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Mapping Macroeconomic Risks of Global Climate Policies: A Systematic Literature Review

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ABSTRACT

Purpose: This study aims to map the macroeconomic risks arising from global climate policies in the international economics literature, identify transmission mechanisms, examine the role of climate policy uncertainty, and explore the thematic evolution of existing studies.

Method: The study employs a Systematic Literature Review based on the PRISMA protocol, applied to Scopus-indexed articles using keywords related to macroeconomic climate risks and climate policy spillovers. From 82 initial documents, 33 core studies were selected and analyzed thematically and comparatively.

Result: This research found that the macroeconomic risks of climate policies are transmitted through four main channels: energy and carbon markets, financial markets, international trade and exchange rates, and institutional and behavioral dimensions. Climate policy uncertainty increases volatility and extreme risks during market stress and triggers cross-sectoral and cross-country spillovers. The literature reveals that financial markets act as the primary mediator between climate policies and macroeconomic stability, while the exchange rate channel operates through changes in global energy prices. The thematic evolution shows a shift from environmental issues toward macroeconomic and financial stability, with a growing dominance of quantile and time-frequency approaches.

Practical Implications for Economic Growth and Development: The study concludes that global climate policies constitute a key determinant of international macroeconomic stability and require an integrated analytical approach across markets and sectors to support sustainable growth and development.

Originality/Value: This study reformulates global climate policy as a systemic macroeconomic risk architecture that integrates the energy, financial, trade, and institutional channels, which have previously been examined in a fragmented manner.

Keywords: *Macroeconomic Risks, Global Climate Policies, Climate Policy Uncertainty, International Spillover, Systematic Literature Review*

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INTRODUCTION

The development of global climate policy over the last decade indicates a paradigm shift from environmental issues toward macroeconomic risk and international economic stability. Climate policy is no longer perceived solely as an instrument for emission mitigation, but as a source of external shocks that influence the behavior of energy markets, financial markets, and international trade patterns. Climate policy uncertainty (CPU) is regarded as a form of transition risk with broad implications for the expectations of economic agents and investment decisions (Liu et al., 2026). Numerous studies emphasize that CPU generates cross-sectoral and cross-country risk transmission through complex and nonlinear mechanisms (He et al., 2025; Liu & Xie, 2026). These risks emerge not only in price volatility but also in higher-order statistical moments, such as skewness and kurtosis, which reflect the likelihood of extreme events (Liu et al., 2026). Under stressed market conditions, the intensity of risk spillovers tends to increase, positioning climate policy as a potential new determinant within the architecture of the international economy. Therefore, a comprehensive understanding of the mechanisms through which global climate policy affects macroeconomic risk becomes increasingly crucial for countries integrated into the global economic system.

In addition to financial channels, the literature highlights the relevance of institutional and behavioral dimensions in determining the effectiveness and risks of climate policy. Climate policy governance involves interactions between state and non-state actors, which frequently generate regulatory ambiguity (Abraham, 2021). Public support for climate policy influences the sustainability of implementation and the stability of market expectations (Thøgersen et al., 2024; Thøgersen & Zhang, 2025). Changes in consumption preferences in developed countries can alter global trade patterns and affect commodity-exporting economies (Sparkman et al., 2021). Furthermore, cross-regional policy spillovers indicate that climate decisions in one major country can influence carbon prices and investment flows in other regions (Fields & Lindequist, 2024). This complexity confirms that the analysis of macroeconomic risks of climate policy must simultaneously integrate economic, institutional, and social perspectives.

From an empirical standpoint, recent literature demonstrates that the transmission of climate policy risk primarily operates through energy market and financial market channels. Climate policy uncertainty has been shown to reinforce the interlinkages between carbon markets and energy markets, both in terms of returns and volatility (Li et al., 2025). In major economies, domestic climate policy can evolve into a source of global shocks that affect international benchmark prices (Liu & Xie, 2026). Furthermore, time dynamics suggest that financial markets are more dominant as risk transmitters in the short term, whereas structural changes in the energy sector become more influential in the long term (He et al., 2025). The reallocation of capital from fossil-based assets to green assets also creates new forms of instability with implications for cross-border financing and investment (Liu et al., 2025). These findings confirm that climate policy has transformed into a strategic macroeconomic variable inseparable from the analysis of international economic stability.

