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Commentary

The unequal planet: Who pays for a warming world?

Kim Johnson, Reginaldo Cassio

Department of Economics, Climate Change Program, Kapi'olani Community College, Honolulu, Hawai

***Correspondence to:** Kim Johnson; kim.john7@gmail.com*

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Abstract

The costs of climate change are distributed unevenly, reflecting longstanding differences in wealth, resource consumption, political influence, and the capacity to respond to environmental risks. Countries with relatively small contributions to global greenhouse gas emissions often face severe climate-related losses, while substantial inequalities also exist among populations within the same country. This commentary examines how historical emissions, socioeconomic vulnerability, unequal adaptive capacity, climate finance, and the transition to low-carbon economies intersect to shape the distribution of climate costs. Drawing on recent climate assessments and research on carbon and income inequality, it argues that the prevailing approach to climate action remains insufficiently attentive to the distribution of both responsibility and protection. In particular, national emissions figures alone provide an incomplete account of climate responsibility, while aggregate measures of climate finance reveal little about whether resources reach those facing the greatest risks. The commentary calls for climate governance that gives greater weight to historical contributions, within-country inequalities, accessible adaptation finance, and the social consequences of decarbonisation. The effectiveness of climate action should ultimately be judged not only by the emissions it prevents, but also by whose livelihoods it protects and whose capacity to recover it strengthens

Keywords: Climate change; Climate justice; Carbon inequality; Climate vulnerability; Historical responsibility; Climate finance; Just transition; Socioeconomic inequality

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The same climate hazard does not produce the same consequences

A prolonged drought may represent a temporary economic setback for a well-resourced agricultural enterprise, yet threaten the food security of an entire community dependent on rain-fed farming. Extreme heat is similarly experienced differently by an office worker with access to air conditioning and a construction labourer working outdoors. The physical hazard may be shared, but the ability to withstand it is not. This distinction is central to understanding one of the most persistent contradictions in the climate crisis: the populations least equipped to absorb its consequences are often those with the fewest resources to prevent or recover from them.

Climate change has made this imbalance increasingly difficult to ignore. Across low-income countries, small island developing states, and climate-sensitive regions of Africa, Asia, and Latin America, changing rainfall patterns, rising temperatures, coastal flooding, and ecosystem degradation threaten livelihoods that are closely tied to local environmental conditions. For smallholder farmers, a failed harvest can mean more than reduced agricultural output; it can result in debt, loss of household assets, disrupted education, and food insecurity. In coastal settlements, repeated flooding and erosion may gradually make established livelihoods untenable, even before permanent displacement occurs. Urban populations face a different but equally uneven burden. Informal settlements, densely populated neighbourhoods, and areas with limited tree cover often experience greater heat exposure, while residents have fewer opportunities to access cooling, healthcare, and reliable water supplies. These differences are not explained by climate exposure alone. Income, housing, employment, public infrastructure, access to healthcare, and the quality of local institutions all influence the extent of damage a hazard produces. The IPCC has repeatedly emphasised that climate vulnerability is shaped by intersecting social, economic, and environmental conditions, with poverty and marginalisation limiting the capacity to adapt [1]. What deserves greater attention is the extent to which these existing disadvantages determine who bears the costs of a warming climate.

The emissions debate must look beyond national averages

Discussions of climate responsibility frequently begin with national greenhouse gas inventories. These are indispensable for tracking emissions and assessing mitigation commitments, but they do not tell the whole story. A country's total emissions can conceal considerable differences in consumption and investment between its wealthiest and poorest residents. Likewise, present-day national emissions do not capture the full benefits that different economies have derived from decades of fossil-fuel-intensive industrialisation.

Research on individual carbon footprints illustrates the scale of this disparity. Chancel (2022), examining global greenhouse gas emissions between 1990 and 2019, estimated that the richest 10% of the world's

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population accounted for 48% of global emissions in 2019, compared with 12% attributable to the bottom 50% [2]. The study also found that 63% of inequality in individual emissions was attributable to differences between high- and low-emitting groups within countries. These findings complicate the familiar division of the world into high-emitting and low-emitting nations. Considerable responsibility for emissions is concentrated among affluent populations, including those living in countries that contain large numbers of people with comparatively low carbon footprints. Historical responsibility remains equally important. Wealthier economies accumulated substantial infrastructure, industrial capacity, and material prosperity during periods of high fossil-fuel consumption. Emerging economies now face the difficult task of expanding energy access, employment, and essential infrastructure while operating within increasingly restrictive global carbon constraints. Treating these circumstances as equivalent would overlook the different starting points from which countries are expected to participate in climate mitigation.

