The air pollution reporting gap: Evidence from 1,000 organizations across high-emitting sectors

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Contents

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Introduction

Air pollution is among the most significant and persistent sustainability impact areas globally. However, the disclosure of air pollutants in corporate sustainability reporting remains fragmented and uneven. While frameworks such as the Global Reporting Initiative's (GRI) provide structured guidance on air emissions, reporting on these pollutants has not achieved the same level of institutionalization as greenhouse gas accounting. Against this backdrop, this study examines how large, publicly listed companies across eight emissions-intensive sectors report on air pollutants. The analysis aims to determine the extent to which organizations quantify and disclose such pollutants, how these disclosures relate to the use of *GRI 305: Emissions 2016* Disclosure 305-7 (GRI 305-7), and what these patterns reveal about the maturity and coverage of air-quality-related reporting practices.

To answer these questions, the study integrates quantitative text analysis with qualitative coding of corporate sustainability and annual reports from the 2023-2024 reporting year. Using automated keyword searches and contextual review, the analysis distinguishes between *mentions* of pollutants (narrative or policy references without quantitative data) and *disclosures*, in which a pollutant appears alongside an emissions value. The sample comprises 1,000 publicly listed firms, evenly distributed across eight sectors with known air pollution profiles, and includes both GRI and non-GRI reporters.

The findings presented in later sections show that nitrogen oxides and sulfur oxides dominate reporting across the sample, while other pollutants such as particulate matter, volatile organic compounds, hazardous air pollutants, and persistent organic pollutants appear far less frequently. Further analysis indicates that GRI adherence positively influences disclosure: firms not using GRI reported an average of 0.46 pollutants, those referencing GRI without formal use reported 1.14 pollutants, and those using GRI formally reported 1.61 pollutants. We also empirically assessed whether referencing GRI 305-7 serves as a reliable proxy for air pollutant disclosure quality by mapping the gaps between narrative commitment and quantitative transparency.

The paper proceeds as follows: the methodology section describes the sampling strategy, data collection and coding, and the way the study characterized mentions and disclosures separately. The analysis and results section describes the findings across the sample and provides sector-specific analysis. The paper concludes with a discussion of the main findings, the research limitations, and pathways for future research.

Methodology

Sampling strategy

The analysis draws on a sample of 1,000 publicly listed firms in sectors with documented links to air pollutant emissions. These sectors are agriculture, pharmaceuticals, transport, construction, metals processing, construction materials, chemicals, and mining. To ensure representation across sectors, the sample was structured into eight equal-sized groups, with 125 organizations selected per sector. Companies were selected from GRI's internal database, which includes all publicly traded companies worldwide with revenues over $250 million (over 15,000 companies).

GRI applied a market capitalization-based selection criterion to identify the 125 highest-valued publicly traded firms within each sector. This logic is based on two assumptions. First, large, highly valued firms face greater stakeholder and regulatory scrutiny, and therefore, tend to be agenda-setting actors in corporate sustainability reporting practices. The sample, therefore, reflects the reporting practices of sector-leading organizations, under the assumption that these entities play a formative role in shaping reporting norms within their sectors. Second, these firms are more likely to publish sustainability reports, and expanding the sample size beyond the top rank would not likely have resulted in a higher report count.

The final sample comprises large, publicly listed companies. The median revenue is $3.3 billion, ranging from a maximum of $29 billion to a minimum of $144 million. Only in agriculture, and to a limited extent in mining and metal processing, did the revenue of the smallest companies drop below $1 billion.

The GRI database includes standardized identifiers, financial data, The Refinitiv Business Classification (TRBC) the Global Industry Classification Standard (GICS), and high-level sustainability reporting data, which enabled systematic screening and extraction of firms that meet the criteria described above, as well as some of the analysis included in this paper.

Inclusion in the sample did not depend on the availability of a sustainability report or equivalent environmental disclosure for the period under review. Firms were retained regardless of reporting availability because the absence of a published report among sector leaders in emissions-intensive industries is also meaningful to this paper's research question. Reporting availability was therefore recorded as an observed characteristic and treated analytically, rather than as a precondition for selection.

The sample covers a broad range of countries, with the largest concentration in East Asia, Europe, and North America. More than a quarter of the companies come from China, reflecting the dominant position of Chinese companies in construction and heavy manufacturing sectors, as well as in pharma. Southeast Asia, South Asia, Latin America, and Africa are also represented (See Table 1).

Table 1. Sample coverage by region

Region or country	Number of companies
East Asia	467
China	274
Japan	117
Europe	176
North America	133
Southeastern Asia	69
Central & South America	41
South Asia	37
Oceania	27
Western Asia / Middle East	29
Africa	19
Central Asia	2
Total	**1000**

Definitions of pollutants

Nitrogen oxide is a reddish-brown, oxidant gas that forms from nitric oxide in air, reacts with water to produce nitric acid, absorbs visible radiation, regulates atmospheric oxidizing capacity, drives ozone formation, and undergoes further transformations that generate secondary pollutants such as nitrate and sulfate particles [1]. Nitrogen oxides are commonly emitted from high-temperature combustion processes, including motor vehicles, power generation, industrial boilers, and other fossil-fuel combustion or extraction activities.

Sulfur oxides are colorless, water-soluble gases formed during the combustion of sulfur-containing fuels, which oxidize in the atmosphere to produce sulfurous and sulfuric acids and subsequently contribute to the formation of bisulfates, sulfates, and fine particulate matter [1]. Sulfur dioxide, the most common form of sulfur oxides, is commonly emitted from fossil-fuel combustion in power plants, industrial processes, metal extraction and smelting, petroleum refining, and the burning of coal or oil for heating in urban and industrial areas.

Particulate matter (PM) is a mixture of solid and liquid particles suspended in air, formed both directly from combustion, dust, and other primary sources, and secondarily through atmospheric chemical reactions that generate inorganic nitrates, sulfates, and organic compounds contributing to PM2.5 and PM10 [1]. Particulate matter is commonly emitted from fossil-fuel combustion, vehicle exhaust, industrial processes, construction activities, biomass burning, and natural sources such as dust and wildfires, with additional secondary formation from gaseous precursors like sulfur dioxide, nitrogen oxides, ammonia, and volatile organic compounds.

Volatile organic compounds (VOC) are organic chemicals emitted as gases from various combustion and non-combustion sources, including consumer products and building materials, which participate in atmospheric photochemical reactions that contribute to ozone and secondary pollutant formation [1]. VOCs are commonly released from vehicle exhaust, industrial processes, petroleum handling, solvent use, paints, cleaning products, pesticides, and some building materials.

Hazardous air pollutants (HAPs) are air contaminants known or suspected to cause cancer or other adverse human health effects, such as reproductive harm or congenital disabilities, and negative environmental impacts [2]. HAPs are commonly emitted from industrial facilities such as chemical plants, refineries, and waste incinerators.

Persistent organic pollutants (POPs) are toxic chemicals that resist degradation, bioaccumulate, and are transported across international boundaries through air, water, and migratory species [3]. POPs are often released through the production, use, and disposal of certain pesticides and industrial chemicals, as well as through combustion, chemical manufacturing, waste handling, and other processes that generate these long-lived organic compounds.

Data collection and coding

For each of the 1,000 firms in the sample, we collected sustainability or annual reports for the 2023-2024 reporting year. Reports were identified from GRI's internal database described above.

The research excluded GRI content indices from the report sample because the intention was to analyse how air pollution is discussed and disclosed within the narrative and data sections of reports. Content indices often indicate alignment with a framework without ensuring corresponding substantive disclosure in the report's main body. By focusing on the report, the analysis determines whether actual, measurable, or metric disclosures occur within the text. Nevertheless, the presence or absence of GRI 305-7 was recorded as a baseline indicator of whether a firm signals coverage of air pollution, even if, as we will see in the following section, using GRI 305-7 is not always indicative of actual disclosure of emissions data.

