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Analyzing COVID-19's Impact on Palm Oil and Biodiesel Investment Feasibility

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ABSTRACT

This research aims to explore the impact of the COVID-19 pandemic on investment feasibility in the palm oil and biodiesel industries, which are vital commodities in Indonesia and highly sensitive to economic conditions. Utilizing Fuzzy Analytical Hierarchy Process analysis and event studies, this research identifies the most critical aspects affecting the profitability of palm oil and biodiesel projects before and after the pandemic. The findings indicate that COVID-19 has a significant impact, particularly on Return on Investment and Modified Internal Rate of Return. The pandemic has increased costs and complicated risk management, impacting profitability and investment sustainability. These findings provide new insights into the challenges faced by the palm oil and biodiesel industries during the pandemic and offer a solid foundation for future strategic decision-making. The research underscores the importance of adaptive investment strategies, including the integration of robust risk management frameworks and resilience planning, to mitigate the effects of future economic shocks. Practical recommendations are provided for policymakers and stakeholders to incorporate comprehensive risk analysis and scenario planning into feasibility assessments, ensuring more sustainable investment outcomes. This study provides new perspectives on the impact of the pandemic on industries that are heavily dependent on global and local economic conditions, providing an analytical framework to measure the impact of significant events on investments in these sectors.

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1. INTRODUCTION

At the beginning of 2020, the COVID-19 pandemic hit Indonesia, causing significant disruptions across economic, social, and political spheres (Abodunrin et al., 2020; McKibbin and Fernando, 2020). The palm oil and biodiesel industries were particularly affected, with many projects delayed or canceled due to restrictions on human movement (Pamidimukkala and Kermanshachi, 2021). These disruptions directly impacted financial aspects such as increased costs, cash flow issues, and logistical challenges (Hesna et al., 2021; Sangtania et al., 2021; Utama and Arisanti, 2021), compounded by the implementation of health protocols and safety standards that further complicated construction activities (Alsharef et al., 2021; Santoso and Riyanto, 2020). This study addresses these challenges within managerial and financial accounting, focusing on cost management, financial planning, and investment decision-making during disruptions. By analyzing financial metrics like ROI, IRR, and MIRR, it provides critical insights into the impact of global crises on investment feasibility and offers practical frameworks for enhancing resilience in project-based industries (Santoso and Riyanto, 2020).

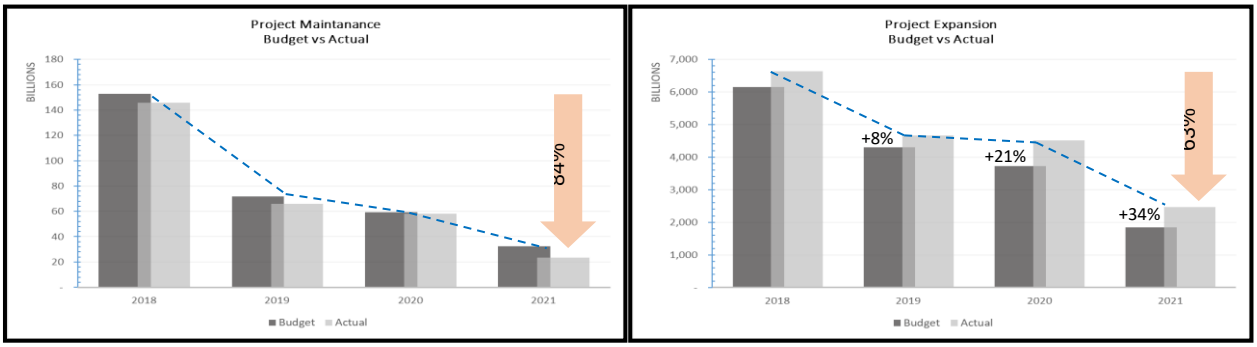

Figure 1. Project Data of Palm Oil industry in 2018-2021
Source: Processed Data

Existing research has addressed the financial impacts of pandemics (Kim and Lee, 2018; Romprasert and Jermsittiparsert, 2019), but few studies focus on sector-specific investments like palm oil and biodiesel. This study bridges that gap by examining the impact of COVID-19 on investment feasibility, focusing on construction-related risks such as supply chain disruptions, labor shortages, and commodity price fluctuations, which significantly affect ROI and MIRR (Management, 2018). Previous studies, including Kim and Lee (2018) and Shimbar and Ebrahimi (2018), introduced financial risk models but did not comprehensively compare internal and external risks under global crises like COVID-19 or emphasize profitability metrics such as MIRR.

This research combines Fuzzy AHP and event study analysis Kumar et al. (2018) and Romprasert and Jermsittiparsert (2019) to assess risk factors and evaluate the pandemic's impact on investment feasibility. Fuzzy AHP addresses uncertainties in risk analysis, while event study methods analyze the effects of specific disruptions, offering a nuanced comparison of projects before and during the pandemic. Inspired by Scheiblich et al. (2017) and Munandar and Chyntia (2019), this study incorporates a temporal benchmark to enhance understanding of global crises' effects on investment.

By focusing on key metrics like ROI and MIRR, this study contributes to applied accounting by integrating risk management into feasibility assessments, aligning with strategic and managerial accounting frameworks. The findings provide actionable insights for stakeholders in the palm oil and biodiesel sectors, offering strategies to navigate financial challenges and optimize

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investments in dynamic economic conditions (Butdee and Phuangsalee, 2019); Ding et al., 2021); Ribas et al., 2019).

