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Exploring How Physical Climate Risks Influence Asset Useful Life Estimation in the Transportation Sector

Iis Solihat*
Universitas Terbuka
Indonesia

Ali Muktiyanto
Universitas Terbuka
Indonesia

Althaf Syah Abdali
Universitas Terbuka
Indonesia

Indah Setia Utami
Universitas Terbuka
Indonesia

***Corresponding author:**
Iis Solihat, Universitas Terbuka, Indonesia.
✉isolihat@ecampus.ut.ac.id

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Abstract

Background: The increasing frequency and intensity of physical climate hazards—including floods, extreme temperatures, storms, and rising sea levels—pose significant challenges to the transportation sector, which relies heavily on long-lived, capital-intensive assets. Conventional approaches to estimating asset useful life rely primarily on historical performance data and engineering assumptions, often overlooking climate-related stressors. This may result in inaccurate depreciation estimates and reduced infrastructure resilience.
Objective: This study explores how physical climate risks are incorporated into asset useful life estimation within transportation organizations.
Methods: This study adopted a qualitative exploratory design. Evidence was gathered through in-depth, semi-structured interviews with two key informants responsible for asset management at express-delivery companies affiliated with the East Java chapter of the Indonesian Express Delivery Companies Association (ASPERINDO). The interviews were complemented by a document analysis of maintenance and asset management records. The collected data were analyzed using the six-phase thematic analysis framework developed by Braun and Clarke.
Results: Five themes were identified. First, physical climate risks accelerate asset degradation. Second, they increase maintenance costs and operational downtime. Third, useful life estimation is shifting from an age-based to a condition-based approach. Fourth, operational data increasingly inform revisions to accounting estimates. Fifth, adaptive organizational strategies moderate the effects of climate risks on asset useful life.
Conclusion: Physical climate risks are an important factor influencing asset useful life estimation. Transportation organizations increasingly rely on condition-based estimation supported by operational evidence and organizational adaptive capabilities.

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INTRODUCTION

Physical climate risk refers to the ways in which climate change directly affects assets, operations, and supply chains, whether through acute events such as hurricanes and floods or through chronic changes, including rising temperatures and sea levels. The increasing materiality of these risks has prompted regulators, investors, and standard-setting bodies to demand more comprehensive climate-related disclosures and risk assessments. The establishment of the

International Sustainability Standards Board (ISSB), followed by the issuance of IFRS S2 Climate-related Disclosures, underscores the growing expectation that organizations identify, assess, and report climate-related risks that may affect financial performance and enterprise value. Similarly, the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) emphasize that climate considerations should be integrated into financial planning, risk management, and strategic decision-making (Braasch & Velte, 2023; Disclosures, 2021).

Despite these advances, physical climate risks remain only marginally reflected in accounting estimates. One area that has received comparatively little academic scrutiny concerns the estimation of the useful lives of property, plant, and equipment (PP&E). In accordance with the standards of the International Accounting Standards Board (IASB) (Board, 2023), particularly IAS 16 Property, Plant and Equipment, entities are required to review the useful lives of their assets at least annually and revise estimates when expectations differ from previous assumptions. Useful life estimation directly influences depreciation expense, asset carrying amounts, maintenance strategies, investment decisions, and overall financial performance. Traditionally, useful life assessments have relied on historical asset usage patterns, technical specifications, maintenance schedules, and managerial judgment. However, these approaches often overlook the potential effects of climate-related stressors that may accelerate asset deterioration, increase maintenance requirements, or shorten the period during which assets remain operationally viable.

The transportation sector represents a particularly relevant context for investigating this issue. Transportation assets are characterized by substantial capital intensity, long investment horizons, and a strong dependence on environmental conditions. Airports may face increased flood risks, railway infrastructure can be damaged by extreme heat, road networks may deteriorate more rapidly due to changing weather patterns, and maritime facilities are increasingly exposed to sea-level rise and coastal erosion. Consequently, conventional approaches to useful life estimation may no longer provide reliable representations of the future economic benefits expected from these assets when physical climate risks intensify.