The urgency of this study is reinforced by the fact that global climate policy also influences macroeconomic stability through financial markets and exchange rates. CPU has been proven to increase cross-sectoral stock volatility and amplify extreme risks, particularly during bearish market conditions (Chen, 2025; Yang et al., 2025). In foreign exchange markets, U.S. CPU functions as a net transmitter that shapes global exchange rate dynamics through the oil price channel (Li, 2022). Exchange rate fluctuations directly affect trade balances, inflation, and the effectiveness of monetary policy in developing countries (Byrne & Vitenu-Sackey, 2024). Moreover, CPU tends to weaken connectivity among green assets and intensify idiosyncratic risk, thereby increasing international financing risk premiums (Pham et al., 2024). These findings illustrate that global climate policy entails tangible macroeconomic consequences mediated by the international financial system.

Despite the growing body of empirical evidence on risk spillover phenomena, scholarly attention remains concentrated on developed countries and China, resulting in limited examination of developing economy contexts. Many studies focus on stock market volatility and carbon prices without adequately linking them to real macroeconomic variables such as growth, inflation, or exchange rates (Yang et al., 2025; Zhang et al., 2025). Thematic fragmentation is also apparent in the separation between financial market analysis, energy sector studies, and institutional dimensions (Vogl et al., 2025). Consequently, the understanding of the macroeconomic consequences of international climate policy remains incomplete and insufficiently synthesized. For developing countries with high dependence on commodity trade and energy imports, the transmission of climate policy risk is likely to be stronger (Li, 2022). The absence of a systematic synthesis connecting these various channels represents a significant scientific gap that needs to be addressed, underscoring the necessity for a systematic literature review.

Considering the advancement of scientific literature, this study seeks to conduct a comprehensive systematic mapping of macroeconomic risks associated with global climate policy within the framework of international economic discourse. The specific objectives are: (1) to identify risk transmission mechanisms through energy markets, financial markets, international trade, and institutional channels (Li et al., 2025; Liu et al., 2026); (2) to evaluate the role of CPU in volatility dynamics and extreme risks (Chen, 2025; Yang et al., 2025); and (3) to examine thematic evolution and conceptual gaps (Vogl et al., 2025). The systematic literature review methodology has been selected due to its ability to synthesize diverse findings into a coherent analytical framework. This investigation is expected to provide a conceptual foundation for assessing macroeconomic risks in developing countries. The contribution is essential for strengthening adaptation and mitigation strategies within the global economic context.

