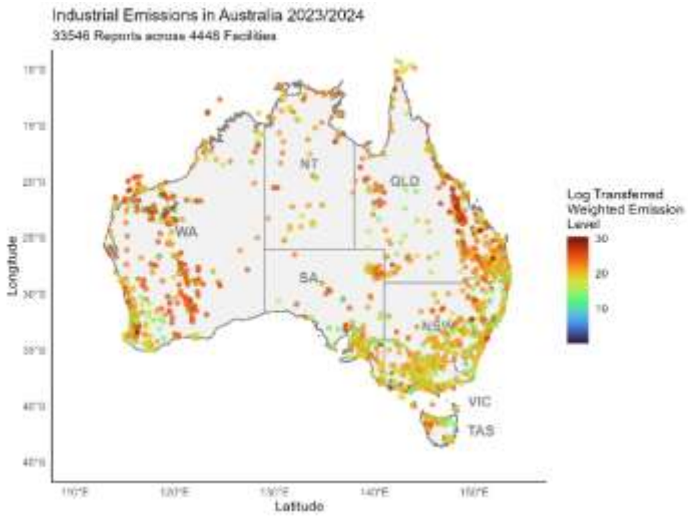


Figure 1. Map of Australian Industrial Weighted Emissions in 1999/2000, 2009/2010 and 2023/2024

Reporting size and pattern

Equally important is the evolution of Australia's aggregate emissions and reporting practices. As shown in Figure 2, total weighted emissions have remained broadly flat over the past 15 years, following a peak in 2007/2008, while the number of emissions reports has risen substantially. This divergence complicates interpretation, as stable aggregate emissions may conceal changes at the facility level.

To account for this, average emissions per report (total weighted emissions divided by the number of reports) is used as a proxy for facility-level emissions intensity. Figure 3 shows a clear downward trend, indicating that emissions per reporting entity have declined over time. Together, these findings point to improved environmental performance, consistent with the impact of regulatory, governmental, and societal pressures on Australian facilities.

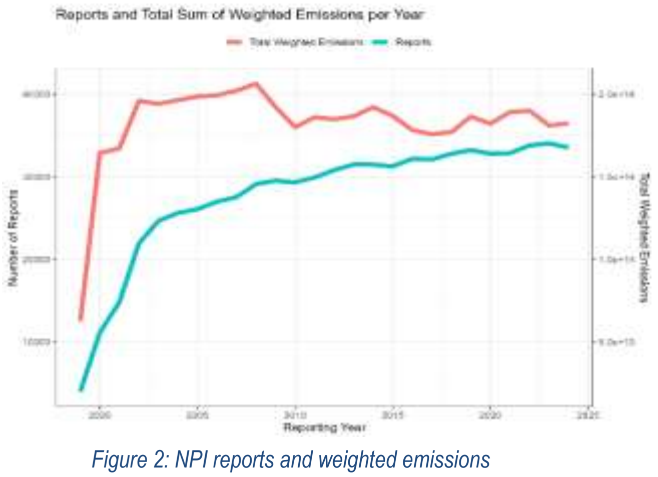


Figure 2: NPI reports and weighted emissions

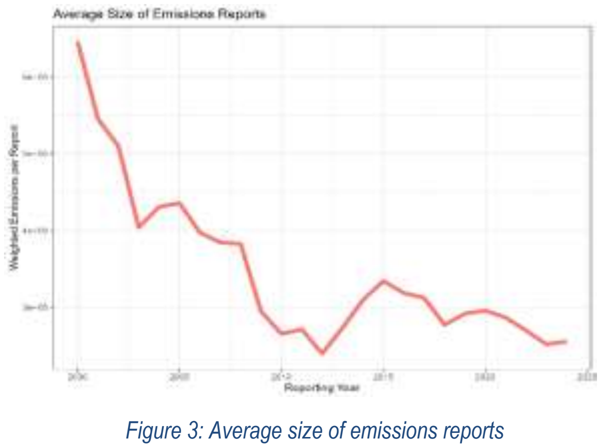


Figure 3: Average size of emissions reports

Breakdown by sector and state

The NPI dataset provides the ANZSIC for each report. Across the 19 reported sectors, emissions are highly concentrated, with Mining, Manufacturing, and Electricity, Gas, Water and Waste Services accounting for the largest shares. These sectors exhibit substantially higher emissions levels than others, as indicated by their consistently darker shading.