Existing studies have predominantly examined climate risk from perspectives such as corporate disclosure, market valuation, operational resilience, insurance costs, and environmental performance. Research exploring the accounting implications of climate change has mainly focused on asset impairment, stranded assets, carbon accounting, and sustainability reporting. Nevertheless, empirical research on how physical climate risks affect useful life estimation remains limited (Kling et al., 2021; Matsumura et al., 2024; Nguyen et al., 2026). Furthermore, previous research has relied heavily on quantitative archival methods, providing limited insight into how managers, engineers, and accounting practitioners incorporate climate-related information into asset estimation processes. The lack of interdisciplinary approaches has created a significant gap in understanding the mechanisms through which physical climate risks influence accounting judgments and asset management practices.

This study addresses these limitations through a qualitative, exploratory approach that examines how express-delivery transportation organizations interpret physical climate risks and incorporate them into asset useful life estimation. By focusing on organizational processes, managerial perceptions, and contextual factors, the study aims to develop an in-depth understanding of how climate-related considerations are translated into accounting judgments and asset management decisions. This approach is particularly relevant because useful life estimation involves interactions among operational conditions, maintenance practices, accounting requirements, and organizational capabilities.

The research gap can be identified from three interconnected perspectives. First, from a theoretical perspective, the accounting literature has given comparatively little attention to incorporating physical climate risks into useful life estimation through the combined application of Contingency Theory and the Resource-Based View (RBV). Second, from a contextual perspective, empirical understanding of climate-related asset estimation practices in express-delivery transportation companies remains limited, despite the exposure of their vehicle fleets to extreme temperatures, heavy rainfall, and flooding. Third, from a methodological perspective, previous research has predominantly emphasized financial reporting outcomes and quantitative indicators, providing limited insight into how organizational decision-makers interpret climate-

related information when evaluating asset conditions and revising useful life estimates. These gaps indicate the need for qualitative investigation into the practical mechanisms linking physical climate risks, organizational responses, and accounting estimation processes.

The urgency of this research arises from the potential consequences of changing climatic conditions for asset deterioration, maintenance requirements, operational continuity, and the reliability of accounting estimates. Under IAS 16, useful life estimates must be reviewed at least annually, and changes in expectations must be reflected in the relevant accounting estimates. However, reliance solely on historical asset usage patterns and chronological age may not adequately capture changes in the expected future economic benefits of assets exposed to increasingly variable environmental conditions. Therefore, examining how transportation organizations incorporate operational and climate-related evidence into useful life assessments is important for supporting more informed accounting judgments and asset management decisions.

What distinguishes this study is its examination of how physical climate risk considerations are incorporated into asset useful life estimation through organizational practices and managerial perspectives in the express-delivery transportation sector. Unlike studies primarily concerned with climate-related disclosures, asset impairment, or financial market consequences, this research focuses on how climate-related asset deterioration, operational evidence, and adaptive organizational capabilities inform the evaluation of useful life assumptions. In addition, the study combines Contingency Theory with the Resource-Based View to interpret how environmental uncertainty and a firm's internal capabilities shape climate-informed asset estimation. This integrated perspective provides a contextual contribution to the understanding of climate-related accounting judgments.

On this basis, the study aims to examine how transportation companies perceive the influence of physical climate risks on asset useful lives, how climate-related factors are incorporated into estimation processes, and how organizational capabilities, managerial perceptions, and contextual conditions shape accounting judgments. The research focuses on express-delivery transportation companies affiliated with the East Java chapter of the Indonesian Express Delivery Companies Association (ASPERINDO). Theoretically, the study is expected to enrich the literature on climate-related accounting estimates by linking environmental uncertainty with organizational adaptation and asset management practices. Practically, its findings may provide insights for transportation companies seeking to strengthen the use of maintenance records, asset condition assessments, and climate-related information when reviewing useful life estimates. The findings may also inform the development of more integrated asset management practices and support the alignment of accounting judgments with the requirements of IAS 16.

METHOD

A qualitative, exploratory research design was adopted in this study to investigate how physical climate risks influence asset useful life estimation in the transportation sector. This design is appropriate because incorporating climate-related information into accounting estimates is a novel and complex issue that remains insufficiently understood. Furthermore, this approach allows for an in-depth examination of organizational experiences, perceptions, and decision-making processes (Creswell & Creswell, 2023).