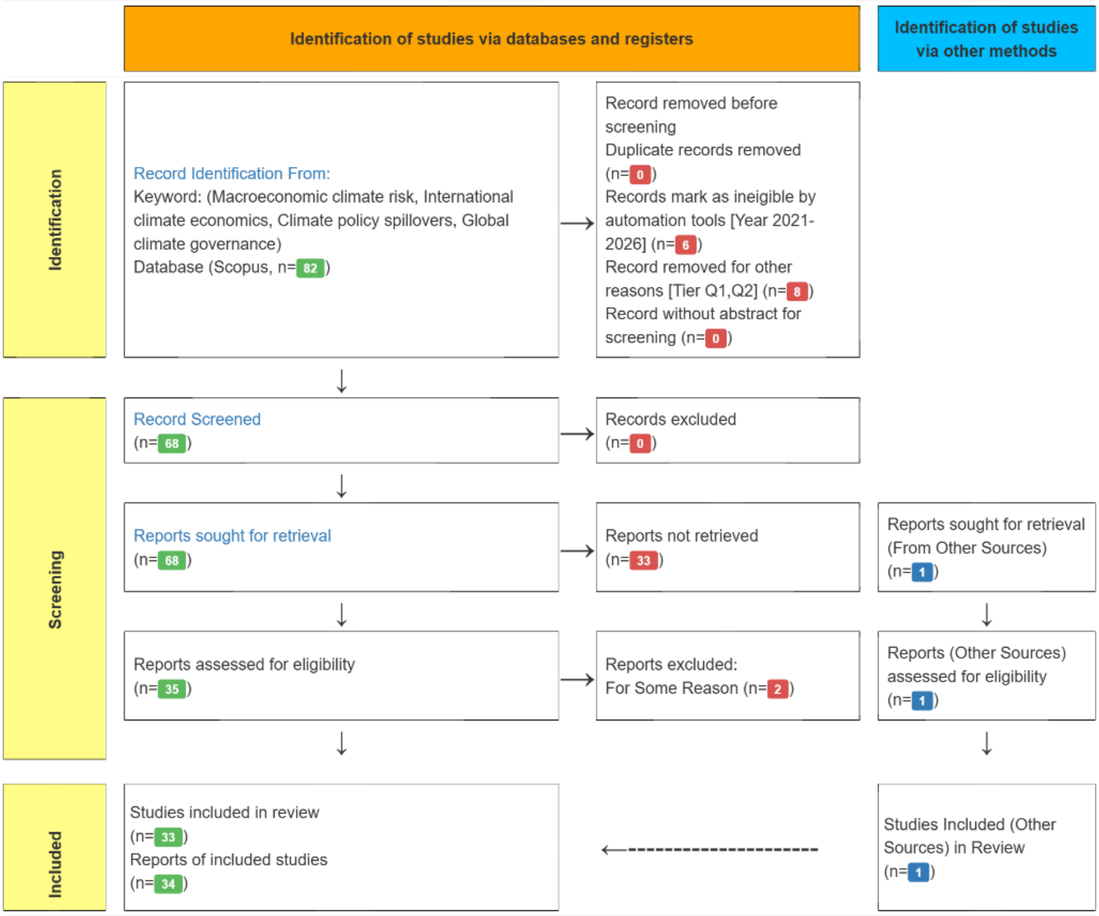
Consistent with this objective, the research problem is formulated through three principal questions: RQ1: How do the transmission mechanisms of macroeconomic risks generated by global climate policy operate through energy markets, financial markets, international trade, and institutional dimensions? RQ2: To what extent does CPU influence volatility dynamics, extreme risks, and macroeconomic stability across different methodological approaches? RQ3: How do the evolution and conceptual gaps appear in studies on the macroeconomic impacts of global climate policy? The responses to these questions are expected to address limitations in the existing literature and facilitate a more coherent direction for future research. Consequently, this investigation holds both theoretical and practical significance in clarifying the role of global climate policy as a determinant of macroeconomic risk.

METHOD

This study employs a Systematic Literature Review (SLR) design aimed at comprehensively mapping the macroeconomic risks of global climate policy in the international economics literature. The research subjects consist of Scopus-indexed scientific articles obtained through keyword searches for macroeconomic climate risk, international climate economics, climate policy spillovers, and global climate governance. The research instrument is a data extraction sheet that records the study's identity, methodological approaches, risk transmission channels, and main findings related to volatility, extreme risks, and macroeconomic stability.

The data collection procedure follows the PRISMA 2020 protocol, as illustrated in Figure 1. The process began with the identification of 82 documents retrieved from Scopus-indexed journals. During the initial screening phase, six articles published outside the 2021–2026 period were excluded, along with eight articles that did not meet the specified journal tier criteria (Q1 and Q2). No duplicate records were identified. This stage resulted in 68 records proceeding to the screening phase. Subsequently, 68 reports were sought for retrieval. Of these, 33 reports could not be retrieved due to the unavailability of full-text access. In parallel, one additional article was identified through other sources and assessed separately. Consequently, 35 reports from the primary database were assessed for eligibility. At the eligibility stage, two articles were excluded because they did not address climate policy uncertainty (CPU) and macroeconomic spillovers. The final sample consisted of 33 core studies derived from Scopus-indexed Q1 and Q2 journals, supplemented by one supporting study identified from other sources, resulting in a total of 34 reports included in the review. These sequential stages ensure methodological rigor, transparency, and thematic relevance. All procedures were systematically documented to allow replication in accordance with the PRISMA 2020 framework.

