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The Influence of Environmental Managementof Oil and Natural Gas Companies on Environmental Performance Rating Value

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Abstract
The main objective of this research is to analyze the influence of GHG Emissions, Energy Consumption and Waste Generation on Profit and the PROPER Index as well as Profit as a mediator and the Role of Environmental Management Cost Regulations as a moderating variable.
The design used in this research is quantitative research by developing a sustainable practice model which is proxied by achieving the company's Proper value using a panel regression model, namely by testing and analyzing the influence of Emissions, Energy Consumption on Proper performance with company profits as a mediating variable and Environmental Management Costs. as a moderating variable. The data structure used is a combination of time series data (multiple data or time series data) and cross section data, using a panel regression equation.
The results of this research show that the variation in PROPER Index values between one company and another is quite high. The blue PROPER Index ranking has the lowest number of PROPER Index ranking achievements. The GHG emission values issued by one oil and gas company compared to other oil and gas companies are relatively heterogeneous or have quite large differences. The energy consumption value is quite heterogeneous between one company and another company and the waste generation produced by oil and gas companies from one company to another company is heterogeneous. Profit values between one company and another oil and gas company are quite heterogeneous. The development of oil and gas company profits during the 2017-2020 period shows a decreasing trend during the 2017-2020 period. Environmental Management Costs, it was found that there was quite heterogeneous variation in Environmental Management Costs between one company and another. The development of Environmental Management Costs during the 2017-2020 period shows an increasing trend from year to year.

Keywords *-GHG Emissions, Energy Consumption, Waste Generation, Profit, PROPER Index and Environmental Management Costs.*

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I. INTRODUCTION

Oil and Gas or oil and gas is one of the natural resources that is still the backbone of development in Indonesia. According to (Nasir, 2014) Indonesia can be said to be an oil producing country, and has even been a member of the world crude oil producing organization, namely OPEC. Based on data from BP (2013), Indonesia has succeeded in producing crude oil of more than 1 million barrels of oil per day or barrel oil per day (bopd) during the period 1972 to 2006. Based on data from SKKMIGAS (2019) with a total of 220 working areas per February 2019, oil and gas production was 768,000 bopd, gas production was 1,311,000 barrels of oil equivalent per day (boepd), and total oil and gas production was 2,079,000 boepd. This makes Indonesia the 23rd oil producing country out of 98 oil producing countries, but if we look at Oil Production per capita (bopd/million population) Indonesia is in 55th place out of 98 countries. Meanwhile, oil and gas production in 2022 will be 644,000 barrels of oil per day (bopd), a decrease of around 6.94% compared to the previous year which reached 692,000 bopd (Energy Institute, 2023). Meanwhile, natural gas production in Indonesia in 2022 will reach 955,000 boepd or barrels of oil equivalent per day (SKKMigas, 2023).

Meanwhile, based on Energy Outlook 2018, Indonesia's oil and gas reserves continue to decline, in 2016 they were 7,251.11 million metric barrels of tank stock or Million Metric Stock Tank Barrels (MMSTB), down 0.74% from 2015, while gas reserves also fell 5.04%. With oil and gas production of 338 million barrels and proven reserves, it is estimated that oil and gas will run out in 9 years (2025) and oil and gas will run out within 42 years. Indonesia's oil reserves in 2023 are reported to be 4.17 billion barrels. This figure includes proven reserves, which are estimated at around 2.44 billion barrels, and unproven reserves, also at 2.44 billion

barrels (ESDM, 2023). By 2024, Indonesia's remaining oil reserves are projected to be around 1137.86 million metric tank stock barrels (MMSTB), which represents a significant decline of 48.56% from 2020 levels.

The oil and gas industry today faces fundamental problems related to sustainability and environmental performance. The problems faced at least include the issue of decreasing production and reserves, increasing energy consumption, climate change due to increasing greenhouse gases, increasing waste and increasingly stringent environmental regulations. To overcome this challenge, effective and strategic steps are needed to create a more sustainable and environmentally friendly future for the oil and gas industry. (ESDM, 2020) There are many reasons why industry does not take stronger action to fulfill its sustainable development commitments. This is supported by the research of Dalal Clayton (2004), who states that decision-making difficulties, when applied explicitly as part of a sustainability assessment, are faced with common challenges, related to policy, practical approaches or performance, and positive outcomes of sustainability change. Policy reconciliation, related to how to weigh, 7 balance or reconcile economic, social and environmental objectives and considerations. Performance or practical approaches, namely which processes and methods (macro and micro) can be used to conduct integrated analysis to inform decision making. Positive outcomes of sustainable change are whether the actions and implementation actions taken contribute to the organization's long-term progress towards sustainable development.

