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# Reviewing the Economic Impacts of Climate Change Across Key Sectors in Developing Countries

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**Abstract**
Climate change is increasingly recognised not only as an environmental challenge but as a first-order economic threat, and its burden falls most heavily on developing countries whose economies depend on climate-sensitive sectors and whose institutions have limited capacity to adapt. This paper reviews the economic impacts of climate change across the key sectors of agriculture, health, water, energy and the wider macroeconomy in low- and middle-income countries, synthesising evidence published between 2015 and 2024. Drawing on econometric studies, computable general-equilibrium models and international assessments, the review shows that rising temperatures and shifting rainfall depress crop yields and agricultural gross domestic product, raise the incidence of climate-sensitive disease and reduce labour productivity, strain water availability and hydropower generation, and slow aggregate economic growth. Country-level modelling projects real GDP losses ranging from a few percent to more than ten percent by mid-century under high-impact scenarios, with the most vulnerable households bearing a disproportionate share of the cost. The review also finds that adaptation finance remains far below estimated need, even though returns on adaptation investment are consistently high. Three summary tables collate quantified sectoral impacts, projected macroeconomic losses, and the adaptation-finance gap. The paper concludes that climate change threatens to reverse hard-won development gains unless context-specific adaptation and mitigation measures are scaled up and adequately financed, and it identifies priorities for future research.

**Keywords:** climate change; developing countries; economic impact; agriculture; adaptation finance; GDP; sectoral analysis.

## 1. Introduction

The economic consequences of a changing climate have moved to the centre of development policy. Higher average temperatures, more variable rainfall and more frequent extreme events act directly on the productive base of economies, and the resulting losses accumulate through interconnected sectors. For developing countries the stakes are especially high: a large share of output and employment is concentrated in agriculture and other climate-exposed activities,

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physical and financial buffers are thin, and public budgets are already stretched. Understanding how these impacts are distributed across sectors is essential for designing effective adaptation and for prioritising scarce resources.

**1.1 Background and Context**

Developing economies face a structural disadvantage in confronting climate change. They are typically located in tropical and sub-tropical regions where warming pushes temperatures beyond the optimal range for major crops, and their livelihoods depend disproportionately on rain-fed farming, natural resources and outdoor labour. At the same time, weak food, water, health and infrastructure systems limit the capacity to absorb shocks, so that a given climatic disturbance translates into a larger welfare loss than it would in a richer economy. Because these countries have contributed least to historical greenhouse-gas emissions yet stand to suffer the most, the economics of climate change in the developing world is also a question of equity.

This disadvantage is compounded by limited fiscal and financial buffers. Many low- and middle-income countries carry high public debt, hold small foreign-currency reserves, and lack deep insurance markets, so that recovery from a climate shock often diverts scarce resources from development spending or deepens borrowing. Rapid population growth, urbanisation in exposed coastal zones, and dependence on a narrow range of climate-sensitive exports further concentrate risk. The cumulative effect is that climatic shocks are not merely transient disturbances but can leave lasting scars on growth trajectories, eroding human capital and productive assets in ways that persist long after the immediate event has passed.

Although research on the socioeconomic impacts of climate change has intensified, the evidence remains fragmented across sectors, methods and regions, which hampers policy coordination. Studies frequently examine a single sector—most often agriculture—in isolation, and rarely place agricultural, health, water, energy and macroeconomic effects side by side within a common frame. As a result, decision-makers lack a consolidated picture of where the largest economic losses arise and how they compound one another. This review addresses that gap by bringing the principal sectoral findings together and relating them to aggregate economic outcomes.

The review pursues four objectives. First, to summarise the quantified economic impacts of climate change in the key sectors of developing economies. Second, to relate these sectoral impacts to projected effects on aggregate output and growth. Third, to assess the scale of the adaptation-finance response relative to estimated need. Fourth, to identify gaps in the current literature and set out priorities for future research. The intention is to provide a compact, evidence-based reference for researchers and policymakers rather than to present new empirical estimates.

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### 1.2 Scope of the study

The scope is limited to low- and middle-income countries and to peer-reviewed and institutional evidence published between 2015 and 2024, supplemented by a small number of foundational earlier works where necessary for context. The remainder of the paper is organised as follows. Section 2 reviews the literature across four thematic sub-areas—agriculture, health and labour, water and energy, and economy-wide effects—and presents three summary tables. Section 3 describes the methodology of the review. Section 4 concludes, and Section 5 outlines directions for future work.

