

Pragyaratna (प्रज्ञारत्न)

A Peer-Reviewed, Open Access Journal



Impact of Targeted and Total Climate-Relevant Budgets on Environmental Sustainability: Analysis of Per-Capita Greenhouse Gas Emissions in Nepal

Sujata Khadka^a , Basudeb Khanal^a  

bashudev.khanal@mrc.tu.edu.np

^a Mahendra Ratna Campus, Tahachal, Tribhuvan University

Article Info

Abstract

Received: September 26, 2025

Accepted: November 20, 2025

Published: December 20, 2025

This study addresses a critical gap in climate governance literature by investigating the empirical relationship between public climate finance and environmental outcomes in Nepal, a country highly vulnerable to climate change despite its minimal historical emissions. Using a correlational research design with a one-year lag, we analyze ten years of national data (2014-2023) to determine whether Nepal's total climate-relevant budget (TCB) and its environment-sector share (ESB) are associated with changes in per-capita greenhouse gas emissions. Our analysis reveals a paradox: a very strong positive correlation between the rapidly expanding TCB and rising emissions, whereas a greater ESB shows a negative, though statistically weaker, association. The findings indicate that the scale of spending alone is an inadequate strategy for mitigation; instead, effectiveness is contingent upon strategic budget composition, prioritizing interventions with verifiable abatement potential, and overcoming systemic implementation bottlenecks. The primary implication for policy and practice is the necessity of a decisive pivot from quantitative expansion to qualitative targeting, establishing a mitigation-sensitive budgeting framework that directly links allocations to measurable emissions reductions through enhanced delivery systems and verification.

Keywords: Climate finance, climate-relevant budget, environmental sustainability, greenhouse gas emissions

Human development has advanced remarkably but often at the expense of the planet's ecological stability, accelerating climate change, biodiversity loss, and pollution (UNEP, 2021). Acting as a threat multiplier, climate change intensifies resource scarcity and undermines human security worldwide (UN, 2023). Global warming has now reached an unprecedented level in the last 10,000 years, driving sea-level rise, extreme weather events, and ocean heating (NASA, 2024). The global average temperature climbed about 1.47°C above pre-industrial levels in 2024, exceeding the 1.5°C target of the Paris Agreement (NASA, 2025; WMO, 2025). These trends signal an urgent need for climate finance mechanisms to sustain environmental resilience and promote low-carbon growth.

Climate finance mobilizes resources toward mitigation and adaptation, aligning investments with strategies that reduce greenhouse gas (GHG) emissions (IPCC, 2022; WEF, 2024). Well-targeted climate finance not only enhances environmental outcomes but also promotes sustainable development (Lee et al., 2022). However, the extent to which these financial mechanisms influence emission outcomes varies across countries, highlighting the importance of examining their effectiveness within specific national contexts such as Nepal.

Nepal, highly vulnerable to climate-induced hazards including floods, landslides, and heat stress, faces escalating threats to human livelihoods, infrastructure, and ecosystems. Despite economic growth over recent decades, climate risks continue to undermine long-term sustainability (Amadio et al., 2023). To address these challenges, Nepal introduced the Climate Change Budget Code (CCBC) in 2012,

enabling the Ministry of Finance to categorize and track climate-related expenditures as Highly Relevant, Relevant, or Neutral (UNDP Nepal, 2024). Initiatives such as the Citizens Climate Budget (Freedom Forum, 2019) and various policy reviews (Rawal, 2024) have enhanced financial transparency, yet the environmental outcomes of such spending remain insufficiently explored.

This study seeks to fill that gap by analyzing the relationship between Nepal's total climate-relevant budget, environmental-sector allocations, and per capita GHG emissions. By examining national data from 2013–2023, the research aims to assess whether targeted environmental spending is more effective in reducing emissions than overall climate allocations. The findings are expected to inform more strategic budgeting for climate action, contributing to Nepal's sustainable development goals and the global climate finance discourse.

Literature Review

Climate Finance and Environmental Sustainability: Global Perspective

Environmental sustainability entails responsible resource management to meet present needs without undermining the ability of future generations to meet theirs (Southern New Hampshire University, 2024). Achieving this goal requires sustainable practices and effective financial mechanisms that advance environmental objectives. Climate finance—mobilized at local, national, or transnational levels from public and private sources—supports mitigation and adaptation actions to address climate change (UNFCCC, 2023).