After collecting the pool of sustainability reports, we used R to perform initial keyword-based text filtering and search. This step aimed to identify occurrences of pollution-related terminology across reports. The search included all the pollutants named in GRI 305-7a, specifically:

- Nitrogen oxides
- Sulfur oxides
- Particulate matter
- Volatile organic compounds
- Hazardous air pollutants
- Persistent organic pollutants

Mention or disclosure characterization

Following the initial automated text search, GRI conducted a systematic contextual coding technique to differentiate between *mentions* of air pollutants and actual *disclosures* of emissions values. This step was necessary because the presence of pollutant-related language in a report does not, in itself, indicate that an organization has provided quantitative emissions data.

To perform this contextual analysis, we used ATLAS.ti, a qualitative text analysis software that facilitates the structured examination, coding, and comparison of textual material. ATLAS.ti was used to review the sentences and paragraphs surrounding each occurrence of the pollutant keywords identified during the automated screening stage. The purpose of this review was to determine whether the reference constituted:

1. **A mention:** a descriptive or narrative statement about a pollutant, emissions policy, mitigation commitment, operational process, or regulatory compliance positioning, without any associated quantitative metric; or
2. **A disclosure:** a statement in which a named pollutant was accompanied by a numerical emissions value, such as mass emitted, concentration, emissions intensity, or normalized emissions per unit of output or land area.

In practice, a reference was coded as a disclosure only when a pollutant and a numeric value appeared together in a meaningful reporting context (e.g., X metric tons of nitrogen oxide emissions per production unit). If the pollutant appeared in narrative text without such a value (e.g., the company seeks to reduce sulfur oxide emissions through operational improvements), it was coded as a mention without disclosure.

This distinction is central to the analysis that follows. Across sectors, the research observed that while mentions of pollutants are relatively common, quantitative disclosures are significantly less frequent. In other words, many organizations describe their air emissions qualitatively, but only a smaller subset reports measurable emission values that would allow verification, comparison, or trend analysis.

The variation between mentions and disclosures is explored in detail in the next section, where cross-sample and sector-specific patterns are illustrated using bar charts.

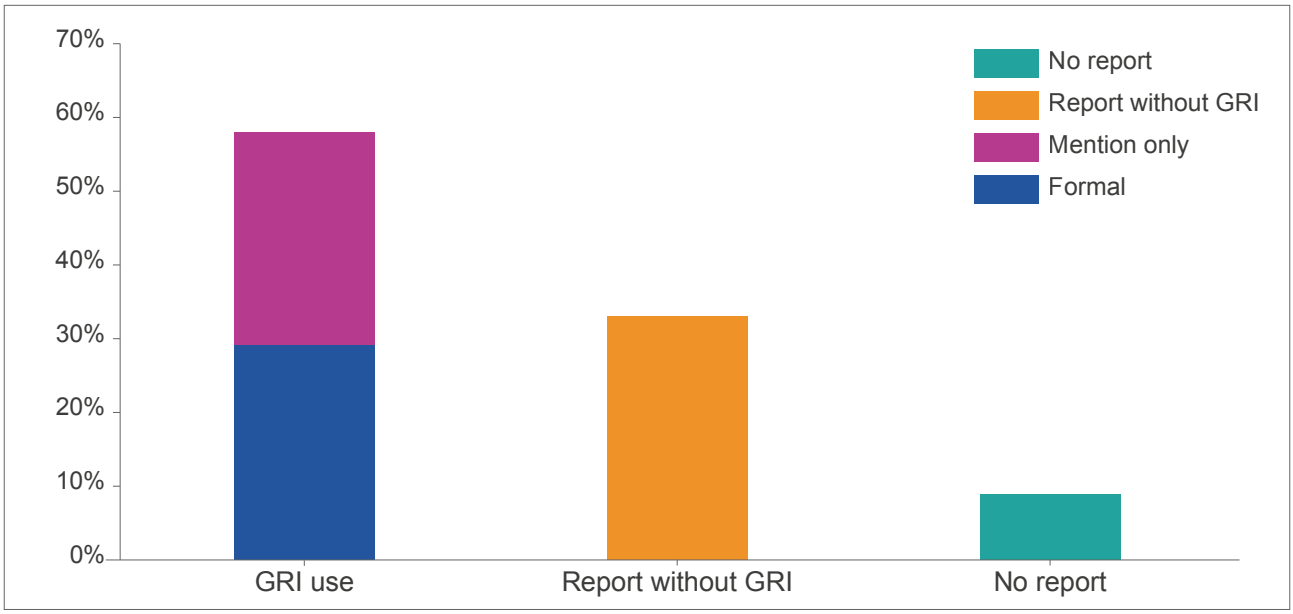
Analysis and results

Sustainability reporting

Across the full sample of 1,000 organizations, 915 firms (91.5%) produced a sustainability or annual report during the 2023-2024 reporting period. This indicates a high prevalence of corporate reporting practices among the largest publicly listed companies in the sectors examined.

57% of the 1,000 organizations analysed used GRI in their reports, although only about half published a GRI content index or included a formal statement of use in their reports. A further 34% published a sustainability report without using the GRI Standards (See Chart 1).

Chart 1. GRI use levels in the sample



The commitment to sustainability reporting in general, and to using the GRI Standards in particular, varies across the eight sectors analyzed, being highest in the chemicals, mining, and transport sectors and lowest in metal processing, agriculture, and construction materials (see Table 2).

Table 2. The use of the GRI Standards across sectors

	GRI formal reporting	GRI mentioning only	Report without GRI	No Report
Agriculture	26%	21%	38%	15%
Chemicals	39%	30%	28%	2%
Construction	26%	33%	36%	5%
Construction materials	29%	26%	32%	14%
Metal processing	18%	26%	40%	17%
Mining	34%	35%	28%	3%
Pharmaceuticals	23%	27%	42%	7%
Transport	34%	30%	30%	5%

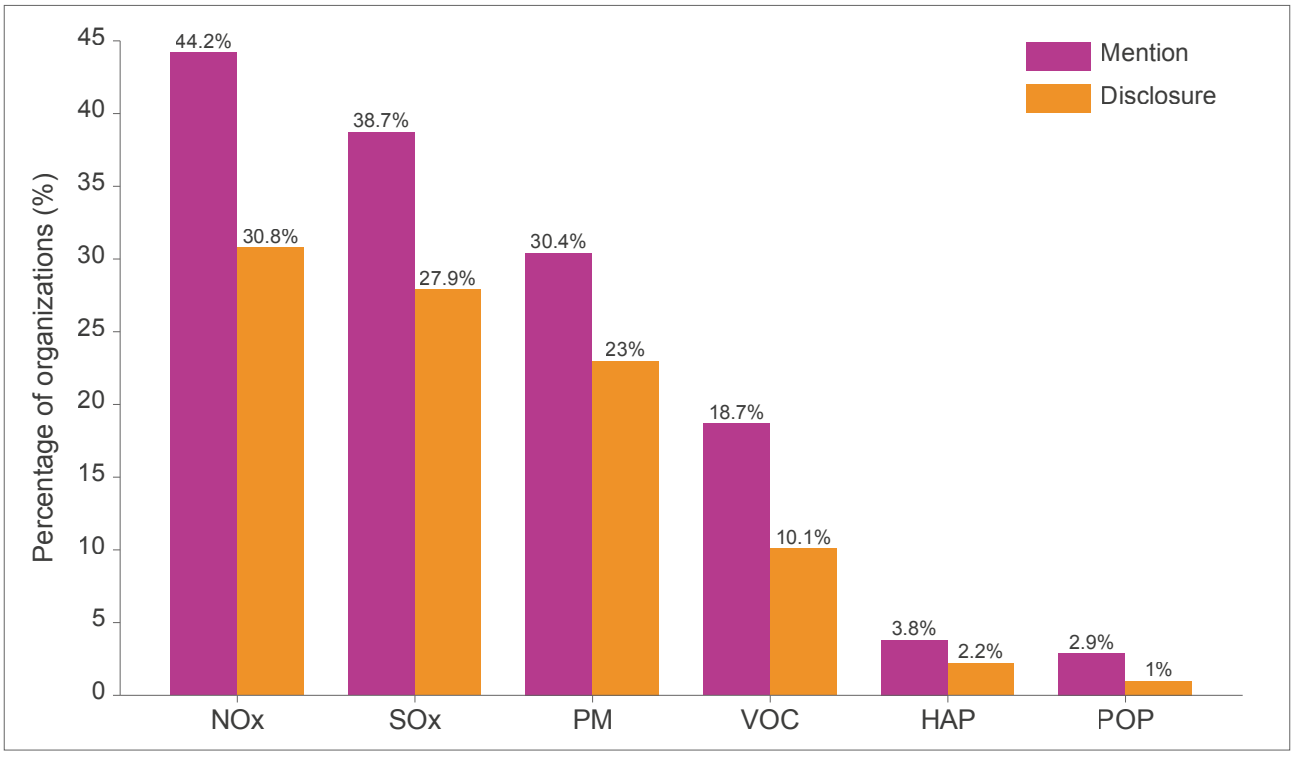
Using the GRI Standards can be understood as a signal of reporting effort and commitment to transparency. Across the 1,000 companies analyzed here, the research observed that those not using GRI reported an average of 0.46 pollutants; those using the GRI Standards informally reported an average of 1.14 pollutants; and those using the GRI Standards formally reported an average of 1.61 pollutants.