A review of the performance of oil and gas companies needs to be carried out to see the influence of environmental management performance mediated by the company's net profit dimension and moderated by environmental management costs 8 (BPL) on environmental sustainability in this sector, as measured by the Proper Index, as a measure. sustainable comprehensive environmental management. It is hoped that this dissertation can assess the practices that have been carried out in oil and gas companies in Indonesia related to efforts to assess and achieve SDGs by understanding the concepts and principles of sustainable development that are included in oil and gas business decision making and implemented in projects or business activities so that business sustainability (business sustainability).

Theoritical Review

The Indonesian government has committed to achieving the 17 goals and 169 SDG targets set by the United Nations (UN) in the 2030 Agenda for Sustainable Development. The Indonesian government has an Indonesian national action plan to achieve sustainable development goals and integrate sustainability principles into national development policies and programs (Bappenas, 2014). This roadmap provides an overview of the steps taken by the Indonesian government to achieve the SDGs, including the roles of various stakeholders and efforts to measure progress (Bappenas, 2017). The Indonesian government is committed to successfully implementing the Sustainable Development Goals by achieving the 2030 development agenda. In this case, Indonesian Presidential Regulation no. 59/2017 concerning the implementation of SDGs in Indonesia mandates the Ministry of National Development Planning of the Republic of Indonesia to provide an Indonesian SDGs Roadmap (Bappenas, 2019). In 2019, issued a Roadmap of SDGs Indonesia at the 2019 SDGs Annual Summit in Jakarta. The roadmap defines the issues and projections of key SDG indicators for each goal, including forward-looking policies to achieve these targets. Indonesia's SDGs consist of around 60 indicators (Bappenas, 2019). Implementing the SDGs in the oil and gas industry in Indonesia involves efforts to reduce environmental impacts, increase energy efficiency, and support the transition to cleaner and more sustainable energy sources. Yulisman (2016), reviewed the regulatory framework and implementation of sustainable development in the Indonesian oil and gas industry, and highlighted efforts to achieve relevant SDGs goals. PwC Indonesia. (2019). explores how energy, utility and resource companies in Indonesia, including the oil and gas industry, can contribute to achieving the SDGs through implementing sustainable and innovative business practices. Sudiyanti et. al. (2020) evaluated the role of the Indonesian oil and gas industry in achieving the SDGs, with a focus on increasing energy efficiency, reducing GHG emissions, and developing new and renewable energy sources.

To minimize the environmental impact of hazardous waste generation in the oil and gas industry, companies must implement appropriate waste management practices, including waste reduction, recycling, processing and disposal. In addition, regulatory compliance and regular monitoring are essential to ensure that hazardous waste is managed in a safe and environmentally responsible manner. The main journal literature reference that discusses the generation of hazardous waste in the oil and gas industry is the paper entitled "Environmental Issues and Management of Waste in Energy and Mineral Production" by R. K. Singhal and A. K. Mehrotra, which was published in the International Journal of Mining, Reclamation and the Environment in 2007.

The performance of environmental and institutional management is the main dimension in seeing changes in the environmental sustainability of oil and gas companies in Indonesia. Based on problem identification, research questions and previous research, the researcher created a framework for thinking in this research which is also based on previously researched dimensions which are contained in the following

conceptual framework in Figure 1.

