

Auditing Climate-Related Risk: Challenges to Auditor Independence and Professional Skepticism

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Article History

Received 23 February 2026

1st Revision 27 February 2026

2nd Revision 02 March 2026

3rd Revision 11 March 2026

Accepted on 17 March 2026

Abstract

Purpose: This study examines how climate-related risk is identified and assessed in financial statement audits and analyzes its implications for auditor independence and professional skepticism within a risk-based auditing framework in regional Public Accounting Firms in Indonesia.

Methodology: This qualitative exploratory study was conducted through semi-structured interviews with four auditors from regional Public Accounting Firms in Makassar, Indonesia, each with a minimum of three years of audit experience. Document analyses of International Standard on Auditing (ISA) 200, ISA 315, and ISA 540 complemented the interviews. Thematic analysis was employed to identify recurring patterns in risk assessment, professional judgements, and responses to climate-related uncertainty.

Results: The findings reveal three dominant themes: (1) climate-related risk is primarily incorporated into the entity-level risk assessment stage; (2) its classification as a material misstatement risk remains inconsistent; and (3) climate-related accounting estimates significantly increase reliance on management assumptions, thereby intensifying challenges to auditor independence and professional skepticism. The integration of climate risk remains largely principle-based and dependent on judgment rather than on structured technical guidance.

Conclusions: This study demonstrates that climate-related risk reshapes inherent risk assessment and expands the behavioral dimensions of auditing practice in regional contexts. The findings highlight the need for more operational guidance to support the consistent integration of climate considerations within risk-based auditing.

Limitations: This study is limited to a small sample of regional auditors and relies on qualitative perceptions.

Contributions: This research contributes to auditing literature by empirically illustrating how climate-related risk affects professional judgment, independence, and skepticism in emerging regional audit environments.

Keywords: *Audit Risk, Auditor Independence, Climate-Related Risk, Professional Skepticism, Risk-Based Auditing*

How to Cite: Susanto, E., Tenriwaru, T., & Kalsum, U. (2026). Auditing Climate-Related Risk: Challenges to Auditor Independence and Professional Skepticism. *Jurnal Akuntansi, Keuangan, dan Manajemen*, 7(3), 125-138.

1. Introduction

Climate change has evolved into a systemic global risk that extends beyond environmental concerns and increasingly influences financial reporting and auditing. Physical risks, such as extreme weather events, and transition risks arising from regulatory reforms, carbon pricing mechanisms, and technological shifts, create financial uncertainties that directly affect asset valuation, operational continuity, and long-term business sustainability. As firms incorporate forward-looking climate

assumptions into their financial statements, estimation uncertainty increases, raising the likelihood of material misstatements. These uncertainties often require management to rely on projections, scenario analyses, and long-term assumptions that are inherently difficult to verify and validate. Consequently, the reliability of financial reporting becomes more dependent on the robustness of the estimation processes and internal controls. This evolving risk landscape places greater pressure on auditors to critically assess whether climate-related assumptions are reasonable, supportable, and adequately disclosed in the financial statements ([Hestyarningsih, Martini, & Anggraeni, 2020](#)).

Recent empirical studies have shown that climate-related disclosures and governance mechanisms influence financial outcomes and audit processes. Firms with stronger climate governance tend to provide more transparent sustainability reports, thereby reducing information asymmetry ([Farooq & Muhammad, 2025](#)). Higher climate disclosure performance is associated with lower financial distress but also leads to increased audit fees, reflecting auditors' recognition of climate risk exposure ([Alshahrani, Eulaiwi, Duong, & Taylor, 2025](#)). Climate policy uncertainty further affects financial statement comparability by encouraging discretionary reporting ([Zhang & Sun, 2025](#)). These findings indicate that climate risk is not merely a disclosure issue but also a determinant of financial reporting quality and audit risk. In this context, climate-related information increasingly shapes investors' perceptions and external assurance expectations. As a result, auditors are required to assess not only the completeness of disclosures but also the consistency between sustainability narratives and the underlying financial assumptions ([Purba, Sitanggang, & Simalango, 2025](#)).