While using the GRI Standards generally improves reporting on air pollution, this study shows that the relationship is not linear and that many reporters do not use the relevant disclosures to their full potential. Among the organizations studied that used GRI, 43% used GRI 305-7 on nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions, indicating that more than half of reporters in these high-polluting sectors were not treating air pollution as a material topic.

Pollution reporting across sectors

Chart 2 summarizes the proportion of organizations that mentioned and quantitatively disclosed pollutants within their reports. The analysis shows that mentions are consistently more common than disclosures across all pollutants. The difference is most apparent for NOx, SOx, and PM, where 30-44% of organizations reference these pollutants, but a smaller subset (23-31%) provides associated numerical emissions values.

Chart 2. Air pollution mentions and disclosures breakdown for the entire sample



Reporting levels for VOC emissions continue to decline: fewer than 20% of organizations mention VOCs, and only about 10% report quantitative data. The pattern becomes particularly pronounced for HAP and POP, which are rarely mentioned (3.8% and 2.9%, respectively) and are disclosed even less frequently (2.2% and 1.0%, respectively). In other words, while a majority of firms acknowledge air emissions in general terms, pollutant-specific quantification remains relatively limited.

Taken together, these patterns indicate that the disclosure of air pollutants is both selective and uneven across pollutant categories. While the information does not reveal the underlying reasons for these differences directly, several plausible explanations can be considered. The pollutants with higher reporting rates in this sample (NOx, SOx, and PM) are also those most frequently referenced in common environmental reporting frameworks and regulatory air quality inventories[1]. These pollutants are widely recognized in discussions of air emissions and are more routinely monitored in operational settings, which could make their inclusion in reporting more straightforward.

In contrast, pollutants such as VOCs, HAPs, and POPs may require more specialized measurement approaches or may be relevant only to certain industrial processes. As a result, even when these pollutants are mentioned qualitatively, organizations may not provide quantitative disclosures, either because such information is not readily available, not standardized across operations, or not prioritized within reporting practices. It is also possible that differences in stakeholder attention play a role, with some pollutants attracting more public or regulatory visibility than others, which could influence the likelihood of their disclosure. However, the data here did not allow the research to draw conclusions about the relative influence of regulation, monitoring systems, or external expectations. However, these baseline observations frame the sector-level analysis, where similar variation appears, though in different configurations depending on the sectoral context.

Table 3 shows the percentage of companies analyzed that report on each pollutant, indicating that the order of preference for the pollutants shown in the previous figures holds across all sectors. The next section will develop a sector-specific analysis.

Table 3. Heat map of disclosure frequency across pollutants and sectors

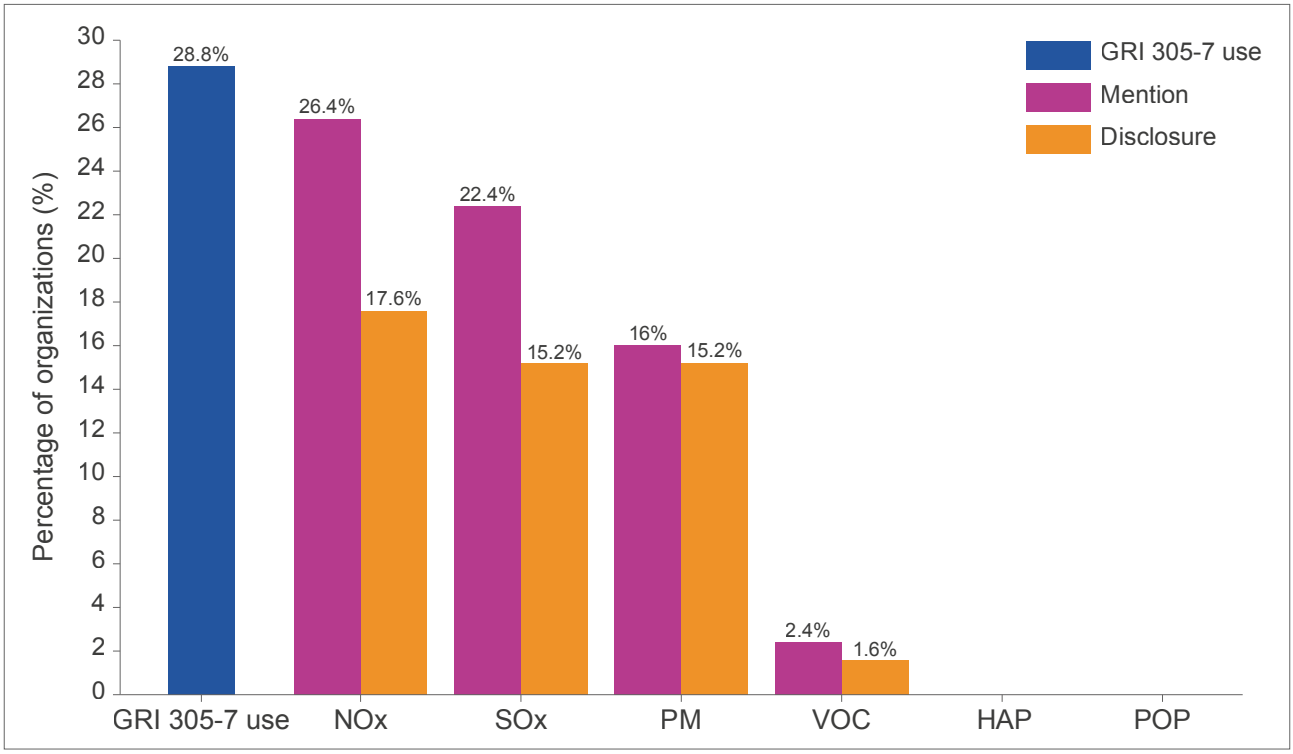
Sector	Nox	Sox	PM	VOC	HAP	POP
Agriculture	18%	15%	15%	2%	0%	0%
Chemicals	42%	38%	21%	27%	10%	4%
Construction	24%	18%	17%	6%	0%	0%
Construction materials	53%	42%	40%	7%	2%	2%
Metal processing	30%	27%	23%	7%	2%	0%
Mining	38%	38%	31%	18%	5%	4%
Pharma	24%	21%	15%	10%	0%	0%
Transport	30%	23%	22%	5%	0%	0%

Analysis by sector

Agriculture

Turning to the agriculture sector (n = 125), the first bar in the chart represents the proportion of organizations that reference GRI 305-7 in their reporting. In this sector, approximately 29% of firms report using this disclosure. We use this figure as a contextual reference point rather than as evidence of pollutant reporting itself, since the presence of 305-7 does not necessarily entail the disclosure of quantitative emissions data in the body of the report.

Chart 3. Air pollution mentions, disclosures, and GRI 305-7 referencing in agriculture



When examining disclosures on specific pollutants, the study reveals a pattern similar to that of the overall sample, though at substantially lower levels. NOx and SOx are the pollutants most frequently mentioned by agriculture companies. For PM, both mention rates fall further, though there is a minimal drop-off from mentions to disclosures. Reporting drops off considerably and is virtually non-existent for the remaining pollutants.