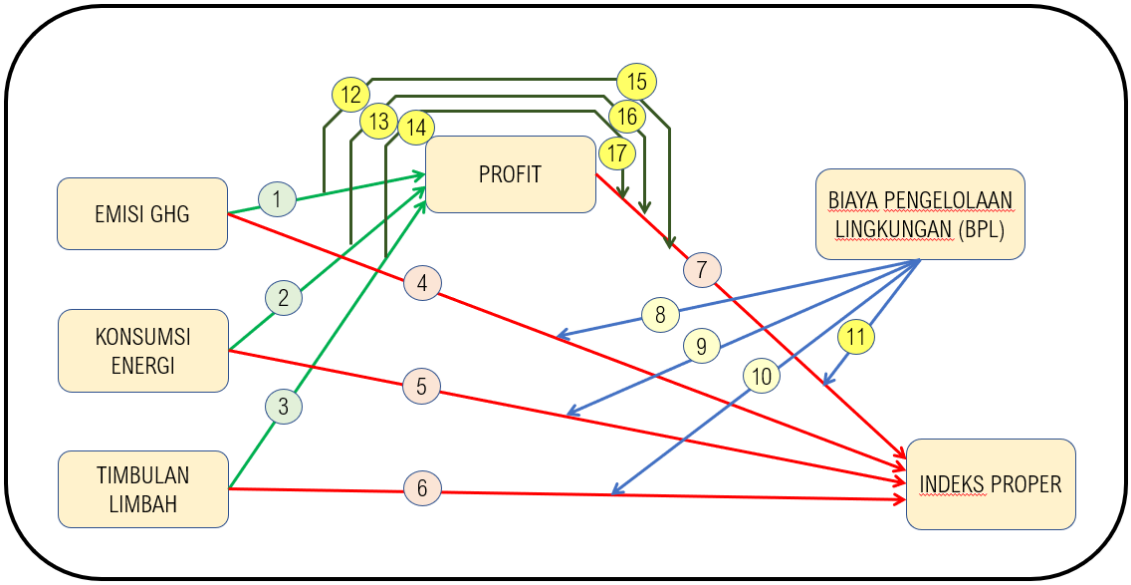

Figure 1.
Research Model

II. METHODOLOGY

The research design used is quantitative research by developing a sustainable practice model which is proxied through achieving the company's Proper value using a panel regression model, namely by testing and analyzing the influence of Emissions, Energy Consumption on Proper performance with company profits as a mediating variable and Environmental Management Costs as a variable moderation. With the data structure used being a combination of time series data (many times data or time series data) and cross section data (many objects at a certain time) a panel regression equation is used. Meanwhile, descriptive research design is used to describe or explain the variables studied as well as see the relationship and dependence of variables on their sub-variables and to analyze the influence of each independent variable and dependent variable in this research. The value of each of these variables is searched for then the development is explained descriptively using hypothesis testing, namely testing the influence of Emissions, Energy Consumption, Waste Accumulation on the Proper Index with Production as a mediating variable and Environmental Processing Costs as a moderating variable.

Based on the population criteria in this research, there were 96 oil and gas companies with a research period of 4 years (2017-2020), so the total sample used in this research was 96 samples.

III. RESULTS AND DISCUSSION

Uji parsial atau uji t dilakuan untuk menguji pengaruh dari masing-masing variabel independen terhadap variabel dependennya. Hasil pengolahan ditunjukkan dengan Tabbel 1. Sebagai berikut :

Tabel 1. Hasil Uji t (Uji Parsial)

Hipotesis		Beta	t-Statistic	Prob.	Simpulan
H_1	Terdapat pengaruh Emisi GRKterhadap Profit	0.3272	2.3534	0.0103**	Hipotesisdidukung
H_2	Terdapat pengaruh KonsumsiEnergi terhadap Profit	0.0976	1.4375	0.0770*	Hipotesis tidak didukung
H_3	Terdapat pengaruh TimbulanLimbah terhadap Profit	0.2309	2.6377	0.0049**	Hipotesisdidukung
H_4	Terdapat pengaruh Emisi GRKterhadap Indeks PROPER	-0.7228	-3,8711	0.0001**	Hipotesisdidukung
H_5	Terdapat pengaruh Konsumsi Energi terhadap Indeks PROPER	-1,3486	-9,0929	0,0000**	Hipotesisdidukung
H_6	Terdapat pengaruh Timbulan Limbah terhadap Indeks PROPER	1.5507	7,4407	0.0000	Hipotesisdidukung
H_7	Terdapat pengaruh Profitterhadap Indeks PROPER	-0,4612	-2,5887	0,0059**	Hipotesisdidukung
H_8	Biaya Pengelolaan Lingkungan memoderasi pengaruh				Hipotesisdidukung

	Emisi GRKterhadap Indeks PROPER	0.0247	3.0124	0,0018**	
H9	Biaya Pengelolaan Lingkungan memoderasi pengaruh KonsumsiEnergi terhadap Indeks PROPER	0.0477	7.9366	0,0000**	Hipotesisdidukung
H10	Biaya Pengelolaan Lingkungan memoderasi pengaruh timbulan limbah terhadap Indeks PROPER	-0.0623	-7.0353	0,0000	Hipotesisdidukung
H11	Biaya Pengelolaan Lingkunganmemoderasi pengaruh profit	0,0188	2,5449	0,0067**	Hipotesisdidukung