Figure 1. Study Selection Flow Based on PRISMA 2020 in the SLR of Macroeconomic Risks of Global Climate Policy



Generate From Watase Uake Tools, based on Prisma 2020 Reporting

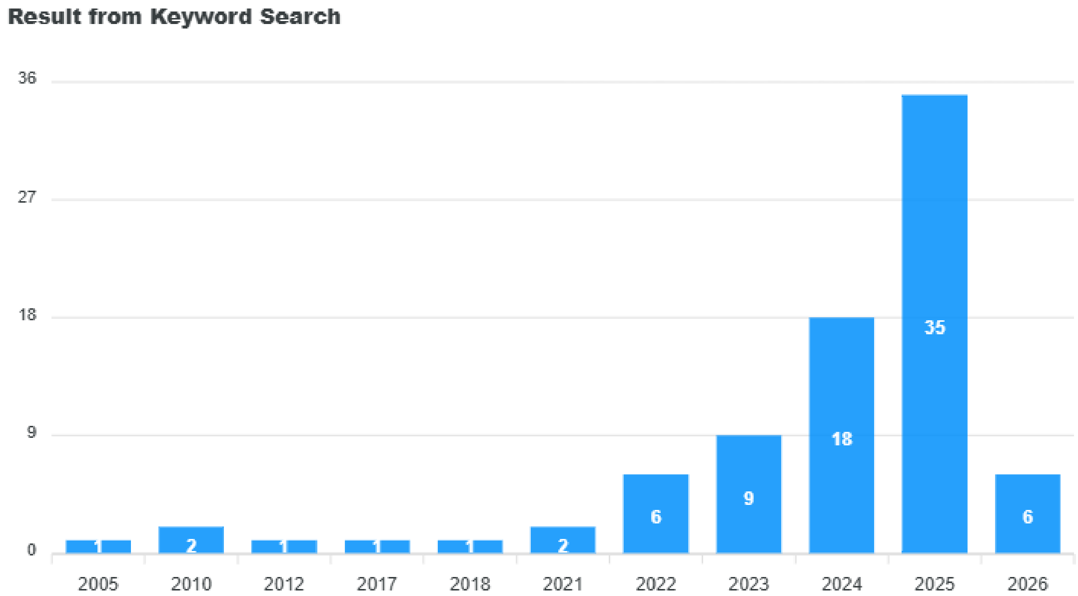
Source: Watase (2026)

RESULT AND DISCUSSION

Trends in Research, Methodologies, and Data Sources

Based on the article screening conducted using the Watase application, as illustrated in Figure 2, the number of publications shows a sharp increase from 2022 to 2025. The graph of keyword search results indicates that before 2021, the number of studies was relatively limited, averaging fewer than three articles per year. However, in 2024, the number increased to 18 articles, and in 2025, it rose to 35 articles. The majority of identified studies employ quantitative approaches based on data from financial markets, energy markets, and the climate policy uncertainty (CPU) index. The distribution of methodologies is dominated by quantile analysis, time-frequency connectedness, dynamic VAR, and macro-financial models. In terms of geographical coverage, the research subjects mostly originate from China, the United States, and Europe, with the main focus on the relationship between CPU, energy prices, and stock market volatility. Only a small portion of studies address other developing countries. Cross-regional analysis shows that climate policy in large countries has cross-border impacts on carbon and commodity prices in other regions. Accordingly, cross-country data are widely used to assess international spillover effects.

