

Analysis of Risk Management Maturity and Risk Governance Using AHP: A Case Study at Pt Pertamina Hulu Energi for the 2020–2025 Period

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Keywords:

analytic hierarchy process,
 risk management maturity,
 risk governance, weighted
 score, company
 performance

Abstract

The upstream oil and gas industry faces complex strategic, operational, financial, and governance risks, making mature risk management essential for organizational resilience and decision-making. This study aims to determine the priority weights of Risk Management Maturity (RMM) indicators and Risk Governance aspects at PT Pertamina Hulu Energi (PHE), test the consistency of the Analytic Hierarchy Process (AHP) matrices, and describe their development during 2020–2025. A descriptive quantitative case study was employed using purposive sampling of five experts. Primary data were collected through expert confirmation and pairwise comparisons, while secondary data were obtained from PHE annual reports and financial statements. AHP and weighted scoring were applied to seven RMM indicators and five Risk Governance aspects. The results show that Leadership and Commitment had the highest RMM weight (28.61%), followed by Risk Governance (21.23%), while the Board of Commissioners and Board of Directors dominated Risk Governance weighting (35.70%). Both matrices were consistent, with CR values of 0.0545 and 0.0814. RMM scores increased from 3.94 to 4.85, while Risk Governance rose from 3.00 to 5.00. The study concludes that stronger leadership, governance structures, and risk identification are central to sustaining risk management maturity, although improved maturity does not automatically guarantee higher profitability performance

INTRODUCTION

The upstream oil and gas industry operates in an environment that has a high level of uncertainty. Exploration, field development, production, facility management, occupational safety, environmental protection, and investment decisions expose the company to strategic, operational, financial, compliance, project, and reputational risks simultaneously. In these conditions, risk management (Eckles et al., 2014) is not enough to be positioned as an administrative function, but needs to be integrated with governance (Ho, 2008), strategy, planning, and evaluation of company performance. ISO 31000:2018 places value (Grace et al., 2015) creation and protection, leadership, integration, continuous improvement, as well as human and cultural factors as important elements of risk management, while COSO (2017) affirms that Enterprise (Baxter et al., 2013) Risk Management must be integrated with strategy and performance (Forman & Peniwati, 1998).

Risk Management Maturity (Djakman & Siregar, 2024) (RMM) describes the level of development of an organization's ability to manage risk in a consistent, documented, integrated, and sustainable manner. (Callahan & Soileau, 2017) and (Farrell & Gallagher, 2019) found that

the maturity of the Enterprise Risk Management (Altuntas et al., 2011) process is related to operational performance and company value, although the strength of these linkages is influenced by the organizational context. Meanwhile, Risk Governance (Aziza & Aviola, 2024) focuses on the authority structure, the role of the Board of Commissioners and the Board of Directors, risk management organizations (Hoyt & Liebenberg, 2011), supervisory mechanisms, accountability, and risk integration in business decisions, as explained through the Three Lines Model (Auditors, 2020). (Malik et al., 2020) and (Horvey & Odei-Mensah, 2024) show that strong governance can strengthen the effectiveness (Jonek-Kowalska, 2022) of Enterprise Risk Management and its correlation with performance (Bromiley et al., 2015).

PT Pertamina Hulu Energi (PHE) (Energi, 2020) carries out the function of upstream subholding with large scale of operations, investment needs, and risk exposure. Changes in the energy environment, oil price volatility, project risks, production challenges, health and safety aspects, as well as environmental and sustainability demands demand a risk management system that is able to support timely decision-making (Standardization, 2018). PHE's Return on Assets (ROA) value increased from 2.49% in 2020 to 10.26% in 2024, but decreased to 6.98% in 2025 (Table 1), which shows that the company's performance is influenced by a combination of internal capabilities and external factors (Maharani & Efa Yonnedi, 2023), so that an increase in risk maturity cannot be directly stated to lead to an increase in performance.