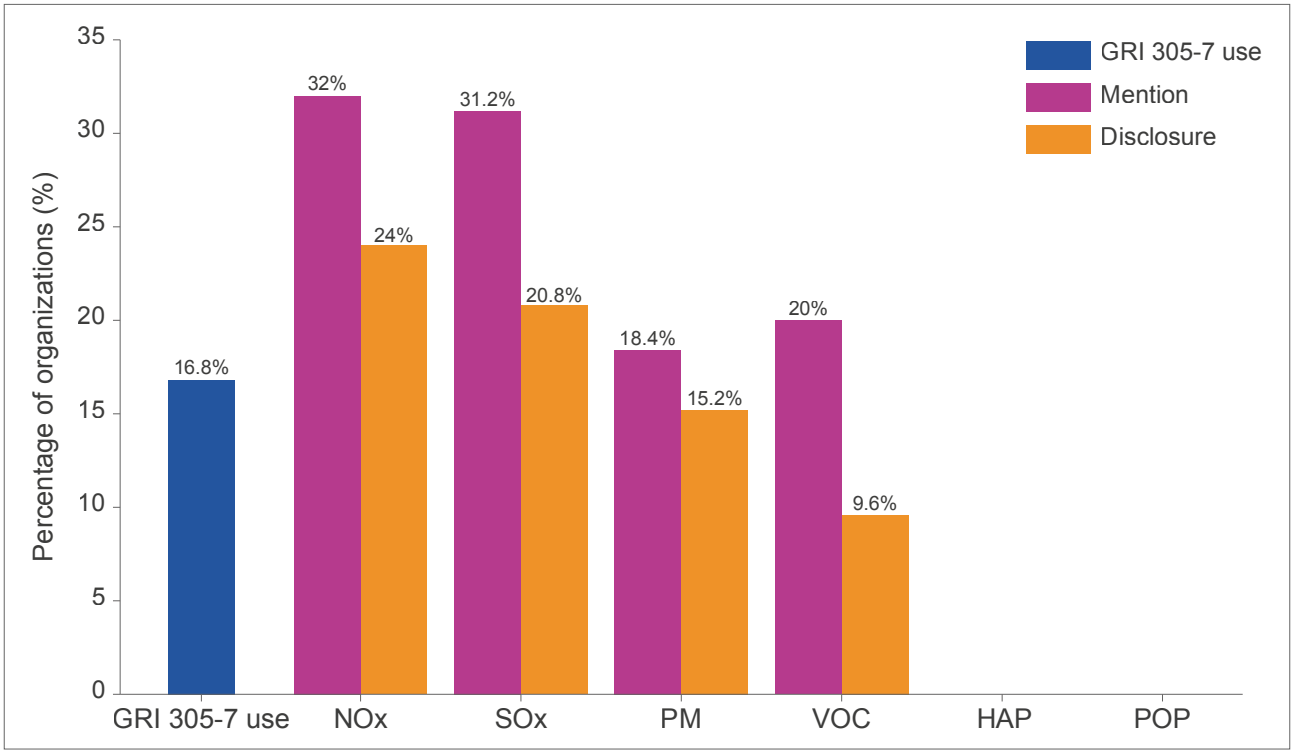
Overall, the pattern in agriculture reflects a selective, limited approach to reporting air pollutants. Some firms reference GRI 305-7, and a subset provides pollutant-specific values, primarily for NOx, SOx, and, to a lesser extent, PM. However, reporting is not comprehensive and does not cover all pollutant categories.

The analysis did not evaluate materiality assessments or the specific reasons for omissions within individual reporting contexts. It is possible that some pollutants in the latter half of the spectrum are not relevant to certain operations within this sector. However, the absence of HAP and POP reporting appears consistent across the full sample, not only in agriculture, suggesting broader patterns in how these pollutants are addressed in corporate reporting rather than sector-specific omission alone.

Pharmaceuticals

In the pharmaceuticals sector (n = 125), approximately 17% of organizations report using GRI 305-7. However, when looking at actual pollutant reporting patterns, the study shows a different relationship than in agriculture. Here, the reporting of certain pollutants exceeds the rate of 305-7 referencing, suggesting that some firms disclose emissions data without explicitly linking this to the GRI framework.

Chart 4. Air pollution mentions, disclosures, and GRI 305-7 referencing in pharmaceuticals



The distinction between mention and disclosure persists, but overall reporting levels for these pollutants are notably higher than those observed in agriculture.

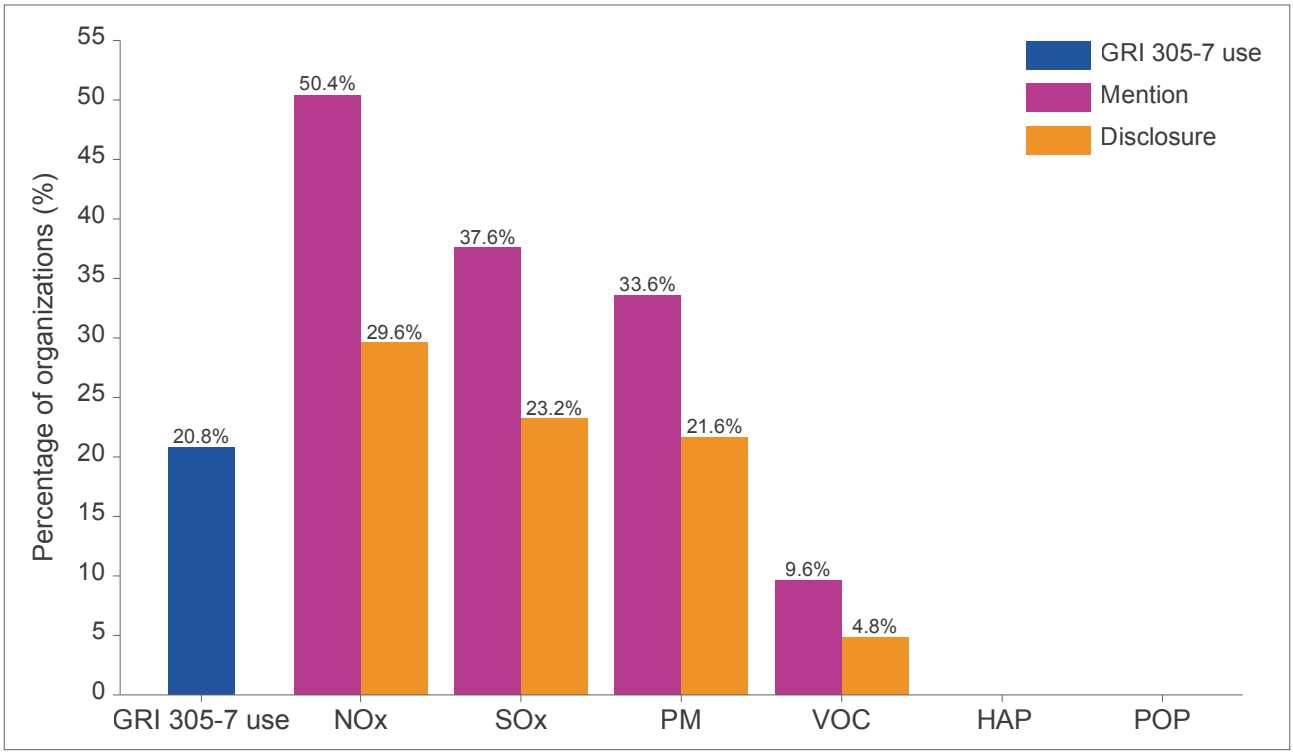
Another point of distinction in this sector is the prevalence of reporting on VOC emissions: approximately 20% of firms report them, though only about 10% provide quantitative data. While we cannot determine underlying motivations from this dataset alone, this pattern may indicate that VOCs are acknowledged as relevant to sector activities, even though quantitative reporting is less developed. The gap between narrative reference and measurement could reflect an early stage of reporting practice where the pollutant is recognized, but disclosure systems are not yet consistently in place.

As with the agriculture sector, reporting on HAPs and POPs is absent in this sample. We do not observe mentions or disclosures for either pollutant category among the pharmaceutical companies reviewed. As noted earlier, the study does not assess firm-level materiality determinations, and these pollutants may be absent from the operational profiles of many firms in this sector. However, the same pattern is observed across sectors, suggesting that these pollutant categories are generally underrepresented in corporate reporting.