The distribution of toxic emissions also varies markedly across states and territories. Smaller states and territories contribute only a minimal share of national emissions, while Queensland, New South Wales, and Western Australia dominate overall emissions. Collectively, these three states account for approximately 80% of Australia's total emissions each year. Over the past decade in particular, Western Australia has driven an increasing share of emissions from the mining sector, with a clear upward trend.

Queensland records the highest overall contribution, accounting for an average of 32% of total emissions over the sample period. New South Wales and Victoria also feature prominently, particularly in the Electricity, Gas, Water and Waste Services sector. However, emissions from Victoria show a downward trend in recent years, potentially reflecting the closure of the Hazelwood power station in 2017—previously the most emissions-intensive facility in Australia—as well as a broader shift toward renewable energy generation.

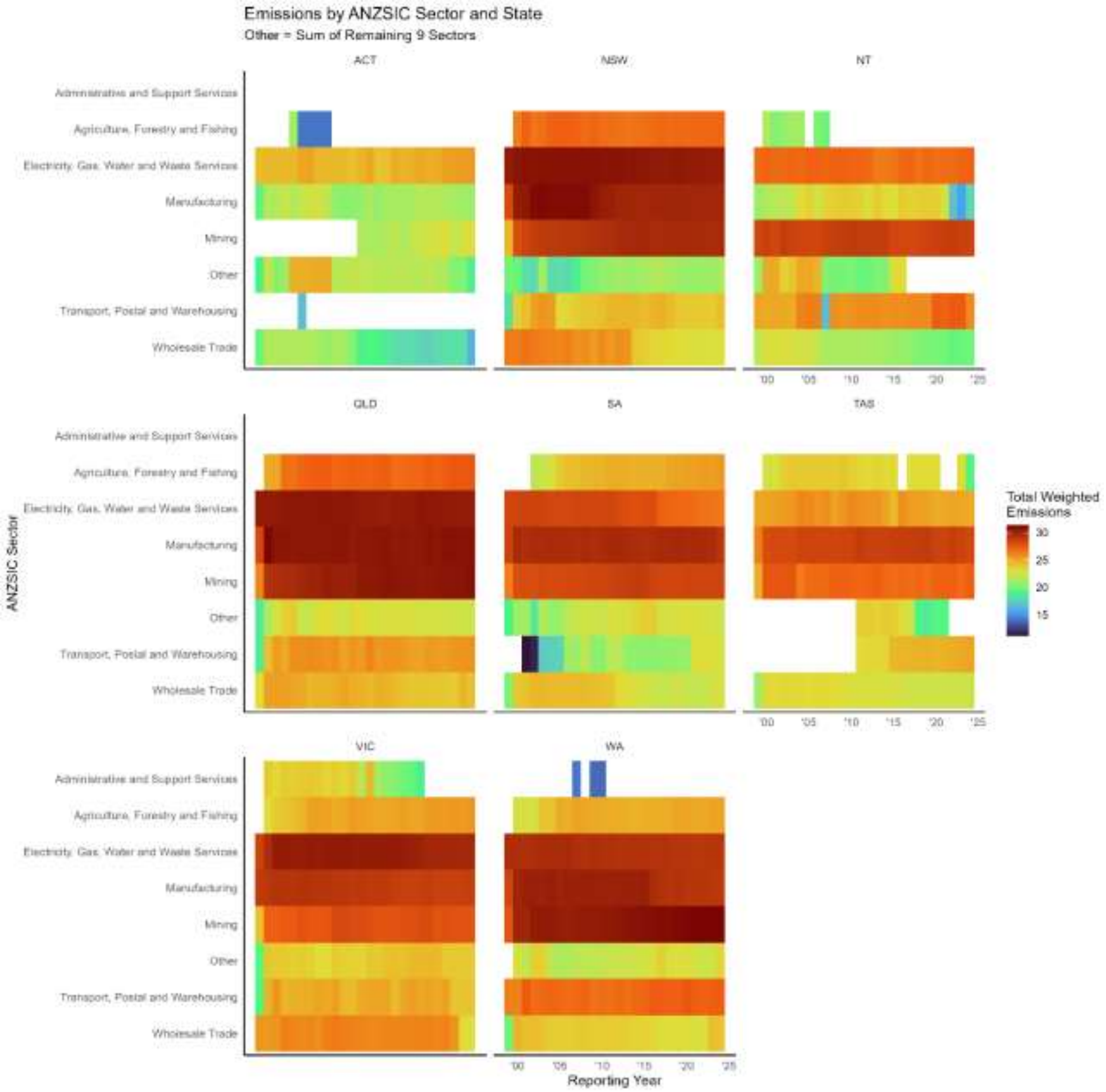