Consistent with the study's exploratory nature, data collection focused on the express delivery subsector, specifically transportation companies affiliated with the East Java chapter of ASPERINDO. This bounded focus enabled an in-depth examination of climate-informed asset management practices within a single, clearly defined context rather than a broad comparison across subsectors, which the available evidence could not support.

Participants were selected purposively based on their direct responsibilities for asset management, maintenance, and depreciation decisions. Two key informants, each with more than three years of relevant experience, participated in in-depth interviews. Given the exploratory scope of the study and the depth of the interviews, data collection continued until no substantially new themes emerged from the available informants and supporting documents. The authors

acknowledge that, with only two informants, this represents a pragmatic assessment of thematic sufficiency rather than full theoretical saturation (Creswell & Creswell, 2023).

Primary data were collected through semi-structured interviews guided by an interview protocol developed based on the literature on physical climate risks, asset management, and useful life estimation. The questions explored informants' perceptions of climate risks affecting transportation assets, existing approaches to estimating useful lives, the incorporation of climate-related information into accounting estimates, and organizational adaptation strategies. Two interviews were conducted, each lasting approximately 60 to 90 minutes. With the informants' permission, both interviews were audio-recorded and subsequently transcribed verbatim.

To enhance data triangulation and provide additional contextual information, the study also incorporated document analysis. Relevant organizational documents were reviewed to gain insights into formal policies, procedures, and practices concerning asset management and the integration of climate-related risks. Document analysis complemented the interview data by examining consistencies and discrepancies between organizational accounts and documented practices.

The data were analyzed using the six phases of thematic analysis proposed by Braun and Clarke (2006) and Clarke et al. (2024): familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. Coding and theme development were performed manually using a spreadsheet-based coding matrix, without dedicated qualitative data analysis software. The resulting themes were subsequently examined in relation to the theoretical framework and existing literature to clarify how physical climate risks influence useful life estimation in the transportation sector.

To strengthen the trustworthiness of the findings, the analysis was grounded in interview transcripts and supporting organizational documents. Methodological triangulation was achieved by comparing interview evidence with relevant documentary records, while the coding and theme development followed the six-phase thematic analysis procedure proposed by Braun and Clarke (2006) and Clarke et al. (2024). The research context, participant roles, data collection procedures, and analytical process are described to promote transparency and facilitate interpretation of the findings.

Ethical considerations were addressed throughout the research process. Informants were briefed on the study's objectives, procedures, and confidentiality safeguards and provided informed consent before the interviews commenced. Participation was voluntary, and identifying information was anonymized to protect the informants' confidentiality.

RESULTS AND DISCUSSION

Physical Climate Risks Accelerate Asset Degradation

The first theme reveals that physical climate risks, particularly extreme temperatures, heavy rainfall, and flooding, directly accelerate the deterioration of transportation assets. Informants emphasised that prolonged exposure to high temperatures increases tire wear, causes engine overheating, and contributes to radiator failures, while excessive rainfall and flooding accelerate corrosion and damage electrical systems.

These findings support prior research suggesting that climate change alters the environmental conditions under which transportation assets operate, resulting in accelerated degradation and reduced operational efficiency (Mulholland & Feyen, 2021; Wang et al., 2024). Unlike traditional asset management models that assume environmental stability, the findings indicate that historical operating conditions are no longer reliable predictors of future asset performance in the transportation sector, as its assets are capital-intensive, geographically immobile, and highly exposed to environmental conditions. Consequently, organisations increasingly recognise climate risk as an important factor influencing future economic benefits, consistent with the requirements of IAS 16 to review asset useful life estimates periodically.

