Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 12 | Issue: 4 | April 2025 -Peer-Reviewed Journal

ANALYSING THE VARIATIONS IN GHG EMISSION REPORTING OF INDIAN COMPANIES

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Article DOI: https://doi.org/10.36713/epra20897
DOI No: 10.36713/epra20897

ABSTRACT
The quality of Greenhouse Gas (GHG) emission disclosure is crucial for assessing the environmental impact of organizations and for making informed decisions. This research is conducted to analyse the quality of emissions disclosure practices of Indian companies. The sample companies include top 100 companies listed by BSE according to market capitalization in 2024. Annual reports of these companies from 2018 to 2022 were analysed for collecting data. This study tries to address the GHG emissions disclosure practices of top 100 companies listed by BSE based on market capitalization in 2024, This also tries to understand the factors influencing the disclosure practices of companies which include the nature of industry, the size of the company and its ownership type. This research is descriptive and exploratory in nature. The study used statistical analysis such as descriptive statistics and regression to analyse data. The study found that GHG emission disclosure practices moderately vary among companies, most of the companies gave emphasis to climate change risk and opportunities and lesser focus on segment level emission and reduction plan. The industry type plays an integral role on the quality of emission disclosure practices especially the energy sector. This study attempts to identify variations in disclosure practices among companies, thereby contributing to the ongoing discourse on corporate environmental accountability. These lessons are important for practitioners and policymakers who seek to push for the advancement in the corporate sustainability.

KEYWORDS: *GHG Emission Disclosure, Environmental Reporting, Environmental Sustainability, Indian Companies*

INTRODUCTION

Climate change problems have become a threat to the world. International organizations and countries together are introducing various measures to combat with these problems. Companies in the world have a pivotal part in reducing GHG emissions and making a sustainable development. There is an increasing need for transparency in environmental disclosure practices of companies. Emission disclosure is important for stakeholders because this helps them to know the corporate contribution towards achieving global sustainability goals. There is variations in the quality of emission disclosure of companies reports, many companies are adopted an incomplete or symbolic reporting system(Liesen et al., 2015) (Liu & Anbumozhi, 2009). Some companies shows a productive association between emission reporting and financial result, this is motivating the companies to adopt transparency in emission disclosure(Ezeagba et al., 2017) (Nguyen et al., 2017) (Alsaifi et al., 2020) there is variations across industries and regions. Some important factors that determine the quality of disclosure include the size of firms, the type of industry, emission intensity, and regulatory frameworks(Nguyen & Tran, 2019)(Luo et al., 2012)(Prado-Lorenzo et al., 2009). Additionally, board diversity, independence, and environmental committee existence are proven to augment disclosure practices ((Liao et al., 2015).This investigation focuses on analysing the quality of GHG emissions disclosure of the top 100 companies listed on the Bombay Stock Exchange in 2024 according to market capitalization. The study attempts to identify variations in disclosure practices across companies and thereby contributing to the ongoing discourse on corporate environmental accountability.

LITERATURE REVIEW

There is a gradual increase in the literature on environmental or GHG emission disclosure year by year. The literature review shows that the quality of GHG emission disclosure in inconsistent and sometime incomplete reporting is performed(Liesen et al., 2015)(Liu & Anbumozhi, 2009). Some studies revealed a productive association between emission reporting and financial result (Ezeagba et al., 2017) (Nguyen & Tran, 2019) (Alsaifi

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et al., 2020). Studies also shows major factors that influence the GHG emission disclosure, this includes profitability, firm size, industry type, emission intensity and regulatory frameworks (Nguyen et al., 2017) (Liu & Anbumozhi, 2009) (Luo et al., 2012) (Prado-Lorenzo et al., 2009) (Prado-Lorenzo et al., 2009)(Chu et al., 2013)(Peng et al., 2015). The studies also revealed Board diversity, board independence, and the existence of environmental committees also are effective factors in improving disclosure quality (Liao et al., 2015). The Regression model, content analysis, as well as multi-case study methodologies show that legitimacy theory is the most prevalent which explains disclosure practices as an effort to align with what the stakeholders expect and forces from society(Bae Choi et al., 2013)(Pellegrino & Lodhia, 2012). The studies revealed that the regional differences observed such as state ownership, regulatory environment, and economic development affect practices in different ways, especially in countries such as China and Indonesia (Prado-Lorenzo et al., 2009) (Faisal et al., 2018). The themes of green innovation and gender diversity emerge and further enrich the discourse in this context, bringing forward the evolving landscape of environmental reporting(Li et al., 2018). These findings indicate that corporate environmental disclosures worldwide are influenced by both internal strategies and external pressures.