Climate-related risks significantly affect impairment testing, useful life estimation, environmental provisions, contingent liabilities, and going concern assessments ([Andersson & Arvidsson, 2023](#); [Borghei, Limmenluecke, & Bui, 2024](#)). The incorporation of forward-looking assumptions increases estimation complexity and audit risk ([Kumarasiri, Morrison, & Maran, 2025](#)). Moreover, climate disclosures remain inconsistent across industries, particularly between carbon-intensive and non-carbon-intensive firms ([Borghei et al., 2024](#)). The lack of standardization and the risks of symbolic reporting highlight the need for a more reliable integration of climate risk into financial reporting and auditing practices ([Mamatzakis & Tzouvanas, 2025](#); [Nyakuwanika & Panicker, 2025](#)). Such inconsistencies may obscure the true extent of climate exposure, thereby increasing the difficulty in assessing material misstatements. Consequently, auditors must exercise heightened professional judgment when evaluating whether the reported figures adequately reflect the underlying environmental risks.

In the auditing context, climate-related risks introduce significant challenges to risk assessment, evidence evaluation, and professional judgment. The International Auditing and Assurance Standards Board (IAASB) emphasizes that auditors must consider environmental and sustainability-related factors when identifying the risk of material misstatements. ISA 200 underscores the importance of independence and professional skepticism in responding to complex risks, whereas ISA 315 requires auditors to understand the entity's external environment. ISA 540 further stresses the rigorous evaluation of accounting estimates characterized by high uncertainty; a condition often associated with climate-related assumptions. Together, these standards provide a principle-based framework for integrating climate considerations into auditing planning and execution. However, translating these principles into operational audit procedures often depends on auditors' experience and contextual judgment ([Siahaan & Purba, 2024](#)).

Empirical research increasingly shows that climate-related risks influence audit pricing and outcomes. Auditors charge higher fees to clients with greater climate exposure or carbon emissions, particularly in regions with higher climate awareness ([Hartlieb & Eierle, 2024](#); [Yang, Wei, Deng, Cao, & Huang, 2023](#)). Disclosure clarity also affects audit fees because ambiguous climate disclosures elevate perceived audit risk ([Gao & Calderon, 2023](#)). However, verifying management's forward-looking assumptions remains challenging, intensifying the need for auditor independence and professional skepticism ([Hrazdil, Li, & Zhang, 2025](#)). These findings suggest that climate risk is progressively embedded in auditors' risk assessments and resource-allocation decisions. However, fee adjustments

alone do not fully capture how auditors internally respond to climate-related uncertainty in their professional judgments.

Despite the growing international evidence, most studies focus on developed markets and large audit firms. Limited research has examined how auditors in regional and emerging contexts interpret and operationalize climate-related risks within a risk-based auditing framework. Emerging market auditors often face constraints such as limited technical guidance, specialized expertise, and institutional support ([Ding, Chourou, & Ben-Amar, 2024](#)). Although climate risk influences audit pricing in these markets, its magnitude and practical integration remain uneven ([Yang et al., 2023](#)). Empirical evidence specifically addressing regional Public Accounting Firms outside major financial centers remains scarce. This gap indicates the need to explore how climate-related risks are practically assessed and incorporated in smaller or regionally based audit environments, where institutional pressures and resource availability may differ significantly.

In Indonesia, climate-related financial reporting and sustainability disclosures have gradually gained attention, particularly following regulatory encouragement and the increasing adoption of sustainability reporting practices. However, empirical evidence on how Indonesian auditors integrate climate-related risks into audit engagements is limited. Existing domestic studies predominantly focus on audit quality, auditor switching, professional skepticism, and ethical dimensions ([Hestyaningsih et al. \(2020\)](#); [Yasa, Yuliansyah, and Kesumaningrum \(2021\)](#)), with minimal attention to climate-related uncertainty as a determinant of audit risk. This indicates that the operationalization of climate-related considerations in Indonesian audit practice remains underexplored.

Makassar, a regional economic hub in Eastern Indonesia, provides a relevant setting for exploring these issues. The region hosts industries with varying exposure to climate-related risks, including the construction, fisheries, infrastructure, and natural resource sectors. However, little empirical evidence exists regarding how auditors in regional Public Accounting Firms incorporate climate-related risks into audit engagements and how such risks influence auditor independence and professional skepticism ([Yasa et al., 2021](#)). Given the diversity of industry exposure and the evolving regulatory landscape in Indonesia, examining this regional context may provide valuable insights into the localized implementation of international auditing standards.

