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Environmental Cost Disclosure in Responsibility Accounting Concept

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A B S T R A C T
Indonesia has long relied on coal as the largest source of energy from 2000 - 2022, as reported by the International Energy Agency (IEA). In line with this, this study aims to analyze the disclosure of environmental costs within the framework of responsibility accounting in coal mining sector companies in Indonesia. This study highlights the extent to which companies follow the Global Reporting Initiative (GRI) 305 standard in reporting Greenhouse Gas (GHG) emissions as well as transparency and accountability. The four companies that became the object of research were PT Adaro Energy Tbk, PT Bukit Asam Tbk, PT Berau Coal Energy Tbk, and PT Indika Energy Tbk. The research method used is qualitative analysis with a descriptive approach, based on secondary data from the company's sustainability report for the period 2021 - 2023. The results show that most companies have implemented the GRI 305 standard, but there are still variations in the level of information disclosure, especially in reporting scope 3 GHG emissions and ozone-depleting substances. PT Bukit Asam Tbk has the highest level of conformity, while PT Adaro Energy Tbk has a medium level of conformity. PT Berau Coal Energy Tbk and PT Indika Energy Tbk have a low level of conformity.

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INTRODUCTION

Indonesia is known as one of the world's largest coal producers, with good quality, especially for power plants. Coal companies play an important role in the national economy, contributing significantly to state revenues and creating jobs. However, the industry also faces challenges, especially related to environmental impacts such as deforestation and pollution.

The impact of coal companies according to the Ministry of Environment and Forestry (KLHK) includes environmental damage, such as deforestation and water and air pollution. Coal burning causes greenhouse gas emissions that are detrimental to air quality and public health. In addition, mining activities often result in the eviction of local communities and loss of livelihoods, causing social tensions. KLHK encourages companies to implement sustainable practices so that these negative impacts can be minimized. Director General of PSLB3, Rosa Vivien Ratnawati said that FABA (Fly Ash Bottom Ash) material which is non-B3 waste is only from the coal combustion process outside the boiler stoker and/or industrial furnace facilities, such as PLTUs that use pulverized coal (PC) combustion systems or chain grate stokers. Meanwhile, from the boiler stoker and/or industrial furnace facilities, it remains in the B3 Waste category, namely Fly Ash waste code B409 and Bottom Ash waste code B410. Although stated as non-B3 Waste, non-B3 waste producers still have an obligation to meet the standards and technical requirements set and stated in the environmental document approval. The Ministry of Environment and Forestry (KLHK) issued Regulation of the Minister of Environment and Forestry No. 1 of 2021 concerning the Corporate Performance Rating Assessment Program in Environmental Management (PROPER) to evaluate the environmental performance of companies with the aim of encouraging companies to comply with environmental regulations and implement sustainable business practices.

Based on monitoring data, KLHK already has 10 mining companies that can be said to be proper. However, when conducting observations, it turned out that only 4 companies were publicly accessible on the Indonesian stock exchange and met the qualifications as coal sector mining companies, including: PT. Adaro Indonesia Tbk, PT. Bukit Asam (Persero) Tbk, PT Berau Coal Energy Tbk, PT Indika Energy Tbk.

Pasaribu, et al (2023) explained that environmental costs are costs that must be incurred by companies as a form of poor environmental management due to company operational activities that produce waste. The more waste a company produces, the more costs the company must incur. Later, investors will assess that the amount of environmental costs incurred shows the company's concern for the environment. The calculation of environmental costs is obtained by dividing environmental costs by the company's net profit.

According to Andara et al. (2023) responsibility accounting is a basic tool in management control, which is determined through four main elements, namely assignment of responsibility, preparation of performance measures or standard comparisons, performance evaluation, and awarding. In this study, responsibility accounting is the disclosure of the quality of Greenhouse Gas

(GHG) carbon emissions, which is in accordance with the Carbon Emission Disclosure (CED) in the Global Reporting Initiative (GRI) standard.

Presidential Regulation (PP) No. 98 of 2021 regulates the implementation of carbon values in order to achieve nationally determined contribution targets or Enhanced Nationally Determined Contribution (ENDC) and control of Greenhouse Gas (GHG) emissions in national development. In this regulation, it is explained that climate change mitigation efforts are a shared responsibility, involving ministries/agencies, local governments, business actors, and society as a whole. Thus, the responsibility to reduce GHG emissions as stipulated in the ENDC is not only the government's obligation, but must also be carried out by business entities.

Once the emission reduction targets are set in the ENDC, they will then be broken down into more specific targets for each province and specific sector. Furthermore, the provincial targets will be further broken down to the district and city levels, while the sectoral targets will be broken down into sub-sectoral ones. Ultimately, the most detailed level of implementation of these targets is at the level of a specific business entity or business actor.

In Article 10 of PP No. 98 of 2021, it is stated that the GHG emission inventory includes three main aspects, namely monitoring, data collection, and emission calculation. Then, in Article 12, it is explained that the calculation process in this inventory includes the calculation of GHG emissions. The results of this inventory must be reported annually as part of the mechanism for obtaining national GHG emission data.