2. METHODS

This study employs a quantitative analysis approach using the Fuzzy Analytical Hierarchy Process (Fuzzy AHP) to prioritize risk factors in the palm oil and biodiesel industry, along with an event study methodology to compare financial metrics before and after the COVID-19 pandemic's impact on construction costs (Witanto and Kuang, 2024). The analysis focuses on internal and external risk factors as identified by Kim and Lee (2018), and involves a survey analyzed using the Fuzzy AHP method to rank priorities and assess changes in these priorities pre- and post-pandemic. The Eid al-Fitr holiday in 2020 serves as a benchmark for this event study, representing a period of significant shifts in construction costs influenced by the pandemic. At the quantitative stage, priority determination is conducted using a hierarchical structure of risk factors analyzed via the Fuzzy AHP method, which enhances accuracy and is better suited to uncertainty conditions, as highlighted by Butdee and Phuangsalee (2019); Ding et al. (2021); and Ribas et al. (2019).

The risk management stage examines uncertain conditions affecting construction, time, and finance, as described by Thabit and Younus (2018), with calculations incorporating Net Present Value (NPV) and Internal Rate of Return (IRR). Previous research by Syah et al. (2019); Syah, Hamdi, et al. (2021); and Syah, Indradewa, et al. (2021) provides models for risk analysis and investment feasibility using standard metrics such as NPV, IRR, Payback Period, Average Rate of Return, and Profitability Index. These are crucial for assessing project cash flow feasibility, as emphasized by Omopariola et al. (2021) and Mahmoud et al. (2021). This study also employs Modified Internal Rate of Return (MIRR), which is recognized as more accurate for determining profitability. Profitability indices and ratios, including ROI, IRR, and MIRR, as well as gross and net profit margins, Return on Assets, and Return on Equity, are analyzed to understand the impact of the pandemic on project feasibility.

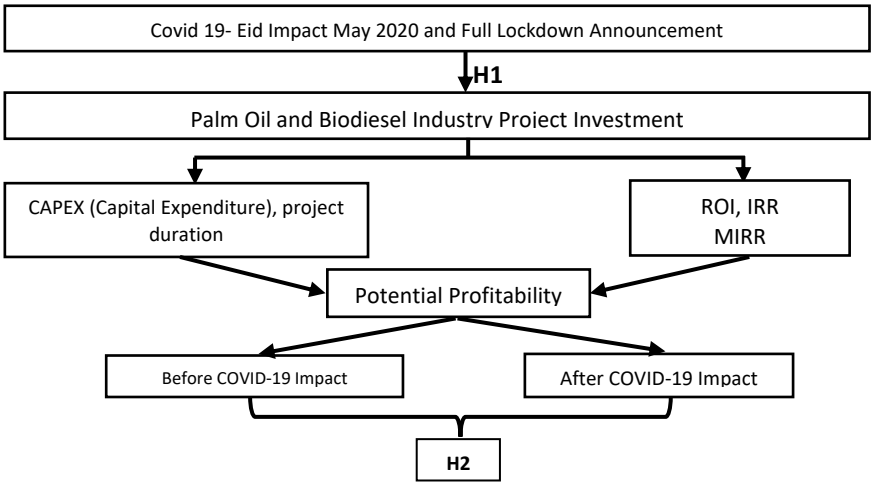

Figure 2. Quantitative Research Model of COVID-19 Impact to Palm Oil and Biodiesel Project Investment
Source: The Processed Primary Data (2023)

The COVID-19 pandemic, particularly during the Eid al-Fitr holiday in May 2020, significantly affected construction costs, logistics, and project timelines in the palm oil and

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biodiesel industry. Initially, construction activities remained unaffected, but government travel bans during Eid disrupted logistics and increased material prices, resulting in delays in construction-related activities. This study examines the dependent variables, including CAPEX, project duration, ROI, IRR, MIRR, and overall profitability, to evaluate investment feasibility amidst these challenges. Juniarta (2020) highlights how time delays impact cash flow and profitability, forming the basis for the hypothesis: "The impact of COVID-19 on the calculation of CAPEX, project duration, ROI, IRR, and MIRR in palm oil and biodiesel industry project investments". By quantitatively analyzing risk factors with Fuzzy AHP, this research aims to provide a comprehensive assessment of investment profitability in uncertain conditions.

3. RESULTS AND DISCUSSION

3.1. Risk factor analysis using Fuzzy AHP (Analytic Hierarchy Process) method

To analyze the effect of the COVID-19 pandemic on the feasibility of project investment in the palm oil and biodiesel industries using the Fuzzy Analytic Hierarchy Process (AHP) so that the most influential aspects can be obtained in the profitability of palm oil and biodiesel industry projects. The criteria used are Economic aspects, company aspects, shareholder aspects, political aspects, government regulations/policies, socio-cultural aspects, financial aspects, technical aspects of palm oil industry project profitability, and COVID-19 aspects in 3 areas, namely Java, Sumatra, and Kalimantan.