Despite the expanding body of literature, three major gaps remain in the literature. First, a theoretical gap exists because prior studies have largely examined climate risk in relation to disclosure quality or audit fees, with limited attention to how climate-related uncertainty reshapes auditor independence and professional skepticism within a risk-based auditing framework. Second, an empirical gap persists as most evidence originates from developed markets and large audit firms, leaving regional Public Accounting Firms in emerging economies underexamined. Third, a methodological gap remains because prior research predominantly relies on archival and quantitative data, offering limited insight into how auditors interpret and operationalize climate-related risks in practice. Addressing these gaps requires in-depth qualitative exploration of regional audit environments.

Based on these considerations, this study addresses the following research question:

- RQ₁*: How do auditors in regional Public Accounting Firms identify and assess climate-related risks in financial statement audits?
- RQ₂*: How do climate-related risks influence auditor independence and professional skepticism?
- RQ₃*: How are ISA 200, ISA 315, and ISA 540 operationalized to address climate-related uncertainty in audit engagements?

By answering these questions, this study contributes to the literature by extending our understanding of how climate-related risk reshapes audit risk assessment and professional judgment in regional practice environments. This study further bridges global regulatory expectations with localized audit realities in emerging economies, thereby strengthening the contextual evidence of climate-related audit risk.

2. Literature Review

2.1 Risk-Based Auditing Theory

This study is grounded in Risk-Based Auditing Theory, which emphasizes that audit procedures should be designed based on the assessment of risks that may lead to material misstatements. Under this approach, auditors concentrate their efforts on areas with higher inherent uncertainty and complexity, rather than applying uniform audit procedures ([Izzalqurny & Utami, 2024](#)). This theory reflects a shift from procedural compliance to risk-oriented professional judgment. In this study, climate change is conceptualized as a non-financial risk that may increase inherent risk by affecting asset valuation, environmental liabilities, and going concern assessments. As climate-related assumptions often involve significant estimation uncertainty, auditors must apply professional skepticism and maintain independence in evaluating management judgments. Therefore, Risk-Based Auditing Theory provides an appropriate conceptual framework for explaining how auditors integrate climate-related risks into risk assessment and audit planning in accordance with ISA 200, ISA 315, and ISA 540.

2.2 Climate Change Risk

Climate change risk refers to the potential adverse impacts of climate change on a company's operations, financial position, and performance. These risks may manifest as physical risks, such as extreme weather events and natural disasters, or transition risks associated with regulatory changes, technological developments, and shifting market preferences. From an auditing perspective, climate change represents a non-financial risk that can increase inherent risk and the probability of material misstatements in financial statements ([Bingler & Colesanti Senni, 2022](#)). Therefore, climate-related risks must be considered within the broader framework of audit risk assessment.

2.3 Audit Risk and Auditor Independence

Audit risk is the risk that an auditor expresses an inappropriate opinion on financial statements containing material misstatements. Audit risk consists of inherent, control, and detection risks. Climate change has the potential to increase inherent risk due to heightened uncertainty and complexity in accounting estimates. Consequently, auditors must adjust their audit planning and procedures in accordance with a risk-based approach. Auditor independence refers to a mental attitude that enables auditors to act objectively and free from undue influence while performing audit engagements. Independence is a fundamental element of audit quality, particularly when auditors face non-financial risks, such as climate change, that require extensive professional judgment and often involve management assumptions that are difficult to verify directly.

2.4 Auditor Professional Skepticism

Professional skepticism is a critical and questioning mindset that includes alertness to audit evidence and management representation. In audits involving climate-related risks, professional skepticism is essential because climate impacts are often indirect and reflected in forward-looking estimates and disclosures ([DeFond & Zhang, 2014](#)). Auditors must critically evaluate the reasonableness of management assumptions and the adequacy of disclosures related to climate uncertainty. Despite growing literature on climate-related financial risk and audit pricing, limited research has specifically examined how such risks influence auditor independence and professional skepticism in regional audit environments

2.5 Accounting Estimates

Accounting estimates are monetary amounts in financial statements that cannot be measured precisely and therefore require judgment. Climate change increases uncertainty in accounting estimates, including asset impairment, environmental provisions, and concerns about the future. As a result, auditors are required to apply appropriate professional judgment in assessing the reasonableness of these estimates to ensure that the financial statements are free from material misstatements.

2.6 Conceptual Framework and Propositional Development

Climate-related risk is an emerging non-financial factor that influences audit risk assessment within a risk-based auditing framework. From the perspective of Risk-Based Auditing Theory, auditors allocate

audit effort based on the level of inherent and control risk associated with an engagement. When climate-related uncertainty affects asset valuation, environmental liabilities, and going concern assumptions, it increases inherent risk due to estimation complexity and uncertainty. Therefore, climate-related risk can be conceptualized as an antecedent that amplifies the inherent risk within financial statement audits.