Figure 4: Breakdown of emissions by sector and state

Pollution within ASX200

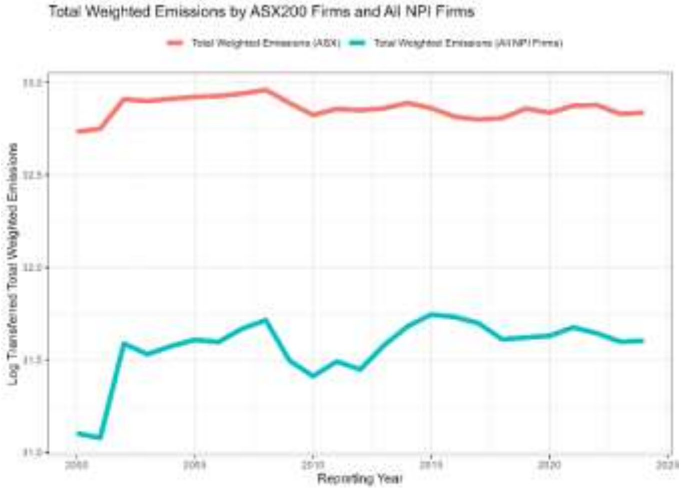


Figure 5: Total weighted emissions for ASX200 and NPI firms

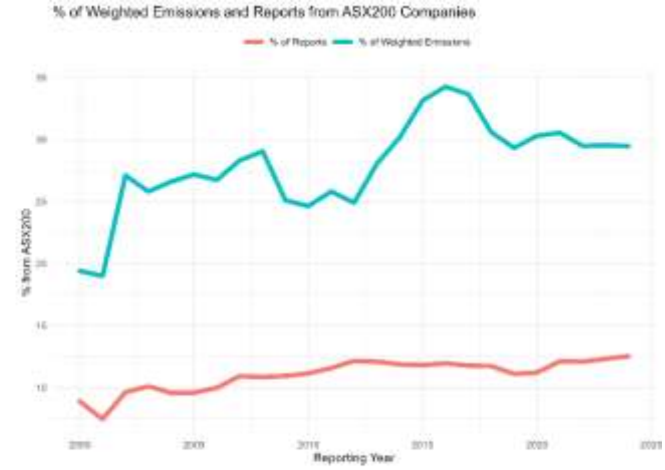


Figure 6: Proportion of Emissions and Reports

Narrowing the focus to ASX200-listed firms, Figure 5 shows that emissions from these firms follow a broadly similar trajectory to aggregate total toxicity-weighted emissions, remaining largely stagnant over the past five to ten years. Figure 6 plots the proportion of NPI reports submitted by ASX-listed firms alongside the share of total toxicity-weighted emissions they generate. The disproportionate contribution of 59 ASX200 firms peaked in 2015/2016, after which their share of total emissions exhibits a downward trend. By 2023/2024, these firms accounted for approximately 12.6% of all reports, yet were responsible for 29.5% of total emissions. This pattern is consistent with improvements in environmental performance among large listed firms, although other structural factors may also contribute to the observed decline.