In order for the process of calculating and reporting GHG emissions to run with uniform standards, clear guidelines are needed in its implementation. At the business entity level, there are several international standards that can be used as a reference in calculating and reporting GHG emissions, such as *GHG Protocol* and standards *ISO* related to *carbon accounting*. These two standards can be used as a basis for business entities in measuring and reporting GHG emissions accurately and in a structured manner.

According to research by Wibowo and Meiden (2022), it is explained that there are 18 subcategories in carbon emissions based on the Carbon Disclosure Project (CDP), but the results found that the Greenhouse Gas (GHG) emissions category is the most widely disclosed category in the company PT Bukit Asam. The method using the CDP checklist was also used in Ovina's research (2024) focusing on banking companies. The results found that Bank Rakyat Indonesia (Persero) Tbk. has the highest level of conformity and quality of disclosure. In the study by Amin and Sisdianto (2024), it was found that Environmental Accounting contributes to sustainability reporting by increasing the transparency of information conveyed to stakeholders. The data produced allows companies to prepare sustainability reports that are more detailed and in line with international standards, such as the Global Reporting Initiative (GRI). However, the results in the study did not use disclosure standards in accordance with GRI, so transparency and regulation are still obstacles in the implementation of sustainability accounting.

Aminudin and Fawaz (2023) analyzed the GRI 305 reports of five mining companies: PT. Bukit Asam, PT. Kaltim Prima Coal, PT. Adaro Energy, PT. Arutmin Indonesia, and PT. Indika Energy. The results showed that only PT. Bukit Asam, PT. Adaro Energy, and PT. Kaltim Prima Coal consistently reported for three consecutive years. PT. Indika Energy reported only in 2021, while PT. Arutmin Indonesia started in 2020. No company achieved 100% data completeness, with report coverage ranging from 10%–60%. Companies are advised to complete GRI indicators to improve their reputation. Further research can extend the study period and cover other industries.

Thus, this study has a special focus on coal mining companies. Because based on the graph *Total Energy Supply Indonesia* on page 3 shows that the largest energy contributor is the coal mining sector. The approach used is based on GRI 305 and is analyzed in detail to assess the quality of GHG emission reporting through the sustainability reports of PT Adaro Energy Tbk, PT Bukit Asam Tbk, PT Berau Coal Energy Tbk, and PT Indika Energy Tbk for the period 2021 - 2023. This approach and analysis are still limited in previous studies. In addition, this study highlights environmental costs as part of responsibility accounting. By using a qualitative descriptive method, this study emphasizes the analysis of the contents of sustainability reports based on the global reporting initiative 305 standard.

Based on the background above, the research was conducted with the title "Disclosure of Environmental Costs in the Concept of Responsibility Accounting".

LITERATURE REVIEW

Triple Bottom Line Theory

Triple bottom line is one of the formulations of the company's success in social responsibility. Elkington popularized the term Triple Bottom Line in 1997 through a book entitled Cannibals With Forks: The Triple Bottom Line in 21st Century Business. Triple bottom line can be developed by Elkington into 3 terms, namely economic prosperity (value of economic wealth), environmental quality (quality of the environment), and social justice (social conditions).

Muhammad Zaki (2024:5) Indirectly, the disclosure of TBL (Triple Bottom Line) functions as a means of communication that explains the strategies, achievements, and challenges faced by the company in its efforts to achieve sustainability. Thus, the application of the TBL concept can provide encouragement for companies to report their information so that they can later get a positive response from stakeholders, including investors.

Triple Bottom Theory Related to Responsibility Accounting

The relationship between the Triple Bottom Line and responsibility accounting can be seen in the context of how responsibility accounting measures and reports organizational performance not only in financial terms, but also the social and environmental impacts generated by the organization's operational activities. In responsibility accounting, managers are responsible for managing

the resources and results achieved by the units they supervise. By applying the TBL concept, managers are not only measured based on financial achievements (profit), but also their contributions to social and environmental sustainability (people and planet).

Accounting Concepts

American Accounting Association (1998:534) states that accounting is "The process of identifying, measuring and reporting economic information to enable clear assessments and decisions for users of the information."

According to Donald Kieso, Jerry Weygandt, and Terry Warfield in Hanggara (2019:4) accounting can be interpreted as identifying, measuring, and reporting economic entities to interested parties. The entity referred to in the accounting sense is in relation to financial statements that specifically explain the problem. Each financial statement is an entity or unique and different from other financial statements.

Responsibility Accounting Concept

According to Mulyadi (2001: 176), responsibility accounting information can be used to assess the performance of managers who are responsible for the responsibility center, because the information describes the relationship between data and managers who manage planning and implementation. The purpose of responsibility accounting is so that each unit in the organization can be held accountable for the results of activities carried out by the units under its supervision. In this system, units in the organization are referred to as responsibility centers.