Empirical evidence highlights climate finance as a key instrument for reducing carbon emissions and promoting green growth, though its effectiveness varies by context. Lee et al. (2022) found that multilateral climate finance significantly reduces carbon emissions, with mitigation investments yielding stronger effects than adaptation, particularly in more developed economies. Similarly, Wei (2025) reported that climate finance lowers GHG emissions and enhances agricultural productivity and water efficiency, though its influence is weaker in fast-growing economies. Adaptation finance, while beneficial, shows limited short-term impact due to the delayed nature of climate adaptation outcomes. Collectively, these findings underline the crucial role of well-targeted and context-sensitive climate finance in fostering environmental sustainability.

Climate Vulnerability and the Case of Nepal

Nepal faces growing risks from heat stress, flooding, and landslides, with projections suggesting these hazards will intensify (Amadio et al., 2023). District-level vulnerability mapping by UNDP (2010) identified significant geographical variation in exposure and adaptive capacity, a finding supported by subsequent national assessments by the Government of Nepal, UNDP, and FAO (2019), which demonstrated zone-specific adaptation costs and differential vulnerabilities.

Recent studies further confirm the depth of Nepal's climate exposure. Tome et al. (2022) found climate change negatively affects health outcomes, while Bista (2023) highlighted its role in reducing household resilience in western watersheds. Chaudhary et al. (2023) documented productivity declines in the Terai's agricultural sector, and Pandey et al. (2025) emphasized the vulnerability of Indigenous agrifood systems across socio-ecological regions. Together, these studies depict Nepal as acutely climate-vulnerable, with impacts spanning livelihoods, health, and ecosystems. Despite these insights, few empirical analyses assess whether climate-related public spending translates into measurable environmental benefits.

Climate-Relevant Budgeting in Nepal

Nepal established the Climate Change Budget Code (CCBC) in 2012 following the Climate Public Expenditure and Institutional Review (CPEIR), enabling systematic categorization of programs as Highly Relevant ($\geq 60\%$), Relevant (20–60%), or Neutral ($< 20\%$) to climate objectives (NPC, 2012). This coding has allowed the Ministry of Finance to monitor climate-related expenditures across sectors.

While Nepal's climate finance framework is recognized for innovation, it also faces governance and capacity challenges. Rawal (2024) found that approximately 32.5% of the national budget is climate-relevant, with local governments contributing nearly half. The government provides the majority of funding (89%), with smaller shares from foreign aid and in-kind contributions. However, Agrawal (2022) identified persistent barriers, including weak fund absorption capacity, inadequate transfers to local levels (below the targeted 80%), and limited transparency. Similarly, Sharma (2014) noted

Nepal's pioneering role in climate budgeting but warned that fragmented systems and local capacity gaps hinder progress. Collectively, these studies reveal that while institutional mechanisms are in place, the translation of climate-relevant spending into tangible environmental outcomes remains uncertain.

Climate-Relevant Budget and Environmental Sustainability: Nepal's Perspective

Emerging research explores how Nepal's climate budgeting interacts with environmental sustainability. Bista and Bishwakarma (2025) found that green finance positively influences environmental quality, whereas economic growth, financial development, and urbanization exert adverse effects, underscoring the need for targeted green investment and renewable energy adoption to achieve net-zero emissions by 2045. Similarly, Mahat, Blaha, Uprety, and Bittner (2019) emphasized Nepal's institutional progress in integrating climate finance into national budgets, enabling coordinated low-carbon and adaptation-focused development.

Despite such advancements, few studies empirically test the link between Nepal's climate-relevant budgets and measurable outcomes such as per-capita GHG emissions. Given Nepal's resource constraints and climate vulnerability, understanding whether environment-targeted allocations are more effective than total untargeted budgets is essential. This study fills that empirical gap by analyzing the impact of both total and environment-specific climate-relevant budgets on per-capita GHG emissions, providing insights to optimize fiscal allocations, strengthen sectoral prioritization, and enhance mitigation effectiveness.

Methodology

Research Design

This study employs a correlational research design using a quantitative approach to examine the relationship between climate-relevant public budgeting and environmental outcomes in Nepal. Specifically, it assesses whether variations in public climate finance are associated with changes in per-capita greenhouse gas (GHG) emissions over time. Since fiscal allocations typically take time to influence environmental performance, a one-year lag is incorporated to align budgetary actions with subsequent emission outcomes.