## 2. Literature Review

The literature on the economic impacts of climate change in developing countries has grown rapidly, spanning micro-level studies of farm households, sector-specific econometric analyses, and economy-wide simulations. This section organises the evidence into four themes: impacts on agriculture and food security; impacts on health and labour productivity; impacts on water and energy systems; and economy-wide macroeconomic effects, including the adaptation-finance response. Across all four themes a consistent finding is that the most vulnerable groups bear a disproportionate burden and that long-term impacts are projected to exceed medium-term effects.

### 2.1 Impacts on Agriculture and Food Security

Agriculture is the most studied sector, reflecting the heavy dependence of developing economies on the primary sector and the direct sensitivity of crops to temperature and rainfall. Reviews of the global evidence conclude that climate change poses a significant threat to agricultural yields, with developing countries projected to bear the brunt of the negative consequences, and that declining production combined with rising world food prices could worsen food insecurity and economic disparities. Empirical estimates suggest that a one-degree Celsius rise in mean temperature can reduce agricultural productivity by roughly ten to seventeen percent depending on the crop, while precipitation variability in some countries has reduced yields by as much as thirty percent in adverse years. Country case studies frequently report larger losses than global averages: modelling of Pakistan projects that climate-induced wheat and rice losses could reduce real GDP by about US$19.5 billion by 2050, corresponding to yield reductions of roughly fifteen and twenty percent respectively, and general-equilibrium work on Nepal finds significant negative effects on the whole economy transmitted through lost agricultural productivity. Table 1 collates representative quantified impacts across sectors, including these agricultural findings.

**Table 1. Representative quantified economic impacts of climate change by sector in developing countries (selected 2015–2024 studies).**

| Sector | Representative impact | Magnitude (reported) | Region / scope |
|---|---|---|---|
| Agriculture | Yield loss per +1°C | 10–17% productivity | Cross-country / |

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| Sector | Representative impact | Magnitude (reported) | Region / scope |
|---|---|---|---|
| | warming | decline | MENA |
| Agriculture | Rainfall-variability yield loss | Up to 30% in adverse years | Ethiopia |
| Agriculture | GDP loss from crop losses by 2050 | ≈ US$19.5 billion | Pakistan |
| Health | Climate-sensitive health burden | US$2–4 billion/year by 2030 | Low/middle-income |
| Water/Energy | Productivity from water constraints | Chronic decline | MENA region |
| Macroeconomy | Real GDP loss by 2050 (high scenario) | ≈ 10% decline | Developing-country avg. |

The pattern in Table 1 shows agriculture as the dominant transmission channel but by no means the only one, with health and macroeconomic losses of comparable importance once aggregated. The concentration of research on agriculture, while justified by its economic weight, has left farmland value, water resources and energy security comparatively under-studied.

The mechanisms behind these agricultural losses are increasingly well understood. Elevated temperatures shorten the growing period of cereals, accelerate crop development at the expense of grain filling, and increase evapotranspiration and water stress, while more erratic rainfall raises the frequency of both drought and flood damage. Warming also favours the spread of pests and crop diseases into new areas. Because a large share of farming in developing countries is rain-fed and undertaken by smallholders with limited access to irrigation, improved seed or credit, the capacity to offset these losses through adaptation is constrained. The result is a double burden in which falling yields reduce farm incomes at the same time as rising food prices increase the cost of consumption, pushing vulnerable rural and urban households deeper into food insecurity and poverty.

**2.2 Impacts on Health and Labour Productivity**

A second strand of literature documents the health and labour consequences of warming. Climate change raises the incidence of heat stress, vector-borne and water-borne disease and malnutrition linked to reduced crop productivity, and these effects are projected to worsen and to expand geographically over time. The projected health burden of climate-sensitive risks in low- and middle-income countries has been estimated at several billion US dollars per year by 2030, and weak healthcare systems mean that these countries are expected to face disproportionate increases in morbidity as well as damage to health facilities themselves. Beyond direct health

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costs, higher temperatures reduce the productivity of outdoor and manual labour, which is a large share of employment in developing economies, thereby lowering incomes and output. Because poverty, inequality and fragile health systems amplify these effects, the health channel represents a substantial and often under-counted component of the total economic cost of climate change.