Management Accounting Concepts

According to (Ari Purwanti 2023: 10) Management accounting is the process of identifying, collecting, measuring, classifying and reporting information that is useful for internal users of the company, namely managers, executives and employees in planning, controlling and making decisions. RA Supriono in Ida Nursanty, et al (2022: 2) said that management accounting based on the Management Accounting Practices (MAP) committee formed by the National Association of Accountants (NAA) that management accounting is a process of identifying, measuring, collecting data, analyzing, preparing, and communicating financial information used, management for planning, evaluation, control in an organization or company and ensuring the accuracy of the use of sources and accountability for all these sources.

GRI (Global Reporting Initiative)

Global Reporting Initiative (GRI) is an independent international organization that plays a role in developing sustainability reporting standards (Sustainability Reports), as stated in www.globalreporting.org. Founded in 1997 in Boston, United States, GRI is now headquartered in Amsterdam, Netherlands, with Eelco Van Der Enden as its chairman. The reporting standards developed

by GRI aim to help businesses and organizations communicate the impacts of their operations.

METHODOLOGY

Using a qualitative approach, this research can be done by observing report data from companies, observing field practices through existing websites, and analyzing relevant documents to gain a better understanding of how environmental accounting is implemented and integrated into various aspects of company operations. This research was conducted by accessing the Sustainability Report or Annual Report from coal companies listed on the Indonesian Stock Exchange, through the website www.idx.co.id. The aim is to collect information about sustainability reports. The companies selected as samples in this study are PT Adaro Energy Indonesia Tbk, PT. Bukit Asam (Persero)Tbk, PT Berau Coal Energy and Tbk PT Indika Energy Tbk. which are planned to be studied for approximately one month.

The data used in this study consists of two types, namely qualitative data and quantitative data. Qualitative data is information that is not expressed in numbers. In this study, qualitative data was obtained from sustainability reports or annual reports published by 4 companies, listed on the Indonesia Stock Exchange (IDX) for the period 2021-2023. The data has been documented in the Indonesian Capital Market Directory (ICMD). Quantitative data is information expressed in numbers. In this study, the quantitative data used relates to the quality of Greenhouse Gas (GHG) emission disclosure reports and environmental costs available from the 4 companies. The research was taken through data from the Sustainability Report for 2021 - 2023 of the companies concerned.In this study, the content analysis method was used to observe the Sustainability Reports of 4 coal companies in Indonesia.Secondary data comes from the Sustainability Report for the period 2021 - 2023, which was taken from the respective sites of each research object.

RESEARCH RESULT AND DISCUSSION

PT Adaro Energy Indonesia Tbk

Greenhouse Gas Emission Reporting of PT Adaro Energy Indonesia

Table 1 PT Adaro Energy Tbk's GHG Emission Reporting based on the Global Reporting Initiative (GRI) 305 standard

GRI 305 : Emissions	2021	2022	2023
GHG Emissions (Scope 1)	1,155,767.63 tCO2e	1,060,461 tCO2e	1,150,255 tCO2e
GHG Emissions (Scope 2)	265.80 tCO2e	2,867 tCO2e	3,621 tCO2e
GHG Emissions (Scope 3)	-	-	-
GHG emission intensity	4.15 tCO2e/GWh	3.67 tCO2e/GWh	1,496 tCO2e/GWh
Reduction of GHG emissions	6.11 tonsC02 e/GWh	0.084 TJ/GWh	52.5 thousand tons of CO2.
Ozone depleting substances emissions	Data combined with Scope 1 & 2 GHG emissions		
Nitrogen oxides (NOx), sulfur (Sox), and other significant air emissions.	Nox = 730.2SOx = 249.8CO = 410.3	Nox = 1471.7SOx = 135.0CO = 244.1	Nox = 2,094.4SOx = 104.9CO = 367.2

Source: Processed data, 2025

Table 2 Table Results of Compliance Calculation of Greenhouse Gas (GHG) Emission Disclosure of PT Adaro Energy Indonesia for 3 Years

NO.	*Carbon Emission Disclosure*	ADRO		
GRI 305: Emissions		2021	2022	2023
1	305-1 GHG Emissions (Scope 1)	1	1	1
2	305-2 Indirect GHG (Scope 2) energy emissions	1	1	1
3	305-3 Other indirect (Scope 3) GHG emissions	0	0	0
4	305-4 GHG emission intensity	1	1	1
5	305-5 Reduction of GHG emissions	1	1	1
6	305-6 Emissions of ozone depleting substances	1	1	0
7	305-7 Nitrogen oxides (Nox), sulfur oxides (SOx), and other significant air emissions	1	1	1
Ni = 7	Total Items Disclosed	6	6	5
	Total Items Disclosed/Ni	0.86%	0.86%	0.71%

Source: Processed data, 2025

Based on the results in table 4.2 above, it can be seen that PT Adaro Energy Tbk. Consistently maintains the level of conformity of GHG emission disclosure in 2021 - 2023. ADRO discloses 5 categories out of 7 emission categories in the sustainability report based on GRI 305 (305 - 1; 305 - 2; 305 - 3; 305 - 4; 305 - 5; 305 - 6; 305 - 7) which is in the Carbon Emision Disclosure (CED) reference. It is known that the percentage of conformity is 0.71% in the 2023 period, while in 2021 - 2022 the percentage is 0.86%.