Table 1 Development of PHE's Return on Assets in 2020–2025

Year	Net Profit (USD million)	Total Assets (USD million)	LENGTH (%)
2020	564	22.635	2,49
2021	2.045	36.987	5,53
2022	4.639	55.631	8,34
2023	4.773	59.098	8,08
2024	3.121	30.422	10,26
2025	2.175	31.157	6,98

Source: PHE financial statements and annual report 2020–2025, reprocessed by researchers, 2026.

Maturity level assessments are often done by summing or flattening scores of various indicators. The approach is easy to use, but it assumes that all indicators have the same level of importance, whereas leadership commitments, governance structures, identification processes, treatments, monitoring, and continuous improvement can have different relative contributions in shaping maturity levels. This study uses the Analytic Hierarchy Process to obtain the relative weight of the indicator based on the individual assessment of five experts, in line (Wibowo & Taufik, 2017) who use AHP to give weight to the attributes of the risk maturity model and calculate the maturity score as the number of times the result between the weight and the assessment value (Tewu et al., 2024).

The weighting data and the achievement level data are strictly separated: the expert determines the relative importance of the indicator through the AHP, while the annual achievement score is obtained from the researcher's documentary assessment of the PHE Annual Report 2020–2025 which is then confirmed by the expert. The research gap lies in the limited number of studies that integrate AHP-based expert assessments with confirmed documentary assessment scores to form a weighted index of Risk Management Maturity and Risk Governance in Indonesian upstream oil and gas companies (Mikes, 2009). The novelty of the research is methodological and contextual, namely two separate AHP hierarchies for the seven RMM indicators and five aspects of Risk Governance, each of which is weighted to the score of the results of the confirmed documentary assessment for the period 2020–2025.

Formulation of Research Problems and Objectives

Based on this description, this study formulates three questions: (1) how to determine the priority of Risk Management (Quang et al., 2024) Maturity indicators; (2) how to determine the priority of Risk Governance indicators; and (3) whether the comparison matrix paired with RMM indicators and Risk Governance aspects meets the AHP acceptance criteria. The objectives of the research were arranged in parallel with the three problem formulations, namely weighting and prioritizing RMM indicators, weighting and prioritizing Risk Governance indicators, and testing the consistency of paired comparison matrices in the two models. The calculation of the weighted score 2020–2025 and the ROA analysis are placed as methodological stages and supporting analyses to enrich the interpretation of the main results, rather than as a separate formulation of the problem.

Enterprise Risk Management (ERM) is an integrated approach to managing uncertainty that can affect the achievement of organizational goals (Commission, 2017). (Nocco & Stulz, 2006) emphasize that ERM creates value when an organization is able to thoroughly assess risk and allocate capital based on risk and return trade-offs, while (Arena et al., 2010) point out that ERM practices evolve through the interaction between formal tools, organizational actors, and managerial needs. (Beasley et al., 2005) found wide variation in the rate of ERM adoption, while (Lundqvist, 2014) showed that ERM consists of multiple pillars that do not always evolve at the same pace, so maturity assessments are more informative than simply stating that organizations have or do not have ERM.

ISO 31000:2018 provides risk management principles (Saeidi et al., 2021), frameworks, and processes that place leadership and commitment at the center of the integration, design, implementation, evaluation, and improvement of risk management systems, with processes that include communication and consultation, scoping and criteria, risk assessment, risk treatment, monitoring and review, and recording and reporting. COSO ERM 2017 organizes ERM into five components, namely governance and culture, strategy and goal setting, performance, review and revision, and information, communication, and reporting, which link risk to strategy selection and performance measurement. The two frameworks underlie the indicators of leadership, identification, assessment, treatment, monitoring, and continuous improvement in the RMM model of this study, as well as the role of governance and leadership in the Risk Governance model.

The maturity model describes the development of organizational capabilities from unstructured practices to integrated and continuously improved practices. Hillson (1997) developed four levels of risk maturity, namely naive, novice, normalised, and natural. The five-level scale used in this study is not the original Hillson scale or the official PHE scale, but an operational rubric developed by the researcher by adapting the logic of the Capability Maturity Model and the risk maturity model literature, then operationalized in the context of risk management and Risk Governance. Wibowo and Taufik (2017) and (Abed & Rashid, 2023) show that maturity attributes can be given different weights using AHP, with the final score calculated through the sum of the results of weight times with assessment.