Figure 2. Publications Trend



Source: Processed data (2026)

With regard to study selection, the PRISMA procedure shows that several articles could not be retrieved, reducing the scope of the synthesis. Differences in CPU indicators and measurement methodologies further contribute to variability in findings across studies. Nevertheless, each study included in the analysis complied with predetermined quality standards. In line with these quality standards, the selected studies use various data sources, including global and national CPU indices, oil prices, carbon price indices, sectoral stock indices, exchange rates, and macroeconomic indicators. Data frequency varies from daily to monthly. Several studies utilize NGFS-based climate policy scenarios for financial risk simulation.

Of the 34 reports synthesized, more than two-thirds employ quantile or connectedness approaches, about one-quarter use dynamic VAR, and the rest rely on structural or experimental models. In terms of empirical focus, the most analyzed market objects are stock and energy markets, followed by carbon markets and exchange rates. Most studies utilize data from the period after 2015, which coincides with the intensification of global climate policy. The studies selected through PRISMA provide empirical evidence regarding the macroeconomic risks associated with global climate policy through various channels. The PRISMA diagram ensures transparency in the selection process, while the selected body of literature reflects the increasing academic attention to these risks.

Main Findings

Most studies report that CPU has a strong association with energy and carbon markets. Spillover effects are identified between carbon prices and energy prices at the levels of returns, volatility, and higher-order statistical moments such as skewness and kurtosis, with stronger intensity under extreme market conditions. In the short term, global climate risk emerges as the main source of shocks to energy markets, whereas, in the long term, national climate policy in large countries acts as a global risk transmitter. Carbon price volatility is found to be more responsive to CPU than changes in the price level itself. Beyond energy markets, financial markets emerge as the primary mediating channel of climate policy risk. Rising CPU is associated with increased volatility connectedness among stock sectors, particularly at extreme quantiles. Clean energy equities, green technology stocks, and green bonds exhibit greater sensitivity to policy changes than conventional assets. Evidence further indicates a dynamic role shift, where CPU behaves as a short-term risk amplifier but may function as a risk stabilizer over longer horizons. At the same time, policy uncertainty reduces connectedness among green assets while strengthening idiosyncratic risk.

Transmission mechanisms also extend to foreign exchange markets and international trade. The United States CPU is frequently identified as a net transmitter within the connectedness system linking oil prices and global exchange rates. Exchange rate fluctuations driven by climate policy uncertainty affect trade balances and commodity pricing, with more pronounced effects during periods of heightened market stress. Cross-country analyses confirm that climate policy in one region can influence carbon prices and economic activity in other regions. In addition to market-based channels, institutional and behavioral dimensions shape the effectiveness of climate policy transmission. Legal responsibilities related to climate change alter incentives for fossil energy production, while public acceptance influences policy sustainability and consumption patterns affecting global commodity demand. Governance dynamics and the involvement of non-state actors further contribute to regulatory uncertainty and market expectations.

Methodological approaches reinforce these findings. Quantile analysis captures asymmetric effects under extreme conditions, time-frequency frameworks distinguish short- and long-term dynamics, macro-financial models link climate scenarios with banking capital adequacy, and spatial panel models document cross-regional spillovers. Difference-in-differences studies provide additional evidence on changes in corporate financing access following climate policy implementation. Thematically, the literature converges into four major clusters: (1) energy and carbon market risks, (2) financial market volatility, (3) international trade and exchange rates, and (4) institutional and behavioral aspects. The first two clusters dominate the empirical landscape, with most studies focusing on spillover intensity and connectedness structures, whereas links to real macroeconomic variables remain comparatively limited.

Across these clusters, three recurring patterns emerge. First, CPU systematically increases volatility and tail risks in energy and financial markets. Second, the effects are asymmetric and intensify during crisis or extreme market conditions. Third, the role of variables evolves over time, shifting between risk recipients and risk transmitters. Collectively, the evidence indicates an interconnected system in which shocks propagate across markets with varying strength depending on time horizons and distributional conditions, with financial markets frequently acting as the central transmission node.