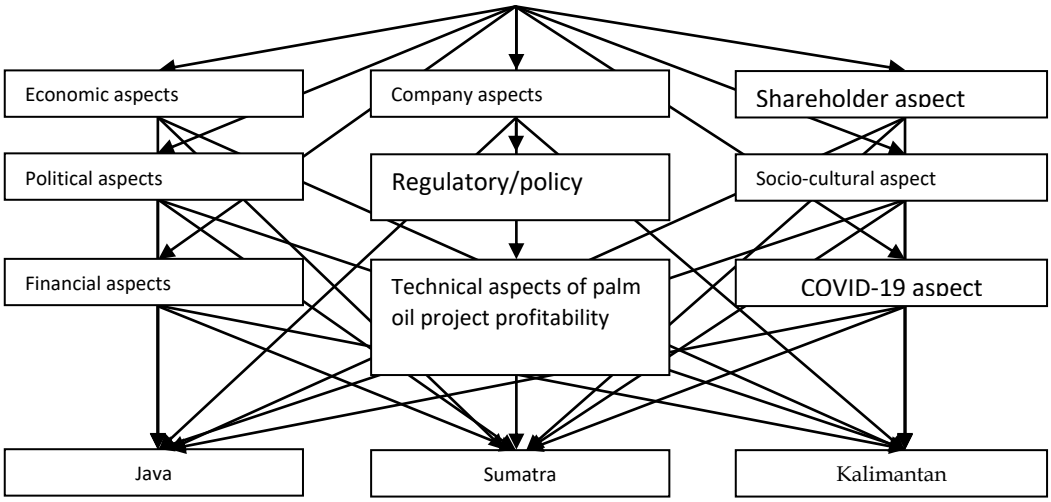

Figure 3. Hierarchical structure of 9 aspects of project investment in 3 areas in Indonesia
Source: The Processed Primary Data (2023)

The hierarchy of 9 aspects is shown in Figure 6, and then from the hierarchical structure, a comparison matrix is made to get the Fuzzy synthesis value (Si) and weight vector (W) as in Appendix 5. Then, after learning the weight vector (Wi), the vector of each criterion will be calculated using the formula $Vi = \begin{bmatrix} W_L \times Si_L \\ W_M \times Si_M \\ W_H \times Si_H \end{bmatrix}$. After a series of calculations and trials, the average ranking of factors determining the most optimal investment is obtained.

Our analysis, conducted using the robust fuzzy analytical hierarchy process (AHP) method, has yielded reliable results. These results allow us to rank the factors that determine the most optimal investment, as indicated by the Kn value or relative importance, as shown in Table 1.

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Table 1. Ranking of survey result aspects that affect Project Investment

Criteria	Si (L)	Si (M)	Si (H)	Value (L)	Value (H)	Value (H)	Si Extent	Wi	Kn
COVID-19 aspects.	0,67	1,00	1,50	6,00	9,00	13,50	9,50	0,24	6,856
Technical aspects of the project.	0,50	0,67	1,00	4,50	6,00	9,00	6,50	0,16	3,209
Financial aspects.	0,33	0,50	0,67	3,00	4,50	6,00	4,50	0,11	1,538
Economic aspects.	0,11	0,33	1,00	1,00	3,00	9,00	4,33	0,11	1,426
Socio-cultural aspects.	0,25	0,33	0,50	2,25	3,00	4,50	3,25	0,08	0,802
Regulatory/policy aspects.	0,20	0,33	0,50	1,80	3,00	4,50	3,10	0,08	0,730
Shareholder aspects.	0,17	0,33	0,50	1,50	3,00	4,50	3,00	0,08	0,683
Aspects of the company.	0,14	0,25	0,50	1,29	2,25	4,50	2,68	0,07	0,545
Political aspects.	0,13	0,25	0,50	1,13	2,25	4,50	2,63	0,07	0,523
Quantity.				22,46	36,00	60,00	39,49	1,00	

Source: The Processed Primary Data (2023)

Our analysis using the Fuzzy Analytical Hierarchy Process (Fuzzy AHP) method identifies and ranks the key factors influencing project costs during the pandemic. The highest-ranked factor, COVID-19 Impact (Kn value: 6.856), highlights pandemic-induced disruptions affecting project resilience, public health protocols, and logistics costs, as supported by Pamidimukkala and Kermanshachi (2021) and Kumar et al. (2018). Managerial accounting frameworks emphasize adaptive financial modeling and risk management in response to external shocks, aligning with Shimbar and Ebrahimi (2018). This underscores the need for integrating external risk factors into investment evaluations (Mulyantini, 2023).

The second-ranked factor, Technical Aspects (Kn value: 3.209), involves challenges in material procurement and operational inefficiencies, exacerbated by pandemic uncertainties. These findings align with Romprasert and Jermsittiparsert (2019) and Sangtania et al. (2021), highlighting the importance of technical risk assessments and cost variance analysis as emphasized by Munandar and Chyntia (2019). Financial Aspects (Kn value: 1.538), ranking third, reflects financing challenges such as erratic regulations and fluctuating interest rates, corroborating Hesna et al. (2021); Kim and Lee (2018); and Shimbar and Ebrahimi (2018). This reinforces the need for flexible budgeting and scenario analysis to address financial volatility during investment feasibility studies.

Economic Aspects (Kn value: 1.426), ranked fourth, underscore the influence of macroeconomic conditions like rising raw material costs and currency exchange rate fluctuations. These align with findings by Theodoridis and Kraemer (2020); Adepu et al. (2023); and Salem et al. (2023), emphasizing the need for adaptive economic forecasting and cost prediction. The regional concentration of palm oil and biodiesel projects in Sumatra, Kalimantan, and Java highlights the importance of localized risk analysis, as noted by Butdee and Phuangsalee (2019). This research contributes to managerial accounting discourse by addressing sector-specific and regional conditions, providing actionable insights for stakeholders to optimize investment strategies in volatile environments (Kurniati et al., 2024).