Transport

In the transport sector, (n = 125) approximately 21% of organizations reference GRI 305-7 in their reporting. However, in this sector, the gap between GRI 305-7 use and actual pollutant reporting is more pronounced than in either agriculture or pharmaceuticals.

Chart 5. Air pollution mentions, disclosures, and GRI 305-7 referencing in transport



NOx and SOx are the most widely reported pollutants in this sector, and they appear at notably higher rates than the proportion of firms referencing GRI 305-7. However, fewer than 30% of organizations provide quantitative disclosure values for these pollutants. This means that while many transport firms acknowledge these emissions, fewer provide measurable emissions data that could support comparison or trend analysis.

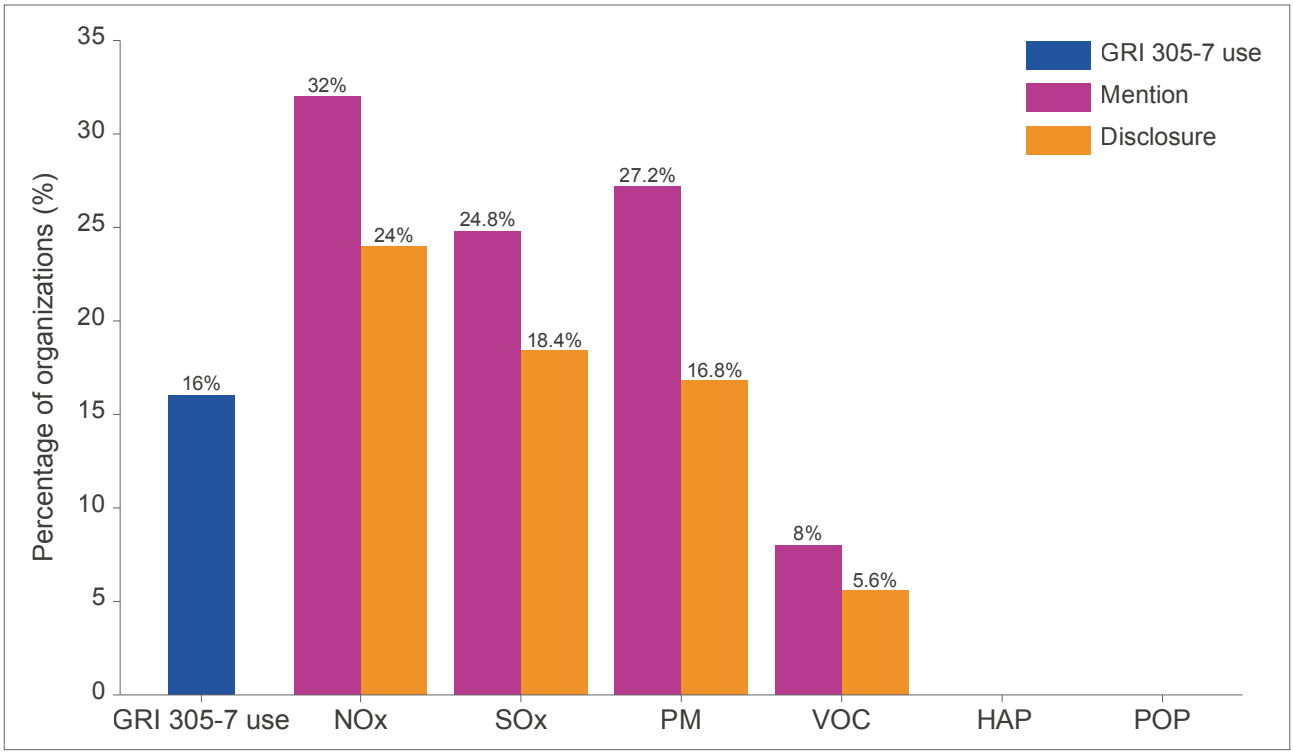
This pattern may indicate that organizations within this subset are responsive to the visibility of these emissions, but that routine measurement or reporting systems are not uniformly established at the organization level. In other words, the recognition of NOx and SOx as relevant appears to outpace the consistent reporting of quantified emissions values.

The study also observed modest reporting on VOCs. A qualitative review of the underlying report excerpts suggests that VOC discussions are often tied to specific fuel or gas uses associated with particular vehicle types or operational contexts, rather than being framed at the organization level.

Construction

In the construction sector, (n = 125) approximately 16% of organizations reference GRI 305-7 in their reporting. The gap between GRI 305-7 use and actual pollutant reporting remains substantial.

Chart 6. Air pollution mentions, disclosures, and GRI 305-7 referencing in construction

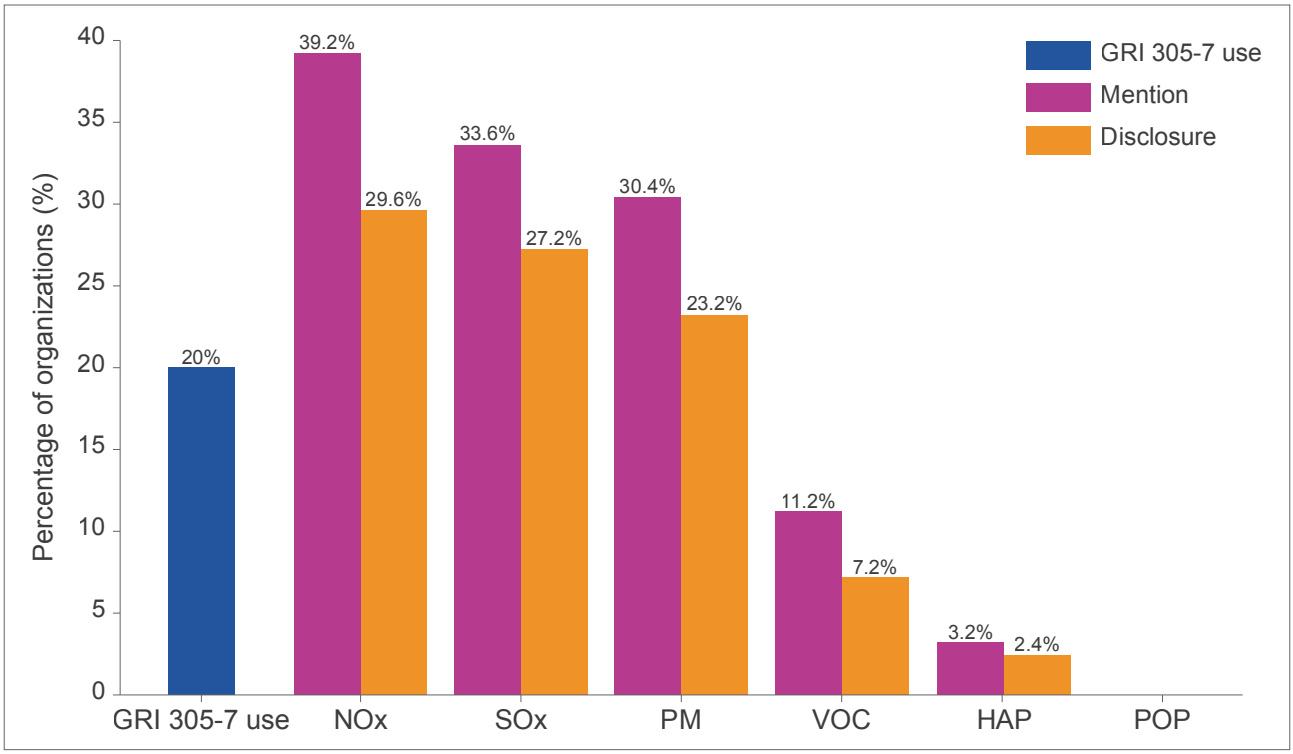


The reporting levels seen in the construction subset are similar to those observed in pharmaceuticals and transport. However, in construction, the gap between mentions and disclosures is somewhat narrower, suggesting that when pollutants are acknowledged, disclosure is more likely to follow than in sectors where emissions are discussed at a higher level of abstraction (as in agriculture). Among the pollutants in this sector, PM shows a more moderate difference between mention and disclosure, suggesting that firms may have somewhat more established data availability or reporting conventions for particulate emissions.