This does not remove the responsibility of emerging economies to pursue lower-emission development. Nor does historical responsibility provide an argument for delaying emissions reductions. It does, however, raise a legitimate question about how the costs of decarbonisation should be shared. The principle of common but differentiated responsibilities and respective capabilities, established within international climate governance, recognises precisely this distinction. Its significance will depend on whether it translates into meaningful differences in financial support, technology access, and the pace and conditions of transition [1].

Inequality within countries is an overlooked part of climate vulnerability

The distinction between countries is important, but it can also obscure inequalities closer to home. A wealthy household and a low-income household may face the same heatwave, flood, or water shortage, yet their prospects for protection and recovery can be markedly different. One may have insurance, secure housing, savings, and the ability to relocate; the other may have little choice but to remain exposed. In this sense, climate vulnerability follows existing patterns of economic and social disadvantage as much as it follows geographical boundaries.

The economic consequences can persist long after the immediate hazard has passed. Families that lose agricultural income may sell productive assets or borrow at unfavourable rates. Informal workers whose earnings depend on outdoor activity may experience repeated income losses during periods of extreme heat. Disruption to transport, electricity, water supply, and healthcare can impose additional costs on households already operating with limited financial security. The cumulative effect is particularly serious where public social protection is weak.

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There is also a distributional dimension to climate policy itself. Measures such as carbon pricing, energy subsidy reform, and restrictions on carbon-intensive activities can impose disproportionate costs on lower-income households if affordable alternatives and compensatory measures are not available. Emissions reduction and social protection therefore cannot be treated as separate policy objectives. A climate policy that increases the cost of essential energy without addressing household vulnerability may weaken public support and deepen the inequalities that climate action is intended to address.

Recent modelling provides further reason to take this relationship seriously. Emmerling and colleagues (2024), using an ensemble of eight integrated assessment models, found that climate impacts could increase economic inequality by an average of 1.4 Gini points by 2100 in their reference scenario. Their analysis also showed that well-designed redistribution measures can offset some of the short-term distributional costs of ambitious climate policies [3]. The findings suggest that inequality should not be regarded as an incidental consequence of climate change or climate policy. It is a dimension that can be examined, anticipated, and addressed through policy design

Climate finance reveals the distance between responsibility and action

International climate negotiations have increasingly acknowledged the financial obligations associated with adaptation and loss and damage. Yet the availability of funding remains far removed from the scale of need. This is particularly concerning for countries that must respond to intensifying climate impacts while facing high borrowing costs, limited fiscal space, and competing development priorities.

The United Nations Environment Programme's *Adaptation Gap Report 2026* estimates that developing countries will require approximately US$305 billion annually for adaptation by 2035, substantially exceeding current international public finance flows [4]. The significance of this gap extends beyond the size of the funding shortfall. It raises questions about which countries can access available resources, how quickly support reaches affected communities, and whether financing arrangements place additional pressure on already constrained public budgets.

The distinction between announcing finance and delivering it is especially important. Adaptation requires sustained investment in agricultural resilience, water management, public health, early-warning systems, and infrastructure. These investments are often less visible than post-disaster reconstruction, but their absence can leave communities repeatedly exposed to avoidable losses. Funding must also reach local institutions and communities that understand the risks they face. Complex application procedures, limited administrative capacity, and a reliance on debt-based instruments can prevent the most vulnerable countries from obtaining the support intended for them.

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Loss and damage presents a related challenge. For some communities, adaptation can reduce risk but cannot fully prevent the consequences of sea-level rise, permanent land loss, ecosystem degradation, or repeated displacement. International arrangements to address these losses are therefore necessary, but their credibility will depend on adequate and predictable contributions, transparent allocation, and accessible procedures. Financial assistance should not leave vulnerable countries with greater debt simply because they have experienced climate-related losses to which they contributed relatively little.