Climate Risks Increase Maintenance Costs and Operational Downtime

The second theme demonstrates that physical climate risks substantially increase maintenance costs and operational downtime. Informants reported that climate-related asset deterioration leads to more frequent servicing, accelerated spare-part replacement, and longer

periods of vehicle unavailability. Importantly, participants emphasised that the economic consequences extend beyond repair costs to include delayed deliveries and reduced customer satisfaction. This finding reinforces the argument that climate risks affect both the physical and economic dimensions of asset performance. Increased downtime reduces asset productivity and limits an organisation's ability to generate expected economic benefits, thereby influencing judgments regarding asset useful life. The results align with the understanding that climate-related deterioration is cumulative rather than instantaneous. Informants noted that asset degradation often occurs gradually through repeated exposure to adverse weather conditions, highlighting the need for continuous monitoring and proactive maintenance strategies.

Useful Life Estimation Is Shifting from an Age-Based to a Condition-Based Approach

The third theme indicates a significant shift in asset useful life estimation practices. Traditionally, useful life was estimated based on chronological age or mileage. However, the findings suggest that transportation companies increasingly rely on actual asset conditions, including maintenance frequency, operational efficiency, intensity of climate exposure, and damage history. This shift reflects a growing recognition that assets of the same age may exhibit substantially different economic lives depending on their exposure to climate-related hazards. Therefore, chronological age alone is no longer sufficient to estimate future economic benefits accurately. These results align with the tenets of Contingency Theory, which hold that no single approach to accounting estimation is optimal across all situations. Instead, effective useful life estimation depends on contextual factors, including environmental conditions, asset characteristics, and organisational risk exposure.

Operational Data Support Accounting Estimates

The fourth theme reveals that revisions to useful life estimates are increasingly based on operational evidence rather than solely on managerial judgment. Informants identified driver reports, maintenance records, repair frequency, service costs, and spare-part replacement histories as critical sources of information for evaluating asset performance and reviewing depreciation assumptions. Despite the growing importance of operational data, participants acknowledged that documentation systems remain largely manual and fragmented. Climate-related information is often not integrated into enterprise asset management systems, limiting organisations' ability to systematically assess the relationship between climate exposure and asset performance. These findings highlight the need for enhanced data infrastructure and digital asset management systems capable of integrating operational and climate-related information. Such systems may support more reliable and evidence-based accounting estimates. Viewed through the lens of the Resource-Based View, data analytics capabilities and information systems constitute valuable organisational resources that strengthen a firm's capacity to adapt to climate uncertainty and make better-informed decisions.

Adaptive Strategies Moderate the Impact of Climate Risks on Asset Useful Life

The fifth theme shows that organisational adaptation strategies can mitigate the effects of physical climate risks on asset useful life. Informants identified preventive maintenance, adherence to standard operating procedures, the use of high-quality spare parts, driver discipline, and fleet monitoring systems as important mechanisms for reducing climate-related asset deterioration. This evidence highlights organisational capabilities as pivotal in determining how effectively firms respond to climate-related challenges. Companies with stronger preventive maintenance practices and more systematic monitoring systems may be better positioned to maintain asset performance and preserve expected useful life despite increasing climate risks. Moreover, the findings indicate that cross-functional coordination remains largely informal, with asset-related decisions often concentrated at the owner or senior management level. Closer cooperation among finance, operations, engineering, and risk management functions could therefore help integrate climate considerations more fully into asset management practices and accounting estimates.

Table 1
Summary of Themes, Categories, and Evidence

Theme	Main Findings	Representative Evidence	Accounting Implication
Physical climate risks accelerate asset degradation	Extreme heat, heavy rainfall, and flooding accelerate deterioration of transportation assets.	Tire wear, engine overheating, radiator failures, corrosion, and electrical damage occur more frequently under extreme weather conditions.	Useful life should be reviewed periodically because climate conditions influence future economic benefits (IAS 16).
Climate risks increase maintenance costs and operational downtime	Climate-related deterioration increases repair frequency and operational interruptions.	More frequent maintenance, spare-part replacement, vehicle downtime, delayed deliveries, and reduced customer satisfaction.	Higher maintenance costs and reduced productivity may affect depreciation estimates and impairment assessments.
Useful life estimation shifts from age-based to condition-based	Companies increasingly evaluate assets using operational condition instead of chronological age.	Maintenance frequency, operational efficiency, climate exposure, and damage history become major considerations.	Depreciation estimates should incorporate actual asset condition rather than age alone.
Operational data support accounting estimates	Accounting judgments increasingly rely on operational evidence.	Driver reports, maintenance records, repair history, spare-part replacement, and service frequency.	Digital asset management systems improve the reliability of accounting estimates.
Adaptive strategies moderate climate impacts	Organizational capabilities reduce climate-related asset deterioration.	Preventive maintenance, SOP compliance, quality spare parts, driver discipline, and fleet monitoring systems.	Organizational capabilities improve asset resilience and extend economic useful life.