3.2. Descriptive Statistics

This research utilized data from financial reports, industry surveys, and government sources to ensure accuracy and reliability. Using SPSS, the analysis identified significant changes in investment parameters before and after the COVID-19 pandemic. Table 2 presents the key findings from this descriptive statistical analysis.

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Table 2. Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Dev
CAPEX Before Covid	30	.7	505.0	71.423	132.0758
CAPEX After Covid	30	1.0	600.0	80.497	152.0285
Project Duration Before Covid	30	8.0	36.0	17.267	7.9825
Project Duration After Covid	30	10.0	48.0	23.100	10.2026
ROI Before Covid	30	.6	9.8	4.867	2.3739
ROI After Covid	30	.9	10.3	5.447	2.4336
IRR Before Covid	30	2.0	172.0	28.533	34.3780
IRR After Covid	30	1.0	112.0	21.500	23.0707
MIRR Before Covid	30	8.0	41.0	17.867	7.4636
MIRR After Covid	30	8.0	36.0	16.233	6.4684

Source: The Processed Primary Data (2023)

Capital Expenditure (CAPEX) increased from an average of 71.42 pre-COVID-19 to 80.49 post-pandemic, driven by health adaptation measures and higher logistics costs, as noted by Pamidimukkala and Kermanshachi (2021). Shimbar and Ebrahimi (2018) highlight the importance of integrating external risks into CAPEX calculations, emphasizing scenario-based budgeting for managing cost inflations. Project duration rose by 33%, from 17.2 to 23 months, reflecting pandemic-induced delays and resource adjustments, aligning with Hesna et al. (2021) and Kumar et al. (2018), who underscore the need for adaptive project management to address extended timelines.

Return on Investment (ROI) increased from 4.867 to 5.447, showcasing market adaptability and revenue resilience, as supported by Theodoridis and Kraemer (2020). Conversely, Internal Rate of Return (IRR) and Modified Internal Rate of Return (MIRR) declined from 28.533 to 21.500 and 17.867 to 16.233, respectively, due to higher costs and delays, aligning with Shimbar and Ebrahimi (2018) and Munandar and Chyntia (2019). These findings emphasize the importance of risk-adjusted metrics in investment feasibility studies.

This research contributes to understanding the economic impacts of global crises like COVID-19, with increases in CAPEX and ROI reflecting market adaptability and strategic cost management, as highlighted by managerial accounting frameworks. The declines in IRR and MIRR emphasize challenges in achieving efficient returns, reinforcing the need for enhanced risk management and scenario-based financial planning, as advocated by Kim and Lee (2018) and Romprasert and Jermsittiparsert (2019).

3.3. Normality Test

After completing the descriptive analysis, the next step is to evaluate the normality of the data using the Kolmogorov-Smirnov test, the table of which can be seen in Appendix 6. This normality test was conducted on 30 data sets for each CAPEX, project duration, ROI, IRR, and MIRR, divided between periods before and after the COVID-19 pandemic. The results of the data normality test using the Kolmogorov-Smirnov test show that most variables deviate from the normal distribution, so the hypothesis testing uses the Wilcoxon Signed Rank Test method.

3.4. Hypothesis Testing

In the second stage, the hypothesis was tested using the Wilcoxon Signed Rank Test, whose table is shown in Appendix 7, considering that the CAPEX, project duration, ROI, IRR, and MIRR data did not show a normal distribution. The Wilcoxon Signed Rank Test analysis evaluated the

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difference between the two conditions before and after the COVID-19 pandemic. The results show more increases in the parameters of CAPEX, project duration, and ROI. For IRR and MIRR, the results show a decrease because the more significant the CAPEX cost, the longer the project will affect the decrease in the interest rate value for the return of capital to maintain project profits.

Table 3. Wilcoxon Signed Rank Test

Test Statistics					
	CAPEX After Covid – CAPEX Before Covid	Project Duration After Covid – Project Duration Before Covid	ROI After Covid – ROI Before Covid	IRR After Covid – IRR Before Covid	MIRR After Covid – MIRR Before Covid
Z	-4.288	-4.833	-4.379	-4.464	-4.045
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000

Source: The Processed Primary Data (2023)

The Wilcoxon Signed Rank Test revealed significant changes in investment parameters pre- and post-COVID-19, with strongly negative Z values and high statistical significance (p = 0.000). CAPEX and project durations increased due to factors like currency fluctuations, rising logistics costs, and labor movement restrictions, as noted by Pavlatos and Kostakis (2023); Rachmawati et al. (2023); and Tahmasebinia and Song (2022). These findings underscore the need for flexible cost management frameworks and adaptive resource allocation strategies, as advocated by Atienza and Tabuena (2021). The pandemic also influenced budget practices, aligning with contingency theory principles emphasizing resource prioritization and cost control during crises (Pavlatos and Kostakis, 2023; Rachmawati et al., 2023).

