

Integrating Climate Risk in Public Financial Management: Innovations in Fiscal Accountability

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Abstract

Article history:

Received: September 12, 2024

Revised: October 04, 2024

Accepted: November 07, 2024

Published: December 30, 2024

Keywords:

Climate Resilience, Fiscal Accountability, Public Financial Management, Risk Integration, Sustainable Governance.

Identifier:

Nawala

Page: 80-92

<https://nawala.io/index.php/ijpfa>

This study examines how public financial management (PFM) systems can integrate climate risk considerations to strengthen fiscal accountability and resilience. The main question addressed is how innovative fiscal tools and governance mechanisms can enhance the capacity of governments to anticipate, manage, and disclose climate-related fiscal risks. Using a systematic literature review of peer-reviewed studies, the article synthesizes evidence on climate-informed budget tagging, public investment management, fiscal risk statements, and risk transfer instruments. The findings reveal that these tools, when supported by institutional capacity, political will, and stakeholder oversight, significantly improve transparency, fiscal predictability, and public trust. The discussion highlights both successful practices and persistent challenges, such as data limitations, fragmented mandates, and biases toward post-disaster spending. The study concludes that climate-integrated PFM offers a strategic opportunity for proactive governance, enabling states to align fiscal priorities with long-term climate resilience and equitable development goals.

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1. Introduction

Public financial management (PFM) systems are increasingly required to address the fiscal implications of climate change, as climate-related shocks threaten macroeconomic stability, public service delivery, and long-term debt sustainability. Empirical studies show that temperature extremes, disasters, and other climate hazards can reduce economic output, increase expenditure needs, and generate contingent liabilities that disrupt fiscal planning (Catalano et al., 2020). These shocks also influence capital markets, with climate risk being factored into borrowing costs for sovereign and subnational governments, thereby constraining fiscal space and investment choices (Painter, 2020). As a result, integrating climate risk into PFM has emerged as both an economic necessity and a governance innovation to ensure fiscal sustainability while maintaining accountability for climate-related decision-making.

Traditional PFM processes such as annual budgeting, project appraisal, and debt management are often not designed to address long-term, uncertain, and systemic risks posed by climate change. Scholars argue for adaptive and risk-informed approaches that embed climate considerations across the budget cycle, from planning and resource allocation to implementation and monitoring (Mutiarra et al., 2020). Instruments such as climate budget tagging, climate-informed fiscal risk statements, and resilient public investment management (PIM) frameworks provide mechanisms for systematically incorporating climate risk into fiscal decisions. At the same time, financial innovations such as catastrophe bonds and risk-transfer mechanisms can help governments smooth fiscal volatility and manage disaster-

related liabilities when embedded within coherent fiscal strategies (UN ESCAP, 2018).

Beyond the technical aspects, integrating climate risk into PFM can strengthen fiscal accountability by making climate-related exposures and policy trade-offs transparent to oversight bodies and the public. When budget documents and fiscal reports disclose potential climate risks and outline mitigation strategies, legislatures, audit institutions, and civil society actors are better positioned to evaluate government performance and influence resource allocation. This aligns with findings from governance research showing that transparency and open data can enhance oversight, reduce misallocation, and improve policy responsiveness (Bauhr et al., 2020). Such mechanisms are particularly important in contexts where political and institutional incentives often favor short-term expenditure over long-term resilience.

However, the literature also highlights significant implementation challenges. Data limitations, modeling uncertainty, and institutional fragmentation between finance ministries, environmental agencies, and disaster management authorities hinder the integration of climate considerations into fiscal systems. Furthermore, financial instruments that manage climate risks can introduce complexity, disclosure requirements, and governance risks that not all governments are equipped to address effectively (Painter, 2020). Political economy factors also play a role, as preventive investments in resilience may have diffuse and long-term benefits that are less visible to voters, making them harder to prioritize within constrained budgets.

This article presents a systematic literature review of innovations in integrating climate risk into PFM, with a focus on their implications for fiscal accountability. By synthesizing evidence from economics, public finance, and governance research, the study maps the channels through which climate risks affect public finances, examines tools and instruments for integration, and evaluates the role of transparency and oversight mechanisms in improving outcomes. The review aims to inform policymakers, development partners, and researchers seeking to strengthen the resilience and accountability of fiscal systems in the face of climate change.