Increased inherent risk subsequently affects auditor behavior, particularly regarding independence and professional skepticism. As estimation uncertainty increases, auditors must rely more heavily on professional judgment when evaluating management assumptions. This condition may intensify cognitive pressure, relational tension with clients, and ethical considerations for social workers. Maintaining independence becomes challenging when auditors face ambiguous data and management projections that are difficult to verify. Simultaneously, professional skepticism is critical in assessing the reasonableness of forward-looking climate assumptions embedded in accounting estimates.

Thus, climate-related risk does not operate in isolation but indirectly influences auditor independence and skepticism through its effects on inherent risk and estimation complexity. This relational structure forms the basis of the conceptual framework of this study. Based on conceptual reasoning, the following propositions were formulated to guide qualitative inquiry:

1. Proposition 1: Climate-related risks increase inherent audit risks owing to heightened uncertainty in accounting estimates and environmental obligations.
2. Proposition 2: Increased inherent risk arising from climate-related uncertainty intensifies the challenges to auditor independence.
3. Proposition 3: Increased inherent risk arising from climate-related uncertainty requires higher levels of professional skepticism in evaluating management assumptions.
4. Proposition 4: The application of ISA 200, ISA 315, and ISA 540 moderates the integration of climate-related risks into audit planning and professional judgment.

These propositions serve as analytical lenses rather than statistical hypotheses, guiding the interpretation of auditors' perceptions and experiences in regional practice environments. The conceptual framework of this research is shown in Figure 1 below.

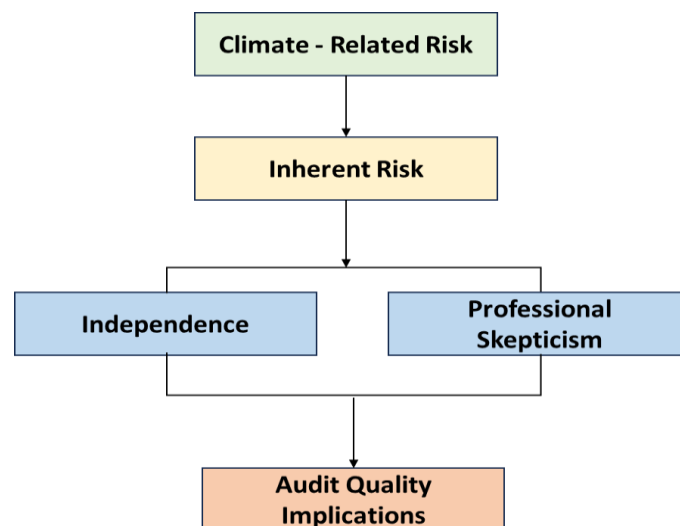


Figure 1. Conceptual framework of climate-related risk in a risk-based auditing context

3. Methodology

3.1 Research Design

This study adopts a qualitative exploratory research design to examine how auditors identify and respond to climate-related risks in financial statement audits. A qualitative approach is appropriate for exploring complex professional judgments and contextual practices that cannot be fully captured

through quantitative measurements (Creswell, 2014; Kumar, 2018). Given that climate-related audit risk represents an emerging and evolving phenomenon, an exploratory design enables an in-depth understanding of auditors' perceptions, experiences, and decision-making processes in real-world professional settings. This study is non-experimental in nature and focuses on interpreting how risk-based auditing principles are operationalized in practice, particularly in relation to auditor independence and professional skepticism.

3.2 Research Setting and Participants

The research was conducted in Makassar, Indonesia, a regional economic center with diverse industries that are potentially exposed to climate-related risks. Participants were selected using purposive sampling based on their professional relevance to the study objective. The informants consisted of auditors working in Public Accounting Firms. The selection criteria were as follows:

1. Having at least three years of audit experience;
2. involvement in financial statement audits; and
3. Familiarity with risk-based audit procedures under ISA 200, ISA 315, and ISA 540.

Four auditors participated in this study, all of whom met the predefined selection criteria and possessed relevant professional audit experience. Although the study involved four auditors, qualitative research prioritizes depth of insight over numerical generalization. The selected participants possessed substantial professional experience and represented diverse industry engagements within regional Public Accounting Firms. Data saturation was achieved when no substantially new themes emerged from the final interviews, consistent with qualitative research standards (Guest, Bunce, & Johnson, 2006). The recurrence of similar patterns regarding climate risk identification, independence challenges, and estimation complexity indicates that thematic saturation had been reached.