Risk Governance is a system through which an organization directs and controls risk management (Commission, 2017), including mandates, division of authority, board oversight, management accountability, independence assurance, reporting quality, and integration of risk into decisions. (Aebi et al., 2012) point out the importance of risk governance structures and reporting pathways in times of crisis, while Malik et al. (2020) found that risk committees can strengthen the relationship between ERM and performance. The Three Lines Model (The Institute of Internal Auditors, 2020) describes the interaction between governance, management, risk and compliance functions, and internal audits that work in a coordinated manner to achieve organizational goals, and underlies one of the aspects of Risk Governance in this study.

Risk Governance is placed as one of the indicators (C2) in the RMM model because the maturity of risk management is not only determined by the maturity of the technical process, but also by the extent to which the process has clear direction, mandate, accountability, and oversight. In a separate Risk Governance model, these conditions are more diagnostically described into five aspects in Table 3. The two models are calculated separately and are not summed into one index so that there is no double counting of the governance elements.

Analytic Hierarchy Process and Supporting Theories

The Analytic Hierarchy Process was developed by (Saaty, 1980, 2008) as a multicriteria decision-making method that breaks down problems into hierarchies, uses paired comparisons, and generates a priority scale (Table 4). The AHP matrix is reciprocal, with a diagonal of value one, and the priority vector is obtained through column normalization as well as row averages. Forman and Peniwati (1998) explained that the aggregation of individual assessments through geometric averages is appropriate when group assessments are represented in a single comparison matrix; this approach is also supported by (Dong et al., 2010), (Escobar et al., 2004), and (Aguarón et al., 2022). Consistency was tested through the Consistency Ratio (CR), with a CR acceptance limit of ≤ 0.10 (Alonso & Lamata, 2006; Ishizaka & Labib, 2011; Vaidya & Kumar, 2006).

The company's performance in this study is measured mainly through Return on Assets (ROA) as an indicator of profitability, with net profit, EBITDA, and oil and gas production as supporting information. ROA has been widely used in research on the relationship between ERM and performance (Horvey & Ankamah, 2020; Horvey & Odei-Mensah, 2024), although it is also influenced by commodity prices, asset structures, investment decisions, costs, and external conditions. Contingency (Woods, 2009) theory states that the effectiveness of ERM depends on the suitability between the risk system and the organization's environment, strategy, structure, size,

and risk profile (Farrell & Gallagher, 2019; Gordon et al., 2009), while the dynamic (Altuntas et al., 2011) capability perspective views risk maturity as an organization's ability to detect change, select responses, and configure resources (Monazzam & Crawford, 2024). These two perspectives underlie the use of ROA as a descriptive context, rather than as evidence (Bohnert et al., 2019) of causal relationships.

Table 5 summarizes some of the previous research relevant to Risk Management Maturity (Garcia et al., 2017), Risk Governance, and Analytic Hierarchy Process. A synthesis of previous research shows three main gaps. First, the size of ERM and maturity is not yet uniform, as most studies use a proxy for the existence of a chief risk officer, disclosure index, or aggregate survey scores that lack indicative indicators that are the main levers. Second, AHP-weighted studies are widely applied to projects or construction (Wibowo & Taufik, 2017; Abed & Rashid, 2023), there is not much in upstream oil and gas companies. Third, studies of the relationship between ERM and performance generally use panel data (Malik et al., 2020; Tan et al., 2026), while the application of expert weight to the longitudinally confirmed documentary assessment score of one company is still limited. The novelty of this study is configurative and contextual: it builds two separate indices that are not summed up, uses the weights of experts who passed the consistency test, maintains the source of the score from the expert-confirmed documentary assessment of the Annual Report, and relates it descriptively with the PHE performance indicators for the period 2020–2025.