The correlational design is appropriate for this exploratory context because it seeks to identify statistical associations rather than establish strict causality. Given the short time series and aggregate nature of national data, introducing numerous control variables would risk overfitting and obscure the core relationship of interest. Hence, the focus remains on capturing the directional and relative strength of associations between total and environment-specific climate budgets and per-capita GHG emissions. While the model does not infer causation, it provides valuable empirical evidence to guide policy discussion and future causal investigations.

Model Specification

The regression model is specified as: $GHG_t = \alpha + \beta_1 TCB_{t-1} + \beta_2 ESB_{t-1} + \epsilon_t, \dots \dots (1)$

Where, GHG_t = per-capita GHG emissions in year t , TCB_{t-1} = total climate-relevant budget in the previous fiscal year, ESB_{t-1} = environment-sector share of the climate-relevant budget in the previous fiscal year, and ϵ_t = error term

Before estimating the model, bivariate correlations between GHG emissions and each budget variable were computed to gauge simple associations. Temporal patterns were also visualized using line graphs for per-capita emissions, total climate-relevant budget, and the environment-sector share to detect co-movements and trends that justify the regression analysis. Given the short annual time series, control variables were excluded to maintain model parsimony and statistical reliability.

Data and Measures

The study utilizes national-level annual data for Nepal spanning 2014-2023 for emissions, aligned with 2013/14-2022/23 fiscal-year budget data. The dependent variable, per-capita GHG emissions (metric tons of CO₂-equivalent per person, excluding LULUCF), is sourced from the World Development Indicators (World Bank, 2025).

The independent variables are Total Climate-Relevant Budget (TCB), measured in billions of NPR, combining budget lines coded as Highly Relevant ($\geq 60\%$) and Relevant (20–60%) under Nepal's Climate Change Budget Code and Environment-Sector Share (ESB), the proportion of the total climate-relevant budget allocated to environmental protection programs (one of seven sectoral

expenditure categories). Both TCB and ESB are derived from the Environmental Statistics of Nepal (2024). To reflect implementation lags, fiscal-year allocations are shifted one year forward when paired with emissions outcomes (e.g., FY 2013/14 budgets align with 2014 emissions). This ensures temporal consistency between budgetary inputs and environmental responses, enabling a meaningful test of the hypothesized relationships.

Findings and Discussion

The analysis presents a compelling and somewhat counterintuitive narrative of Nepal's decade-long endeavor to align its public finances with climate objectives. The central finding, a strong positive association between escalating total climate-relevant budgets (TCB) and rising per-capita GHG emissions, demands a nuanced interpretation that moves beyond mere correlation. This pattern suggests that the current architecture of climate spending, while ambitious in scale, may not be effectively configured to deliver near-term mitigation outcomes. This discussion synthesizes these empirical results with the broader literature on climate finance efficacy and Nepal's specific institutional context to unravel the mechanisms behind this paradox.

Trend of Per-Capita GHG Emissions and Total Climate-Relevant Budget

Trend analysis of data used in the time series format is mandatory before applying the econometric examination (Khanal et al., 2025). So, table 1 and figure 1 reports annual trajectories for Nepal's per-capita GHG emissions alongside the total climate-relevant budget. This side-by-side view highlights year-to-year co-movements and inflection points, offering an initial sense of whether shifts in public climate spending correspond with changes in emissions intensity. The summary serves as descriptive context for the subsequent correlation and regression analyses.

Table 1

Trend of Per-Capita GHG Emissions and Total Climate-Relevant Budget

Year	Climate Relevant Budget (NPR in Billions)	Total greenhouse gas emissions excluding LULUCF per capita
2014	53.42	1.573
2015	66.35	1.553
2016	159.35	1.734
2017	201.61	1.804
2018	393.35	1.885
2019	487.01	1.817
2020	463.88	1.894
2021	478.84	1.879
2022	547.22	1.879
2023	609.487	1.914

Table 1 presents Nepal's total climate-relevant budget and per-capita greenhouse gas (GHG) emissions from 2014 to 2023. Over this period, climate finance increased more than tenfold, rising from NPR 53.42 billion in 2014 to NPR 609.49 billion in 2023. In contrast, per-capita GHG emissions exhibited only modest fluctuations, increasing slightly from 1.57 CO₂e/capita in 2014 to 1.91 tCO₂e/capita in 2023. This suggests that rising climate allocations have not yet translated into measurable reductions in national emissions, highlighting potential inefficiencies in allocation, implementation, or targeting of climate-relevant spending.