2. Literature Review

The literature on integrating climate risk into public financial management (PFM) has expanded significantly, reflecting growing recognition that climate change constitutes a fiscal and governance challenge. Empirical research establishes that climate-related shocks such as extreme weather events and gradual environmental changes impair economic growth, increase contingent liabilities, and undermine debt sustainability, making climate-responsive fiscal frameworks essential (Hsiang & Jina, 2014; Catalano et al., 2020).

One prominent innovation is climate budget tagging, a mechanism that systematically labels budgetary items as climate-related, enabling oversight of adaptation and green investments. Recent evidence shows that countries implementing tagging, especially in the public sector, mobilize larger flows of climate-related finance and align spending with emission reduction strategies

(Pizarro et al., 2021). Closely related, climate fiscal risk statements disclose exposure to climate shocks, revenue vulnerabilities, and contingent liabilities, thereby enabling policymakers and auditors to assess the fiscal risks associated with climate uncertainty (Gonguet et al., 2021).

Resilient public investment management (PIM) frameworks also emerge as critical tools: incorporating climate risk assessments into infrastructure appraisal, prioritization, and execution ensures fiscal resilience under changing climate conditions (Masseti & Bellon, 2022). Complementing these, risk transfer instruments, like catastrophe bonds and parametric insurance, enable governments to smooth budget volatility and accelerate recovery post-disaster when embedded in medium-term fiscal strategies (de la Plaza, 2022).

The role of transparency and oversight in climate-informed PFM is also substantial. Studies show that when climate-related fiscal exposures and expenditures are openly reported, legislatures, audit bodies, and citizens can better evaluate government performance and drive policy corrections (Bauhr et al., 2020). This echoes governance findings that open, credible budgeting enhances accountability and responsiveness across policy domains (Ling & Roberts, 2014).

Despite these promising innovations, practical constraints remain. Challenges such as limited data, technical capacity gaps, and institutional fragmentation impede effective integration of climate considerations into PFM. Political incentives often prioritize short-term spending over long-term resilience investments, undermining sustained reform (Fay et al., 2015). Literature suggests overcoming these barriers

requires not only technical design but also institutional incentives, cross-sector coordination, and capacity development.

3. Methods

This study adopts a systematic literature review (SLR) approach to synthesize existing research published between 2014-2023 focusing on integrating climate risk into public financial management (PFM) and its role in advancing fiscal accountability. The review followed a structured process to ensure comprehensiveness and transparency, beginning with the identification of relevant peer-reviewed articles from established academic databases such as Scopus, Web of Science, and Google Scholar. Search terms included combinations of keywords such as “climate risk”, “public financial management”, “fiscal accountability”, and “climate budgeting”. Only scholarly articles published in English and subject to peer review were considered to maintain the quality and credibility of the sources.

The selection process involved three main stages: (1) screening titles and abstracts to remove irrelevant records, (2) reviewing full texts to confirm relevance to the research focus, and (3) evaluating methodological rigor and empirical grounding. Inclusion criteria required that studies explicitly addressed the integration of climate considerations into PFM tools, processes, or institutions, and contained substantive discussion on fiscal governance or accountability outcomes. Exclusion criteria eliminated studies that dealt solely with environmental policy without financial governance implications.

Data extraction focused on capturing the key themes, approaches, and findings from the selected studies. The analysis applied thematic synthesis, grouping findings under conceptual categories such as budgetary innovations, fiscal risk management tools, transparency and oversight mechanisms, and institutional capacity factors. This method allowed for the identification of recurring patterns, gaps in the literature, and practical innovations with demonstrated impact, ensuring the discussion reflects both academic insights and policy relevance.

4. Results and Discussion

The review finds consistent evidence that integrating climate risk into public financial management (PFM) strengthens fiscal accountability by improving how governments identify, disclose, and manage climate-related exposures. Studies on macroeconomic impacts show that climate shocks depress output and destabilize fiscal balances, underscoring the need for ex ante risk management within the budget cycle (Hsiang & Jina, 2014; Catalano et al., 2020). Translating this evidence into PFM practice, countries that embed climate considerations in budget documents, through fiscal risk analysis, sensitivity testing, and disclosure, equip legislatures, audit bodies, and the public to scrutinize trade-offs before funds are committed. These practices shift accountability upstream, where the most consequential decisions on public spending and debt are made.