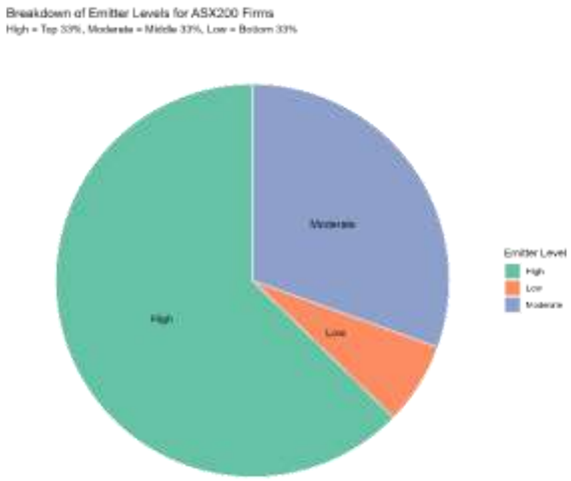


Figure 7: Breakdown of emitter levels for ASX200 firms by in-sample mean

Quantile-based classifications group the 59 ASX-listed firms into High, Moderate, and Low Emitters, averaging across the years. As shown in Figure 7, 37 firms are High Emitters, 18 Moderate, and 4 Low – consistent with expectations, as ASX200 firms are typically large-scale and concentrated at the upper end of the emissions distribution. Among the High Emitters, four firms stand out for persistently high toxicity-weighted emissions, reflecting a strong skew toward fossil fuel, mining, and manufacturing sectors. Encouragingly, emissions from these four firms trend downward over the sample period, indicating improving environmental performance.