To provide contextual clarity regarding the participants, Table 1 summarizes the informants' professional characteristics, including their position, years of experience, and industry exposure. This information demonstrates that the selected auditors possess relevant expertise and are exposed to industries potentially affected by climate-related risks. In this study, regional Public Accounting Firms refer to locally operated audit firms in Makassar that are not affiliated with international Big Four networks.

Table 1. Profile of research informants

Informant Code	Position	Years of Experience	Industry Exposure	Firm Type
A1	Auditor	8 years	Construction, Infrastructure	Regional KAP
A2	Audit Senior Supervisor	6 years	Natural Resources, Trading	Regional KAP
A3	Senior Auditor	7 years	Fisheries, Manufacturing	Regional KAP
A4	Partner-Level Auditor	12 years	Multi-sector engagements	Regional KAP

3.3 Data Collection

Data were collected through semi-structured interviews and document analyses (Creswell, 2014; Sugiyono, 2013). The interview guide was developed based on Risk-Based Auditing Theory and relevant international auditing standards. Interviews focused on:

1. Identification of climate-related risks
2. Integration of climate risk into audit planning
3. Challenges in maintaining independence
4. Application of professional skepticism
5. Evaluation of accounting estimates affected by climate uncertainty

Each interview lasted approximately 45–60 min and was conducted either face-to-face or online. Document analysis included relevant audit standards (ISA 200, ISA 315, and ISA 540), firm-level audit documentation (where accessible), and regulatory materials related to climate and financial reporting. Data collection was concluded when thematic saturation was achieved, as no substantially new themes emerged from the final interview. This indicates that the number of participants was sufficient to capture the recurring patterns relevant to the research objectives.

3.4 Data Analysis

The data were analyzed using thematic analysis by [Creswell \(2014\)](#). The analysis process involved the following steps:

1. Data familiarization through transcript review
2. Coding of relevant statements related to climate risk and audit response
3. Categorization into themes aligned with audit risk components
4. Interpretation using Risk-Based Auditing Theory

The iterative analysis ensured consistency between the empirical findings and theoretical interpretations. The coding process was conducted manually by the researchers without using qualitative data analysis software. This involved repeated and careful reading of the interview transcripts to identify meaningful patterns, concepts, and recurring themes relevant to the study objectives. The analysis followed systematic stages of open coding, axial coding, and thematic categorization, allowing the relationships among the emerging concepts to be identified and organized into coherent analytical themes. Throughout the analytical process, an audit trail was maintained to document coding decisions, theme development, and interpretation procedures, thereby ensuring transparency, consistency, and traceability of the data analysis process.

3.5 Trustworthiness of Data

To enhance credibility, this study applied triangulation techniques by comparing the interview responses with audit standards and relevant regulatory documents. The consistency across informants was examined to validate the recurring themes. The confidentiality and anonymity of the participants were maintained to encourage open and unbiased responses ([Creswell, 2014](#)).

4. Results and Discussions

4.1 Results

The thematic analysis generated several key patterns related to climate-related risk identification, inherent risk escalation, auditor independence, professional skepticism, and the operationalization of auditing standards. The findings indicate that climate-related uncertainty influences both risk assessment processes and auditor behavioral responses. To provide a structured overview of the empirical findings, Table 2 summarizes the main themes, subthemes, supporting evidence, and interpretative meanings derived from the coding process.

Table 2. Thematic analysis of climate-related audit risk

Main Theme	Subtheme	Empirical Evidence (Excerpt)	Interpretation
Climate Risk Identification	Industry Sensitivity	We assess climate risk based on a client's industry exposure.	Climate risk is primarily identified at the entity level.
Increased Inherent Risk	Estimation Uncertainty	Environmental liabilities are difficult to measure accurately.	Climate risk elevates inherent risk through the complexity of estimation.
Independence Challenges	Reliance on Management Assumptions	We depend heavily on the management projections.	High uncertainty increases relational and judgmental pressures.

Professional Skepticism	Critical Evaluation of Projections	Therefore, long-term climate assumptions must be carefully questioned.	Climate uncertainty demands a heightened level of skepticism.
ISA Implementation	Principle-Based Application	Standards guide us, but practical guidance remains limited.	The ISA was applied normatively rather than operationally.

