

CLASSIFICATION OF OIL AND GAS COMPANIES AS TO THEIR ESG PARAMETERS FROM THE AHP-TOPSIS-2N METHOD

ABSTRACT

More and more has been heard about ESG, an acronym that in English means Environmental, Social, and Governance. This concept represents a company's practices considering environmental, social, and governance aspects. These points today do not represent only the companies' ideas, they directly reflect the market value and the brand's establishment. The ESG index is constantly being measured and analyzed by companies and independent market players. This article proposed a methodology for comparing these companies, in the oil and gas industry case, by applying a multicriteria decision-making method (AHP-TOPSIS-2N) that stipulated a ranking of the prominent companies of this follow-up regarding their ESG requirements.

Keywords: AHP; AHP-TOPSIS-2N; ESG; Oil and gas.

1. Introduction

Today, sustainable development is not just about an idea or awareness of organizations, but a matter of survival and competitiveness because the market already charges companies responsible for the impacts of their operation from the social and environmental perspective, requiring not only a positioning but mainly the governance of this impact in general, thus giving great importance to sustainability in the process of creating new strategies for Companies.

2. Literature Review

Value-Focused Thinking (VFT) is a methodology suggested in 1992 by Keeney to establish the values to be used by the decision-makers for orientation in the decision-making process. The AHP-TOPSIS-2N method, proposed by Souza *et al.* (2018), is a hybrid method formed by two multicriteria decision-making techniques: AHP and TOPSIS methods.

3. Hypotheses/Objectives

Our main objective is to analyze the results obtained by the large oil and gas companies with regard to the ESG evaluation concept, apply a multicriteria analysis to classify these companies within this context.

4. Research Design/Methodology

Following the Value-Focused Thinking (VFT) approach, a series of meetings were held with sustainability experts to establish the criteria and the indicators for the case study. Data from the Capital IQ platform that analyzes the ESG criteria for companies of various economic segments were used for the problem in question. Analyzing the data and the VFT methodology of problem structuring, it was possible to identify the objectives explained by the adopted criteria and the actions of unfolding it, structured by the platform itself.

5. Data/Model Analysis

Based on the criteria established in Table 5, Appendix A, the decision matrix is obtained (Table 1).

Table 1 - Decision Matrix

	Climate Strategy	Operational Eco-Efficiency	Water Related Risks	Biodiversity	Environmental Policy & Management Systems	Environmental Reporting
Ecopetrol S.A.	90	49	100	54	52	100
Petróleo Brasileiro S.A. - Petrobras	92	86	100	50	71	100
Equinor ASA	84	77	73	35	50	100
Exxon Mobil Corporation	48	39	53	30	46	100
Chevron Corporation	51	23	16	16	42	50

After applying the AHP-TOPSIS-2N hybrid modeling, we obtained the result considering the two normalizations (Table 2 and 3). Pair-to-peer comparison matrix (Table 6), criteria weights (Table 7) and consistency rate (Table 8) are presented in the Appendix A.

Table 2 – Result for First Normalization

	D+	D-	PONTUAÇÃO NORMALIZAÇÃO 1	RANKING NORMALIZAÇÃO 1
Ecopetrol S.A.	0,224	0,412	0,648	3
Petróleo Brasileiro S.A. - Petrobras	0,005	0,548	0,990	1
Equinor ASA	0,105	0,454	0,813	2
Exxon Mobil Corporation	0,476	0,114	0,193	4
Chevron Corporation	0,532	0,026	0,046	5

Table 3 – Result for Second Normalization

	D+	D-	PONTUAÇÃO NORMALIZAÇÃO 2	RANKING NORMALIZAÇÃO 2
Ecopetrol S.A.	0,105	0,134	0,561	3
Petróleo Brasileiro S.A. - Petrobras	0,002	0,212	0,989	1
Equinor ASA	0,039	0,177	0,820	2
Exxon Mobil Corporation	0,169	0,053	0,239	4
Chevron Corporation	0,209	0,007	0,031	5

After the two normalizations, the final result of the alternatives is reached by the Table 4, made possible by the comparison of the results of the two normalizations.

Table 4 - Final Ranking of Alternatives

EMPRESA	POSIÇÃO NO RANKING
Petróleo Brasileiro S.A. - Petrobras	1
Equinor ASA	2
Ecopetrol S.A.	3
Exxon Mobil Corporation	4
Chevron Corporation	5

6. Limitations

For future studies, it is suggested a greater scope of criteria, which can also be encompassed the social and governance pillars of ESG practices for an even broader comparison of companies in the sector. In addition, a different method of multicriteria analysis can be applied to compare the results obtained.

7. Conclusions

The application of the AHP-TOPSIS-2N method to classify the alternatives presented coherent results, both in the analysis of weights and because convergence between the two normalizations was observed. Finally, the results pointed to the Brazilian company Petrobras as the best placed, among the alternatives, when analyzing the important environmental criteria for the economic sector in which it is inserted.

8. Key References

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9. Appendix A

Table 5 presents the classification of alternatives within the fundamental scale in the analysis of the base in the analysis of the significance classified by the platform evaluated each of the criteria.

Table 5 - Criteria Relationship Matrix

	Climate Strategy	Operational Eco-Efficiency	Water Related Risks	Biodiversity	Environmental Policy & Management Systems	Environmental Reporting
Climate Strategy	1	1	6	7	7	9
Operational Eco-Efficiency	1	1	6	7	7	9
Water Related Risks	1/6	1/6	1	3	3	5
Biodiversity	1/7	1/7	1/3	1	1	2
Environmental Policy & Management Systems	1/7	1/7	1/3	1	1	2
Environmental Reporting	1/9	1/9	1/5	1/2	1/2	1

Table 6 – Pairwise Comparison Matrix

	Climate Strategy	Operational Eco-Efficiency	Water Related Risks	Biodiversity	Environmental Policy & Management Systems	Environmental Reporting
Climate Strategy	0,390	0,390	0,433	0,359	0,359	0,321
Operational Eco-Efficiency	0,390	0,390	0,433	0,359	0,359	0,321
Water Related Risks	0,065	0,065	0,072	0,154	0,154	0,179
Biodiversity	0,056	0,056	0,024	0,051	0,051	0,071
Environmental Policy & Management Systems	0,056	0,056	0,024	0,051	0,051	0,071
Environmental Reporting	0,043	0,043	0,014	0,026	0,026	0,036

Table 7 – Criteria Weight Table

Crítério	Peso
Climate Strategy	0,375
Operational Eco-Efficiency	0,375
Water Related Risks	0,115
Biodiversity	0,052
Environmental Policy & Management Systems	0,052
Environmental Reporting	0,031

Table 8 – Consistency rate

Parâmetro	Valor
Lambda máximo:	6,405
Índice de consistência:	0,081
Razão de consistência:	0,065