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Climate resilience investments in coastal communities such as Kuakata, Bangladesh, may not be effective without addressing increasing salinity intrusion.

CLIMATE POLICY

Climate adaptation finance: From paper commitments to climate risk reduction

Science can help to target climate finance at better-quality adaptation

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Climate adaptation finance is intended to fund activities to reduce the physical climate risks faced by countries. The quantity of adaptation finance has been a highly contentious political issue, and a critical negotiating point for developing countries in international climate negotiations. Yet we argue, as have others, that countries' resilience to the impacts of climate change will not be noticeably enhanced unless the international adaptation finance community shifts its focus from the quantity of finance to its quality and risk-reducing impacts. We provide five recommendations, underpinned by evidence from scientific research, to transform the quality of adaptation delivered with adaptation finance, to build credibility that it will cost-effectively reduce the future impacts of climate change. Doing so requires an urgent shift in efforts toward improving the enabling environment of governments, sectors, and communities to identify, appraise, prioritize, finance, implement, and monitor adaptation programs and projects.

At the United Nations climate conference (COP29) in Baku in November 2024, global leaders from developed nations agreed to a renewed pledge to increase climate finance for climate adaptation and mitigation to USD 300 billion per year, and up to USD 1.3 trillion in 2035. On paper, this more ambitious commitment would bring the adaptation finance distributed by the international community, at present amounting to around USD 30 billion annually, a small step closer to the estimated adaptation requirement of USD 215 to 387 billion annually by 2030 for emerging market and developing economies (EMDEs) (*1*). But despite its political importance, there is no reason to believe that the current adaptation finance system will have the desired impact of reducing climate risks to vulnerable people.

Part of the reason for focusing on inputs to climate finance rather than risk-reducing outputs is a lack of agreement among international policy-makers as to what successful adaptation looks like (*2*) and how it can be measured and monitored across countries (*3*). After years of limited progress toward the Global Goal on Adaptation (GGA), the joint commitment under the Paris Agreement to ensure adequate adaptation action, some encouraging developments have recently emerged. During COP28, a first set of targets and indicators toward the GGA was approved under the UAE Framework for Global Climate Resilience, and during COP29, Multilateral Development Banks (MDBs), who are at the forefront of distributing climate finance, released a common approach to measuring climate results. Several new climate risk tools and analytical products [e.g., the World Bank's Country Change and Development Reports (CCDRs)]

PHOTO: MUNIR UZ ZAMAN/GETTY IMAGE

have been developed, and the International Monetary Fund (IMF) has piloted the inclusion of climate risk as relevant fiscal risk into their Financial Sector Assessment Program (FSAP).

Although these are welcome steps, there is still a chasm between top-down politically driven developments and the adaptation that is (not) materializing on the ground. Despite good intentions and skilled people dedicated to adaptation, the lack of impact is in part due to the culture in international policy and development finance that is quite disconnected from implementing adaptation. In particular, adaptation is not just about building new infrastructure, promoting climate-resilient agricultural practices, or retrofitting buildings, but also about improving the processes and capabilities of local and national institutions to lead adaptation efforts through the adaptation cycle (i.e., identify, appraise, prioritize, implement, and monitor). Although the latest climate and adaptation science is now at a stage that it can answer those questions that initially prevented the GGA from moving forward, the current underappreciation of improving the capabilities and processes of institutions is preventing it from delivering adaptation impact.

WHAT GOES IN, OR WHAT COMES OUT?

In their "Adaptation Gap Report," the United Nations Environmental Programme (UNEP) estimates the adaptation gap in EMDEs by comparing model-based assessments of adaptation needs (*1*) to the reported public international adaptation finance in the database maintained by the Development Assistance Committee (DAC) within the Organization for Economic Cooperation and Development (OECD) (*4*). However, modeled adaptation needs and reported adaptation finance are fundamentally different, making it unclear what the gap between them represents. Modeled adaptation needs cover the adaptation action necessary to reduce climate risk relative to a "no adaptation" counterfactual. This, in turn, is a function of the frequency and severity of present and future climatic hazards, the damage and losses that are incurred because of those hazards, and the lost economic opportunities because of real and perceived climate risks.

In contrast to this approach based on climate risk reduction, MDBs assign a simple "adaptation ratio" to each project that they finance. This ratio indicates the share of the project that is considered to be climate adaptation, based on the investment's adaptation intent. Data between 2016 and 2022 show that the MDBs have increased their adaptation finance by a factor of 4 in 6 years (see the first figure, top). This is driven by the fact that more projects have been classified as incorporating some form of adaptation, while the average adaptation spend per project (see the first figure, top) and share of financing across adaptation projects (see the first figure, bottom) have remained stable. In other words, MDBs have mainly added adaptation throughout their portfolio of development projects (i.e., adaptation mainstreaming), rather than focusing more finance on projects whose primary aim is climate adaptation. The mainstreaming of adaptation in development, in part motivated by the uptake of climate risk screening methodologies [e.g., the World Bank Resilience Rating System (RSS)], is to be welcomed. By applying the RSS framework, it was, for example, found that including climate adaptation in a transport connectivity project (worth USD 275 million) in Nepal would cost only 3% more, while ensuring the delivery of development benefits over the project lifetime (*5*).