RESEARCH OBJECTIVE

- To analyse the GHG emissions disclosure practices of top 100 companies listed by BSE based on market capitalization in 2024.
- To identify the variation in GHG emissions disclosure practices across different industries.
- To analyse the GHG emission disclosure practices according to company size.
- To analyse the GHG emission disclosure practices according to Ownership type.

HYPOTHESIS

a. H_0: Industry type does not significantly affect the GHG emissions disclosure.
   H_1: Industry type significantly affects the GHG emissions disclosure
b. H_0: There is no significant influence of company size (measured by market capitalization or revenue) on the GHG emissions disclosure.
   H_1: Company size significantly influences the GHG emissions disclosure.
c. H_0: Ownership type (public vs. private ownership) does not significantly impact the GHG emissions disclosure.
   H_1: Ownership type (public vs. private ownership) significantly impacts the GHG emissions disclosure.

RESEARCH METHODOLOGY

SAMPLE

The investigation mainly aims to analyse the quality of GHG emission disclosure across different industries and sectors. The sample include top 100 companies listed in BSE according to market capitalisation in 2024. These companies provide diverse and comprehensive representation of key industries and sectors. We can easily avail the annual reports of these companies from their official websites.

CONTENT ANALYSIS: CREATING CHECKLIST

To determine the quality of GHG emissions disclosure, we developed a “checklist”. This checklist was developed using the factors presented in Information request sheet of CDM. This checklist was first made by (Bae Choi et al., 2013) and applied by many other researchers (Faisal et al., 2018). The checklist contains five broad Classification relevant to GHG emissions and climate change. The five categories are: climate change Problem and opportunities, Greenhouse gas emission accounting , Energy Consumption Accounting , Greenhouse gas reduction , and Cost and emission accountability (Bae Choi et al., 2013). Within these five categories there are 18 specific items. The score was “1” if company disclose each item in checklist and “0” was assigned if it was not disclosed in annual report. The total emission disclosure checklist or score was 18. The table 1 shows the disclosure checklist:

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Table 1: GHG Emission Disclosure Checklist

Emission Disclosure Classification	GHG Emission Items
1. climate change Problem and opportunities	**1.** Description of the problems due to climate change and remedies taken to manage those risks
	2. opportunities of climate change
2. GHG emissions accounting	**3.** Methodology used to calculate GHG emissions
	4. External assessment of GHG emission
	5. Total GHG emissions
	6. Scopes 1 and 2 and Scope 3 emission
	7. GHG emissions by sources
	8. GHG emissions by segment
	9. GHG emissions compared with previous years
3. Energy consumption accounting	**10.** Total energy consumption
	11. Energy used from renewable sources
	12. Energy consumption with segments
4. GHG reduction and cost	**13.** Policy and program to reduce GHG emissions
	14. GHG emission target with year
	15. Emission reduction and connected cost saving target
	16. capital expenditure planning on emission reduction
5. emission accountability	**17.** Description about the responsibility of climate change plan and actions
	18. Board assessment to company's progress on climate change action

MEASUREMENT OF VARIABLES

INDEPENDENT VARIABLES

The independent variables of this study are Industry/Sector Type, Company Size, and Ownership Type that are critical to an understanding of the variations in quality of GHG emissions disclosure between the top 100 companies listed on Bombay Stock Exchange (BSE) by market capitalization in 2024. Industry/Sector Type is the categorization of firms into sectors such as energy, manufacturing, information technology, finance, etc., allowing a sector-specific analysis of the disclosure practices. Measures include those used in assessing indicators related to company size using, among others, market capitalization, revenue, and total assets to indicate organizational scale impacts on disclosure quality. Ownership Type: ownership forms as public, private, and government ownership determine what kinds of governance structures play the determining factor in environmental reporting, that is, what triggers GHG emissions transparency as portrayed in the industry, particularly within organizational characteristics.

DEPENDENT VARIABLES

The dependent variable is quality of GHG emission disclosure, which is systematically derived from the annual reports of the top 100 companies listed on the Bombay Stock Exchange (BSE) by market capitalization in 2024. A checklist was used to derive the GHG emission disclosure which is mentioned above table1.

REGRESSION MODEL

The study used multiple regression analysis to investigate the relation of independent variables—the different types of industries/ sectors, types of companies, and owners—and a dependent variable which refers to quality in GHG emissions disclosures—can be represented through this model below:

Quality of GHG Emissions Disclosure=β0+β1(Industry/Sector Type) +β2(Company Size) +β3(Ownership Type) +ϵ

Here, $\beta 0$ represents the intercept term, while β1, β2 and β3 are the coefficients that capture the influence of each independent variable on the quality of GHG emissions disclosure. The error term ϵ epsilonϵ accounts for the variation in the dependent variable not explained by the independent variables.