METHOD

The research used a descriptive quantitative approach with a case study design on PT Pertamina Hulu Energi. The main analysis methods are AHP for weighting and weighted scoring for maturity score calculation, which is carried out on two separate models: RMM with seven indicators and Risk Governance with five aspects. The company's data period covers 2020–2025, while the processing and preparation of research is carried out in 2026. Descriptive quantitative design was chosen because the study generates numerical weights, weighted indices, and annual trends without testing causal hypotheses.

Research Subject and Expert Selection

The primary data subjects were five experts selected using purposive sampling, as AHP requires consideration from individuals who understand the object and are able to compare the importance of the indicators (Table 6). Based on these criteria, the research panel consisted of five experts with different functional roles in PHE (Table 7): Risk Management Manager, Internal Control & Business Continuity Manager, Senior Internal Auditor, Project Senior Engineer, and Planning & Strategy Manager. The combination of roles includes the functions of risk policymakers, independent supervisors, operational risk owners, and strategic decision-makers.

Table 2 Expert Selection Criteria

No.	Criteria
1	Minimum 10 years of professional experience in the field of risk management, governance, internal audit, control, and/or other relevant fields.
2	Occupy a minimum position of Senior Staff or a higher level at the time the research is conducted.
3	Have participated in training/workshops related to Risk Management Maturity and/or risk management maturity assessment.
4	Understand the business processes, risk characteristics, and governance environment of PHE.
5	Have relevant involvement with risk management, Risk Governance, internal audit, and/or decision-making.
6	Able to understand RMM indicators, Risk Governance aspects, and AHP pairing comparison mechanisms.
7	Willing to provide an individual assessment and have no conflict of interest.

Source: Compiled by researchers based on AHP needs, 2026.

Table 3 Brief Profiles and Expert Rankings

Code	Areas of Relevance	Role in Research
P1	Manager Risk Management	Confirm criteria and data; individual AHP weighting
P2	Manager Internal Control & Business Continuity	Confirm criteria and data; individual AHP weighting
P3	Senior Internal Auditor	Confirm criteria and data; individual AHP weighting
P4	Senior Engineer Project	Confirm criteria and data; individual AHP weighting
P5	Planning & Strategy Manager	Confirm criteria and data; individual AHP weighting

Source: Research primary data, 2026.

Data Collection Techniques

Primary data were obtained from five experts individually and consisted of two types. First, expert confirmation of the suitability of indicators, maturity level descriptors, and scores of documentary assessment results using three categories: "Compliant", "Needs Revision", and "Non-Compliant". Second, pairwise comparison to determine the relative importance of indicators using the Saaty scale of 1–9 and its inverse values; The RMM questionnaire consists of 21 pairs for seven indicators, while the Risk Governance questionnaire consists of 10 pairs for five aspects. Secondary data consists of the PHE Annual Report for the 2020–2025 period, financial statements,

company performance data, and the results of official risk maturity assessments (BPKP, PRISMA, RMA) which are used as comparative information at the aggregate level, not as a direct score for each indicator.

Each indicator is assessed using an ordinal scale of 1 to 5 based on the evidence disclosed in the Annual Report which is matched with the maturity level descriptor (Initial, Repeatable, Defined, Managed, and Optimizing) adapted from the maturity level logic and operationalized according to the risk management characteristics. The initial score of the document analysis results was then confirmed to five experts before being used in further analysis. This confirmation stage is separate from, and does not produce, the weight of the AHP.

Data Analysis Techniques

The ratings of five experts on each pair were aggregated using a geometric average (Equation 1) to form a single group matrix. The matrix is then normalized (Equation 2) and the priority weight is obtained from the average of the normalized matrix rows (Equation 3). Consistency was tested by multiplying the group matrix by the weight vector to obtain the weighted sum vector, then averaging it to the weights to obtain λ_{max} . The Consistency Index (Equation 4) and Consistency Ratio (Equation 5) were calculated using a Random Index (RI) of 1.32 for $n=7$ and 1.12 for $n=5$; The matrix is expressed consistently when the $CR \leq 0.10$.