PT Bukit Asam Tbk

Reporting of Greenhouse Gas Emissions of PT Bukit Asam Tbk.

Table 2 PT Bukit Asam Tbk's GHG Emission Reporting based on the Global Reporting Initiative (GRI) 305 standard

GRI 305 : Emissions	**2021**	**2022**	**2023**
GHG Emissions (Scope 1)	468215.93 tCO2e	710834.31 tCO2e	904688.24 tCO2e
GHG Emissions (Scope 2)	89,823 tCO2e	118,080 tCO2e	123,542 tCO2e
GHG Emissions (Scope 3)	24.62 tCO2e	47.16 tCO2e	41.83 tCO2e
GHG emission intensity	0.02 tCO2e	0.02 tCO2e	0.03 tCO2e
Reduction of GHG emissions	224.07 tCO2e	130.07 tCO2e	760.70 tCO2e
Emissions of ozone depleting substances	100 tCO2e	116 tCO2e	127 tCO2e
Nitrogen oxides (NOx), sulfur (SOx), and other significant air emissions.	NOx = 7.48 tonsSOx = 18.12 tonsCO = 34.63 tons	NOx = 8.53 tonsSOx = 20.68 tonsCO = 37.69 tons	NOx = 0.003 tonSOx = 0.013 tonCO = 0.004 ton

Source: Processed data, 2025

Table 4. Results of the Calculation of the Compliance of Greenhouse Gas (GHG) Emission Disclosure of PT Bukit Asam Tbk for 3 Years

NO.	*Carbon Emission Disclosure*	PTBA		
GRI 305: Emissions		2021	2022	2023
1	305-1 GHG Emissions (Scope 1)	1	1	1
2	305-2 Indirect GHG (Scope 2) energy emissions	1	1	1
3	305-3 Other indirect (Scope 3) GHG emissions	1	1	1
4	305-4 GHG emission intensity	1	1	1
5	305-5 Reduction of GHG emissions	1	1	1
6	305-6 Emissions of ozone depleting substances	1	1	1
7	305-7 Nitrogen oxides (Nox), sulfur oxides (SOx), and other significant air emissions	1	1	1
Ni = 7	Total Items Disclosed	7	7	7
	Total Items Disclosed/Ni	1%	1%	1%

Source: Processed data, 2025

The calculation results in table 4.4 show that PT Bukit Asam Tbk discloses 7 categories of GRI 305 based on carbon emission disclosure. The company maintains the level of GHG emission compliance for 3 years consistently in 2021 - 2023. Based on the table above, the percentage of compliance is 1%. This shows that PT Bukit Asam has the highest level of GHG emission disclosure compliance compared to the other 3 companies.

PT Berau Coal Energy Tbk

Greenhouse Gas Emission Reporting of PT Berau Coal Energy Tbk

Table 3 PT Berau Coal Energy Tbk GHG Emission Reporting based on Global Reporting Initiative (GRI) 305 standard

GRI 305 : Emissions	2021	2022	2023
GHG Emissions (Scope 1)	3,775,671 tons/CO2e	4,381,679 tons/CO2e	4,899,073 tons/CO2e
GHG Emissions (Scope 2)	11,444 tons/CO2e	4,540 tons/CO2e	5,628 tons/CO2e
GHG Emissions (Scope 3)	22,673 tons/CO2e	14,566 tons/CO2e	16,151 tons/CO2e
GHG emission intensity	0.10 tons/CO2e	0.14 tons/CO2e	0.17 tons/CO2e
Reduction of GHG emissions	3,803,972 tons of CO_2e	4,400,784 tons of CO_2e	4,926,668 tons of CO_2e
Emissions of ozone depleting substances	-	-	-
Nitrogen oxides (NOx), sulfur (SOx), and other significant air emissions.	-	-	-

Source: Processed data, 2025

Table 4 Results of the Calculation of the Compliance of Greenhouse Gas (GHG) Emission Disclosure of PT Berau Energy Coal Tbk for the Last 3 Years

NO.	*Carbon Emission Disclosure*	BRAU		
GRI 305: Emissions		2021	2022	2023
1	305-1 GHG Emissions (Scope 1)	1	1	1
2	305-2 Indirect GHG (Scope 2) energy emissions	1	1	1
3	305-3 Other indirect (Scope 3) GHG emissions	1	1	1
4	305-4 GHG emission intensity	1	1	1
5	305-5 Reduction of GHG emissions	1	1	1
6	305-6 Emissions of ozone depleting substances	0	0	0
7	305-7 Nitrogen oxides (Nox), sulfur oxides (SOx), and other significant air emissions	0	0	0
Ni = 7	Total Items Disclosed	5	5	5
	Total Items Disclosed/Ni	0.71	0.71	0.71

Source: Processed data, 2025

According to the calculation results in table 4.6 above, PT Berau Coal Energy has successfully disclosed GHG emissions in 5 categories in accordance with the Global Reporting Initiative (GRI) standards. The company is consistent in reporting carbon emission disclosure during the 2021-2023 period based on sustainability report data, there has been no increase in categories over the past 3 years. Therefore, a percentage level of conformity of 0.71% was obtained.