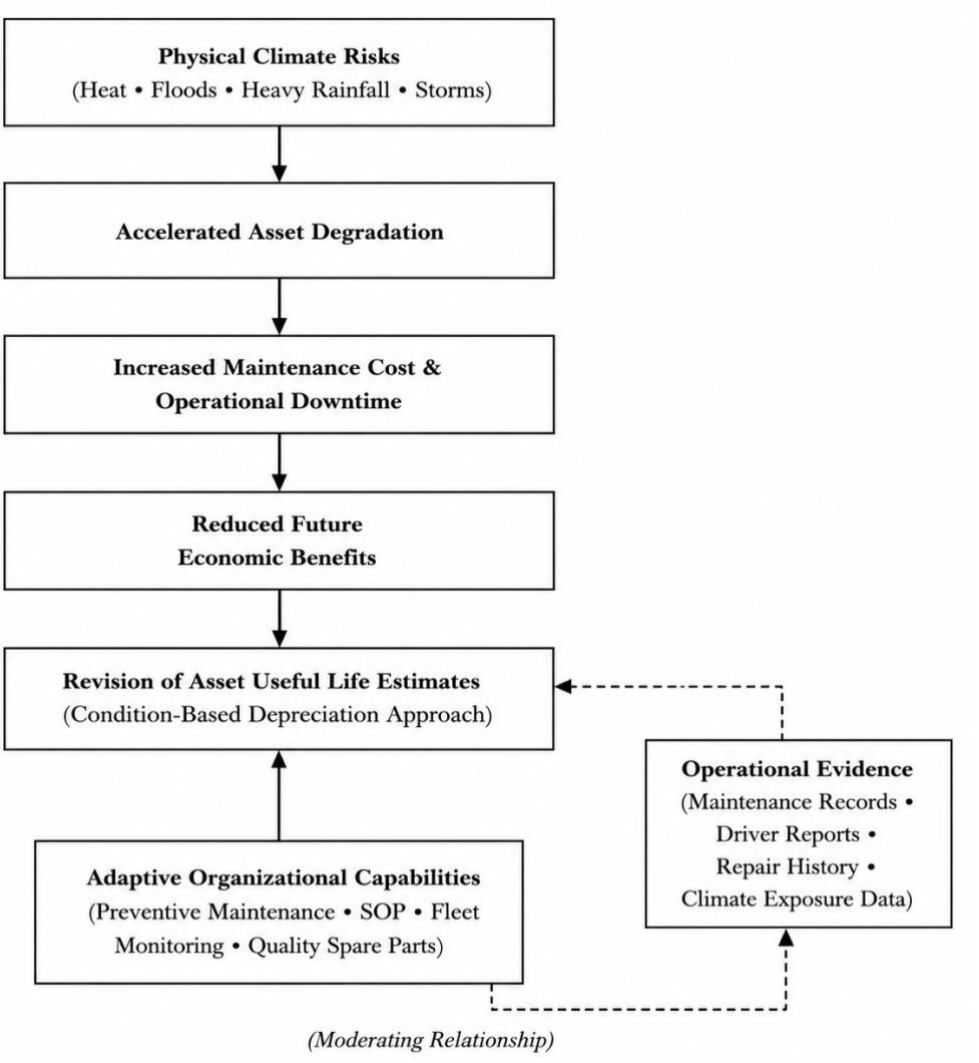


Figure 1. Conceptual Framework

Table 2
Representative Interview Evidence

Theme	Representative Statement	Interpretation
Asset degradation	"Extreme temperatures accelerate tire wear and engine overheating, while flooding causes corrosion and electrical failures."	Physical climate hazards directly reduce asset performance.
Maintenance cost	"Maintenance frequency has increased significantly after repeated exposure to heavy rainfall."	Climate risks increase operating expenditures.
Useful life estimation	"We no longer rely solely on vehicle age but also consider actual operating conditions."	Useful life estimation becomes condition-based.
Operational evidence	"Maintenance records and repair history are our primary basis for reviewing depreciation estimates."	Accounting estimates increasingly rely on empirical operational data.
Adaptive strategy	"Preventive maintenance and fleet monitoring help reduce climate-related damage."	Organizational capabilities mitigate climate risks.