Hipotesis		**Beta**	**t-Statistic**	**Prob.**	**Simpulan**
terhadap Indeks PROPER					
H12	Profit memediasi pengaruh dariemisi GRK terhadap Indeks PROPER	-0.1509	-1,7413	0,0408**	Hipotesisdidukung
H13	Profit memediasi pengaruh dari konsumsi energi terhadap IndeksPROPER	-0.0450	-1,2567	0,1044	Hipotesis tidak didukung
H14	Profit memediasi pengaruh dari timbulan limbah terhadap IndeksPROPER	-0.1065	-1,8475	0,0320**	Hipotesisdidukung
H15	Profit memediasi pengaruh dariEmisi GRK terhadap Indeks PROPER yang dimoderasi olehBiaya Pengolahan Lingkungan	0.0061	1,7279	0,0420**	Hipotesisdidukung
H16	Profit memediasi pengaruh dari konsumsi energi terhadap IndeksPROPER yang dimoderasi oleh Biaya Pengolahan Lingkungan	0.0018	1,2516	0,1053	Hipotesis tidak didukung
H17	Profit memediasi pengaruh dari timbulan limbah terhadap Indeks PROPER yang dimoderasi olehBiaya Pengolahan Lingkungan	0.0043	1,8315	0,0335**	Hipotesisdidukung

Sumber: Data Diolah

A partial test or t test is carried out to test the influence of each independent variable on the dependent variable. The processing results are shown in Table 1. As follows:

Hypothesis 1:

Hypothesis 1 was carried out with the aim of testing the positive influence of GHG emissions on profits in oil and gas companies in Indonesia. The processing results are shown by an estimated coefficient value of 0.3272, which means that increasing GHG emissions will increase profits and conversely decreasing GHG emissions will reduce profits. The statistical t value of 2.3534 produces a p-value of 0.0103 < 0.05, which means that Ho is rejected and Ha is accepted so it can be concluded that it is proven that GHG emissions have a positive influence on profit.

Hypothesis 2

Hypothesis 2 aims to test the influence of Energy Consumption on Profit in Oil and Gas companies in Indonesia. The estimated coefficient value of 0.0976 means that increasing energy consumption will increase oil and gas profits and conversely decreasing energy consumption will reduce profits. The statistical t value of 1.4375 produces a p-value of 0.0770 > 0.05, which means Ho is accepted and Ha is rejected so it can be concluded that it is proven that Energy Consumption does not have a positive influence on the Profit of the oil and gas sector in Indonesia.

Hypothesis 3

Hypothesis 3 was carried out with the aim of testing the positive influence of waste generation on profits in oil and gas companies in Indonesia. The processing results are shown by an estimated coefficient value of 0.2309, which means that increasing waste generation will increase oil and gas profits and conversely decreasing waste generation will reduce profits. The statistical t value of 2.6377 produces a p-value of 0.0049 < 0.05, which means Ho is rejected and Ha is accepted so it can be concluded that it is proven that Limban Generation has a positive influence on Profit.

Hypothesis 4

Hypothesis 4 was carried out with the aim of testing the negative influence of GHG emissions on the PROPER Index. The processing results are shown by an estimated coefficient value of -0.7228, which means that increasing GHG emissions will reduce the PROPER Index and conversely decreasing GHG emissions will increase the PROPER Index. The statistical t value of -3.8711 produces a p-value of 0.0001 < 0.05, which means that Ho is rejected and Ha is accepted so that the hypothesis that GHG emissions have a negative effect on the PROPER Index is proven.

Hypothesis 5

Hypothesis 5 aims to test the negative influence of Energy Consumption on the PROPER Index. The processing results are shown by an estimated coefficient value of -1.3486, which means that increasing Energy Consumption will reduce the PROPER Index and conversely decreasing Energy Consumption will increase the PROPER Index. The statistical t value of -9.0929 produces a p-value of 0.0101 < 0.05, which means that Ho is rejected and Ha is accepted so that the hypothesis that Energy Consumption has a negative influence on the PROPER Index is proven.