$$\bar{a}_{ij} = (\prod_{k=1}^5 a_{ij}(k))^{1/5} \dots\dots\dots (1)$$

$$n_{ij} = a_{ij} / \sum_{i=1}^n a_{ij} \dots\dots\dots (2)$$

$$w_i = (1/n) \sum_{j=1}^n n_{ij} \dots\dots\dots (3)$$

$$CI = (\lambda_{max} - n) / (n - 1) \dots\dots\dots (4)$$

$$CR = CI / RI \dots\dots\dots (5)$$

The weights of AHP that met the consistency limit were further multiplied by the scores of the results of the confirmed documentary assessment in the same year and summed up to obtain an annual weighted score (Equation 6), which was compared to a simple average to show the impact of weighting. The weighted scores of RMM and Risk Governance were then juxtaposed descriptively with ROA (Equation 7), net profit, EBITDA, and oil and gas production as the context of performance. No regression or significance test was carried out because the analysis unit was only one company with six periods.

$$St = \sum_{i=1}^n w_i x_{it} \dots\dots\dots (6)$$

$$ROA = (\text{Net Profit} / \text{Total Assets}) \times 100\% \dots\dots\dots (7)$$

Data quality control is carried out at the collection and processing stages, including the completeness of pairs and years, the reciprocal nature of the matrix ($a_{ji} = 1/a_{ij}$), the number of weights equal to one, $CR \leq 0.10$, traceability of individual data to aggregate, consistency of the application of weights to the same indicators, and restrictions on the interpretation of performance linkages so as not to be declared as causality.

RESULTS AND DISCUSSION

Data Validation and Expert Confirmation

Before the AHP weighting, five experts confirmed the suitability of seven RMM indicators, five Risk Governance aspects, maturity level descriptors level 1–5, and 72 scores from

documentary assessment results (42 RMM scores and 30 Risk Governance scores) for the 2020–2025 period (Kappes & Perez, 2023). All experts declared "Appropriate" on all confirmed items without substantive corrections (Tan et al., 2026), so that all indicators, descriptors, and scores were declared suitable for use as research inputs. Further data quality checks showed that all AHP comparison pairs were fully populated (21 pairs $\times$ 5 experts for RMM; 10 pairs $\times$ 5 experts for Risk Governance), the matrix was reciprocal with a diagonal of one, and the sum of weights in both models was equal to 1.0000. The data was declared feasible to proceed to the analysis of the weighting of AHP.

Prioritizing Risk Management Maturity

The five-expert paired comparison assessment of the seven RMM indicators was aggregated using geometric averages, normalized, and lowered to priority weights as presented in Table 8. Leadership and Commitment received the highest weight at 28.61%, followed by Risk Governance at 21.23%, Risk Identification at 14.66%, Risk Assessment at 12.26%, Risk Treatment at 10.39%, Monitoring and Review at 7.17%, and Continuous Improvement at 5.68%.

Table 4 Weighting of Priority Risk Management Maturity Indicators

Code	Indicator	Weight	Percentage (%)	Ratings
C1	Leadership and Commitment	0,2861	28,61	1
C2	Risk Governance	0,2123	21,23	2
C3	Risk Identification	0,1466	14,66	3
C4	Risk Assessment	0,1226	12,26	4
C5	Risk Treatment	0,1039	10,39	5
C6	Monitoring and Review	0,0717	7,17	6
C7	Continuous Improvement	0,0568	5,68	7

Source: AHP processing results, 2026.

The dominance of Leadership and Commitment shows that leadership, exemplary, directional setting, and leadership resource support are considered as the main levers of risk management maturity (Paape & Speklé, 2012), in line with the leadership positions in ISO 31000:2018 and COSO ERM 2017. C1 and C2 together make up 49.84% of RMM's weight, so almost half of the maturity index is determined by leadership and governance. The three core process indicators (C3–C5) made up 37.31%, while Monitoring and Review and Continuous Improvement made up 12.85%. The lower weights of the last two indicators do not mean that they are negligible, as the AHP measures relative importance in the hierarchy, rather than determining the need for an indicator.