Metals processing

In the metals processing sector (n = 125), 20% of organizations reference GRI 305-7 in their reporting. The subset of organizations in this sector shows substantially lower rates of GRI 305-7 use than mentions of pollutants such as NOx, SOx, and PM.

Chart 7. Air pollution mentions, disclosures, and GRI 305-7 referencing in construction

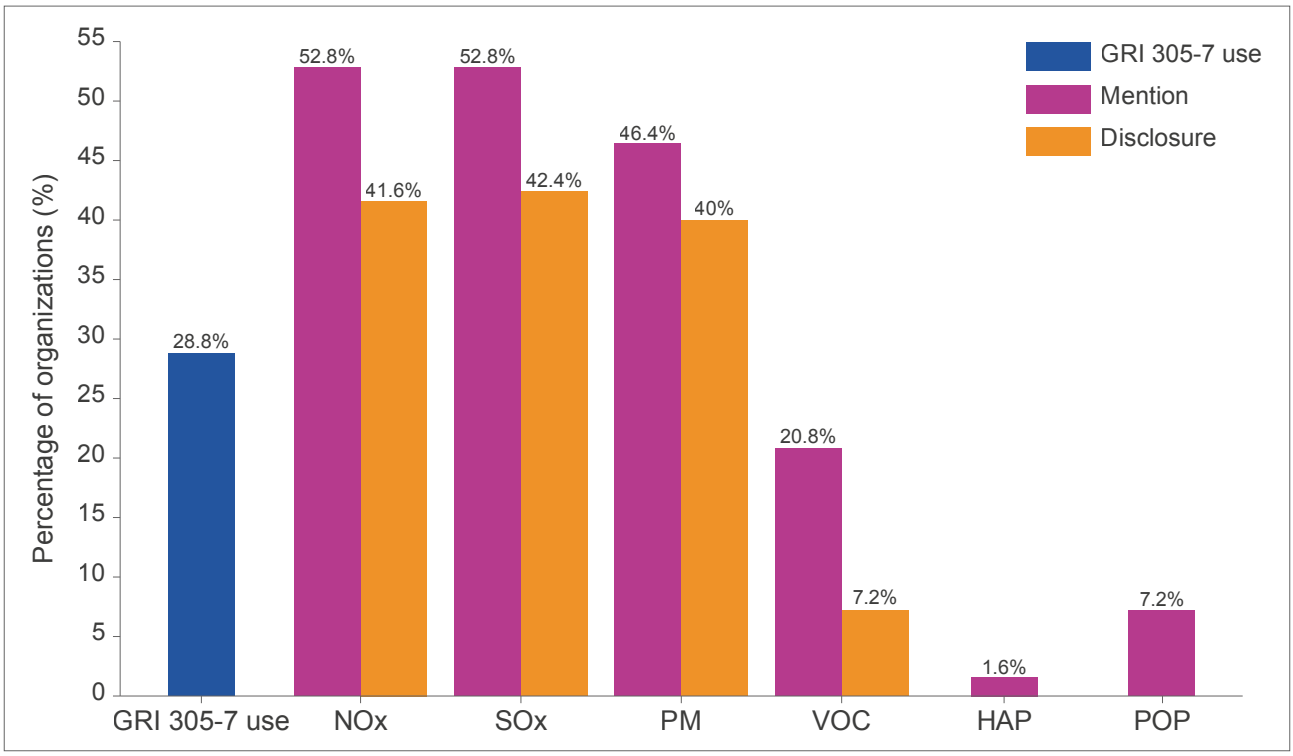


NOx, SOx, and PM are the pollutants most consistently discussed in this sector. Reporting on VOCs is low: only 11% of firms mention VOCs, and 7% disclose emissions values. This suggests that while VOCs may be relevant to certain production or energy use processes in the sector, quantitative reporting is comparatively low.

Construction materials

In the construction materials sector (n = 125), nearly 30% of organizations reference GRI 305-7 in their reporting. This baseline reference point places the sector at the upper end of the first group of sectors previously discussed. However, what is notable in this case is that the actual reporting patterns exceed what might be expected from the 305-7 reference rate alone, particularly for the most commonly reported pollutants.

Chart 8. Air pollution mentions, disclosures, and GRI 305-7 referencing in construction materials



NOx, SOx, and PM are reported at substantially higher and more consistent rates in this sector than in metals processing, despite both sectors being associated with energy-and heat-intensive manufacturing processes.

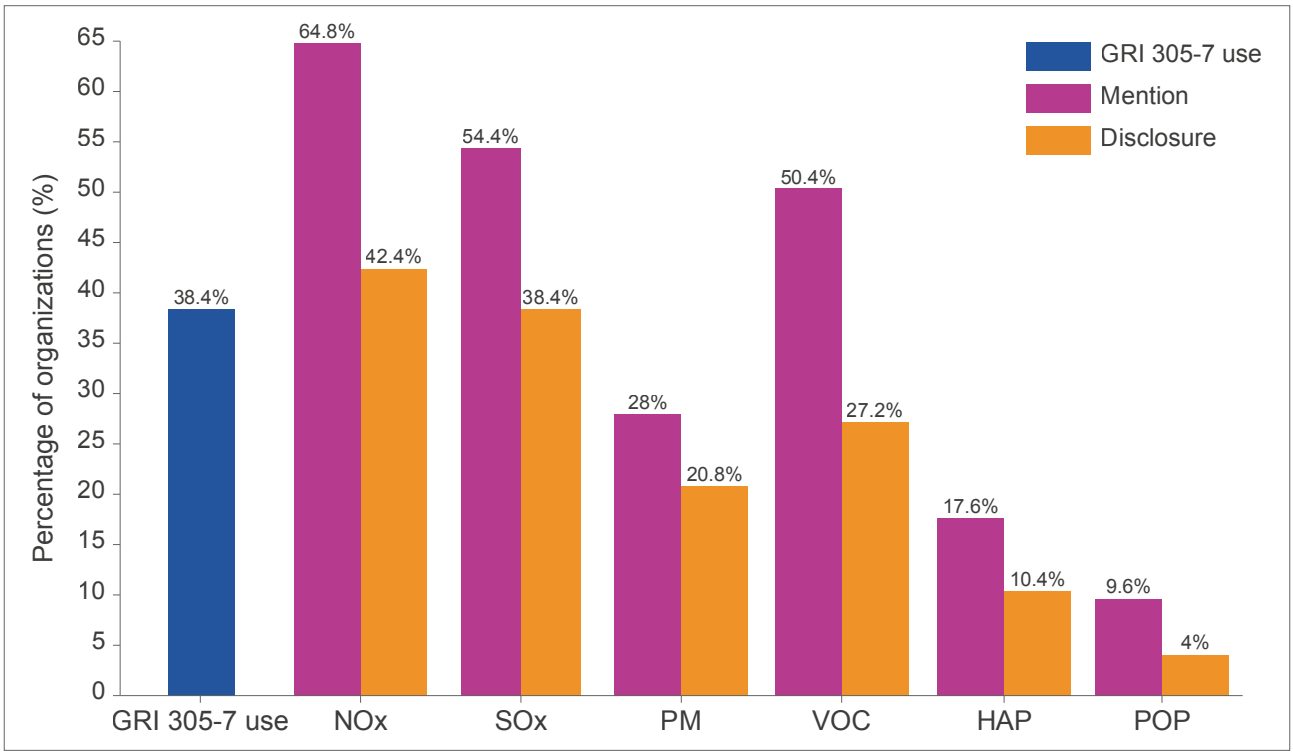
Not only are the overall reporting levels higher than in the preceding sectors, but the gap between mention and disclosure is the smallest observed across all eight sectors in this study. In other words, when construction materials firms acknowledge a pollutant, they are also most likely to disclose quantitative information. This suggests that reporting practices for these pollutants may be relatively well integrated into sustainability reporting within the sector, at least for NOx, SOx, and PM.