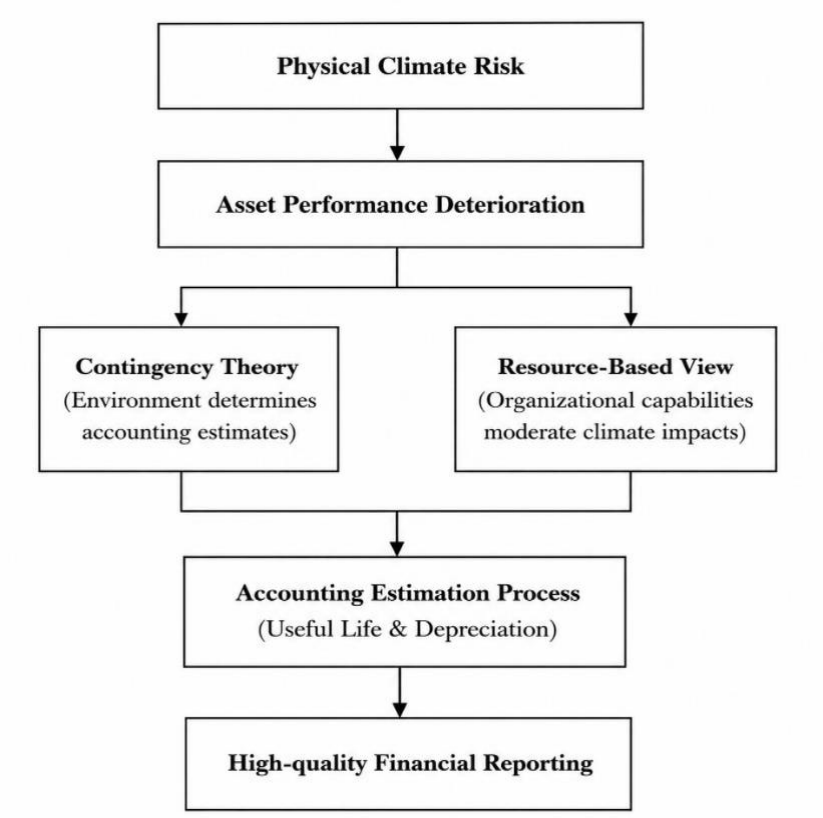


Figure 2. Theoretical Integration Framework

Figure 2 brings together the theoretical interpretation of the findings, linking physical climate risks and declining asset performance to the accounting estimation process through Contingency Theory and the Resource-Based View. Contingency Theory explains how useful life estimates are adjusted in response to changing environmental conditions, whereas the Resource-Based View clarifies the role of organisational capabilities in moderating climate-related impacts.

Discussion

This study demonstrates that physical climate risks are important contextual factors influencing asset useful life estimation in the transportation sector. Through thematic analysis, five interrelated themes emerged, explaining how climate-related hazards influence accounting estimates through both physical and organisational mechanisms. The findings indicate that physical climate risks accelerate the deterioration of transportation assets. Extreme temperatures, flooding, and heavy rainfall intensify wear, corrosion, and mechanical failures, which, in turn, diminish the capacity of assets to generate future economic benefits. This finding extends the application of climate-related considerations in accounting by demonstrating that environmental hazards directly influence the assumptions underlying depreciation estimates. It also supports the requirements of IAS 16, which require entities to review useful life estimates at least at each financial year-end and whenever changes in operating conditions indicate that previous estimates may no longer be appropriate. Comparable evidence regarding the physical vulnerability of transportation assets is reported in recent infrastructure studies (Liu et al., 2023; Verschuur et al., 2024).