As shown in Table 2, climate-related risks were primarily identified at the entity level and linked to estimation uncertainty and environmental exposure. The following sections elaborate on each theme in greater detail.

4.1.1 Identification and Assessment of Climate Change Risk as Part of Audit Risk

The findings indicate that auditors in Public Accounting Firms in Makassar have begun to recognize climate change as a relevant non-financial risk in the audit process, although its implementation is not yet fully structured. Climate-related risks are generally identified during the stage of obtaining an understanding of the entity and its environment, particularly in industries whose operations are closely related to natural resources, energy, and environmental activities. These risks are primarily considered within the context of inherent risk, especially those related to going concern assumptions, asset valuation, and environmental liabilities. One auditor stated:

“We usually assess climate change risk based on the industry type. If the company operates in an environmentally sensitive sector, we become more cautious in evaluating risk, especially regarding long-term assets and liabilities.”
(Interview with auditor, 2025)

The meaning of this interview statement can be understood at several levels. First, this indicates that auditors associate climate change risk with the characteristics and environmental sensitivity of the client’s industry. Auditors recognize that companies do not face uniform levels of exposure to climate-related impacts; therefore, audit risk assessments are conducted contextually rather than uniformly. Second, the statement highlights that auditors should focus on the long-term implications of climate change, particularly on long-term assets and liabilities. This reflects the understanding that climate-related risks may influence asset valuation, environmental obligations, accounting estimates, and going concern assumptions. Third, the statement demonstrates the practical application of a risk-based auditing approach, as emphasized in ISA 315, by increasing the level of scrutiny for entities with higher environmental exposure. Fourth, implicitly, the statement also suggests that climate risk assessment still relies heavily on auditors’ professional judgment owing to the absence of specific and standardized audit guidelines addressing climate change.

4.1.2 Challenges to Auditor Independence and Professional Skepticism in Auditing Climate Change Risk

The findings indicate that auditors face practical challenges in maintaining independence and exercising professional skepticism when auditing climate change risk. One of the primary challenges is the reliance on management assumptions, particularly when the financial impact of climate change cannot be measured clearly. One informant stated:

“The impact of climate change is often based on management assumptions. Auditors inevitably have to rely heavily on client explanations because the data are not always available.”
(Interview with auditor, 2025)

This statement reflects that climate-related implications are frequently embedded in long-term projections, asset valuations, and environmental liabilities that are not supported by sufficiently structured data. As a result, auditors depend largely on the information provided by management,

making the evaluation process more complex and increasing the need for careful professional judgment. In addition to evidential limitations, relational pressures influence auditor independence. Some auditors reported that management does not always consider climate risk to be material, which may create tension in the audit discussions. Another auditor explained this as follows:

“Sometimes clients believe that environmental risks are not yet material, so auditors must be extra cautious to remain objective without damaging the working relationship.”
(Interview with auditor, 2025)

These findings show that auditing climate change risk involves both evidential challenges and relational dynamics, requiring auditors to balance objectivity, caution, and professional judgment when evaluating management assumptions and disclosures.

4.1.3 Implementation of ISA 200, ISA 315, and ISA 540 in Auditing Climate Change Risk

The findings indicate that auditors in Public Accounting Firms in Makassar understand the fundamental principles of ISA 200, ISA 315, and ISA 540. However, their implementation in auditing climate change risks is not yet fully structured or explicitly integrated into audit procedures. In practice, ISA 315 is applied by obtaining an understanding of the client’s business and conducting audit team discussions.

Nevertheless, climate change risk is not always formally classified as a material misstatement risk, especially when clients operate in sectors perceived to have limited environmental exposure. Regarding ISA 540, auditors acknowledged that accounting estimates affected by environmental and climate-related factors, such as asset impairment and environmental provisions, are among the most challenging areas of the audit. These estimates often involve long-term projections with significant uncertainty. A senior auditor explained:

“For estimates related to environmental matters, auditors really have to rely on professional judgment. ISA 540 provides the principles, but the technical guidance is still limited.”

This statement reflects that audits of climate-related accounting estimates depend heavily on professional judgment because of limited technical guidance and insufficient structured data. In many cases, the application of auditing standards remains compliance-oriented rather than fully adaptive to the complexities of climate risk. Overall, the findings show that while auditors recognize the relevance of climate change in audit engagements, the integration of ISA 200, ISA 315, and ISA 540 in addressing climate-related risks is still evolving and largely dependent on auditor experience and contextual factors. The empirical findings suggest an emergent conceptual model in which climate-related risk increases estimation uncertainty and inherent risk, which subsequently influence auditor independence and professional skepticism. Figure 2 illustrates this relationship between the two.