Although reporting levels for VOCs, HAPs, and POPs remain low compared to the top three pollutants, the presence of mentions across all pollutant categories marks this sector as one in which the full pollutant spectrum is at least acknowledged, even if measurement and disclosure remain uneven.

Chemicals

In the chemicals sector (n = 125), the study observed the highest rate of GRI 305-7 use across all sectors in the sample, with approximately 38% of organizations referencing the standard in their reporting. The chemicals sector also reports some of the highest levels of pollutants compared to the other sectors.

Chart 9. Air pollution mentions, disclosures, and GRI 305-7 referencing in chemicals



NOx and SOx are the most frequently mentioned pollutants in this sector, with 65% of respondents referencing NOx in their reporting. These are among the highest mention and disclosure rates observed in the entire dataset, indicating that NOx and SOx reporting is relatively established within the sector.

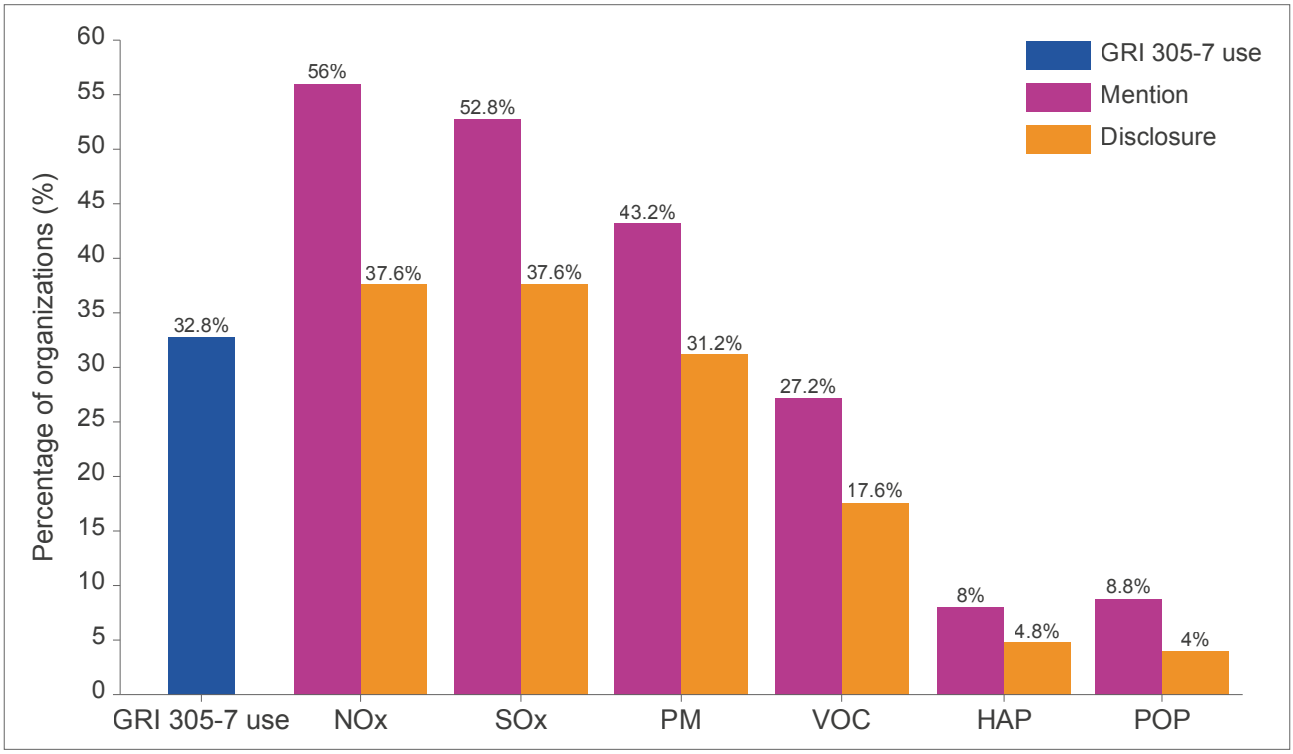
What distinguishes the chemicals sector further is the comparatively high level of reporting on VOCs. Half of the sample mentions VOCs in their reporting. However, only 27% of firms disclose numerical data on VOC emissions. This means that approximately half of the organizations that recognize VOC-related emissions do not provide quantification.

The chemicals sector is also one of only two sectors in the sample (alongside mining) that report on HAPs and POPs. Although these disclosure rates remain low in absolute terms, the presence of both mentions and quantitative values distinguishes the chemicals sector from the others reviewed so far, where HAPs and POPs were almost absent from reporting.

Mining

In the mining sector (n = 125), approximately 33% of organizations reference GRI 305-7 in their reporting. This places mining among the higher-referencing sectors, alongside chemicals and construction materials. Consistent with this, the sector demonstrates relatively strong pollutant reporting.

Chart 10. Air pollution mentions, disclosures, and GRI 305-7 referencing mining



The mining sample shows substantial discussion of NOx, SOx, and PM, with VOCs also appearing, though to a lesser degree. Although there is a drop-off from mention to disclosure across these pollutants, the disclosure rates themselves are comparatively strong. With over 30% of firms disclosing PM emissions, mining is second only to the construction materials sector in particulate matter disclosure.

The consistency between NOx and SOx disclosure levels also places mining among the more numerically transparent sectors in the sample. Reporting on VOCs is present, though less frequently than for the top three. Over a quarter of organizations mention VOCs, but less than one in five provide quantitative values.

This pattern mirrors what was observed in the chemicals sector: VOC emissions are recognized, but disclosing VOC measurements appears less consistent. Mining is also one of only two sectors in the dataset with any reporting activity related to HAPs and POPs, even though such reporting is rare.

Disclosure rates across sectors

The first five sectors examined (agriculture, pharmaceuticals, transport, construction, and metals processing) exhibit similar reporting characteristics. In all five sectors, GRI 305-7 use remains relatively low, generally ranging from 16% to 28%, and pollutant-specific disclosures occur at even lower rates. Even for nitrogen oxides, the most frequently disclosed pollutant, disclosure levels do not exceed 30% across these sectors and, in some cases, are as low as 17%. Meanwhile, HAPs and POPs are rarely mentioned and seldom disclosed. The metals processing sector shows a small exception (approximately 2% disclosure for HAPs), but the pattern remains broadly consistent across these sectors.

In all cases, organizations mention pollutants more frequently than they disclose quantitative emissions values, indicating that while air emissions are acknowledged in narrative terms, measurement or reporting at the level of pollutant-specific quantification is more limited.

In contrast, the latter three sectors (construction materials, mining, and chemicals) exhibits higher rates of GRI 305-7 use, typically between 30% and 39%, and shows more consistent and comparatively higher reporting across the pollutant categories. These sectors also include all five pollutant categories in their reporting to some degree, although HAPs and POPs continue to be reported at very low levels. Even in these higher-reporting sectors, the pattern remains the same: mentions exceed disclosures, suggesting that recognition of emissions continues to outpace the provision of quantitative emissions data.

Mention and disclosure gap

Across all sectors in the sample, mentions of air pollutants occur substantially more frequently than disclosures. At a descriptive level, this pattern is partly the result of how the analysis distinguishes between mentions and disclosures, since an organization cannot disclose a pollutant without first mentioning it. In this sense, the mention category necessarily includes all disclosures. However, the analytical focus here lies with the subset of organizations that mention pollutants without providing corresponding quantitative data.

A closer reading of these instances reveals a consistent pattern of acknowledgment. Many organizations refer to ‘reducing air emissions’, ‘improving energy efficiency’, or ‘minimizing environmental impacts’ without specifying the magnitude of change or identifying the pollutants involved. Others invoke more procedural framings, stating that emissions are ‘managed’, ‘monitored’, or ‘controlled’ without quantitative substantiation. These formulations convey a commitment to mitigation or oversight, but do so in broad, often aspirational terms. In some cases, firms describe emissions reductions as outcomes of operational changes, such as equipment modernization, fuel switching, or process optimization, without accompanying numerical data that would allow readers to gauge the scale of those reductions.

Several reports note that detailed air emissions data are available elsewhere, usually referencing external sustainability data portals, corporate websites, or separate environmental filings. These cross-references signal a degree of transparency but also create information fragmentation, as emissions data are not consistently integrated within the sustainability reports themselves.