This study reveals that climate-related deterioration generates substantial economic consequences through increased maintenance costs and operational downtime. Rather than affecting only the physical condition of assets, climate hazards also reduce operational productivity by increasing repair frequency, extending vehicle downtime, delaying service delivery, and reducing customer satisfaction. These findings suggest that useful life estimation should not be viewed solely as an engineering assessment but also as an economic evaluation of an asset's capacity to continue generating future economic benefits.

The findings demonstrate a transition from traditional age-based approaches to

condition-based useful life estimation. Transportation companies increasingly rely on maintenance frequency, operational efficiency, climate exposure, and asset condition rather than chronological age alone. Such evidence lends weight to Contingency Theory, which contends that accounting practices should be tailored to contextual conditions rather than follow a single universal estimation procedure. Under increasing climate uncertainty, identical assets may exhibit substantially different economic lives because of differences in environmental exposure and operational circumstances. Operational evidence has become an essential basis for revising accounting estimates. Maintenance records, repair histories, driver reports, service frequency, and climate exposure information provide relevant evidence for reassessing useful life assumptions. Nevertheless, the findings also reveal that many organisations continue to rely on fragmented and manually maintained records. This limitation may reduce the reliability of accounting estimates and highlights the need for integrated digital asset management systems capable of combining operational and climate-related information. Such integration would improve the quality of professional judgment and strengthen evidence-based accounting estimation (Lawrence & Lorsch, 1967; Mwaniki et al., 2026; Ul-Durar et al., 2023).

The study demonstrates that the effects of physical climate risks are moderated by organisational adaptive capabilities. Preventive maintenance programmes, compliance with standard operating procedures, fleet monitoring systems, and the use of high-quality spare parts help reduce climate-related deterioration and improve asset resilience. This finding accords with the Resource-Based View, under which organisational capabilities serve as strategic resources that allow firms to respond effectively to environmental uncertainty. Consequently, firms with stronger adaptive capabilities may be better positioned to sustain asset performance and preserve their expected useful lives even as climate risks intensify (Abbasi et al., 2025; Barney, 1991; El Nemar et al., 2025; Hossain et al., 2022).

The present study advances the accounting literature by applying Contingency Theory and the Resource-Based View to climate-related accounting estimation. Contingency Theory explains why useful life estimation should reflect changing environmental conditions, whereas the Resource-Based View explains why firms may differ in their ability to mitigate the consequences of climate risks through organisational capabilities. Together, these perspectives provide a theoretical explanation of how physical climate risks influence accounting estimates and why organisations may respond differently to similar environmental challenges.

CONCLUSION

This study indicates that physical climate risks are important factors influencing asset useful life estimation within the express-delivery transportation context examined. Extreme temperatures, heavy rainfall, and flooding were associated with accelerated asset deterioration, increased maintenance requirements, and operational downtime. The findings also indicate a shift from age-based to condition-based useful life estimation, in which maintenance records, repair histories, driver reports, asset conditions, and climate exposure information provide operational evidence for reviewing accounting estimates. Adaptive organisational capabilities, including preventive maintenance, fleet monitoring, compliance with standard operating procedures, and the use of high-quality spare parts, may help reduce climate-related asset deterioration. From a theoretical perspective, Contingency Theory explains the need to adjust estimation practices to changing environmental conditions, while the Resource-Based View highlights the role of organisational capabilities in responding to climate-related uncertainty.

Practically, the findings support greater integration of operational and climate-related information into periodic reviews of asset useful life, as well as stronger coordination among relevant organisational functions. However, the study is limited by its qualitative scope and its reliance on two key informants from express-delivery companies affiliated with the East Java chapter of ASPERINDO. Accordingly, the results should be interpreted as specific to this research context rather than as broadly generalisable across the transportation sector. Future research could examine these relationships using larger samples, additional transportation subsectors, and quantitative or mixed-methods designs to assess the broader applicability of the findings.

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AUTHOR CONTRIBUTION STATEMENT

Iis Solihat contributed to the conceptualization, methodology, investigation, data curation, formal analysis, and preparation of the original manuscript. Ali Muktiyanto contributed to the conceptualization, methodological development, supervision, validation, and critical review of the manuscript. Althaf Syah Abdali was responsible for investigation, data collection, formal analysis, visualization, and manuscript review. Indah Setia Utami contributed to the literature review, data curation, validation, and manuscript editing. All authors reviewed and approved the final version of the manuscript for publication.