Prioritizing Risk Governance

The same treatment is applied to five aspects of Risk Governance, resulting in priority weights in Table 5. The role of the Board of Commissioners and the Board of Directors received

the highest weight of 35.70%, followed by Risk Management Organizational Structure 22.40%, Implementation of the Three Lines Model 20.04%, Risk Supervision and Evaluation 11.83%, and Risk Governance Integration in Business Processes 10.02% (Yang et al., 2018).

Table 5 Priority Weighting of Risk Governance Aspects

Code	Aspects	Weight	Percentage (%)	Ratings
A1	The Role of the Board of Commissioners and the Board of Directors	0,3570	35,70	1
A2	Risk Management Organizational Structure	0,2240	22,40	2
A3	Implementation of the Three Lines Model	0,2004	20,04	3
A4	Risk Monitoring and Evaluation	0,1183	11,83	4
A5	Integration of Risk Governance in Business Processes	0,1002	10,02	5

Source: AHP processing results, 2026.

The A1 weights that account for more than one-third of the index indicate that risk governance is seen primarily as the responsibility of the company's steering and supervisory bodies, in line with COSO ERM's emphasis on board risk oversight. A2 and A3 together have a weight of 42.44%, so that leadership, structure, and division of roles make up 78.14% of the total weight, while A4 and A5 serve to ensure that formal structures translate into effective oversight and risk-taking business decisions.

AHP Consistency Test

The consistency of the paired comparison matrix was tested using the maximum eigenvalue, Consistency Index, and Consistency Ratio, as summarized in Table 10. Both CR values are below the limit of 0.10, so that the comparison assessment of RMM and Risk Governance pairs is declared consistent and the resulting weights are suitable for use at the weighted score calculation stage. These results answer the formulation of the third problem of the study.

Table 6 AHP Consistency Test Summary

Components	Risk Management Maturity	Risk Governance
λ_{maks}	7,4316	5,3645
n	7	5
CI	0,0719	0,0911

Components	Risk Management Maturity	Risk Governance
RI	1,32	1,12
CR	0,0545	0,0814
Status	Consistent	Consistent

Source: AHP processing results, 2026.

A CR value that meets the limit indicates that the expert comparison pattern does not contain large logical contradictions. Nonetheless (Tai et al., 2020), mathematical consistency is not the same as substantive truth; The validity of the results remains dependent on the definition of the indicator, the competence of the expert, and the suitability of the context (Ishizaka & Labib, 2011). Therefore, the resulting weights are read as PHE contextual priorities based on a panel of five experts, rather than as a standard weight for the entire company or industry.

Risk Management Maturity Weighted Score 2020–2025

AHP weights that have met the consistency limit are applied to the scores of the confirmed documentary assessment results to produce the annual weighted score of the RMM (Table 11). The score increased from 3.9432 in 2020 to 4.8534 in 2025, with a slight correction in 2023 of 0.1039 due to a decrease in Risk Treatment from a score of 5 to 4. By 2025, only Risk Identification will still be worth 4, while six other indicators have reached a maximum score of 5.

Table 7 Documentary Assessment Score and PHE Risk Management Maturity Weighted Score 2020–2025

Code	2020	2021	2022	2023	2024	2025
C1	4	4	4	4	4	5
C2	4	4	5	5	5	5
C3	4	4	4	4	4	4
C4	4	4	4	4	5	5
C5	4	4	5	4	5	5
C6	4	4	5	5	5	5
C7	3	4	5	5	5	5
Weighted Score (AHP)	3,9432	4,0000	4,4447	4,3409	4,5674	4,8534
Medium Average	3,8571	4,0000	4,5714	4,4286	4,7143	4,8571
Category (AHP)	Managed	Managed	Optimized	Optimized	Optimized	Optimized

Source: Results of documentary assessment based on PHE Annual Report 2020–2025 and multiplication by AHP weight, processed by researchers, 2026.

The comparison of AHP scores and simple averages shows the weighting function: in 2020 the AHP score was 0.0860 higher because six large-weighted indicators were valued at 4, while in 2022–2024 the AHP score was lower because some scores of 5 were on lower-weighted indicators while Leadership and Commitment were still valued at 4. The largest difference occurred in 2024 of –0.1469, indicating that a high score is not considered to have the same effect if it is on an indicator with a different level of importance.