**2.3 Impacts on Water and Energy Systems**

The third theme concerns water and energy, sectors that are tightly coupled to climate and to each other. Chronic water constraints depress agricultural and industrial productivity and jeopardise food security, and shifting precipitation alters the reliability of the water supply on which irrigation, drinking water and hydropower all depend. Energy systems in many developing countries rely heavily on hydropower, so that drought directly reduces electricity generation, while rising temperatures increase cooling demand and can strain generation and transmission capacity. Despite their importance, the review literature notes that impacts on water resources and energy security have received considerably less attention than agriculture, leaving a gap in the quantification of these losses. Table 2 summarises the channels through which each key sector transmits climate impacts to economic outcomes.

**Table 2. Principal transmission channels from climate change to economic outcomes, by sector.**

| Sector | Primary climate driver | Economic transmission channel | Groups most affected |
|---|---|---|---|
| Agriculture | Heat, rainfall variability | Lower yields, higher food prices | Smallholder / rural households |
| Health | Heat, disease spread | Morbidity, health spending, lost labour | Poor, elderly, children |
| Water | Drought, altered rainfall | Scarcity, irrigation and supply costs | Farmers, urban poor |
| Energy | Drought, rising temperature | Hydropower loss, higher cooling demand | Industry, households |
| Macroeconomy | Compound of above | Slower GDP growth, fiscal strain | Whole economy |

Table 2 makes clear that the sectors are not independent: a single drought can simultaneously cut crop yields, reduce hydropower, raise disease incidence and strain public budgets, so that sectoral losses compound into larger economy-wide effects. This interconnection is central to understanding the aggregate estimates discussed next.

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### 2.4 Economy-Wide and Macroeconomic Effects

The fourth theme aggregates sectoral impacts into economy-wide outcomes. Panel econometric studies find that rising temperatures and carbon emissions negatively influence long-run economic growth in developing countries, with higher temperatures reducing growth particularly in poorer economies and many of these impacts being non-linear. Computable general-equilibrium simulations translate sectoral shocks into aggregate losses: one widely cited synthesis reports real GDP declines of about 2.5 percent, 6.6 percent and 10.0 percent by 2050 under low-, medium- and high-impact scenarios respectively. Against these mounting costs, the adaptation response remains inadequate. Adaptation finance reached record levels in the early 2020s but still fell far short of need, and international assessments estimate that developing countries excluding China will require on the order of several hundred billion US dollars annually by the mid-2030s, while public adaptation needs already exceed one percent of GDP in roughly fifty low-income economies and can reach up to twenty percent of GDP for small island states exposed to cyclones and rising seas. Crucially, the returns to adaptation are high—every dollar invested can yield up to ten dollars in avoided damage and co-benefits over a decade—underscoring the economic case for closing the gap. Table 3 summarises projected macroeconomic losses and the scale of the adaptation-finance shortfall.

**Table 3. Projected macroeconomic losses and the adaptation-finance gap for developing countries (2015–2024 estimates).**

| Indicator | Reported value | Time horizon | Source type |
|---|---|---|---|
| Real GDP loss (low scenario) | ≈ 2.5% | by 2050 | CGE synthesis |
| Real GDP loss (medium scenario) | ≈ 6.6% | by 2050 | CGE synthesis |
| Real GDP loss (high scenario) | ≈ 10.0% | by 2050 | CGE synthesis |
| Adaptation need (excl. China) | ≈ US$400 bn/year | by 2035 | Institutional |
| Adaptation finance delivered | ≈ US$46–63 bn/year | 2022–2023 | Institutional |
| Adaptation return on investment | Up to 10:1 | over 10 years | Institutional |

Table 3 juxtaposes the potential losses with the financing response and exposes a stark mismatch: projected GDP losses run into double digits under adverse scenarios, yet delivered adaptation finance is roughly an order of magnitude below estimated annual need. The high

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benefit-to-cost ratio of adaptation makes this shortfall difficult to justify on purely economic grounds and frames the policy challenge that the concluding sections address.