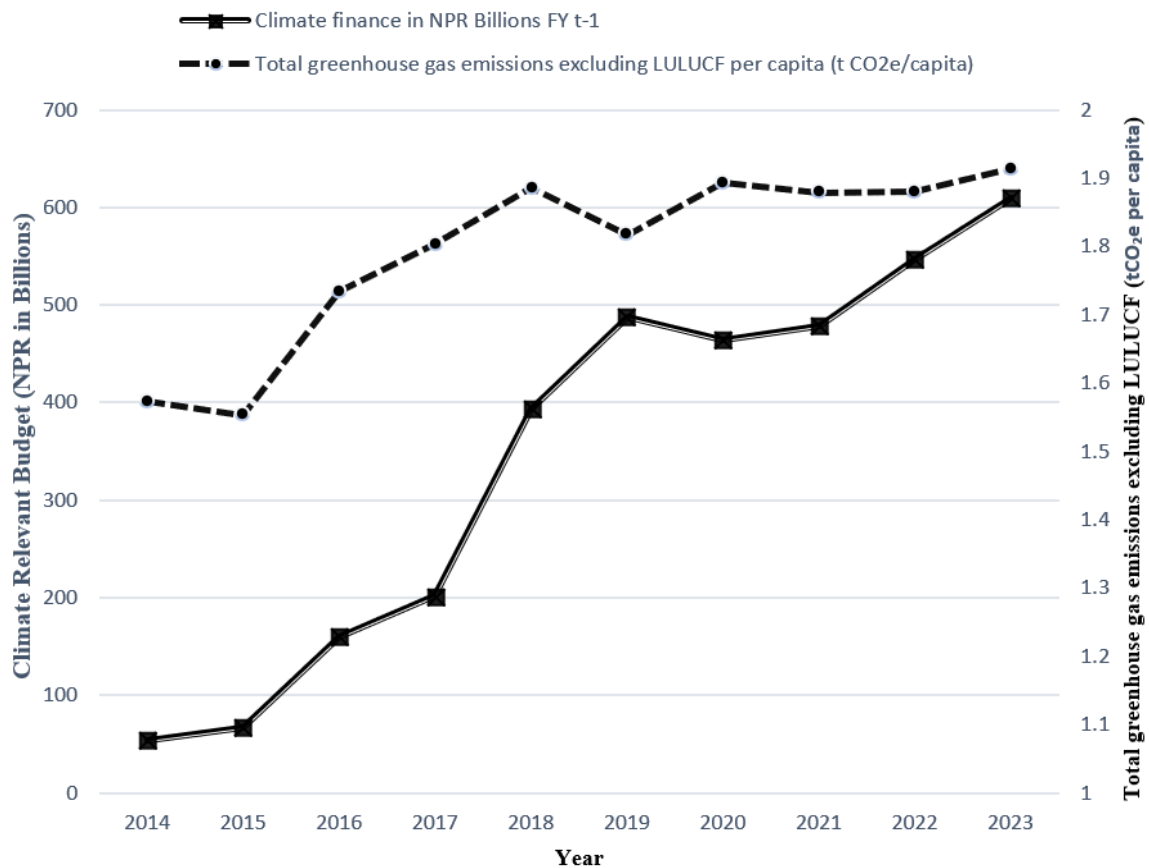
Figure 1*Trend line of Climate Relevant Budget and Per Capita GHG Emissions*

Figure 1 illustrates the trend of Nepal's per-capita GHG emissions and total climate-relevant budget from 2014 to 2023. While the climate budget shows a steep upward trajectory, emissions per capita also follow a gradual increasing trend. The parallel rise suggests that higher allocations alone have not been sufficient to curb emissions.

Trend of Per-Capita GHG Emissions and Environment-Sector Share in Climate Budget

Table 2 summarizes annual patterns in Nepal's per-capita GHG emissions alongside the environment-sector share of the climate-relevant budget. Budget shares are aligned with emissions using a one-year implementation lag to reflect the time required for allocations to influence outcomes. Presenting these series side-by-side provides descriptive context on potential co-movement, whether periods of greater environment-focused budgeting coincide with shifts in emissions intensity, and motivates the subsequent correlation and regression analysis.