PT Indika Energy Tbk

Reporting of Greenhouse Gas Emissions of PT Indika Energi Tbk

Table 5 PT Indika Energi Tbk's GHG Emission Reporting based on the Global Reporting Initiative (GRI) 305 standard

GRI 305 : Emissions	2021	2022	2023
GHG Emissions (Scope 1)	1,197,167 tons/CO2e	1,155,280 tons/CO2e	1,023,433 tons/CO2e
GHG Emissions (Scope 2)	3,866 tons/CO2e	5,482 tons/CO2e	6,576 tons/CO2e
GHG Emissions (Scope 3)	-	-	-
GHG emission intensity	0.022 tons/CO2e	0.029 tons/CO2e	0.031 tons/CO2e
Reduction of GHG emissions	1,201 ktCO2e	1,161 ktCO2e	1,030 ktCO2e
Emissions of ozone depleting substances	-	-	-
Nitrogen oxides (NOx), sulfur (SOx), and other significant air emissions.	-	-	Combined (Scope 1 and 2)

Source: Processed data, 2025

Table 6 Results of the Calculation of the Compliance of Greenhouse Gas (GHG) Emission Disclosure of PT Indika Energi Tbk for the Last 3 Years

NO.	*Carbon Emission Disclosure*	INDY		
GRI 305: Emissions		2021	2022	2023
1	305-1 GHG Emissions (Scope 1)	1	1	1
2	305-2 Indirect GHG (Scope 2) energy emissions	1	1	1
3	305-3 Other indirect (Scope 3) GHG emissions	0	0	0
4	305-4 GHG emission intensity	1	1	1
5	305-5 Reduction of GHG emissions	1	1	1
6	305-6 Emissions of ozone depleting substances	0	0	0
7	305-7 Nitrogen oxides (Nox), sulfur oxides (SOx), and other significant air emissions	0	0	1
Ni = 7	Total Items Disclosed	4	4	5
	Total Items Disclosed/Ni	0.57	0.57	0.71

Source: Processed data, 2025

Based on the calculation results of the conformity of greenhouse gas emission disclosure in table 4.8 above, it was found that PT Indika Energi Tbk disclosed 4 categories of items for the 2021-2022 period, while in 2023 the company disclosed 5 categories that were in accordance with carbon emission disclosure GRI 305. This data was found in the company's sustainability report for the last 3 years (2021-2023). Thus, the percentage of conformity of the company's GHG emission disclosure was 0.57 for the 2021-2022 period, and 0.71 for the 2023 period.

Table 7 Results of Calculation of GHG Emission Compliance Percentage Based on 4 Companies for the Period 2021 – 2023

Issuer Code	Year			Average	Quality Level
	2021	2022	2023		
ADRO	0.86	0.86	0.71	34.7%	Medium
PTBA	1	1	1	42.9%	Tall
BRAU	0.71	0.71	0.71	30.4%	Low
INDY	0.57	0.57	0.71	26.4%	Low

Source: Processed data, 2025

$$\text{Class Interval} = \frac{\text{Highest percentage} - \text{Lowest percentage}}{3\ \textit{Suitability level}}$$

$$\text{Class Interval} = \frac{42{,}9 - 26{,}4}{3} = 5{,}5$$

Low : 26.4 – 31.9
Medium : 32.0 – 37.5
Tall : 37.6 – 43.0

The quality of Greenhouse Gas (GHG) emission disclosure by PT Bukit Asam Tbk is the highest in terms of its compliance percentage. In the period 2021-2023, the company consistently disclosed 7 categories of carbon emission disclosure in accordance with the Global Reporting Initiative (GRI) Standard. It can be seen in the data above that PT Bukit Asam Tbk obtained a percentage of 42.9%, and this percentage is superior compared to the other 3 companies.

At PT Adaro Energy Tbk, it obtained 34.7% in its compliance percentage. Based on the data above, the company has disclosed 6 categories during 2021 - 2022, while in 2023 the company disclosed 5 categories in carbon emission disclosure that are in accordance with GRI standards. Based on this data, the level of compliance obtained by PT Adaro Energy Tbk is moderate.

PT Berau Coal Energy Tbk discloses 5 GRI 305 emission categories that are in accordance with carbon emission disclosure. The company consistently maintains the quality of its disclosure for the period 2021 - 2023. The data above shows the percentage of company compliance which is still relatively low, at 30.4%.

Based on table 9, PT Indika Energi Tbk has obtained a percentage of conformity for the quality of GHG emission disclosure of 26.4%, where the data shows that the company consistently discloses 4 categories in accordance with the GRI 305 standard on carbon emission disclosure for the period 2021-2022. In 2023, the company increased the quality of its disclosure to 5 categories so that the percentage of conformity increased to 0.71%. So in this result, the company obtained a disclosure quality that is still relatively low.