Despite an increase in ROI, declines in IRR and MIRR highlight reduced investment efficiency due to higher project costs and extended timelines, aligning with Pavlatos and Kostakis (2023). Managerial accounting theories stress the need for dynamic financial modeling and adaptive capital budgeting to address these challenges (Pavlatos and Kostakis, 2023; Rachmawati et al., 2023). Ethical dilemmas in resource allocation further strained financial performance, particularly in healthcare, as seen in studies by (Carson et al., 2021; Koonin et al., 2020; Koraishy and Mallipattu, 2023). These findings validate the importance of integrating uncertainty into profitability metrics and reinforcing contingency-based strategies.

The construction industry demonstrated resilience by adapting to pandemic-induced disruptions, such as rising material costs and logistical delays, while maintaining capital efficiency (Atienza and Tabuena, 2021; Pavlatos and Kostakis, 2023; Rachmawati et al., 2023; Tahmasebinia and Song, 2022), This adaptability aligns with contingency theory, highlighting the critical role of resource allocation and cost management during crises. Ethical considerations in budgeting and cost practices, particularly in healthcare, have further emphasized the need for strategic contingency-based approaches to navigate global crises effectively (Atienza and Tabuena, 2021; Carson et al., 2021; Koonin et al., 2020; Koraishy and Mallipattu, 2023; Pavlatos and Kostakis, 2023; Rachmawati et al., 2023; Tahmasebinia and Song, 2022).

3.5. First Hypothesis

"COVID-19, as the most severe and immediate risk factor, is significantly and urgently impacting the profitability of palm oil and biodiesel industry projects".

The COVID-19 pandemic has emerged as a critical risk factor, significantly impacting the profitability and feasibility of investment projects in the palm oil and biodiesel industries. The Fuzzy Analytic Hierarchy Process (Fuzzy AHP) identified COVID-19 as the top-ranked risk, aligning with Theodoridis and Kraemer (2020) and Triyawan and Fendayanti (2021), who

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reported price drops and project delays. This research highlights the pandemic's multifaceted effects, offering valuable insights into key challenges and adaptive strategies for maintaining project viability.

1) Public Health and Movement Restrictions: Strict health protocols and labor movement restrictions disrupted logistics and operations, increasing costs and causing delays. Klayme et al. (2023) confirm the financial strain from these measures, illustrating the balance between safeguarding health and managing timelines and budgets.
2) Project Resilience and Adaptability: Effective resource management, including optimized procurement and adaptive labor strategies, mitigated disruptions. Lim and Morris (2023) highlight the importance of supply chain optimization and contingency planning in maintaining operational continuity.
3) Commodity Demand and Price Volatility: Fluctuations in demand and prices, as noted by Esomar (2021), created financial unpredictability. Enhanced forecasting models and dynamic strategies were crucial to mitigate revenue risks and sustain profitability.

This study underscores the importance of comprehensive risk assessments and proactive management strategies, integrating scenario planning and financial stress testing to address pandemic-induced disruptions. By combining health protocols, innovative strategies, and market-responsive planning, stakeholders can enhance resilience and sustainability, demonstrating the relevance of Fuzzy AHP in addressing challenges in pandemic-affected industries.

3.6. Second Hypothesis

"The impact of COVID-19 on the calculation of CAPEX (Capital Expenditure), project duration, ROI, IRR, and MIRR in palm oil and biodiesel industry project investments".

The COVID-19 pandemic has disrupted nearly every sector of the global economy, with its effects especially pronounced in industries dependent on supply chains, global markets, and significant capital expenditures (CAPEX). The palm oil and biodiesel industries, vital components of Indonesia's economy, have faced unprecedented challenges due to this disruption. The pandemic's impact is multifaceted, influencing investment decisions, project financial evaluations, and overall profitability. This discussion explores the pandemic's specific effects on key financial parameters such as CAPEX, project duration, Return on Investment (ROI), Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR), providing insights into how these industries have adapted and highlighting areas for strategic improvement.

Impact on CAPEX

Capital Expenditure (CAPEX) is a critical factor in project feasibility, representing the upfront costs required for raw materials, machinery, and initial infrastructure. The pandemic significantly increased CAPEX in the palm oil and biodiesel industries due to disruptions in global supply chains and rising costs of raw materials. For instance, supply chain interruptions led to shortages of essential materials, pushing average CAPEX from approximately 71.42 (pre-pandemic) to 80.49 (post-pandemic). This increase was further exacerbated by health adaptation measures, including the implementation of workplace safety protocols and enhanced sanitation measures, which added to operational costs (Adepu et al., 2023; Salem et al., 2023; Tu et al., 2021).

In addition, transportation and logistics costs surged during the pandemic due to border restrictions and labor shortages. These logistical challenges delayed material deliveries and forced companies to seek alternative, often more expensive, supply routes. Such increases in CAPEX directly impacted investment decisions and project financial evaluations, as projects

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became more expensive to initiate and maintain. The rising CAPEX underscores the need for robust contingency planning in future investment projects, particularly in industries reliant on global supply chains.

Impact on Project Duration

The COVID-19 pandemic significantly extended project durations for palm oil and biodiesel investments, increasing the average timeline from 17.2 to 23 months due to labor shortages, material disruptions, and compliance with health protocols (Hesna et al., 2021). Mobility restrictions limited skilled labor availability, particularly in remote areas, and international travel bans reduced access to foreign expertise. These delays not only increased costs but also strained financial models by postponing revenue generation.

Technical challenges, including remote work adaptation and managing social distancing on construction sites, further complicated timelines. These findings emphasize the need for flexible and adaptive project planning to mitigate the effects of such disruptions in the future.