REFERENCES

Abbasi, K. A., Amoozad, M. H., Masoumi, S., & Jafari-Sadeghi, V. (2025). Developing sustainable competitive advantages from the lens of resource-based view: Evidence from IT sector of an emerging economy. *Journal of Strategic Marketing*, *33*(6), 775–797.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Board, I. A. S. (2023). *Effects of climate-related matters on financial statements*. IFRS Foundation.

Braasch, A., & Velte, P. (2023). Climate reporting quality following the recommendations of the task force on climate-related financial disclosures: A Focus on the German capital market. *Sustainable Development*, *31*(2), 926–940.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Clarke, R., Weare, V., Chow, H., Bowering-Sheehan, L., & Hitchcock, C. (2024). "It saved me": A thematic analysis of experiences of psychological therapy following critical illness and intensive care. *Journal of the Intensive Care Society*, *25*(3), 288–295.

Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications.

Disclosures, T. F. on C. F. (2021). *Recommendations of the Task Force on Climate-related Financial Disclosures*. TCFD.

El Nemar, S., El-Chaarani, H., Dandachi, I., & Castellano, S. (2025). Resource-based view and sustainable advantage: a framework for SMEs. *Journal of Strategic Marketing*, *33*(6), 798–821.

Hossain, M. S., Hussain, K., Kannan, S., & Kunju Raman Nair, S. K. (2022). Determinants of sustainable competitive advantage from resource-based view: implications for hotel industry. *Journal of Hospitality and Tourism Insights*, *5*(1), 79–98.

Kling, G., Volz, U., Murinde, V., & Ayas, S. (2021). The impact of climate vulnerability on firms' cost of capital and access to finance. *World Development*, *137*, 105131. https://doi.org/10.1016/j.worlddev.2020.105131

Lawrence, P. R., & Lorsch, J. W. (1967). *Organization and environment: Managing differentiation and integration*. Harvard University Press.

Liu, K., Wang, Q., Wang, M., & Koks, E. E. (2023). Global transportation infrastructure exposure to the change of precipitation in a warmer world. *Nature Communications*, *14*. https://doi.org/10.1038/s41467-023-38203-3

Matsumura, E. M., Prakash, R., & Vera-Muñoz, S. C. (2024). Climate-risk materiality and firm risk. *Review of Accounting Studies*, *29*(1), 33–74. https://doi.org/10.1007/s11142-022-09718-9

Mulholland, E., & Feyen, L. (2021). Increased risk of extreme heat to European roads and railways with global warming. *Climate Risk Management*, *34*, 100365. https://doi.org/10.1016/j.crm.2021.100365

Mwaniki, A. W., He, F., & Chege, S. M. (2026). Impact of differentiation strategy on organizational

performance in developing countries. *Human Systems Management*, *45*(2), 276–303.

Nguyen, M., Nguyen, T. D., & Dang, T. T. (2026). Financing under climate change: The effect of climate risk sensitivity on firms' access to credit. *Journal of Climate Finance*, *15*, 100089.

Ul-Durar, S., Awan, U., Varma, A., Memon, S., & Mention, A.-L. (2023). Integrating knowledge management and orientation dynamics for organization transition from eco-innovation to circular economy. *Journal of Knowledge Management*, *27*(8), 2217–2248.

Verschuur, J., Fernández-Pérez, A., Mühlhofer, E., Nirandjan, S., Borgomeo, E., Koks, E. E., Pant, R., & Hall, J. W. (2024). Quantifying climate risks to infrastructure systems: A comparative review of developments across infrastructure sectors. *PLOS Climate*, *3*(4), e0000331. https://doi.org/10.1371/journal.pclm.0000331

Wang, Q., Liu, K., Wang, M., Koks, E., & Wang, H. (2024). Exposure of global rail and road infrastructures in future record-breaking climate extremes. *Earth's Future*, *12*(1), e2023EF003632.