Table 2*Environmental Sector Share in Climate Budget (% of total budget)*

Year	Climate Budget in Environmental Protection (%)
2014	5.4
2015	8.5
2016	4.5
2017	7.0
2018	3.6
2019	7.46
2020	5.59
2021	2.19
2022	2.05
2023	1.6

Table 2 presents the proportion of Nepal's climate-relevant budget allocated to environmental protection from 2014 to 2023. The share exhibits a fluctuating but overall declining trend, dropping from 5.4% in 2014 to just 1.6% in 2023. This indicates that, despite increasing total climate budgets, the relative focus on environment-specific programs has diminished over time, highlighting a potential misalignment between overall funding and sectoral prioritization.

Figure 2

Environmental Sector Share in Climate Budget (%)

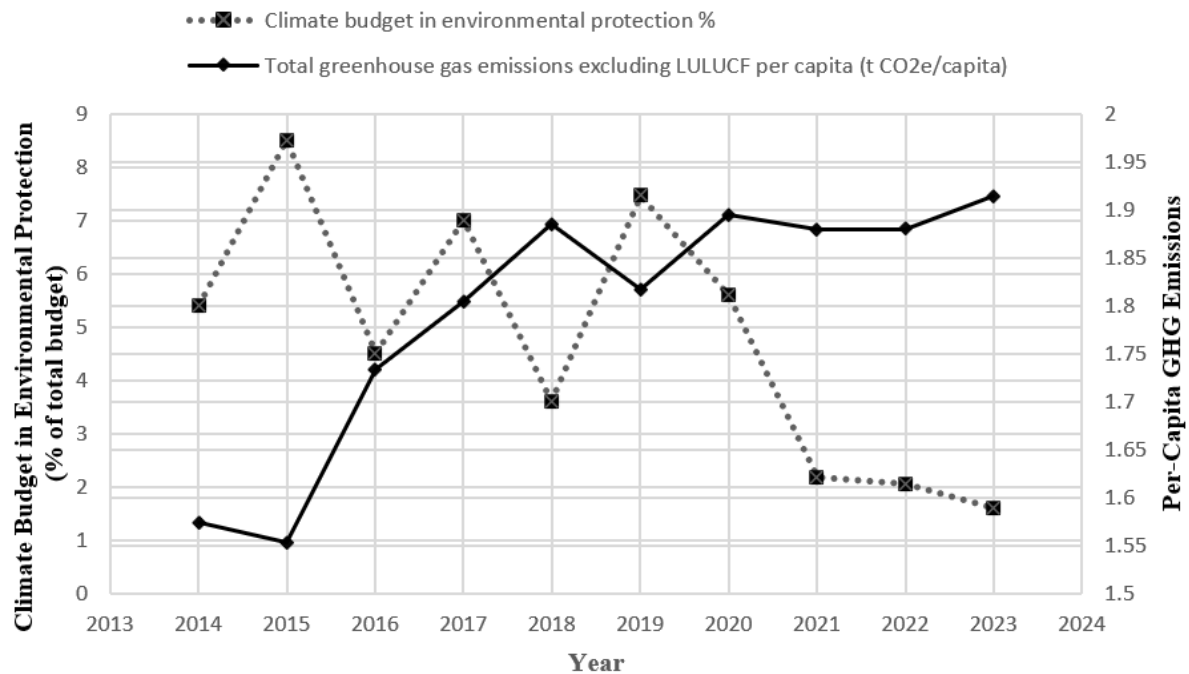


Figure 2 illustrates the relationship between the proportion of the climate-relevant budget allocated to environmental protection and per-capita GHG emissions from 2014 to 2023. While both variables fluctuate over time, a general inverse relationship is observable: years with a higher share of the climate budget allocated to environmental protection tend to correspond with lower per-capita GHG emissions. The trend highlights the potential effectiveness of targeted environment-sector allocations in mitigating emissions, despite inconsistencies in annual budget shares and other influencing factors.

Relationship between Climate-Relevant Budget Variables and Per-Capita GHG Emissions

This section reports Pearson correlation coefficients (r) between per-capita GHG emissions and the two budgeting variables, total climate-relevant budget (TCB) and the environment-sector share (ESB), using the one-year lag alignment. The coefficients and corresponding ppp-values provide an initial, non-causal indication of association: positive r suggests emissions tend to rise with higher values of the budget variable, while negative r suggests the opposite. These results are interpreted as preliminary diagnostics to motivate the multivariable regression, recognizing the limits of bivariate correlations in short time series and the possibility of confounding and temporal trends.