DISCUSSION

Compliance of Responsibility Accounting with Global Reporting Initiative standards of PT Adaro Energy Tbk

Table 8 Comparison of Accountability Accounting Reporting of PT Adaro Energy Indonesia, Tbk with Global Reporting Initiative (GRI) Standards

No	GRI 305	Responsibility Accounting	Information
1	305-1 GHG Emissions (Scope 1)	Calculation of GHG emissions scope 1 (direct emissions) comes from sources owned and controlled by the company, including: Emissions from fuel combustion (stationary, vehicles, heavy equipment), fugitive emissions (coolant gas, waste water treatment, blasting activities, waste burning).	In accordance
2	305-2 GHG energy emissions (Scope 2) indirect	Derived from the consumption of electrical energy purchased by the company.	In accordance
3	305-3 GHG Emissions (Scope 3) other indirect	-	It is not in accordance with

No	GRI 305	Responsibility Accounting	Information
4	305-4 GHG emission intensity	Calculated by comparing total GHG emissions with certain performance indicators, such as coal production or electricity.	In accordance
5	305-5 Reduction of GHG emissions	The company has taken various concrete steps to reduce GHG emissions, including renewable energy transition, energy efficiency, and the application of decarbonization technology. Through the roadmap that has been prepared, Adaro targets a more sustainable business transformation towards a green economy and NZE by 2060..	In accordance
6	305-6 Emissions of ozone depleting substances	Adaro Group prohibits the use of hazardous materials/products prohibited by the Stockholm Convention, and various other materials such as asbestos-containing materials, ozone-depleting compounds, and Polychlorinated biphenyls (PCBs).	In accordance
7	305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions.	Table 4.2 PT Adaro Energy Tbk's GHG Emission Reporting based on the Global Reporting Initiative (GRI) 305 standard	In accordance

Source: Processed data, 2025

In table 4.10, the accountability accounting report of PT Adaro Energy Indonesia, Tbk includes: Direct GHG emissions (Scope 1), Indirect GHG energy emissions (Scope 2), Reduction of GHG emissions, Emissions of ozone depleting substances, Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions. The accountability accounting report is in accordance with the GRI 305 standard.

Compliance of Responsibility Accounting with Global Reporting Initiative standards of PT Bukit Asam Tbk

Table 11 Comparison of Responsibility Accounting Reporting of PT Bukit Asam, Tbk with Global Reporting Initiative (GRI) Standards

No	GRI 305	Responsibility Accounting	Information
1	305-1 GHG Emissions (Scope 1)	During the reporting year, PTBA has measured CO2 from greenhouse gas emissions (scope 1) whose main source is the use of energy from non-renewable fossil fuel energy sources. Among them: Production process emissions and supporting factor emissions.	In accordance
2	305-2 GHG energy emissions (Scope 2) indirect	The Company calculates the electricity generation purchased/supplied by PLN as well as that generated by the Company's own generators.	In accordance
3	305-3 GHG Emissions (Scope 3)	The calculation is based on business travel by plane calculated using the ICAO (International Civil Aviation Organization) carbon calculator.	In accordance

No	GRI 305	Responsibility Accounting	Information
	other indirect		
4	305-4 GHG emission intensity	Companies calculate GHG emission intensity based on the total generated and then compared to the total production or specific operational activities.	In accordance
5	305-5 Reduction of GHG emissions	Conducting Decarbonization of operations, Use of New Renewable Energy (EBT), Carbon Capture, Utilization, and Storage (CCUS), Efficiency and Circular Economy Programs, Emission Monitoring and Reporting and Environmental Reclamation and Restoration.	In accordance
6	305-6 Emissions of ozone depleting substances	Regarding BPO, PTBA has conducted mapping in mining and office operations to determine whether or not there is use of the substance. The mapping results show the use of BPO, namely in the use of office & residential AC refrigerants. Furthermore, in accordance with the initial commitment to reduce greenhouse gas emissions, including emissions due to BPO, PTBA has a policy to reduce BPO emissions, namely using environmentally friendly AC refrigerants.	In accordance
7	305-7 Nitrogen oxides (Nox), sulfur oxides (SOx), and other significant air emissions.	The company is committed to reducing air pollution, namely the entry or inclusion of substances, energy, and/or other components into ambient air by human activities, so that it exceeds the established emission quality standards. In accordance with the Regulation of the Minister of Environment of the Republic of Indonesia Number 11 of 2021 concerning Emission Quality Standards for Internal Combustion Engines.	In accordance

Based on table 11 of PT Bukit Asam Tbk's Accountability Accounting Report, it includes reporting of direct scope 1 GHG emissions, indirect scope 2 GHG emissions, other indirect scope 3 GHG emissions, GHG emission intensity reports, GHG emission reduction reports, ozone depleting substances emissions reports, and reports of Nitrogen oxides (Nox), sulfur oxides (SOx), and other significant air emissions. It can be concluded that accountability accounting is in accordance with GRI 305 and environmental cost reports have a preventive nature through investment in renewable energy and conservation, an audit nature through environmental measurement and audit, and a corrective nature with reclamation efforts and mitigation of environmental impacts that have occurred. However, in its budget allocation, the company has not presented a quantitative breakdown of costs, only in the form of a total budget. In its presentation, the company more often discloses qualitative reports. In this case, the company needs topresent more specific budget details for each aspect of sustainability, so that transparency in spending can be increased.