**3. Research Methodology**

This paper adopts a structured narrative review methodology to synthesise the economic evidence on climate change across key sectors in developing countries. A narrative review is appropriate because the underlying studies are heterogeneous in method—ranging from panel econometrics to computable general-equilibrium modelling and institutional assessment—so that a formal meta-analysis with a common effect size would not be feasible. Instead the review organises findings thematically and draws out consistent patterns while acknowledging differences in scope and approach. The aim is analytical synthesis: to identify where evidence converges, where it conflicts, and where important gaps remain, rather than to produce a single pooled estimate that would obscure the genuine diversity of the underlying work.

The evidence base was assembled from peer-reviewed journal articles and reports from established international institutions published between 2015 and 2024, with a small number of foundational earlier studies retained where they are essential for context. Sources were identified through academic databases and the reference lists of recent survey articles, and were selected on the basis of three criteria: a focus on low- or middle-income countries; an explicit economic outcome such as yield loss, GDP change, sectoral output or financing need; and sufficient methodological transparency to interpret the reported magnitudes. Studies focusing solely on high-income economies or on physical climate science without an economic dimension were excluded.

The selected studies were grouped into four thematic sectors—agriculture and food security, health and labour, water and energy, and economy-wide effects—mirroring the structure of the literature review. Within each theme, quantified impacts were extracted and tabulated to allow comparison of magnitude, region and time horizon, as presented in Tables 1 to 3. Where studies reported results under multiple scenarios, the range was preserved rather than reduced to a single figure, so as not to overstate precision. Because the review relies on secondary sources of differing methodology, the synthesis is qualitative and comparative rather than statistical, and reported magnitudes should be read as indicative of scale and direction rather than as directly comparable point estimates.

Several limitations follow from this design. The reliance on published studies introduces the possibility of publication bias toward significant findings, and the concentration of primary research on agriculture means that health, water and energy impacts are represented by a thinner evidence base. Differences in baseline assumptions, emissions scenarios and modelling frameworks across studies limit strict comparability, and the review does not capture

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unpublished or grey-literature estimates beyond the institutional reports cited. These limitations are noted so that the synthesised figures are interpreted with appropriate caution.

**4. Conclusion**

This review has synthesised the economic impacts of climate change across the key sectors of developing economies. The evidence points consistently in one direction: rising temperatures and more variable rainfall depress agricultural yields and agricultural GDP, raise the incidence of climate-sensitive disease and reduce the productivity of labour, strain water availability and hydropower generation, and slow aggregate economic growth. Agriculture emerges as the dominant and most-studied transmission channel, but health, water and energy effects are substantial and, once aggregated, compound into economy-wide losses that country-level modelling places at a few percent to more than ten percent of real GDP by mid-century under adverse scenarios.

Two cross-cutting conclusions stand out. First, the burden is distributed unequally: within and between countries, the poorest and most vulnerable groups bear a disproportionate share of the cost, and impacts are projected to be larger in the long term than in the medium term, so that inaction today compounds future losses. Second, the response is inadequate relative to the challenge. Adaptation finance, though rising, remains roughly an order of magnitude below estimated need, even though the returns to adaptation investment are high and early action is far cheaper than delayed response. Taken together, these findings imply that unchecked climate change threatens to reverse hard-won development gains and to place the Sustainable Development Goals further out of reach.

It is also important to recognise what the evidence does not yet settle. Estimates vary widely with the emissions scenario, modelling framework and baseline assumptions adopted, and the concentration of primary research on agriculture means that losses in health, water and energy are likely under-counted rather than absent. The figures assembled here should therefore be read as indicative of the scale and direction of impact rather than as precise forecasts. This uncertainty strengthens rather than weakens the case for action: because the distribution of possible outcomes is skewed toward severe losses and because adaptation yields high returns even under moderate scenarios, prudent policy favours early, flexible investment in resilience over delay.

The policy implication is not that a single universal remedy exists, but the opposite: because impacts are heterogeneous across sectors, countries and social groups, adaptation and mitigation measures must be designed to reflect local contexts and delivered through adequate, accessible finance. Prioritising the sectors and populations where losses are largest, closing the adaptation-finance gap, and integrating climate risk into national economic planning together offer a feasible path to limiting the economic damage documented in this review.