Discussion

The synthesis results indicate that the transmission mechanism of macroeconomic risks stemming from global climate policy operates through four primary channels: energy markets, financial markets, international trade, and institutional dimensions. The most robust empirical evidence is observed within the energy market channel, where climate policy uncertainty (CPU) strengthens risk linkages between carbon and energy markets, particularly in terms of volatility and higher-order statistical moments such as skewness and kurtosis (Liu et al., 2026). These findings underscore that climate policy not only impacts average energy prices but also influences the distribution of extreme risks that are critical to macroeconomic stability. This mechanism is driven by shifts in investor expectations regarding regulatory directions, which in turn affect energy production and investment decisions. In the short term, global climate risk emerges as the primary source of shocks, whereas, in the long term, national climate policies in large countries serve as cross-country risk transmitters (Liu & Xie, 2026).

The financial market represents the second most influential channel. Numerous studies highlight that CPU amplifies volatility connectedness across stock sectors, particularly at extreme quantiles (Chen, 2025; Yang et al., 2025). Clean energy stock markets and green assets are more sensitive to policy changes compared to traditional assets, leading to the emergence of a novel risk structure as a result of the energy transition. Several studies further demonstrate the dynamic shifts in the role of variables, from risk recipients to risk transmitters, over different time horizons (He et al., 2025). This body of evidence substantiates the role of financial markets as the primary mediators between climate policy and macroeconomic performance, as changes in risk premiums directly influence capital costs, investment decisions, and financial system stability.

In the international trade and exchange rate channel, it is found that the CPU in the United States acts as a net transmitter through oil prices, which subsequently influence global exchange rate dynamics (Li, 2022). These fluctuations impact trade balances and inflation in countries integrated into the global energy markets. Additionally, studies within the food sector reveal that spillover effects are most pronounced during extreme market conditions (Zeng et al., 2025). These findings illustrate how global climate policy can alter relative prices across countries, with direct implications for open macroeconomic stability.

The institutional dimension provides a critical complement to purely economic transmission mechanisms. Legal obligations related to climate change influence incentives for fossil energy production (Johnston, 2025), while public acceptance of climate policy determines its long-term sustainability (Thøgersen & Zhang, 2025). The participation of non-state actors and governance dynamics further contribute to regulatory uncertainty and shape market expectations (Abraham, 2021). Collectively, these findings highlight that the transmission of climate policy risk is multifaceted and cannot be reduced to financial or energy markets alone. These results shift the perspective of climate policy from a sector-specific issue to a source of systemic macroeconomic risk. Mapping the four transmission channels provides a more operational framework for assessing the vulnerability of developing countries that are heavily reliant on energy and international trade.

The response to Research Question 2 (RQ2) reveals a high degree of consistency in that CPU acts as a risk amplifier. Quantile studies demonstrate that an increase in CPU raises the probability of extreme events in both energy and financial markets (Liu et al., 2026; Yang et al., 2025). The most significant impacts are observed at the lower and upper quantiles, indicating asymmetric characteristics. This evidence affirms that climate policy influences not only average economic performance but also the distribution of tail risks that affect both financial and real-sector resilience.

Extending the risk amplification mechanism to financial system resilience, the Climate Value-at-Risk approach suggests that climate policy shocks can reduce banking capital adequacy through asset value declines (van der Walt & van Vuuren, 2025). Additionally, CPU reduces connectedness among green assets and heightens idiosyncratic risk (Pham et al., 2024). These empirical observations explain the increased volatility in financial markets, irrespective of the long-term positive trajectory toward a sustainable green economy. In essence, the transition process itself introduces a source of short-term instability.

The robustness of these findings is supported by methodological diversity. Time-frequency analysis highlights distinctions between short-term and long-term effects (Liu & Xie, 2026), while spatial panel models confirm the existence of cross-regional spillover effects (Zhu et al., 2022). Difference-in-differences methodologies provide additional evidence on the shifts in corporate financing access following climate policy implementation (Hong et al., 2025). Despite the methodological differences, the general trend of findings remains consistent: CPU increases volatility and macroeconomic uncertainty.