Hypothesis 6

Hypothesis 6 aims to test the influence of Waste Generation on the PROPER Index. The processing results are shown by an estimated coefficient value of 1.5507, which means that increasing Waste Generation will increase the PROPER Index and conversely decreasing Waste Generation will reduce the PROPER Index. These findings indicate that the hypothesis which states that waste generation has a negative effect on PROPER is not proven. The statistical t value of 7.4407 produces a p-value of 0.0000 ≤ 0.05, which means Ho is rejected and Ha is accepted so that the hypothesis stating that Waste Generation has a positive influence on the Proper Index is proven.

Hypothesis 7

Hypothesis 7 was carried out with the aim of testing the influence of Profit on the PROPER Index in oil and gas companies in Indonesia. The results of data processing show an estimated coefficient value of -0.4612, which means that increasing oil and gas profits will reduce the PROPER Index and conversely, decreasing oil and gas profits will increase the PROPER Index. The statistical t value of -2.5887 produces a p-value of 0.0059 ≤ 0.05, which means that Ho is rejected and Ha is accepted so that the hypothesis that oil and gas profits have a positive effect on the PROPER Index is proven.

Hypothesis 8

Hypothesis 8 was carried out with the aim of testing the role of Environmental Management Costs in moderating the influence of GHG Emissions on the PROPER Index. From the results of data processing, an estimated coefficient value of 0.0247 is obtained, which means that increasing GHG emissions will increase the PROPER Index with Environmental Management Costs moderating and conversely decreasing GHG Emissions will reduce the PROPER Index with Environmental Management Costs as moderation. The statistical t value of 3.0124 produces a p-value of 0.0018 ≤ 0.05, which means Ho is rejected and Ha is accepted so that the hypothesis stating that the role of Environmental Management Costs has an influence in moderating oil and gas GHG emissions on the PROPER Index is proven.

Hypothesis 9

Hypothesis 9 was carried out with the aim of testing the role of Environmental Management Costs in moderating the influence of energy consumption on the PROPER Index. From the results of data processing, an estimated coefficient value of 0.0477 is obtained, which means that increasing Energy Consumption will increase the influence on the PROPER Index which is moderated by Environmental Management Costs and conversely decreasing Energy Consumption will reduce the PROPER Index with Environmental Management Costs as moderation. The statistical t value of 7.9366 produces a p-value of 0.0000 ≤ 0.05, which means that Ho is rejected and Ha is accepted so that the hypothesis states that Environmental Management Costs positively moderate Energy Consumption which has an influence on the PROPER Index with proven Profit.

Hypothesis 10

Hypothesis 10 was carried out with the aim of testing the role of Environmental Management Costs in moderating the influence of Waste Generation on the PROPER Index. From the results of data processing, an estimated coefficient value of -0.0623 is obtained, which means that increasing Waste Generation will reduce the PROPER Index moderated by Environmental Management Costs and conversely decreasing Waste Generation will increase the PROPER Index with Environmental Management Costs as moderation. The results of the data processing findings state that the statistical t value is -7.0353, resulting in a p-value of 0.0000 ≤ 0.05, which means that Ho is rejected and Ha is accepted so that the hypothesis stating that Environmental Management Costs positively moderate Waste Generation has an influence on the PROPER Index is proven.

Hypothesis 11

Hypothesis 11 was carried out with the aim of testing the role of Environmental Management Costs in moderating the influence of Profit on the PROPER Index. From the results of data processing, an estimated coefficient value of 0.0188 is obtained, which means that increasing Profit will increase the PROPER Index with Environmental Management Costs as moderation and conversely decreasing Profit will reduce the PROPER Index with Environmental Management Costs as moderation. The statistical t value of 2.5449 produces a p-value of 0.0067 ≤ 0.05, which means Ho is rejected and Ha is accepted so that the hypothesis states that Environmental Management Costs moderate Profit which has a positive influence on the PROPER Index is proven.

Hypothesis 12

Hypothesis 12 was carried out with the aim of testing profit mediating the effect of GHG emissions on the PROPER Index. The processing results are shown by an estimated coefficient value of -0.1509, which means that increasing emissions will reduce PROPER with profit as mediation and conversely decreasing emissions will increase PROPER with profit as mediation. The statistical t value is -1.7413 with a p-value of 0.0408 ≤ 0.05 so that Ho is rejected and Ha is accepted so it can be concluded that it is proven that profit mediates the positive influence of GHG emissions on the PROPER Index.