Table 3

Correlation between Climate-Relevant Budget Variables and Per-Capita GHG Emissions (2014–2023)

Variables	Correlation Coefficient (r)
Total Climate-Relevant Budget vs Per Capita GHG Emissions	0.8982
Environment Share (%) vs Per Capita GHG Emissions	-0.6212

The results indicate a very strong positive correlation ($r = 0.8982$) between the total climate-relevant budget and per-capita GHG emissions, suggesting that overall increases in climate allocations have coincided with rising emissions. In contrast, the share of the climate budget directed toward

environmental protection shows a moderately strong negative correlation ($r = -0.6212$) with emissions, implying that greater emphasis on environment-targeted spending is associated with lower per-capita GHG emissions.

Multiple Regression Analysis

Table 4 presents OLS estimates of per-capita GHG emissions on a one-year-lagged total climate-relevant budget and the environment-sector share. Controlling for the other predictor, β_1 reflects the change in emissions (tCO₂_22e per person) associated with a one-unit increase in TCB (in NPR billions), while β_2 reflects the change associated with a one-percentage-point increase in ESB. Reported standard errors and p-values indicate the statistical significance of each effect; R^2 and adjusted R^2 summarize model fit. The coefficient signs show whether higher overall climate spending and/or a greater environmental focus are linked to lower emissions. Given the short annual series, estimates are interpreted cautiously and treated as indicative rather than causal.

Table 4

Regression Results on Per-Capita GHG Emissions (2014–2023)

Variable	Coefficient
Constant	1.6335*** (0.0937)
Total Climate Budget (NPR Billions)	+0.00054** (0.000134)
Environment Sector Share (%)	-0.00546 (0.0115)
R^2	0.81
Adjusted R^2	0.76

Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$

The regression model ($R^2 = 0.81$, Adjusted $R^2 = 0.76$) demonstrates strong explanatory power. Results indicate that the total climate-relevant budget has a statistically significant and positive association with per-capita GHG emissions ($\beta = 0.00054$, $p < 0.01$), suggesting that increased budgetary allocations have not yet translated into emission reductions. In contrast, the environment-sector share of the climate budget exhibits a negative but statistically insignificant relationship with emissions ($\beta = -0.00546$, $p > 0.05$). These findings imply that while targeted environment allocations may theoretically reduce emissions, their current scale and implementation in Nepal are insufficient to yield measurable outcomes.

Spending Up, Emissions Up: Why Bigger Climate Budgets Haven't Yet Bent Nepal's Curve

The results present a clear but disquieting pattern: although Nepal's climate-relevant budget expanded sharply between 2014 and 2023, per-capita GHG emissions increased rather than declined. The very strong positive correlation between total climate allocations and emissions, together with the positive and statistically significant coefficient on total climate-relevant budget (TCB) in the regression, indicates that higher aggregate spending has not yet produced near-term mitigation. This finding aligns with global evidence that the composition of climate finance is pivotal: mitigation-oriented investments tend to affect emissions more readily than adaptation finance, whose benefits often materialise over longer horizons (Lee et al., 2022; Wei, 2025). In my view, Nepal must pivot from simply scaling climate budgets to deliberately composing them around interventions with near-term, verifiable abatement.

Three mechanisms likely underpin this divergence. First, composition effects: the Climate Change Budget Code (CCBC) aggregates “highly relevant” and “relevant” programmes, many of which are adaptation or enabling investments (e.g., climate-proofing infrastructure, watershed protection) with mitigation impacts that accrue slowly. If a growing share of TCB has flowed to such lines, near-term emissions responses would be muted even as resilience improves. Second, absorption and delivery constraints: long-standing bottlenecks—weak local capacity, delays in fund transfers (particularly to

local governments), and fragmented systems—can delay implementation and push benefits beyond the study window (Sharma, 2014; Agrawal, 2022; Rawal, 2024). Third, countervailing macro-structural pressures: post-disaster reconstruction, urbanisation, transport expansion, and rising energy demand may have offset efficiency gains, consistent with evidence that fast-growing economies exhibit weaker short-run mitigation effects from finance (Wei, 2025). Accordingly, my assessment is that without a decisive rebalancing toward high-yield mitigation lines and a tightening of delivery systems, additional allocations will continue to underperform on emissions.