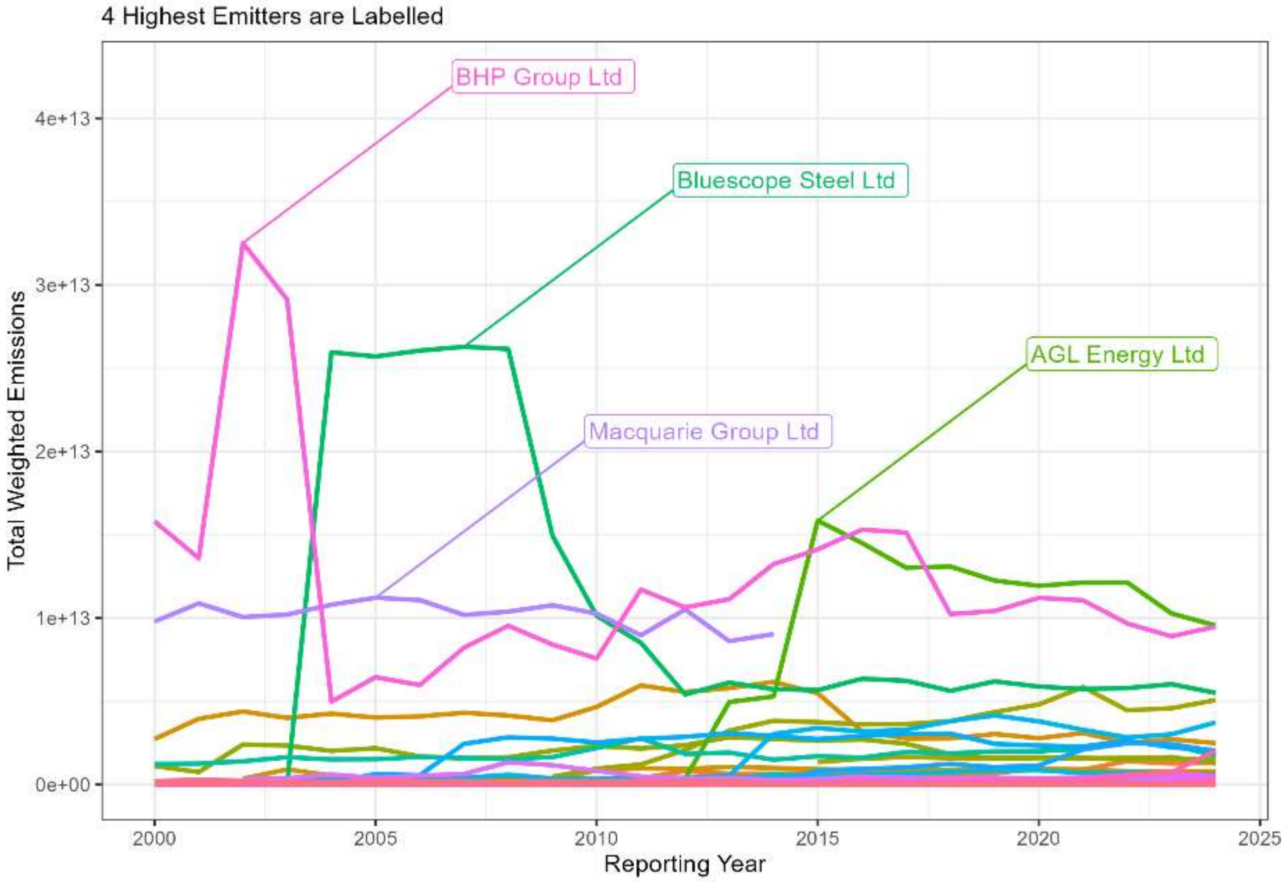


Figure 8: Total weighted emissions per year by 59 ASX200 firms

Emissions regression

To complement the descriptive visual analysis, I estimate a panel regression of the log transferred weighted emissions intensity, with the reporting year centred around 0:

$$\log(1 + emissions\_intensity_{it}) = \beta_0 + \beta_1 year_t + \alpha_i + \gamma_i year_t + \epsilon_{it}$$

Where $\alpha_i \sim N(0, \sigma_\alpha^2), \gamma_i \sim N(0, \sigma_\gamma^2), \epsilon_{it} \sim N(0, \sigma_\epsilon^2),\ N = 862$ (1)

Parameter	Coefficient
Year	-0.018 (0.034)
Intercept	15.943*** (0.516)
Firm FE	Yes
Firm random slope	Yes
Observations	781
Firms	57

Table 1: Regression estimates
*Note: Standard errors are presented in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01*

The coefficient on *Year* (−0.018, p > 0.10) is negative but statistically insignificant, indicating no evidence of a time trend in emissions intensity over the sample period. This suggests that emissions intensity has remained broadly stable, with no meaningful increase or decrease on average across firms.

To assess whether the largest contributors exhibit materially different emissions dynamics, I perform the following model:

$$\log(1 + emissions\_intensity_{it}) = \beta_0 + \beta_1 year_t + \beta_2 Moderate_{it} + \beta_3 High_{it} + \beta_5 year_t * Moderate_{it} + \beta_6 year_t * High_{it} + \alpha_i + \gamma_i year_t + \epsilon_{it} \quad (2)$$

where *High* and *Moderate* are indicator variables that take the value of one if the firm falls into the high or moderate emissions category, respectively, as determined by terciles of lagged emissions intensity.

Parameter	Coefficient
Year (Low emitters)	0.002 (0.032)
Moderate	1.278*** (0.162)
High	1.929*** (0.213)
Moderate*Year	-0.032* (0.020)
High*Year	-0.039 (0.025)
Intercept	15.279*** (0.418)
Firm FE	Yes
Firm random slope	Yes
Observations	724
Firms	54

Table 2: High/Moderate/Low emitters
*Note: Standard errors are presented in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01*

The coefficient on *Year* (0.002, p > 0.1) implies that low-emitting firms experience no statistically significant change in emissions intensity over time, indicating a largely stable emission profile for this group. Relative to low emitters, moderate and high emitters exhibit substantially higher baseline emissions, with coefficients of 1.278 and 1.929, respectively (p < 0.01), indicating economically large cross-sectional differences.

The interaction term *Moderate*Year* is negative and weakly significant (−0.032, p < 0.10), implying a modest decline in emissions intensity among moderate emitters relative to low emitters over time. In contrast, the insignificant coefficient on *High*Year* indicates no robust evidence of differential emissions intensity between high and low emitters over time.