Impact on ROI, IRR, and MIRR

Despite challenges, the palm oil and biodiesel industries showed resilience, with ROI increasing from 4.867 to 5.447, driven by higher global biodiesel demand and supportive renewable energy policies. This indicates revenues were sufficient to offset pandemic-induced costs. However, IRR and MIRR declined, with IRR dropping from 28.533 to 21.500 and MIRR from 17.867 to 16.233, reflecting reduced investment efficiency.

The decline in IRR and MIRR highlights the impact of rising CAPEX, extended project durations, and higher costs for materials, labor, and logistics on profitability. Additionally, global commodity price volatility, particularly for palm oil, introduced revenue uncertainties, reducing investment attractiveness and efficiency.

Statistical Validation

The comprehensive analysis conducted using the Wilcoxon Signed Rank Test provides robust evidence of the pandemic's impact on the financial and operational parameters of palm oil and biodiesel projects. The test results showed strongly negative Z-values and high statistical significance (p-value = 0.000) for all variables tested, confirming the substantial effects of COVID-19. The statistically significant differences between pre- and post-pandemic metrics for CAPEX, project duration, ROI, IRR, and MIRR underscore the profound influence of the pandemic on these industries.

The Wilcoxon Signed Rank Test also highlights how pandemic-induced cost increases and project delays directly impacted financial outcomes. The statistically significant results reinforce the need for comprehensive risk assessments and adaptive strategies to navigate the complexities of pandemic-era investments (Adepu et al., 2023; Salem et al., 2023; Tu et al., 2021).

Challenges Highlighted by the Analysis

1. Increased Construction Costs: The pandemic drove up construction costs due to higher prices for raw materials, supporting materials, and logistics. These increases were compounded by inconsistent government policies and fluctuating currency exchange rates, which further destabilized financial planning. In some cases, companies had to renegotiate contracts with suppliers or adjust project scopes to accommodate budget constraints, leading to additional delays and cost overruns.
2. Delays and Operational Inefficiencies: Labor shortages and disruptions in material supply chains caused significant delays, reducing operational efficiency and increasing costs. The need to comply with health and safety protocols added further complexity, requiring

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project managers to develop new workflows and reallocate resources to maintain compliance.

3. Volatile Market Conditions: Fluctuations in commodity prices and demand for palm oil and biodiesel created uncertainty in revenue projections. These market instabilities made it challenging for investors to make informed decisions, particularly as financial models became less predictable.
4. Lower Efficiency of Investments: While the ROI increased, the declines in IRR and MIRR indicate that the overall efficiency of investments was negatively impacted. This suggests that the additional costs and delays reduced the net profitability of these projects, even as they generated higher revenues.

Implications for Future Investments

The findings of this research underscore the importance of integrating comprehensive risk management strategies into investment planning. Companies in the palm oil and biodiesel industries must adopt more flexible and adaptive approaches to mitigate the impact of future disruptions Hesna et al. (2021). Key recommendations include:

1. Enhanced Risk Assessment: Utilizing advanced analytical tools, such as Fuzzy AHP, to evaluate and rank potential risks, enabling more informed decision-making.
2. Scenario Planning: Developing contingency plans for various scenarios, including supply chain disruptions, labor shortages, and market fluctuations, to reduce vulnerabilities.
3. Investment in Technology: Leveraging digital tools to improve efficiency and resilience, such as predictive analytics for supply chain management and remote monitoring systems for construction projects.
4. Collaboration with Policymakers: Engaging with government stakeholders to advocate for consistent and supportive policies that reduce uncertainty and facilitate investment.

The COVID-19 pandemic significantly impacted CAPEX, project timelines, and financial metrics like ROI, IRR, and MIRR. While the industries showed resilience, increased costs and delays reduced investment efficiency. These findings stress the importance of flexibility, innovation, and proactive management to sustain growth and profitability in an uncertain global environment. The pandemic underscores the value of adaptive strategies for ensuring long-term sustainability and success.

4. CONCLUSION

This study confirms the significant impact of COVID-19 on investment projects in Indonesia's palm oil and biodiesel industries. Using Fuzzy AHP and comparative statistical tests, it highlights increased CAPEX, extended project durations, and reduced IRR and MIRR, driven by rising material costs, supply chain disruptions, and stricter health protocols. While ROI remained resilient due to adaptive measures and global demand, the efficiency of investments was compromised, emphasizing the need for innovative solutions.

Key recommendations include implementing risk management frameworks like scenario planning and advanced forecasting, adopting adaptive strategies for resource allocation and contingency planning, and fostering collaboration with policymakers to ensure regulatory stability. These measures aim to minimize disruptions, reduce costs, and enhance project resilience. This study provides a practical framework for strategic planning, enabling stakeholders to sustain profitability and growth in uncertain global conditions.

5. REFERENCES

Abodunrin, O., Oloye, G., and Adesola, B. (2020). Coronavirus Pandemic and Its Implication on

DOI: https://doi.org/10.17509/jaset.v16i2
p- ISSN 2086-2563 e- ISSN 2541-0342

Global Economy. *International Journal of Arts, Languages and Business Studies (IJALBS)*, *4*(March), 13–23.

Adepu, N., Kermanshachi, S., Pamidimukkala, A., and Loganathan, K. (2023). Analyzing the factors affecting construction project schedules amidst COVID-19 pandemic. *Project Leadership and Society*, *4*(May), 100100.