Risk Governance Weighted Score 2020–2025

The same procedure is applied to five aspects of Risk Governance (Table 12). The score increased from 3.0000 in 2020 to 5.0000 in 2024 and 2025. The most notable difference occurred in 2023, when a simple average of 4.4000 treated a score of 5 on A4 and A5 equivalent to a score of 4 on A1–A3, while an AHP score of only 4.2185 because A1–A3 had a combined weight of 78.14%. These findings show that high achievement in the aspects of supervision and integration has not completely replaced the importance of strengthening leadership, structure, and division of roles.

Table 8 Documentary Assessment Score and PHE Risk Governance Weighted Score 2020–2025

Code	2020	2021	2022	2023	2024	2025
A1	3	4	4	4	5	5
A2	3	4	4	4	5	5
A3	3	3	4	4	5	5
A4	3	4	4	5	5	5
A5	3	4	4	5	5	5
Weighted Score (AHP)	3,0000	3,7996	4,0000	4,2185	5,0000	5,0000
Medium Average	3,0000	3,8000	4,0000	4,4000	5,0000	5,0000
Category (AHP)	Defined	Managed	Managed	Optimized	Optimized	Optimized

Source: Results of documentary assessment based on PHE Annual Report 2020–2025 and multiplication by AHP weight, processed by researchers, 2026.

Performance Development and Descriptive Linkages with ROA

Table 13 presents the development of PHE performance indicators for the 2020–2025 period. ROA increased from 2.49% in 2020 to 8.34% in 2022, decreased slightly to 8.08% in 2023, peaked at 10.26% in 2024, then dropped to 6.98% in 2025. Net profit and EBITDA reached the highest value in 2023, while oil and gas production increased to the range of 1,044–1,046 MBOEPD in 2023–2025.

Table 9 PHE Performance Indicators 2020–2025

Year	LENGTH (%)	Net Profit (USD million)	EBITDA (USD billion)	Oil and Gas Production (MBOEPD)
2020	2,49	564	3,2	≈967
2021	5,53	2.045	5,4	≈968
2022	8,34	4.639	8,1	≈968
2023	8,08	4.773	8,4	≈1,044
2024	10,26	3.121	7,9	≈1,045
2025	6,98	2.175	7,5	≈1,046

Source: PHE annual report and financial statements 2020–2025, reprocessed by researchers, 2026.

Table 9 compares the development of RMM and Risk Governance weighted scores with ROA. The 2020–2022 period shows generally unidirectional movements between the three indicators. In 2023, the pattern became more complex: RMM decreased, Risk Governance increased, and ROA decreased slightly. In 2024 all three indicators will again be at a high position, but in 2025 RMM and Risk Governance will remain high as ROA decreases to 6.98%. The pattern confirms that maturity and risk governance are related to organizational capabilities, but do not automatically result in a certain level of profitability; ROA remains influenced by commodity prices, cost structures, investments, and other external conditions beyond the scope of risk management.

Table 10 Descriptive Linkages of Risk Scores and ROA

Year	RMM	Risk Governance	LENGTH (%)
2020	3,94	3,00	2,49
2021	4,00	3,80	5,53
2022	4,44	4,00	8,34
2023	4,34	4,22	8,08
2024	4,57	5,00	10,26
2025	4,85	5,00	6,98

Source: Research data processing results, 2026.

Contingency perspectives (Gordon et al., 2009; Farrell & Gallagher, 2019) explains this pattern: the effectiveness of ERM depends on the suitability of the system with the organization's strategy, structure, and risk profile, so the benefits of risk management are more accurately understood as the ability to recognize uncertainty and maintain resilience, rather than as a single predictor of profit. These findings are in line with Callahan and Soileau (2017) and (Florio &

Leoni, 2017) who demonstrated the benefits of ERM maturity, as well as (Bromiley et al., 2015; McShane et al., 2011) and (Pagach & Warr, 2011) who cautioned that the relationship between ERM and performance is not always consistent.