The question of climate finance is ultimately a question of political commitment. If historical responsibility and capacity to pay are recognised in international agreements, they must also be reflected in the resources made available to countries facing the greatest risks

A low-carbon economy is not necessarily an equitable economy

The transition away from fossil fuels is essential, but the distribution of its benefits and costs deserves closer scrutiny. Renewable energy expansion, electrification, clean transport, and low-carbon industrial development can create new employment opportunities and reduce dependence on fossil fuels. However, the transition may also expose workers, households, and resource-dependent communities to economic disruption if the necessary protections are absent.

The implications extend beyond employment in coal, oil, and gas industries. The technologies underpinning the energy transition depend on minerals such as lithium, cobalt, nickel, copper, and rare earth elements. Their extraction and processing can generate substantial environmental and social pressures in producing regions, including land-use conflicts, water stress, and unequal distribution of economic benefits. DiCarlo and colleagues (2026) draw attention to the need for greater attention to the geographical and social organisation of critical-material supply chains in discussions of a just energy transition [5]. A transition that reduces emissions in one region while transferring environmental burdens to communities elsewhere risks reproducing familiar patterns of unequal development.

Energy access presents another difficulty. For households that still lack reliable electricity or depend on traditional fuels, the transition must expand access rather than simply impose new restrictions. Similarly, workers in carbon-intensive industries require credible pathways into alternative employment, supported by training, income protection, and regional economic investment. These are not peripheral considerations. They influence whether climate policies are socially acceptable and whether the benefits of decarbonisation are shared.

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A just transition should therefore be assessed by more than the speed of renewable energy deployment or the decline in fossil-fuel use. It should also consider who owns new energy infrastructure, where employment is created, who bears the environmental costs of mineral extraction, and whether affordable energy remains available to lower-income populations. Without these considerations, the low-carbon economy could become cleaner in its energy profile while remaining unequal in its economic structure

Climate action needs a different measure of success

The global climate response is often assessed through emissions trajectories, temperature projections, national commitments, and financial pledges. These measures are necessary, but they cannot establish whether climate action is fair. The UNEP *Emissions Gap Report 2026* makes clear that current national commitments remain insufficient to return global warming to the 1.5 °C level by the end of the century without substantial additional action [6]. The need for faster mitigation is therefore beyond dispute. The more difficult question is whether that action will be accompanied by a fair distribution of responsibility and protection.

Four questions should be central to this assessment: who has contributed most to the problem, who is most exposed to its consequences, who can afford to respond, and who actually receives the resources needed to adapt and recover. These questions should inform the design of national climate policies as well as international agreements. They also point to the importance of measuring progress at a level that aggregate national indicators often overlook. Changes in household energy affordability, livelihood security, access to adaptation funding, and recovery after climate-related disasters can reveal whether the benefits of climate action are reaching vulnerable populations.

There is a further issue that deserves attention. Communities most affected by climate decisions are not always adequately represented in the institutions that make them. Adaptation projects, energy developments, and land-use changes can have lasting consequences for local livelihoods and rights. Meaningful participation is therefore essential, particularly for Indigenous peoples, rural communities, and populations facing displacement. Climate policy should not treat these groups merely as recipients of assistance; they should have a voice in determining the priorities and terms of intervention.

The costs of a warming world will not be shared equally, and there is little reason to expect that they will become more equitable without deliberate political choices. Those with greater historical contributions and greater capacity to respond must accept a proportionate share of the financial and technological burden. Within countries, climate policies must recognise that income and social position shape both emissions and vulnerability. International finance must move beyond commitments towards accessible support, while the

transition to low-carbon economies must protect the livelihoods and rights of those who might otherwise bear its hidden costs.

The central issue, then, is not simply whether the world can reduce emissions quickly enough. It is whether the process of doing so will correct or reproduce the inequalities that have shaped the crisis. A climate response that protects global temperature targets while leaving vulnerable communities without the means to adapt, recover, or participate in the transition will remain incomplete. The measure of a fair climate future will be found not only in what the world manages to reduce, but in whom it chooses to protect.

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