Against this backdrop, the environment-sector share (ESB) displays a negative correlation with emissions but an imprecise effect in the multivariable model. Two features are salient: the ESB shrank and was volatile over the period (from 5.4% in 2014 to 1.6% in 2023), and the time series is short, both of which limit statistical power. Nonetheless, the directional evidence coheres with the broader literature's central lesson: targeting matters. Where limited budgets prioritize interventions with demonstrable abatement-renewables deployment, transport electrification, industrial and building efficiency, and clean cooking—the probability of bending the emissions curve increases (Lee et al., 2022). On balance, we interpret the evidence as warranting a sustained and scaled commitment to environment-targeted lines with clear emissions payoffs.

These dynamics must be read alongside Nepal's vulnerability profile. Risks are spatially heterogeneous across provinces and agro-ecological zones (UNDP, 2010; Government of Nepal, Ministry of Finance, UNDP, 2019; Amadio et al., 2023). Rising national totals without sharper sectoral and spatial targeting are therefore unlikely to suffice. A declining emphasis on environment-specific lines risks further dilution of mitigation impact precisely where vulnerability argues for strategic concentration. My position is that a place-sensitive, mitigation-first budgeting rule, explicitly linking funds to provincial and agro-ecological abatement opportunities, is now indispensable.

Limitations qualify these interpretations but also point to a forward agenda. The sample comprises ten annual observations; key confounders (e.g., GDP per capita, energy mix, urbanization, reconstruction cycles) are not explicitly controlled; and a one-year lag may be too short for many investments to manifest. Future work should test longer and distributed lags, incorporate structural controls, and exploit subnational variation (panel designs) or programmed-level data linked to verified outcomes. Even with these constraints, my conclusion is firm: sharpening targeting, strengthening delivery, and verifying results constitute the most credible pathway for Nepal's climate finance to bend the emissions curve.

Conclusion

The empirical analysis from 2014 to 2023 leads to a conclusive finding: the substantial expansion of Nepal's climate-relevant budget has not, in itself, been sufficient to curtail the nation's per-capita greenhouse gas emissions. This paradox underscores that the effectiveness of climate finance is determined not merely by its scale, but by its strategic composition, its efficient delivery, and its alignment with clear mitigation objectives. The results compellingly argue for a fundamental reframing of climate budgeting, shifting the central policy question from how much is spent to what for, where, and how effectively it is deployed.

In response, policy must pivot from aggregate financial scaling to targeted, results-oriented deployment. This entails establishing a protective minimum allocation for environment-focused, mitigation-heavy programmes, refining the Climate Change Budget Code to distinguish investments by their expected abatement impact, and linking disbursements to verifiable performance metrics. Concurrently, overcoming implementation bottlenecks through timely fiscal transfers to local governments, streamlined procurement, and a robust measurement, reporting, and verification (MRV) framework is critical to convert allocations into tangible emissions reductions. Future research should build on this foundation by incorporating structural controls, testing longer impact lag periods, and exploiting subnational data to precisely identify which budgetary interventions deliver the most durable and cost-effective climate outcomes.