Alsharef, A., Banerjee, S., Uddin, S. M. J., Albert, A., and Jaselskis, E. (2021). Early impacts of the COVID-19 pandemic on the United States construction industry. *International Journal of Environmental Research and Public Health*, *18*(4), 1–21.

Atienza, M. A., and Tabuena, A. C. (2021). The Impact of COVID-19 Pandemic on Managerial Accounting and Its Adjustments in Financial Markets. *International Journal of Business, Technology and Organizational Behavior (IJBTOB)*, *1*(4), 287–296.

Ayşe Konyali. (2010). *Financial Evaluation of Kizildere Geothermal Power Plant*.

Butdee, S., and Phuangsalee, P. (2019). Uncertain risk assessment modelling for bus body manufacturing supply chain using AHP and fuzzy AHP. *Procedia Manufacturing*, *30*, 663–670.

Carson, R. C., Forzley, B., Thomas, S., Preto, N., Hargrove, G., Virani, A., Antonsen, J., Brown, M., Copland, M., Michaud, M., Singh, A., and Levin, A. (2021). Balancing the needs of acute and maintenance dialysis patients during the COVID-19 pandemic: A proposed ethical framework for dialysis allocation. *Clinical Journal of the American Society of Nephrology*, *16*(7), 1122–1130.

Dachyar, M. I. (2012). Analisis Kelayakan Investasi dan Risiko Proyek Pembangunan PLTU Indramayu PLN. *Academia Journal*.

Ding, D., Wu, J., Zhu, S., Mu, Y., and Li, Y. (2021). Research on AHP-based fuzzy evaluation of urban green building planning. *Environmental Challenges*, *5*(June), 100305.

Dziadosz, A., and Rejment, M. (2015). Risk Analysis in Construction Project - Chosen Methods. *Procedia Engineering*, *122*(January 2016), 258–265.

Esomar, M. J. F. (2021). *Analisa Dampak Covid-19 terhadap Kinerja Keuangan Perusahaan Pembiayaan di Indonesia*.

Hesna, Y., Sunaryati, J., and Hidayati, A. (2021). COVID-19 pandemic impact: an identification of the cause of cost overrun in construction project. *E3S Web of Conferences*, *331*, 01014.

Iyer, K. C., and Kumar, R. (2016). Impact of Delay and Escalation on Cash Flow and Profitability in a Real Estate Project. *Procedia Engineering*, *145*, 388–395.

Jayasudha, K., Vidivelli, B., and Surjith, G. (2018). Risk Assessment and Management in Construction Industries. *International Journal of Research and Engineering*, *5*(2), 315–320.

Juniarta, I. K. P. (2020). *Model Analisis dan Strategi Mitigasi Risiko Keuangan*.

Kim, S. C., Yoon, J. S., Cheol, O. K., and Paek, J. H. (2005). Feasibility Analysis Simulation Model for Managing Construction Risk Factors. *Journal of Asian Architecture and Building Engineering*, *4*(1), 193–200.

DOI: https://doi.org/10.17509/jaset.v16i2
p- ISSN 2086-2563 e- ISSN 2541-0342

Kim, Y., and Lee, E. B. (2018). A probabilistic alternative approach to optimal project profitability based on the value-at-risk. *Sustainability (Switzerland)*, *10*(3).

Klayme, T., Gokmenoglu, K. K., and Rustamov, B. (2023). Economic policy uncertainty, COVID-19 and corporate investment: Evidence from the gold mining industry. *Resources Policy*, *85*(PA), 103787.

Koonin, L. M., Pillai, S., Kahn, E. B., Moulia, D., and Patel, A. (2020). Strategies to Inform Allocation of Stockpiled Ventilators to Healthcare Facilities During a Pandemic. *Health Security*, *18*(2), 69–74.

Koraishy, F. M., and Mallipattu, S. K. (2023). Dialysis resource allocation in critical care: the impact of the COVID-19 pandemic and the promise of big data analytics. *Frontiers in Nephrology*, *3*(October), 1–9.

Kumar, L., Jindal, A., and Velaga, N. R. (2018). Financial risk assessment and modelling of PPP based Indian highway infrastructure projects. *Transport Policy*, *62*(July 2016), 2–11.

Kurniati, E., Hidayah Napitupulu, I., Simamora, L., and Hidayat, A. (2024). Good Corporate Governance Mechanisms, Company Size, and Company's Growth on Company's Financial Performance. *Jurnal Aset (Akuntansi Riset)*, *16*(1), 13–24.

Lim, K. Y., and Morris, D. (2023). Business optimism and the innovation-profitability nexus: Introducing the COVID-19 adaptable capacity framework. *Research Policy*, *52*(1), 104623.

Mahmoud, H., Ahmed, V., and Beheiry, S. (2021). Construction Cash Flow Risk Index. *Journal of Risk and Financial Management*, *14*(6), 269.

Management, I. R. (2018). A Risk Practitioners Guide to ISO 31000 : 2018. *Institute of Risk Management*, 20.

McKibbin, W. J., and Fernando, R. (2020). The Global Macroeconomic Impacts of COVID-19: Seven Scenarios. *SSRN Electronic Journal*.

Mulyantini, S. (2023). Reaching Persistence of Financial Performance By Implementing Working Capital Management. *Jurnal ASET (Akuntansi Riset)*, *14*(1), 171–186.