RESULTS AND DISCUSSION

INDUSTRY WISE CLASSIFICATION OF COMPANIES

Figure- 1 shows the industry wise classification of top 100 companies listed by BSE according to market capitalisation. The classification reveals that 40% of companies are in manufacturing sector, 23% of companies

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are in Banking and finance sector, 20% of companies are in Service sector, 11% are in Energy sector and 6% are other sectors

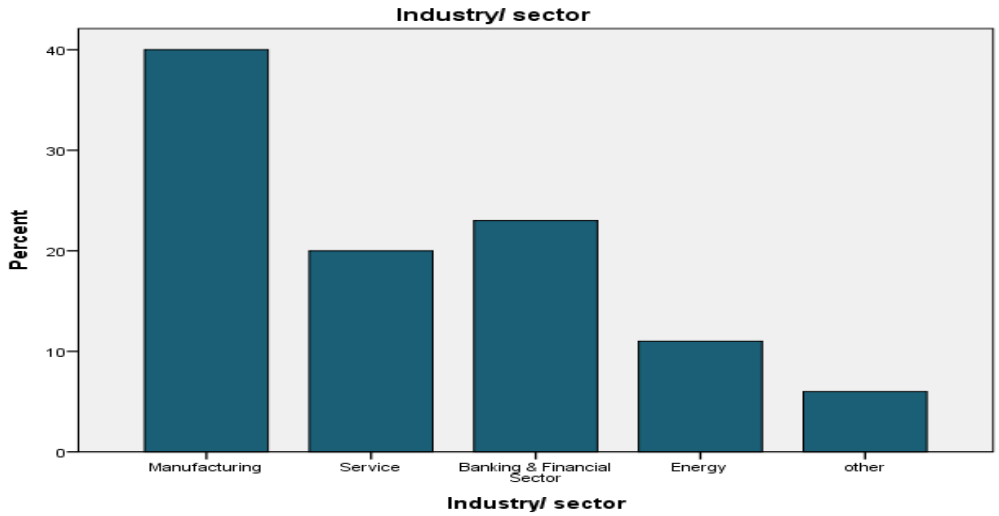


Figure 1: Industry wise classification of companies

DESCRIPTIVE STATISTICS OF GHG EMISSIONS DISCLOSURE CHECKLIST

Table- 2 provide insight into the descriptive statistics of GHG emission disclosure practices of top 100 Indian companies listed in BSE according to market capitalisation using emissions disclosure checklist for five years from 2018 to 2023. The descriptive statistics shows varied but some common trends in GHG emission disclosure practices. The Emission disclosure categories such as "Description of the problems due to climate change and remedies taken to manage those risks" (mean = .79) and "opportunities of climate change" (mean= .75) have highest disclosure rate, indicating that these categories are most prioritized by most of the companies. Categories such as "GHG emissions by segment" (mean = .56) and "Emission reduction and connected cost saving target" (mean = .58) are less common. The standard deviation of emission disclosure checklist varying from .409 to .499, this shows that moderate variability across companies.

Table 2: Descriptive Statistics

Emission Disclosure Category	N	Minimum	Maximum	Mean	Std. Deviation
Description of the problems due to climate change and remedies taken to manage those risks	100	0	1	.79	.409
Opportunities of climate change	100	0	1	.75	.435
Methodology used to calculate GHG emissions	100	0	1	.59	.494
External assessment of GHG emission	100	0	1	.61	.490
Total GHG emissions	100	0	1	.60	.492
Scopes 1 and 2 and Scope 3 emission	100	0	1	.65	.479
GHG emissions by sources	100	0	1	.60	.492
GHG emissions by segment	100	0	1	.56	.499
GHG emissions compared with previous years	100	0	1	.58	.496
Total energy consumed	100	0	1	.62	.488
Energy used from renewable sources	100	0	1	.64	.482
Energy consumption with segments	100	0	1	.59	.494
Policy and program to reduce GHG emissions	100	0	1	.75	.435
GHG emission target with year	100	0	1	.66	.476
Emission reduction and connected cost saving target	100	0	1	.58	.496
capital expenditure planning on emission reduction	100	0	1	.60	.492
Description about the responsibility of climate change plan and actions	100	0	1	.69	.465
Board assessment to company's progress on climate change action	100	0	1	.72	.451
Valid N (listwise)	100				

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MULTIPLE REGRESSION ANALYSIS