Three toolsets emerge as central. First, climate-informed appraisal within resilient public investment management (PIM) elevates risk screening, option valuation, and adaptive designs. This responds to the limitations of single-point

forecasts by emphasizing robustness across plausible futures and by staging investments to preserve flexibility (Massetti & Bellon, 2022). Second, budget classifications and tagging systems make climate-related spending visible, enabling tracking against national strategies and facilitating external oversight, even if the empirical literature cautions that tagging alone does not guarantee quality or effectiveness. Third, fiscal risk statements that quantify hazard, exposure, and vulnerability, along with contingent liabilities, help embed climate scenarios into debt sustainability analysis and medium-term fiscal frameworks, narrowing the space for optimistic bias in baseline projections (Agarwala et al., 2021).

Risk transfer complements these budget tools. Instruments such as catastrophe bonds and parametric insurance can offload peak losses and smooth post-disaster outlays, but their accountability value depends on transparent triggers, clear sovereign risk layering, and integration with budget execution rules (de la Plaza, 2022). Where well-designed, these instruments limit ad hoc reallocations and protect core services after shocks; where poorly specified, they introduce basis risk and governance concerns that complicate audit trails and public reporting. Capital-market dynamics reinforce these incentives: evidence that climate exposure influences municipal borrowing costs implies that credible disclosure and resilient investment programs can affect pricing and investor demand, enhancing fiscal space over time (Fankhauser & Jotzo, 2018; Painter, 2020; Kling et al., 2021).

Transparency and external checks are decisive for translating technical reforms into accountability gains. Research on fiscal openness and integrity shows that credible disclosure paired with enforcement and civic monitoring deters

misallocation and corruption, outcomes that are equally relevant to climate-related spending (Bauhr et al., 2020; Chan et al., 2023). In practice, this means publishing climate-related fiscal risks and tagging data in accessible formats; linking them to parliamentary scrutiny, audit follow-up, and procurement oversight; and aligning performance reporting with climate outcomes (e.g., resilience metrics for infrastructure). These mechanisms increase the reputational and political costs of under-investing in prevention or diverting earmarked funds, thereby improving allocative efficiency (Price, 2020).

At the same time, the evidence base reveals implementation hurdles and research gaps. Data constraints and fragmented mandates limit the precision of fiscal risk quantification, while political incentives favor visible reconstruction over preventive adaptation. Tagging can devolve into compliance exercises if line ministries lack capacity to classify expenditures consistently or if evaluations of effectiveness are absent. Few studies trace the full causal chain from climate-informed PFM reforms to measurable fiscal outcomes (e.g., reduced volatility of disaster spending) and onward to service delivery and welfare effects. Future research should integrate administrative financial data with hazard and asset registries, exploit natural experiments (e.g., staggered adoption of tagging or fiscal risk statements), and examine how disclosure affects both legislative behavior and market responses. Mixed-methods designs, combining econometric analysis with audit case studies, are well suited to capture institutional mechanisms and context.

Overall, the results support a pragmatic conclusion: climate-informed PFM can enhance fiscal accountability when technical tools (resilient PIM, risk statements,

risk transfer) are embedded in transparent processes with credible oversight. The strongest gains occur where disclosure is timely and actionable, where debt and investment decisions internalize climate scenarios, and where external monitors, auditors, parliaments, media, and markets, have incentives and capacity to respond. These conditions convert climate risk integration from a reporting exercise into a governance reform that improves the quality, durability, and legitimacy of public spending.

5. Conclusion

This review highlights that integrating climate risk considerations into public financial management (PFM) is not simply a technical exercise but a governance reform that can strengthen fiscal accountability. Evidence from diverse contexts shows that tools such as climate-informed public investment management (PIM), budget tagging, fiscal risk statements, and risk transfer instruments improve the transparency, predictability, and resilience of public finances when paired with credible oversight mechanisms. These measures allow governments to anticipate and manage climate-related fiscal shocks, align investments with resilience objectives, and build public trust through open disclosure and responsive decision-making. The strongest gains occur when technical reforms are supported by institutional capacity, political commitment, and incentives for external stakeholders, including auditors, legislatures, markets, and civil society, to scrutinize and act upon climate-related fiscal information.