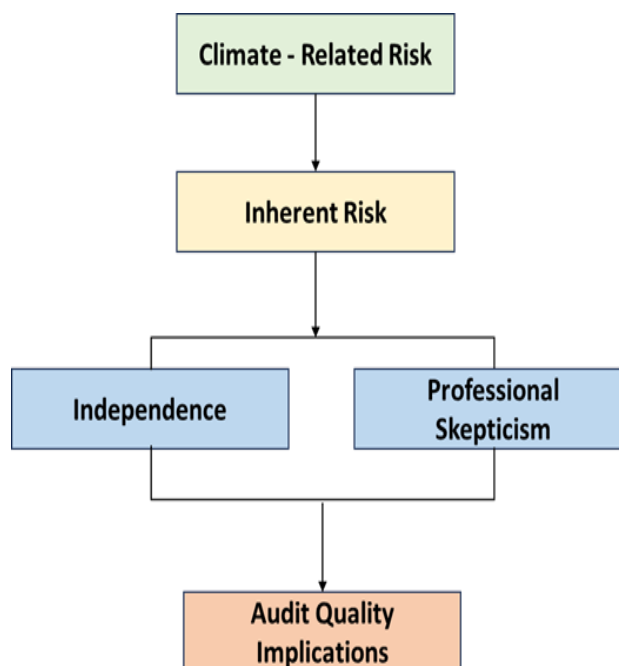


Figure 2. The emergent model is derived from empirical findings illustrating the relationship between climate-related risk, inherent risk, and auditor behavioral responses

4.2 Discussions

The findings demonstrate that climate-related risks have become increasingly embedded within the audit risk assessment process, particularly in industries with significant environmental exposure. This aligns with recent research indicating that climate risk progressively influences financial reporting judgments and audit procedures (Dombrovska, 2023; Kolisnyk & Skliarov, 2025). Unlike earlier studies that primarily examined climate disclosure quality, this study emphasizes climate change as a determinant of inherent audit risk. Empirical evidence suggests that climate uncertainty affects asset valuation, environmental liabilities, and going-concern considerations, thereby increasing the likelihood of material misstatements (Bolton & Kacperczyk, 2021; Griffin, Lont, & Sun, 2017). The results confirm that auditors are beginning to integrate these risks into their understanding of the entity and its environment, although such integration remains only partially structured. This indicates that climate-related considerations are gradually shifting from peripheral sustainability concerns to the core components of audit risk evaluation. Nevertheless, the depth of integration varies depending on the complexity of the client’s industry and the auditor’s risk perception.

The study further reveals that climate-related risks are primarily incorporated during the entity-level risk assessment stage, consistent with ISA 315 requirements. However, its explicit classification as a material misstatement risk remains inconsistent across all engagements. This finding resonates with recent observations that climate risk integration into audit planning varies depending on auditors’ experience and industry exposure (Pandini, Nugroho, & Arifin, 2025). In emerging markets, the operationalization of climate considerations often depends on contextual judgment rather than on standardized procedures (Coman et al., 2022). This suggests a transitional phase in audit practice, where regulatory expectations evolve faster than implementation mechanisms. Such transitional conditions may create disparities in audit quality across firms and regions, particularly when climate-related risks are not systematically documented in formal risk assessment frameworks.

The findings also highlight that climate-related uncertainty intensifies the challenges of auditor independence and professional skepticism. Management assumptions regarding long-term environmental impacts often lack verifiable data, which increases reliance on forward-looking projections. Recent studies emphasize that estimation uncertainty amplifies the cognitive demands

placed on auditors and may affect skepticism levels ([Griffin et al., 2017](#); [Tavares, Azevedo, Marques, & Bastos, 2023](#)). When climate-related assumptions influence impairment testing or environmental provisions, auditors must critically evaluate the reasonableness of these projections under significant uncertainty. This underscores the heightened importance of independence in safeguarding audit quality. In practice, maintaining skepticism becomes more demanding when the evidence is largely based on probabilistic models and strategic management forecasts rather than observable historical data.