Table – 3 highlight the regression model summary. This indicates a positive relationship between independent variables (Industry, Size and Ownership) and dependent variable (Quality of GHG Emissions Disclosure) with an R value of .525. the R^2 value .276 shows that independent variables (Industry, Size and Ownership) explain 27.6% of variance in GHG Emissions Disclosure. The adjusted R^2 indicates that the model formulate has 22.1% predictability.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.525[a]	.276	.221	6.669

a. Predictors: (Constant), Ownership, Mid-cap, Service, Energy, Banking & Financial Sector, Manufacturing, Large cap

ANOVA table (Table-4) evaluates whether the regression model has a strong ability to influence the dependent variable that is, the "quality of emission disclosure." Here, the regression model has F-value 5.006 that is significant. Its p-value is 0.000; hence, there is a joint statistical significance among the independent variable: Ownership, Mid-cap, Service, Energy, Banking & Financial Sector, Manufacturing, and Large-cap to the emission disclosure index. The regression sum of squares is 1558.557, while the residual sum of squares is 4091.633, which represents unexplained variance. The total sum of squares of 5650.190 results in a huge portion of explained variance.

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1558.557	7	222.651	5.006	.000[b]
	Residual	4091.633	92	44.474		
	Total	5650.190	99			

a. Dependent Variable: emission disclosure index

b. Predictors: (Constant), Ownership, Mid-cap, Service, Energy, Banking & Financial Sector, Manufacturing, Large cap

The coefficients table (Table- 5) indicate the individual contributions of predictors to the emission disclosure index. The constant (12.467) represents the baseline index when all predictors are zero, but it is not statistically significant (p = 0.091). Among the predictors, the Energy sector has a significant positive impact (B = 7.115, p = 0.044), indicating that companies in this sector tend to have higher disclosure scores. Manufacturing also exhibits a positive influence (B = 5.533) but is marginally insignificant at p = 0.063. Other sectors such as Service, Banking & Financial, Large-cap, and Mid-cap, are not significant at all, since their p-values are more than 0.05. Ownership is also insignificant. Overall, the Energy sector comes out as the most significant driver of emission disclosure while other predictors are contributing less.

Table 5: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.467	7.290		1.710	.091
	Manufacturing	5.533	2.943	.361	1.880	.063
	Service	3.353	3.123	.178	1.074	.286
	Banking & Financial Sector	-2.709	3.089	-.152	-.877	.383
	Energy	7.115	3.486	.296	2.041	.044
	Large cap	-3.362	6.760	-.199	-.497	.620
	Mid-cap	-5.758	6.888	-.336	-.836	.405
	Ownership	.162	1.941	.008	.083	.934

a. Dependent Variable: emission disclosure index

HYPOTHESIS TESTING

a. H_0: Industry type does not significantly affect the GHG emissions disclosure.
H_1: Industry type significantly affects the GHG emissions disclosure

Based on the findings, the type of industry is significant for the quality of GHG emissions disclosure only in the Energy sector, with $p = 0.044$. Hence, H_0 is rejected for this industry. However, for Manufacturing, Service, and Banking & Financial industries, $p > 0.05$. We, therefore, fail to reject H_0 for these industries.

b. H_0: There is no significant influence of company size (measured by market capitalization or revenue) on the quality of GHG emissions disclosure.
H_1: Company size significantly influences the quality of GHG emissions disclosure.

As far as company size is concerned, neither Large-cap ($p = 0.620$) nor Mid-cap ($p = 0.405$) has a significant influence on GHG emissions disclosure, which results in the acceptance of the null hypothesis (H_0).

d. H_0: Ownership type (public vs. private ownership) does not significantly impact the GHG emissions disclosure.
H_1: Ownership type (public vs. private ownership) significantly impacts the GHG emissions disclosure**.**

Ownership type: public vs. private, with no significant impact on GHG emissions disclosure ($p = 0.934$), so we accept H_0 for this factor as well.

Overall, only the Energy sector demonstrates a significant effect on GHG disclosure, while company size and ownership type do not show any substantial influence.

CONCLUSION

The study explores the quality of GHG emission disclosure practices of top 100 companies listed by BSE according to market capitalisation. The study found that GHG emission disclosure practices moderately vary among companies, most of the companies gave emphasis to climate change risk and opportunities and lesser focus on segment level emission and reduction plan. The industry type plays an integral role on the quality of emission disclosure practices especially the energy sector. The study also finds that Company size and Ownership type does not significantly influence quality of emission disclosure practices. These findings indicate the noteworthiness of specific Emission disclosure practices structure among different industries. The findings also put forward the significance of transparency on emission disclosure practices of companies.

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