Overall, the results provide limited evidence that firms are transitioning toward lower emissions intensity over time. While high- and moderate-emitting firms continue to exhibit higher emissions levels, there is only modest evidence of convergence, concentrated primarily among moderate emitters. High emitters do not display statistically significant reductions relative to low emitters. These findings suggest that meaningful emissions reduction is unlikely to be achieved through incremental improvements alone. Instead, substantial progress will likely require policies that address structural characteristics across firms and accelerate the pace of transition, particularly among the most emissions-intensive firms.

CONCLUSION

This brief examines emissions trends within the NPI, with a focus on ASX200 firms. Although aggregate pollution appears broadly stable despite increasing reporting, emissions remain structurally concentrated within heavy industries, particularly Mining, Manufacturing, and Electricity, Gas, Water and Waste Services.

59 ASX200 firms contribute disproportionately to national emissions, accounting for only 12.6% of total reports yet approximately 29.5% of total toxicity-weighted emissions. Regression results indicate no statistically significant overall time trend in emissions intensity, suggesting that emissions profiles have remained largely stable over the sample period. Furthermore, both high- and low-emitting firms show no evidence of meaningful reductions in emissions intensity, while

moderate-emitting firms exhibit a modest decline. This pattern suggests limited convergence and strong persistence in emissions behaviour. Taken together, these findings point to stabilisation among major contributors rather than substantive decarbonisation.

Pollution in Australia is disproportionately concentrated among a relatively small number of large firms and emissions-intensive sectors. The absence of sustained reductions suggests that current trends remain inconsistent with a net-zero transition. Accordingly, policy responses should move beyond uniform approaches and instead focus on addressing structural differences across firms, particularly by accelerating emissions reductions among high-emitting firms while also limiting growth among lower-emitting firms. Achieving sustained decarbonisation will require accountability across all emitters, with particular responsibility placed on major contributors given their disproportionate contribution to total emissions.

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APPENDIX A

A.1 Method for Calculating Weighted Emissions Values

To calculate the weighted values the method from the National Pollutant Inventory South Australia summary report 2006 07 was adapted. The idea is to multiply the emissions by the risk score which drastically increases the scale of more dangerous emissions. The SA report uses only the environmental hazard score (0 to 3), but this brief used the full risk score (0 to 18). These scores were sourced from the National Pollution Inventory Technical Advisory Panel (1999). Following the SA report, these scores were linearly transformed from the scale of 0 to 18 to 0.1 to 100,000. This was conducted using the following linear transformation:

$$NPI\_Risk\_Score\_Scaled = NPI\_Risk\_Score * 5{,}555.55 + 0.1 \quad (3)$$

For each observation, the size of emissions (kg) was multiplied by this scaled risk score of that substance to get the final weighted emissions value:

$$Weighted\_Emission = NPI\_Risk\_Score\_Scaled * Emission \quad (4)$$

These scores can now be added together freely; however, the meaning of an individual value is arbitrary. Thus, the trend overtime and comparisons between firms is what gives the values significance.

A.2 Additional Tables

State/Territory	Average Proportion of Weighted Emissions
Queensland	32.3%
New South Wales	25.0%
Western Australia	22.3%
Victoria	10.4%
South Australia	6.31%
Northern Territory	1.97%
Tasmania	1.65%
Australian Capital Territory	0.000230%

Table A1: Proportion of weighted emissions by state (Averaged over 2000-2024)

Primary ANZSIC Class	Number of Reports 2000-2024	First Reported
Oil and Gas Extraction	17818	1999/2000
Coal Mining	6953	1999/2000
Fossil Fuel Electricity Generation	5515	1999/2000
Gold Ore Mining	5474	1999/2000
Iron Ore Mining	5406	1999/2000
Other Petroleum and Coal Product Manufacturing	3229	2005/2006
Mineral Sand Mining	3166	2001/2002
Port and Water Transport Terminal Operations	2906	1999/2000
Alumina Production	2074	1999/2000
Iron Smelting and Steel Manufacturing	1657	1999/2000

Table A2: Top 10 ANZSIC classes for reports in the ASX200

Organisations	Total Weighted Emissions	Number of Reports
ASX Listed	5.31e+13	4211
Total	1.80e+14	33546

Table A3: Emissions and reports 2024 – ASX and Total

Further information

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