Hypothesis 13

Hypothesis 13 was carried out with the aim of testing profit mediating the effect of energy consumption on the PROPER Index. The results of data processing show that the estimated coefficient value is -0.0450, which means that increasing energy consumption will reduce the PROPER Index with profit as mediation and conversely decreasing emissions will increase PROPER with profit as mediation. The statistical t value is -1.2567 with a p-value of 0.1044 > 0.05 so that Ho is accepted and Ha is rejected, thus it can be concluded that it is proven that profit mediates the influence of GHG emissions and does not have a positive effect on the PROPER Index.

Hypothesis 14

Hypothesis 14 was carried out with the aim of testing profit mediating the effect of waste generation on PROPER. The results of data processing show that the estimated coefficient value is -0.1065, which means that increasing waste generation will reduce the PROPER Index with profit as mediation and conversely decreasing waste generation will increase the PROPER Index with profit as mediation. The statistical t value is -1.8475 with a p-value of 0.0320 ≤ 0.05 so that Ho is rejected and Ha is accepted and it can be concluded that Profit mediates the effect of waste generation on the Proper index.

Hypothesis 15

Profit mediates the effect of emissions on the Proper Index, moderated by the regulatory role of environmental processing costs. Hypothesis 15 was carried out with the aim of testing Profit mediating the effect of GHG emissions on the PROPER Index moderated by Environmental Processing Costs. From the data processing results, it was found that the estimated coefficient value was 0.0061, which means that increasing GHG emissions will increase the PROPER Index moderated by Environmental Processing Costs and profit as mediation and conversely decreasing GHG emissions will reduce the PROPER Index moderated by Environmental Processing Costs with Profit as mediation. The statistical t value is 1.7279 with a p-value of 0.0420 ≤ 0.05 so that Ho is rejected and Ha is accepted so that the hypothesis states that Profit mediates the effect of GHG emissions on the PROPER Index moderated by Environmental Processing Costs and this is proven.

Hypothesis 16

Hypothesis 16 was carried out with the aim of testing Profit mediating the influence of energy consumption on the PROPER Index which is moderated by environmental processing costs. From the processing results, it is found that the estimated coefficient value is 0.0018, which means that increasing energy consumption will increase the PROPER Index moderated by Environmental Management Costs and profit as mediation and conversely decreasing energy consumption will reduce the PROPER Index moderated by Environmental Management Costs with profit as mediation. The statistical t value is 1.2516 with a p-value of 0.1053 > 0.05 so that Ho is accepted and Ha is rejected. It can be concluded that Profit does not mediate the effect of energy consumption on the Proper Index which is moderated by Environmental Management Costs.

Hypothesis 17

Hypothesis 17 was carried out with the aim of testing Profit mediating the influence of waste generation on the PROPER Index moderated by Environmental Management Costs. From the results of data processing, an estimated coefficient value of 0.0043 is obtained, which means that increasing waste generation will increase the PROPER Index moderated by Environmental Management Costs and profit as mediation and conversely, decreasing waste generation will reduce the PROPER Index moderated by Environmental Management Costs with profit as mediation. The statistical t value is 1.8315 with a p-value of 0.0335 ≤ 0.05 so that Ho is rejected and Ha is accepted so that the results of the hypothesis test state that profit mediates the effect of waste generation on the PROPER Index moderated by Environmental Management Costs and this is proven.

IV. Conclusion

From the results of the research that has been carried out, the following conclusions are obtained: GHG emissions have an influence on profits. Energy Consumption has no influence on Profit. Waste generation has an influence on Profit. GHG emissions have an influence on the PROPER Index. Energy Consumption has an influence on the PROPER Index. Waste generation has an influence on the PROPER Index. Profit has an influence on the PROPER Index. Environmental Management Costs moderate the influence of GHG Emissions on the PROPER Index. Environmental Management Costs moderate the influence of Energy Consumption on

the PROPER Index. Environmental Management Costs moderate the influence of Waste Generation on the PROPER Index. Environmental Management Costs moderate the influence of Profit on the PROPER Index. Profit mediates the influence of GHG emissions on the PROPER Index. Profit does not mediate the influence of Energy Consumption on the PROPER Index. Profit mediates the influence of Waste Generation on the PROPER Index. Profit mediates the influence of GHG emissions on the PROPER Index which is moderated by Environmental Processing Costs. Profit does not mediate the influence of Energy Consumption on the PROPER Index which is moderated by Environmental Processing Costs. Profit mediates the influence of Waste Generation on the PROPER Index which is moderated by Environmental Processing Costs.

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