Munandar, A., and Chyntia, M. (2019). Reaksi Pasar Modal Terhadap Penetapan Bencana Skala Nasional Wabah COVID-19. *Tjyybjb.Ac.Cn*, *3*(2), 58–66.

Omopariola, E. D., Windapo, A., Edwards, D. J., and El-Gohary, H. (2021). Level of Financial Performance of Selected Construction Companies in South Africa. *Journal of Risk and Financial Management*, *14*(11), 518.

Pamidimukkala, A., and Kermanshachi, S. (2021). Impact of Covid-19 on field and office workforce in construction industry. *Project Leadership and Society*, *2*, 100018.

Pavlatos, O., and Kostakis, H. (2023). Moderating Role of Cost Accounting Information Quality on the Relationship Between the COVID-19 Pandemic and Budgeting in Public Hospitals. *Australian Accounting Review*, *33*(1), 14–30.

Rachmawati, D., Wijaya, J., and Anjelina. (2023). *The Importance and Use of Management Accounting Practices: Descriptive Study During the Covid Pandemic* (Issue August 2021). Atlantis Press International BV.

DOI: https://doi.org/10.17509/jaset.v16i2
p- ISSN 2086-2563 e- ISSN 2541-0342

Ribas, J. R., Arce, M. E., Sohler, F. A., and Suárez-García, A. (2019). Data and calculation approach of the fuzzy AHP risk assessment of a large hydroelectric project. *Data in Brief*, *25*.

Romprasert, S., and Jermsittiparsert, K. (2019). Energy risk management and cost of economic production biodiesel project. *International Journal of Energy Economics and Policy*, *9*(6), 349–357.

Salem, M., Kirkham, R., Al-sabah, R., and Chebli, S. (2023). COVID-19 and the construction sector : Impacts and an agenda for post-pandemic policy in the context of Kuwait. *Journal of Engineering Research*, *September*.

Sangtania, B., Astanto, I. W., and Nugraha, P. (2021). Studi Awal Pengaruh COVID-19 terhadap Pekerjaan Konstruksi Tradisional and Konstruksi 4. *Jurnal Dimensi Pratama Teknik Sipil Petra Surabaya*, *10*.

Santoso, A., and Riyanto, S. (2020). Risk Management Strategies at PT X Construction Company during Pandemic COVID-19. *International Journal of Research and Innovation in Social Science*, *IV*(VI), 601–605.

Scheiblich, M., Maftei, M., Just, V., and Studeny, M. (2017). Developing a project scorecard to measure the performance of project management in relation to EFQM excellence model. *Amfiteatru Economic*, *19*(Specialissue11), 966–980.

Shimbar, A., and Ebrahimi, S. B. (2018). Modified-Decoupled Net Present Value: The Intersection of Valuation and Time scaling of Risk in Energy Sector. *Environmental Energy and Economic Research*, *1*(2017), 347–362.

Syah, T. Y. R., Hamdi, E., Indradewa, R., and Wafiq, Z. (2021). Investment Analysis of Startups Company PT. Zaps Teknologi Service Application of BPJS. *International Journal of Research and Review*, *8*(8), 504–509.

Syah, T. Y. R., Indradewa, R., and Saputra, A. (2021). Risk Management Application for Business Startups "Jamu Partnership" in Indonesia. *International Journal of Research and Review*, *8*(8), 327–333.

Syah, T. Y. R., Pusaka, S., Indradewa, R., and Marsiwi, C. K. K. (2019). Investment Feasibility Analysis in Financial Aspects of Startup Business In Lifestyle Combining Barbershop And Coffee shop Over PT. Jeeva Work Corporation. *Journal of Multidisciplinary Academic*, *3*(4), 97–100.

Tahmasebinia, F., and Song, V. (2022). Significant Factors Causing Delay in the Cambodian Construction Industry. *Sustainability (Switzerland)*, *14*(6).

Theodoridis, T., and Kraemer, J. (2020). *DAMPAK PANDEMI COVID-19: Perspektif Adaptasi dan Resiliensi Sosial Ekonomi Pertanian* (Achmad Suryana (ed.)). IAARD Press.

Triyawan, A., and Fendayanti, Z. E. U. (2021). Dampak pandemi covid-19 terhadap keberlangsungan perusahaan jasa konstruksi. *Forum Ekonomi*, *23*(2), 223–230.

Tu, Q., Mo, J., Liu, Z., Gong, C., and Fan, Y. (2021). Using green finance to counteract the adverse effects of COVID-19 pandemic on renewable energy investment-The case of offshore wind power in China. *Energy Policy*, *158*(June), 112542.

Utama, Y. Y., and Arisanti, N. (2021). Coronavirus Disease 2019 and Cash Flow: Sebuah Studi

DOI: https://doi.org/10.17509/jaset.v16i2
p- ISSN 2086-2563 e- ISSN 2541-0342

Kualitatif. *Jurnal Akuntansi Terapan Dan Bisnis*, *1*(1), 25–34.

Witanto, R. F., and Kuang, T. M. (2024). Can ESG Save Zombie Companies During the Covid-19 Pandemic? *Jurnal ASET (Akuntansi Riset)*, *16*(1), 1–12.

DOI: https://doi.org/10.17509/jaset.v16i2
p- ISSN 2086-2563 e- ISSN 2541-0342