References

- Agrawal, D. (2022). Climate adaptation financing in Nepal. *Journal of APF Command and Staff College*, 5(1), 131–146. <https://doi.org/10.3126/japfcsc.v5i1.49353>.
- Amadio, M., Behrer, P., Bosch, L., Kaila, H., Krishnan, N., & Molinaro, G. (2023). *Climate risks, exposure, vulnerability and resilience in Nepal* [Background paper]. World Bank. <https://doi.org/10.1596/40597>
- Bista, P., & Bishwakarma, K. (2025). Green finance, economic growth, and environmental sustainability: Evidence from Nepal (1990-2023). *Environmental Economics and Policy Studies*. <https://doi.org/10.1142/S281094302550009X>
- Bista, R. B. (2023). Assessment of climate change induced household vulnerability in Nepal: Application of index method. *ARRUS Journal of Social Sciences and Humanities*, 3(1), 9-20. <https://doi.org/10.35877/soshum1151>
- Chaudhary, B. R., Acciaioli, G., Erskine, W., Piya, L., & Joshi, N. P. (2023). Adaptation to climate change by the indigenous farmers in the western Tarai of Nepal. *Environmental Development*, 38, 1-10. <https://doi.org/10.1016/j.cliser.2025.100559>
- Freedom Forum. (2019). *Where is Nepal's money being spent? Nepal citizen's climate budget 2018–2019*. Freedom Forum. <https://shorturl.at/WWJgX>
- Intergovernmental Panel on Climate Change [IPCC] (2023). *Climate change 2022: Impacts, adaptation, and vulnerability*. Cambridge University Press. <https://doi.org/10.1017/9781009325844>
- Khanal, B., Joshi, B. M., Ghimire, D. D., Koirala, P., & Acharya, M. R. (2025). The trend analysis of public education expenditure: A cross-country comparative analysis with focus on Nepal. *Nepal Journal of Multidisciplinary Research*, 8(4), 38-60. <https://doi.org/10.3126/njmr.v8i4.82071>
- Khanal, P. (2024). *Leveraging climate finance in Nepal*. <https://dialogue.earth/en/climate/leveraging-climate-finance-in-nepal/>
- Lee, C.-C., Li, X., Yu, C.-H., & Zhao, J. (2022). The contribution of climate finance toward environmental sustainability: New global evidence. *Energy Economics*, 111, 15-39 <https://doi.org/10.1016/j.eneco.2022.106072>
- Mahat, T. J., Bláha, L., Uprety, B., & Bittner, M. (2019). Climate finance and green growth: reconsidering climate-related institutions, investments, and priorities in Nepal. *Environmental Sciences Europe*, 31(1), 1-13. <https://doi.org/10.1186/s12302-019-0222-0>
- NASA. (2024). *Evidence*. <https://science.nasa.gov/climate-change/evidence>
- NASA. (2025, January 10). *Temperatures rising: NASA confirms 2024 warmest year on record*. NASA. <https://shorturl.at/nxVhl>
- National Statistics Office. (2024). *Environment statistics of Nepal 2024*. <https://shorturl.at/vh458>
- NPC (2012). *Climate change budget code: Documenting the national process of arriving at multi-sectoral consensus: Criteria and method*. <https://shorturl.at/fZBs9>
- Pandey, H. P., Aryal, S., Poudyal, B. H., Bhusal, S., & Maraseni, T. N. (2025). Navigating climate change: Impacts on indigenous practices concerning agrifood systems in Nepal's socio-ecological landscape. *Sustainable Horizons*, 14, 1-13. <https://doi.org/10.1016/j.horiz.2025.100143>
- Rawal, S. B. (2024). Climate change finance in Nepal: A review from policy framework and practice. *Journal of Sustainability and Environmental Management*, 3(2), 121-128. <https://doi.org/10.3126/josem.v3i2.71921>
- Sharma, H. P. (2014). *Climate change financing in Nepal*. International Institute for Environment and Development. <https://www.iied.org/17229iied>
- Southern New Hampshire University. (2024). *What is environmental sustainability?* <https://shorturl.at/ZCicJ>
- Tome, J., Richmond, H. L., Rahman, M., Karmacharya, D., & Schwind, J. S. (2022). Climate change and health vulnerability in Nepal: A systematic review of the literature since 2010. *Global Public Health*, 17(7), 1406-1419. <https://doi.org/10.1080/17441692.2021.1924824>
- UNDP (2019). *Climate change risk and vulnerability assessment in agro-ecological zones of Nepal*. <https://shorturl.at/e50hJ>
- UNDP Nepal. (2024). *Climate Finance*. <https://www.undp.org/nepal/projects/climate-finance>

- United Nations Development Programme (UNDP). (2010, August 31). *Climate change vulnerability mapping in Nepal*. <https://shorturl.at/1wRUy>
- United Nations Environment Programme. (2021). *Making peace with nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies*. <https://doi.org/10.18356/9789280738377>
- United Nations Framework Convention on Climate Change (UNFCCC). (2023). *Climate finance*. <https://unfccc.int/topics/introduction-to-climate-finance>
- United Nations Framework Convention on Climate Change (UNFCCC). (2015). *The Paris agreement*. <https://unfccc.int/process-and-meetings/the-paris-agreement>
- United Nations. (2023). *Five ways the climate crisis impacts human security*. United Nations Climate Change. <https://shorturl.at/i4074>
- Wei, B. (2025). Does climate finance achieve its goals in developing countries? An econometric assessment of mitigation and adaptation outcomes. *Discover Sustainability*, 6(1), 441. <https://doi.org/10.1007/s43621-025-01284-9>
- World Economic Forum. (2023, November 29). *What is the Paris Agreement's Article 2.1(c) on climate finance-and why does it matter?* <https://shorturl.at/0BLR1>
- World Meteorological Organization. (2025, January 10). *WMO confirms 2024 as warmest year on record at about 1.55°C above pre-industrial level*. <https://shorturl.at/wXtS5>