A smaller subset of firms specifically mentions pollutants, stating that they are not tracked or monitored. These passages are often brief, framed as factual clarifications such as 'VOC emissions are not currently measured', or 'data unavailable for PM emissions', and sometimes positioned as future commitments such as 'will be included in the next reporting cycle'. While these statements acknowledge the pollutant, they do so to describe the lack of systematic monitoring.

These patterns indicate organizational awareness around air pollutants in response to stakeholder expectations and potential organizational intent to manage or eventually disclose such emissions. However, they rarely provide the level of precision necessary for external evaluation or comparison. In this sense, narrative acknowledgment without quantification appears to function as a form of symbolic transparency, signaling a commitment to reducing air emissions while leaving the substantive measurement aspect unaddressed.

Among firms that disclose numerical emissions data, organizations typically present aggregated data for the whole organization for a single year in metric tons or thousand tons. Some organizations do provide data across multiple years. A smaller subset of reports goes further by breaking down emissions by operational unit, such as individual manufacturing sites, vessels in transport operations, mine sites, or land-based intensity metrics (e.g., emissions per acre).

Many reporters express a general intent to reduce air-pollution impacts, often framing commitments around improving measurement methodologies, expanding pollutant inventories, or strengthening management practices. While many reports articulate general ambitions to reduce pollutant emissions or improve operational performance, substantive numeric targets (such as percentage reduction goals within specified timeframes) appear significantly less frequently. In several cases, disclosure narratives focus on past performance, such as 'emissions decreased due to operational improvements', without committing to future benchmarked reductions. Even when reductions are reported, firms often attribute them to operational changes (e.g., technology upgrades, changes in the fuel mix) without providing roadmap-style projections.

Another notable trend is the expansion of pollutant tracking over time. In some reports, pollutants such as particulate matter, carbon monoxide, VOCs, or metals are absent from earlier reporting years but appear in later ones, suggesting that organizations have gradually expanded the pollutants they measure or consider material. One reviewed report, for instance, revised its emission-factor methodology for selected pollutants mid-series to better reflect fleet characteristics, leading to changes in reported values. This delayed inclusion across successive reporting periods suggests that monitoring capacity may be improving over time, though unevenly across pollutants.

Disclosure of emission factors and calculation methods

Methodologies for calculating emissions were not systematically tracked or quantified in this study.[1] Nevertheless, instances of references to calculation methodologies were occasionally encountered in proximity to pollutant disclosures. These references, however, were rarely elaborated upon within the reports. In nearly all observed cases, the methodologies were externally sourced, with the report merely citing the origin or framework without describing the calculation approach, emission factors, or data sources used. This suggests that while some firms align their reporting with recognized methodological structures, they do not reproduce or summarize those methods in the main body of their sustainability disclosures.

Broadly, the external methodological sources cited across the reports can be grouped into three main categories. The first category includes widely used sustainability frameworks such as GRI, Sustainability Accounting Standards Board (SASB), Carbon Disclosure Project (CDP), and the Science Based Targets Network (SBTN). In most cases, no further details are provided on how emission factors were applied or how data were collected across facilities. The second category contains stock exchange-level sustainability reporting requirements, such as the Hong Kong Stock Exchange Environmental KPIs, the London Stock Exchange's Green Economy Mark, and the Singapore Exchange Sustainability Reporting Guide. However, these frameworks do not prescribe specific calculation methodologies, so these references may be used to signal compliance with listing obligations rather than to ensure methodological transparency in the data presented. The third category included references to domestic or supranational regulations that define or influence emissions measurement. Examples include the Automotive NOx and PM Law (Japan), the U.S. Environmental Protection Agency's Clean Air Act and its SmartWay Technical Documentation, the European Union Ambient Air Quality Directives, and national-level Pollutant Release and Transfer Register (PRTR) laws.

Additional air pollutants beyond the study scope

Although the analysis systematically focused on six air pollutant categories (NOx, SOx, PM, VOCs, HAPs, and POPs), the reports reviewed contained additional pollutants and indicators that fell outside the search scope but co-occurred with the searched key terms. These included chlorine gas, hexane, ammonia (NH_3), nitric oxide (NO), ammonia-nitrogen (NH_3-N) in the agriculture sample; xylene, boron, cresol, and fugitive dust metals in the mining and metals processing sample; silica dust, black carbon, and ozone-depleting substances (covered under GRI 305-6). While these pollutants were not coded in the core incidence analysis, their appearance in reports suggests a broader emissions and exposure landscape than is captured by the six-category framework used here.

[1] This decision is tied to the methodological focus of the analysis. Corporate sustainability reports frequently contain multiple methodological references across various sustainability issue areas such as GHG accounting, waste management, and water use, among others. Fine-tuning a search to isolate only those methodological references relevant to air pollutants would have required a distinct keyword framework, additional coding parameters, and a more consolidated cross-referencing process than was feasible within the scope of this study. As such, the focus remained on pollutant mentions and disclosures themselves, rather than the specific methods used to derive them.

Discussion and conclusion

This study examined how and to what extent large, publicly listed organizations report on non-GHG air pollutants. Drawing on a sample of 1,000 firms across eight high-emitting sectors, the analysis combined automated keyword identification with qualitative coding to distinguish between pollutant mentions and quantitative disclosures.

The findings show that NOx and SOx are the most frequently reported pollutants across the sample, both in terms of mentions and disclosures. PM and VOCs exhibit greater sectoral variation, with disclosure levels fluctuating with industrial activity. Reporting on HAPs and POPs is minimal to non-existent, appearing only sporadically in a few sectors. This uneven distribution points to both the concentration of reporting on familiar combustion-related pollutants and the marginalization of less-standardized or process-specific emissions categories.

This study finds that the broader use of the GRI Standards is associated with higher overall reporting effort: firms not using GRI reported an average of 0.46 pollutants, those informally referencing GRI reported 1.14 pollutants, and those formally applying the Standards reported 1.61 pollutants. However, when we examine disclosure practices in depth, specifically GRI 305-7, the study found that the relationship between GRI use and substantive reporting is uneven. Sampled organizations often mention or even quantify pollutants without citing GRI 305-7, while others reference the standard without reporting any of the quantitative elements it requires.

These findings have several implications for efforts to strengthen transparency around non-GHG air pollutants. One area of action is through the ongoing update of the GRI Topic Standard for Air Pollution, which aims to provide more comprehensive reporting requirements and clearer guidance to support consistent pollutant disclosure. At the same time, the standard-development process itself is being used as a mechanism to increase the visibility and uptake of the disclosure requirements through public comment periods, exposure drafts, and targeted stakeholder engagement intended to generate sustained attention on air pollutants reporting.

It is also possible that at least part of the disclosure gap reflects limitations in measurement capacity. Several reports in the sample show delayed incorporation of certain pollutants over successive years, suggesting that organizations may lack the monitoring systems needed to operationalize pollutant reporting. Strengthening reporting practices will therefore require not only clearer standards but also support for the underlying systems that enable organizations to measure, track, and disclose air emissions.

Two main limitations qualify these findings. First, while the analysis reveals consistent underreporting of HAPs and POPs, it does not identify the reasons behind this absence. Further, sector-specific research is needed to determine whether the lack of reporting stems from measurement challenges, regulatory gaps, or limited materiality in specific operational contexts. Second, the study does not evaluate pollutant materiality or omission rationale at the firm level. Some pollutants may be genuinely immaterial to specific activities, leading to their omission from reports. However, the sectors included in this study were selected precisely because of their known emission profiles, suggesting that at least some of these pollutants would be expected to appear more consistently across the sample.

Looking ahead, future research could extend this analysis in several directions. Comparative work across additional sectors or reporting frameworks could help trace how non-GHG air emissions reporting evolves in the context of emerging standards, such as those being developed by EFRAG and SASB. It is also possible to further explore organizational drivers behind mention-only reporting. Research on the linkages between regulatory requirements and disclosure practice would also help clarify why certain pollutants persistently fall outside formal reporting structures.

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The air pollution reporting gap: Evidence from 1,000 organizations across high-emitting sectors

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