At the same time, the findings underscore persistent gaps that merit attention in both research and policy. Weak data systems, fragmented mandates, and political biases toward post-disaster spending limit the full potential of climate-informed PFM. Tagging and disclosure, while necessary, are insufficient without rigorous evaluation of spending effectiveness and clear links to performance metrics. Future work should deepen empirical evidence on causal pathways from PFM reforms to fiscal stability and social outcomes, particularly in climate-vulnerable developing countries. Strengthening these connections can help governments move beyond reactive spending toward a proactive, transparent, and accountable fiscal strategy, one that not only mitigates the economic risks of climate change but also leverages them as an opportunity for more resilient and equitable public investment.

References

- Agarwala, M., Burke, M., Klusak, P., Mohaddes, K., Volz, U., & Zenghelis, D. (2021). Climate change and fiscal sustainability: Risks and opportunities. *National Institute Economic Review*, 258, 28-46.
- Bauhr, M., Czibik, Á., de Fine Licht, J., & Fazekas, M. (2020). Lights on the shadows of public procurement: Transparency as an antidote to corruption. *Governance*, 33(3), 495-523.
- Catalano, M., Forni, L., & Pezzolla, E. (2020). Climate-change adaptation: The role of fiscal policy. *Resource and Energy Economics*, 59, 101111.

- Chan, T., Ford, L., Higham, C., Pouget, S., Setzer, J., Williamson, L., & Dávalos González, J. (2023). Corruption and integrity risks in climate solutions: an emerging global challenge. LSE Policy Report, 10, 23.
- de la Plaza, L. (2022). Fiscal insurance: a new tool of fiscal stability. In *The Sustainability of Asia's Debt* (pp. 389-408). Edward Elgar Publishing.
- Fankhauser, S., & Jotzo, F. (2018). Economic growth and development with low-carbon energy. *Wiley Interdisciplinary Reviews: Climate Change*, 9(1), e495.
- Fay, M., Hallegatte, S., Vogt-Schilb, A., Rozenberg, J., Narloch, U., & Kerr, T. (2015). *Decarbonizing development: Three steps to a zero-carbon future*. World Bank Publications.
- Gonguet, M. F., Wendling, M. C. P., Sakrak, O. A., & Battersby, B. (2021). Climate-Sensitive Management of Public Finances—"Green PFM". International Monetary Fund.
- Hsiang, S. M., & Jina, A. S. (2014). The causal effect of environmental catastrophe on long-run economic growth: Evidence from 6,700 cyclones (No. w20352). National Bureau of Economic Research.
- 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.
- Ling, C., & Roberts, D. K. (2014). Evidence of development impact from institutional change: a review of the evidence on open budgeting. World Bank Policy Research Working Paper, (6968).

- Masseti, E., & Bellon, M. M. (2022). Planning and Mainstreaming Adaptation to Climate Change in Fiscal Policy. International Monetary Fund.
- Mutiara, Z. Z., Krishnadianty, D., Setiawan, B., & Haryanto, J. T. (2020). Climate budget tagging: amplifying sub-national government's role in climate planning and financing in indonesia. In *Climate Change Research, Policy and Actions in Indonesia: Science, Adaptation and Mitigation* (pp. 265-280). Cham: Springer International Publishing.
- Painter, M. (2020). An inconvenient cost: The effects of climate change on municipal bonds. *Journal of Financial Economics*, 135(2), 468-482.
- Pizarro, R., Delgado, R., Eguino, H., & Pereira, A. L. (2021). Climate change public budget tagging: connections across financial and environmental classification systems.
- Price, R. (2020). Climate adaptation: lessons and insights for governance, budgeting, and accountability.
- UN ESCAP. (2018) Disaster risk financing: opportunities for regional cooperation in Asia and the Pacific. Retrieved from: <https://hdl.handle.net/20.500.12870/543>.