Moreover, the complexity of climate-related accounting estimates supports ISA 540's emphasis on the rigorous evaluation of management assumptions. Research indicates that increased estimation complexity leads to greater audit efforts and expanded procedures ([Rahayu et al., 2024](#)). Climate-related risks often involve long-term projections, regulatory uncertainty, and technological transitions, which complicate evidence gathering and verification processes. In such circumstances, professional judgment is central to audit conclusions. The findings reinforce the argument that climate change introduces not only technical complexity but also behavioral and ethical challenges within audit engagements. Therefore, auditors must balance analytical rigor with ethical responsibility to ensure that optimistic management assumptions do not compromise the credibility of financial reporting.

Another significant insight concerns the principle-based nature of ISA implementation in addressing climate risks. Although auditors are aware of ISA 200, ISA 315, and ISA 540, practical integration remains largely dependent on professional experience and contextual adaptation. Similar concerns have been raised by [AccountancyEurope \(2021\)](#), who argue that auditors require more structured technical guidance and climate-specific expertise. In regional contexts, resource limitations and uneven regulatory enforcement may further constrain the integration of comprehensive risk. This suggests that strengthening auditor capacity and developing more operational guidelines are necessary steps to enhance audit effectiveness in climate-sensitive environments. Without clearer methodological guidance, auditors may excessively rely on individual judgment, potentially leading to inconsistent audit approaches across similar engagements.

Overall, this study contributes to the evolving discourse on climate-related audit risk by emphasizing its implications for auditor independence and for professional skepticism. Recent literature increasingly recognizes climate change as a systemic financial risk that reshapes governance and assurance. However, empirical investigations into how auditors operationalize this risk remain limited, particularly in emerging regional economies. By examining the Makassar context, this study extends prior research beyond major financial centers and highlights the local challenges of implementing international auditing standards. These findings underscore the need for adaptive audit methodologies capable of responding to global environmental uncertainties while maintaining professional integrity and audit quality. In this regard, regional evidence is essential for understanding how global sustainability expectations are translated into day-to-day audit practices.

5. Conclusions

5.1 Conclusion

This study demonstrates that climate-related risks increasingly influence audit risk assessments within regional Public Accounting Firms in Indonesia. The findings reveal that climate-related uncertainty elevates inherent audit risk, particularly through its impact on accounting estimates, environmental obligations, and forward-looking projections. Although auditors recognize the relevance of climate risk, its integration into audit planning remains partially structured and largely dependent on professional judgment. The study further shows that climate-related risks intensify challenges to auditor independence and professional skepticism, especially when management assumptions lack verifiable evidence.

5.2 Research Limitations

This study had several limitations. First, the research involved only four auditors from regional Public Accounting Firms in Makassar, which limits the generalizability of the findings beyond similar regional contexts. Although thematic saturation was achieved, the relatively small sample size may not fully capture the variations in climate-related audit practices across different institutional or firm-level

environments. Second, the study relied on self-reported perceptions obtained through interviews, which may be subject to response bias or retrospective interpretation. The findings reflect auditors' interpretations and experiences, rather than direct observations of audit documentation or working papers. Future research incorporating document analysis or multi-method approaches may provide a deeper validation of how climate-related risks are operationalized in practice. Third, the study focuses on regional audit firms and does not include large national or international audit firms, where implementation practices may differ because of greater technical resources and structured methodologies. Expanding the comparative analysis across firm sizes and institutional settings would enhance our understanding of how climate-related risk integration varies across audit ecosystems.

5.3 Suggestions and Directions for Future Research

Future research should expand the sample to include auditors from different regions and firm sizes, particularly national and international audit firms, to enhance comparative insights into the integration of climate-related risks. Subsequent studies should employ quantitative or mixed-method approaches to examine the relationship between climate-related risk exposure, auditor judgment, and audit quality outcomes. Further investigation is needed to explore how evolving sustainability standards and regulatory frameworks influence audit methodologies and professional training systems. Such research would deepen our understanding of how systemic environmental risks reshape auditing practices across diverse institutional contexts.

Acknowledgement

The authors sincerely thank the auditors who participated in this study for their valuable time and insight. We also appreciate the constructive feedback from our colleagues and reviewers, which has significantly improved the quality of this manuscript.

Author Contributions

ES conceptualization, methodology, formal analysis, investigation, writing original draft, writing review & editing, supervision. t investigation, data curation, validation, writing review & editing. UK literature review, theoretical framework development, validation, writing review, and editing. All authors have read and approved the final version of the manuscript.

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