These results are significant because they provide an empirical foundation for treating climate policy as a macroprudential variable. Macroeconomic stability is inseparable from the design and credibility of climate policy, particularly for countries that are sensitive to capital flows and energy prices.

The evolution of the literature reveals three main phases. The initial phase focuses on the relationship between climate policy and energy markets (Liu et al., 2026). The second phase transitions to the exploration of extreme risks in financial markets (Chen, 2025; Zhang et al., 2025). The most recent phase incorporates social and geopolitical dimensions (Averchenkova et al., 2025). However, the integration across these themes remains limited, with studies often criticized for being fragmented (Vogl et al., 2025).

Geographic bias is the first identified gap in the literature, with the majority of studies focusing on China, the United States, and Europe, while developing countries are only partially addressed (Hong et al., 2025). The second gap concerns the dominance of financial market indicators over real macroeconomic variables. The third gap lies in the limited integration of institutional dimensions within macroeconomic models, although the role of governance has been acknowledged (Abraham, 2021; Johnston, 2025). These gaps explain why the understanding of macroeconomic impacts remains incomplete.

Mapping the evolution of the literature provides scientific legitimacy for this study's effort to integrate across channels and perspectives. Without such integration, adaptation policies in developing countries may be misaligned with their intended objectives.

In conclusion, this discussion confirms that global climate policy is a source of macroeconomic risk through complex and asymmetric mechanisms. The responses to Research Questions 1–3 (RQ1–RQ3) provide consistent evidence regarding the role of CPU in increasing volatility, altering market structures, and creating cross-country spillovers. This study is crucial as it offers an integrated synthesis that was previously unavailable, while opening new avenues for research, particularly for developing economies. The principal contribution lies in mapping the transmission channels, clarifying extreme impacts, and identifying conceptual gaps that future studies must address.

CONCLUSION

This study aims to explore the macroeconomic risks associated with global climate policy by systematically mapping the transmission mechanisms across four primary channels: energy markets, financial markets, international trade, and institutional dimensions, employing a PRISMA-based systematic literature review approach. The findings reveal that climate policy uncertainty (CPU) consistently amplifies volatility and extreme risks, particularly under unstable market conditions, and generates cross-sectoral and cross-country spillovers. The impact of climate policy is identified as non-linear, with its effects strongly dependent on time horizons and prevailing market conditions. This study consolidates previously fragmented findings into a cohesive conceptual framework, positioning climate policy as an integral component of the global macroeconomic risk architecture. By doing so, it extends the scope of climate economics from a sector-specific issue to one that pertains to macroeconomic stability and international economics, with particular relevance for developing countries embedded within global markets.

The implications of these findings suggest that policymakers must manage climate policy uncertainty through transparent and credible policy communication to mitigate volatility risks. It is recommended that macroprudential authorities incorporate climate-related scenarios into financial stress-testing frameworks to enhance resilience against climate-driven risks. Additionally, international policy coordination is critical in minimizing cross-country spillovers. Within the financial sector, investors are advised to account for the sensitivity of green assets to climate policy uncertainty and to adopt diversification strategies that consider asymmetric risk characteristics. For developing countries, effective exchange rate management is becoming increasingly important due to the transmission of climate policy risk through energy price channels. Future research should expand the geographical scope by focusing primarily on developing countries to better understand the unique challenges they face. Further studies should also integrate real macroeconomic indicators, such as economic growth, inflation, and employment, alongside financial market and energy indicators, to provide a more holistic view of climate-related risks. The development of empirical models that explicitly incorporate institutional dimensions and public behavior is encouraged, given the significant influence of governance structures and policy acceptance on the stability of climate policies. Methodologically, the combination of quantile, spatial, and macro-structural approaches could yield a more comprehensive assessment of risk than relying on single-method analyses. Additionally, future research is urged to explore the long-term dynamics of climate policy under varying energy transition scenarios.

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