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## 5. Future Work

Several priorities follow from the gaps identified in this review. First, research should extend beyond agriculture to quantify economic impacts on water resources, energy security, farmland value and infrastructure, which remain comparatively under-studied despite their evident importance; more balanced sectoral coverage would allow a fuller accounting of total economic cost. Second, future studies should adopt integrated, economy-wide frameworks that capture the compounding of shocks across sectors—for example, how a single drought simultaneously reduces crop yields, hydropower and public revenue—rather than analysing sectors in isolation.

Third, there is a need for harmonised methods and shared baseline scenarios so that estimates from different countries and studies become genuinely comparable, reducing the fragmentation that currently hampers policy coordination. Standardised reporting of assumptions, emissions pathways and time horizons would materially improve the evidence base. Fourth, more work is needed on the effectiveness and returns of specific adaptation interventions in developing-country settings, including rigorous evaluation of financing instruments, early-warning systems and social-protection measures, so that scarce adaptation resources can be allocated to the highest-return uses.

Finally, future research should give greater attention to distributional and equity dimensions—how impacts and adaptation benefits are shared across income groups, genders and regions—and to the interaction between climate risk, debt and fiscal space in vulnerable economies. Advancing these areas would strengthen the analytical foundation for the context-specific, adequately financed climate response that the evidence in this review shows to be urgently required.

## References

1. Abbas, S., Kousar, S., & Pervaiz, A. (2023). Effects of climate change on health outcomes in developing economies: A panel analysis. Environmental Science and Pollution Research, 30(9), 22845–22860.
2. Abeysekara, W. C. S. M., Siriwardana, M., & Meng, S. (2023). Economic consequences of climate change impacts on the agricultural sector of South Asia. Economic Analysis and Policy, 77, 435–450.
3. Adom, P. K. (2024). The socioeconomic impact of climate change in developing countries over the next decades: A literature survey. Heliyon, 10(15), e35134. https://doi.org/10.1016/j.heliyon.2024.e35134
4. Ahmed, M., Rahman, M. S., & Islam, M. (2023). Climate change, sea-level rise and food security in coastal developing countries. Environmental Challenges, 12, 100728. https://doi.org/10.1016/j.envc.2023.100728

5. Alcayna, T., & O'Donnell, D. (2022). How much global climate adaptation finance is targeting the health sector? European Journal of Public Health, 32(Suppl. 3), ckac129.146.
6. Chandio, A. A., Jiang, Y., Akram, W., Ozturk, I., & Rauf, A. (2023). Assessing the impacts of climate change on cereal production in developing economies. Environment, Development and Sustainability, 25(6), 5487–5510. https://doi.org/10.1007/s10668-022-02277-8
7. Climate Policy Initiative. (2023). Global landscape of climate finance 2023. Climate Policy Initiative. https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2023/
8. Duan, H., Yuan, D., Cai, Z., & Wang, S. (2022). Valuing the impact of climate change on China's economic growth. Economic Analysis and Policy, 74, 155–174.
9. George, J., Adelaja, A., & Awokuse, T. (2024). Climate change and health system vulnerability in low-income countries. The Lancet Planetary Health, 8(4), e250–e260.
10. Global Center on Adaptation. (2023). State and trends in climate adaptation finance 2023. Global Center on Adaptation. https://gca.org/reports/state-and-trends-in-climate-adaptation-finance-2023/
11. Gumus, S., Bellora, C., & Fuss, S. (2024). Temperature, precipitation and agricultural output in the MENA region: An econometric analysis. Economies, 13(12), 340. https://doi.org/10.3390/economies13120340
12. International Monetary Fund. (2022). Poor and vulnerable countries need support to adapt to climate change. International Monetary Fund. https://www.imf.org/en/blogs/articles/2022/03/23/blog032322
13. Khan, S., Ahmad, N., & Malik, A. (2020). Economic effects of climate change–induced loss of agricultural production by 2050 in Pakistan. Sustainability, 12(3), 1216.
14. Kotz, M., Levermann, A., & Wenz, L. (2022). The effect of rainfall changes on economic production. Nature, 601(7892), 223–227.
15. Ozili, P. K. (2024). Impact of climate change on the economies of developing countries: A panel ARDL analysis. International Journal of Science and Research Archive, 13(2), 3223–3236.