Weight- and Gap-Based Improvement Priorities

The priority for RMM improvement is compiled based on the results of multiplying the weight of the AHP by the gap of the 2025 score to the maximum score, namely $w_i(5 - x_{i,2025})$, so that high-weight indicators with non-optimal achievements get the top priority (Table 15). Only Risk Identification still has a gap in 2025, at 0.1466, making it a key improvement priority, especially through the expansion of the scope of new risk identification and cross-entity risks. In the Risk Governance model, all aspects have a value of 5 by 2025 so that the weight $\times$ gap is equal to zero; managerial priorities therefore shift from closing the score gap to maintaining effectiveness, especially in the roles of the Board of Commissioners and the Board of Directors, which are the highest weight.

Table 11 RMM Improvement Priorities Based on Gap 2025

Code	Indicator	Weight (%)	Score 2025	Weight $\times$ Gap	Direction of Action
C1	Leadership and Commitment	28,61	5	0,0000	Maintain oversight and exemplary
C2	Risk Governance	21,23	5	0,0000	Maintain mandate and accountability
C3	Risk Identification	14,66	4	0,1466	Expand new risks and interdependencies
C4	Risk Assessment	12,26	5	0,0000	Maintain the calibration method
C5	Risk Treatment	10,39	5	0,0000	Measure the effectiveness of mitigation
C6	Monitoring and Review	7,17	5	0,0000	Maintain early indicators
C7	Continuous Improvement	5,68	5	0,0000	Maintain continuous learning

Source: AHP weight processing results and confirmed documentary assessment scores, 2026.

Overall, the results of the study answered three problem formulations: the priority of the RMM indicator was determined by leadership and governance as the two highest weights; Risk Governance priorities are determined by the role of the Board of Commissioners and the Board of Directors together with the organizational structure and the Three Lines Model; and both paired comparison matrices met the AHP consistency limit ($CR \leq 0.10$). (Lestari, 2020) The methodological contribution of the study lies in the separation of the weight sources (five-expert

AHP) and the score sources (confirmed documentary assessments), which have been shown to be more sensitive to gaps in priority indicators than simple averages. The contextual contribution lies in the application of the model to Indonesia's upstream oil and gas subholding for the 2020–2025 period, with a descriptive relationship to ROA that emphasizes that risk management (Power, 2009) plays a role as a capability to support organizational resilience, not as a guarantee of profitability.

CONCLUSION

This study concludes that the priority of Risk Management Maturity indicators at PT Pertamina Hulu Energi is determined by Leadership and Commitment (28.61%), Risk Governance (21.23%), Risk Identification (14.66%), Risk Assessment (12.26%), Risk Treatment (10.39%), Monitoring and Review (7.17%), and Continuous Improvement (5.68%); the priority of the Risk Governance aspect is determined by the role of the Board of Commissioners and the Board of Directors (35.70%), the Risk Management Organizational Structure (22.40%), the Implementation of the Three Lines Model (20.04%), Risk Supervision and Evaluation (11.83%), and the Integration of Risk Governance in Business Processes (10.02%); and the two paired comparison matrices were declared consistent with a Consistency Ratio of 0.0545 for RMM and 0.0814 for Risk Governance, so that the resulting weights are feasible to be used to calculate the weighted score. The RMM weighted score increased from 3.94 in 2020 to 4.85 in 2025, while the Risk Governance score increased from 3.00 to 5.00, and both showed a descriptive relationship that was generally in line with ROA until 2024, but the decline in ROA in 2025 when both scores remained high confirms that the relationship is descriptive, not causal. Based on these findings, PHE is recommended to prioritize the continuity of leadership and oversight of the board, strengthen Risk Identification as the only RMM gap by 2025 through updating taxonomy and interrelated risk mapping, complement annual assessments with evidence and follow-up plans per indicator, review AHP weights at least every six months or when there are material changes to risk strategies and profiles, as well as developing a dashboard that links maturity scores to key risk indicators and company performance. Further research is suggested to involve more experts, test models on multiple companies, add weight sensitivity analysis, and test performance linkages using panel or time series data if observations are adequate, given the limitations of the study that included only one company and six observation periods.

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