Compliance of Responsibility Accounting with Global Reporting Initiative standards of PT Berau Coal Energy Tbk

Table 12 Comparison of Responsibility Accounting Reporting of PT Berau Coal Energy, Tbk with Global Reporting Initiative (GRI) Standards

No	GRI 305	Responsibility Accounting	Information
1	305-1 GHG Emissions (Scope 1)	Direct greenhouse gas (GHG) emissions come from primary operational activities, including fuel consumption for heavy equipment in coal mining and transportation activities. (Table 4.)	In accordance
2	305-2 Indirect GHG (Scope 2) energy emissions	Indirect emissions come from the consumption of electrical energy used in company operations. (Table 4)	In accordance
3	305-3 GHG Emissions (Scope 3) other indirect	Emissions from operational support activities such as business travel and administrative activities. (Table 4)	In accordance
4	305-4 GHG emission intensity	Emission intensity is calculated based on the amount of emissions produced per ton of coal produced.	In accordance
5	305-5 Reduction of GHG emissions	PT Berau Coal Energy Tbk has made various emission reduction efforts, such as: Utilization of digital technology in operations to improve energy efficiency. Routine inventory of GHG emissions for monitoring and controlling emissions. Pollution prevention through management of fuel and mining equipment. Climate change mitigation through post-mining land rehabilitation.	In accordance
6	305-6 Emissions of ozone depleting substances	-	It is not in accordance with
7	305-7 Nitrogen oxides (Nox), sulfur oxides (SOx), and other significant air emissions.	-	It is not in accordance with

PT Berau Coal Energy has reported most of its greenhouse gas emissions in accordance with the Global Reporting Initiative (GRI) 305 standard, especially in the categories of direct emissions from fuel consumption, indirect emissions from electricity use, and emissions from supporting operational activities. In addition, the company has also calculated emission intensity based on the amount of energy used in coal production.

However, there are several aspects that are not fully in accordance with GRI standards, especially in terms of reporting specific and measurable emission reductions. Although the company has mentioned energy efficiency measures and emission monitoring, the data presented does not include clear reduction targets. In addition, emissions of ozone-depleting substances and other

pollutants, such as nitrogen oxides and sulfur oxides, are not reported, so there is still a lack of transparency and detail in the sustainability report.

Overall, PT Berau Coal Energy has demonstrated a commitment to reporting greenhouse gas emissions, but still needs to improve the completeness and clarity of reporting emission reductions and the environmental impacts of other pollutants to better meet expected sustainability standards.

The impact of the GHG emission compliance level (Category: Low, Medium, High) according to the GRI 305 standard

1. ***Low Category GHG Emissions***

Based on the research results, there are 2 companies that have low quality Greenhouse Gas (GHG) emission disclosures, including PT Indika Energy Tbk and PT Berau Coal Energy Tbk.If the level of Greenhouse Gas (GHG) emission compliance based on the GRI 305 standard is in the low category, it means that an organization or company has not fully met the expected reporting and emission reduction standards. This can have a negative impact in several aspects, bgood for the environment, corporate reputation, regulations, as well as economic and competitive aspects. From an environmental perspective, high GHG emissions contribute to climate change which causes global temperature increases and increases the risk of natural disasters such as floods and droughts. In addition, deteriorating air quality due to high carbon emissions can threaten public health. In terms of reputation, companies that do not demonstrate a commitment to environmental issues risk losing the trust of stakeholders, such as investors, customers, and the community. Meanwhile, public criticism, pressure from environmental activists, and potential boycotts can also damage the company's image in the eyes of the public.

2. ***Medium Category GHG Emissions***

PT Adaro Energy Tbk is a company that has a medium category of GHG emission disclosure quality in this study.If the level of conformity of Greenhouse Gas (GHG) emissions based on GRI 305 is in the moderate category, it means that the company still has challenges and opportunities in managing its impacts. From the company's perspective, this category shows that PTAdaro Energy Tbkhas made efforts in managing emissions, but still has room for improvement. The company's reputation can be considered quite good, although there is still an expectation to further improve its emission reduction efforts. In terms of regulatory compliance, the company may still be within the specified limits, thus avoiding fines or sanctions. However, it has not met the best standards expected in sustainability practices. In addition, the moderate category can also be an indication that there is still potential for energy efficiency that has not been fully utilized to help reduce operational costs while reducing environmental impacts.

3. ***High Category GHG Emissions***

Based on the research results, PT Bukit Asam Tbk has achieved a high level of Greenhouse Gas (GHG) emission compliance based on the GRI 305 standard, of course this provides various benefits for the company, the

environment, and stakeholders. From the company's side, this achievement improves its image as a leader in sustainable and environmentally responsible business. In addition, the company can minimize the risk of sanctions or fines because it has met or even exceeded the established regulatory standards. The application of green technology and energy efficiency carried out by Bukit Asam has also helped reduce GHG emissions, reduce production costs, and increase competitiveness in the market.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. The application of the concept of accountability accounting at PT Adaro Energy Tbk, includes; GHG Emission Reporting (Scope 1), GHG Emission Reporting (Scope 1), Indirect GHG Energy Emissions (Scope 2), GHG Emission Reduction Reporting, GHG Emission Intensity Reporting, Ozone Depleting Substances Emission Reporting, Nitrogen Oxides (NOx), Sulfur Oxides (SOx), and Other Significant Air Emissions are in accordance with GRI Standard 305. Based on this data, the company has a moderate level of compliance for the disclosure of Greenhouse Gas (GHG) emission reporting information.
2. The application of the concept of accountability accounting at PT Bukit Asam Tbk, includes; GHG Emission Reporting (Scope 1), GHG Emission Reporting (Scope 1),Indirect (Scope 2) GHG Energy Emissions, Other Indirect (Scope 3) GHG Emissions Reporting, GHG Emission Reduction Reporting, GHG Emission Intensity Reporting, Ozone Depleting Substances Emissions Reporting, Nitrogen Oxides (NOx), Sulfur Oxides (SOx), and Other Significant Air Emissions Reporting are in accordance with GRI Standard 305. Based on the research results, the company has succeeded in achieving the highest level of compliance for GHG emission reporting information disclosure.
3. The application of the concept of accountability accounting at PT Berau Coal Energy Tbk, includes; GHG Emission Reporting (Scope 1), GHG Emission Reporting (Scope 1), Indirect (Scope 2) GHG Energy Emissions, Other Indirect (Scope 3) GHG Emissions Reporting, GHG Emission Reduction Reporting, GHG Emission Intensity Reporting, and Other Significant Air Emissions Reporting are in accordance with GRI Standard 305. Based on the research results, the company is at a low level of compliance for GHG emission information disclosure. So, the company still has room for improvement to improve their information.
4. Implementation of the concept of accountability accounting at PT Indika Energy Tbk, includes; GHG Emission Reporting (Scope 1), GHG Emission Reporting (Scope 1), Indirect Energy GHG Emissions (Scope 2), GHG Emission Reduction Reporting, and GHG Emission Intensity Reporting are in accordance with GRI Standard 305. Based on the research results, the company has a low level of compliance for the disclosure of their GHG

emission information. So, there is still room for better disclosure of GHG emission information.

Recommendation

1. Improving Accuracy and Transparency of Emissions Data. Companies need to improve the accuracy of recording and reporting greenhouse gas emissions, including nitrogen oxides (NOx), sulfur oxides (SOx), and ozone-depleting substances (ODS). Implementing automated monitoring systems and regular audits can help ensure that the data presented is more accurate and accountable.
2. Regulatory Adjustment and Increased Supervision.
   The government needs to optimize its role in understanding the context of environmental costs in order to create a common perception with various stakeholders. This can be done through joint efforts in discussing community problems and needs, as well as building effective two-way cooperation and communication in community empowerment. In addition, the government and related parties are expected to tighten regulations related to industrial emissions and increase supervision of company compliance with environmental standards. Such as providing incentives for companies that succeed in reducing emissions, as well as imposing sanctions for those who violate, can be effective steps to increase compliance and encourage more sustainable industrial practices.
3. Adoption of Green Technology and Energy Efficiency
   Companies are advised to invest in green technologies that can help reduce GHG emissions. Innovation in the use of renewable energy and optimization of production processes will support sustainability efforts and increase competitiveness at the global level.
4. Transparency to Stakeholders
   Increasing transparency in GHG emissions disclosure can increase investor confidence, consumer appeal, and government support. More transparent sustainability reporting will help companies gain a positive image and increase access to green funding.

ADVANCED RESEARCH

This advanced research underscores the varying degrees of accountability accounting practices among major Indonesian energy companies, particularly in their alignment with GRI Standard 305 for GHG emissions disclosure. While PT Bukit Asam Tbk demonstrates exemplary compliance and transparency, others such as PT Berau Coal Energy Tbk and PT Indika Energy Tbk exhibit lower levels of disclosure, highlighting significant room for improvement. To elevate the overall standard, this study recommends strategic advancements including the integration of automated emissions monitoring systems, enhanced regulatory frameworks, and the adoption of green technologies to foster data accuracy, regulatory compliance, and operational sustainability. Furthermore, fostering stakeholder trust through improved transparency and robust environmental

reporting will not only enhance corporate reputation but also unlock access to sustainable financing and global competitiveness, thereby positioning these entities at the forefront of environmentally responsible industrial transformation.

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