The current reporting system adopted by MDBs (and others) could nonetheless incentivize box-ticking and mislabeling. There is no reason to believe that a dollar of adaptation finance spent in two different locations or on projects with a similar "adaptation ratio" will achieve equivalent risk-reducing benefit without examining the present and future climate risks and the efficiency of the proposed intervention. Yet quantification of expected climate risk reduction is either absent or not readily comparable. Therefore, current practice provides no way of knowing how adaptation investments "add up" to manage climate risk. The 2023 update to the MDBs' joint adaptation tracking methodology expanded the definition of adaptation finance further to include sectors like education, health, and social protection. Although undoubtedly important for effective adaptation, this broadening makes it even harder to compare the reported adaptation finance with countries' climate risk and adaptation needs.

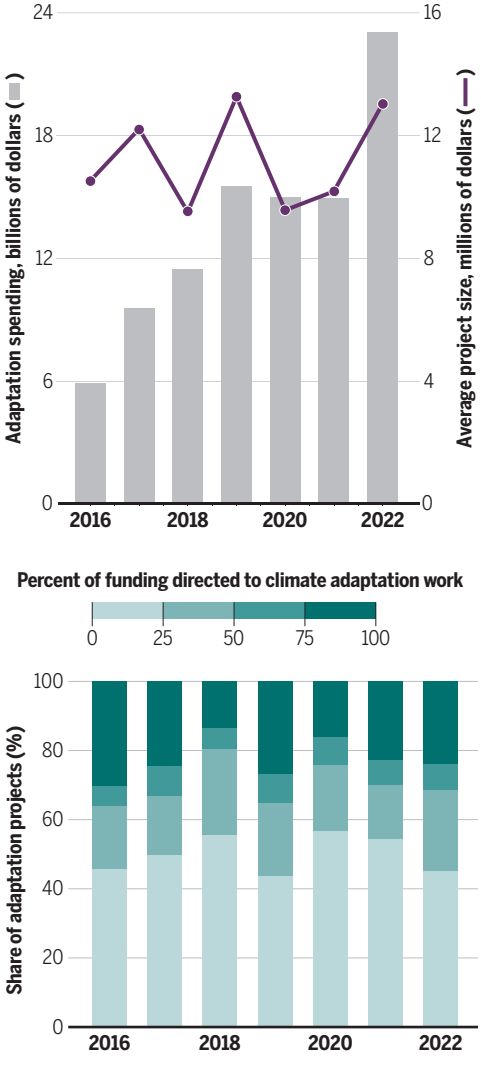
In short, the current focus on measuring "what goes in" draws away attention from "what comes out" of the adaptation finance apparatus. Mainstreaming adaptation in development projects is key, in particular to ensure that new projects do not increase exposure to the impacts of climate change. Yet, dependence on the adaptation ratio for measuring adaptation finance risks insufficient and fragmented adaptation, especially given the systemic impacts that climate change may pose to communities, economies, and infrastructure (*6*) and the transformative adaptation that may be needed in response (*2*). For instance, climate resilience investments in low-lying deltas, like the Mekong and in the Bay of Bengal (*7*) (see the photo), may not be effective or sustainable without addressing the worsening salinity intrusion that coastal communities face over the coming decades as a result of sea-level rise and human activities.

THE CLIMATE INVESTMENT TRAP

Increasing finance through the existing adaptation finance apparatus, without noticeably reducing climate impacts, further increases the likelihood of countries becoming stuck in a "climate investment trap." Many EMDEs are making investments in sectors like real estate, infrastructure, and industry to spearhead growth, which increases a country's exposure to climate-related hazards. Investments to reduce

Mainstreaming adaptation funding

Multilateral development banks increased adaptation finance by a factor of 4 in 6 years (top), as more projects have been classified as incorporating some form of adaptation, while the average adaptation spend per project (top) and share of financing across types of adaptation projects (bottom) have remained stable. See supplementary materials for details on data.



GRAPHIC: V. PENNEY/*SCIENCE*

climate risks often lag behind this growing exposure, resulting in elevated climate losses that are being exacerbated by climate change. Such losses affect government budgets (owing to reconstruction costs and lost taxation revenues) and elevate their debt-to-GDP (gross domestic product) ratio, a measure of debt distress.

Rising debt levels can, in turn, lower borrowing capacity and reduce investments in productive capital and adaptation, dragging the economy further. The rising debt crisis in many countries is only accelerating this vicious circle. For example, the Maldives, facing major adaptation challenges like those of other small island developing states, is required to spend around 8% of GDP on debt servicing in 2024–2025 (*8*), likely slowing down public investments in adaptation.

Most adaptation finance is through debt (see the second figure, top), with grants primarily benefiting low-income countries (see the second figure, bottom). Those countries relying on debt financing, though having a high debt-to-GDP ratio, already struggle to finance adaptation projects. Between 2016 and 2022, middle-income countries —which primarily rely on debt financing—with a ratio of above 50% received less than half the adaptation finance as a share of GDP relative to those with a ratio below 50% (see the second figure, bottom). Adaptation gains often emerge beyond loan repayment horizons, so even with the favorable conditions of MDB-backed loans, excessive debt for climate adaptation may be unaffordable.

The fiscal position of debt-ridden countries is unlikely to be alleviated soon. Although some initiatives have emerged to promote adaptation investment for high-debt countries, like debt-for-adaptation swaps, their scale has been too small to substantially improve debt sustainability or bridge the adaptation gap (*9*). In plain words, scaling up adaptation efforts simply cannot happen without improvements in fiscal sustainability, and vice versa.

FROM PAPER COMMITMENTS TO RISK REDUCTION

To accelerate adaptation, we highlight five focus areas to improve the capabilities, processes, and institutions throughout the adaptation cycle so that the latest developments in science can be turned into impact. These focus areas are intended to support countries in meeting their proposed commitments under the UAE Framework for Global Climate Resilience by 2030 to advance efforts throughout the adaptation cycle.

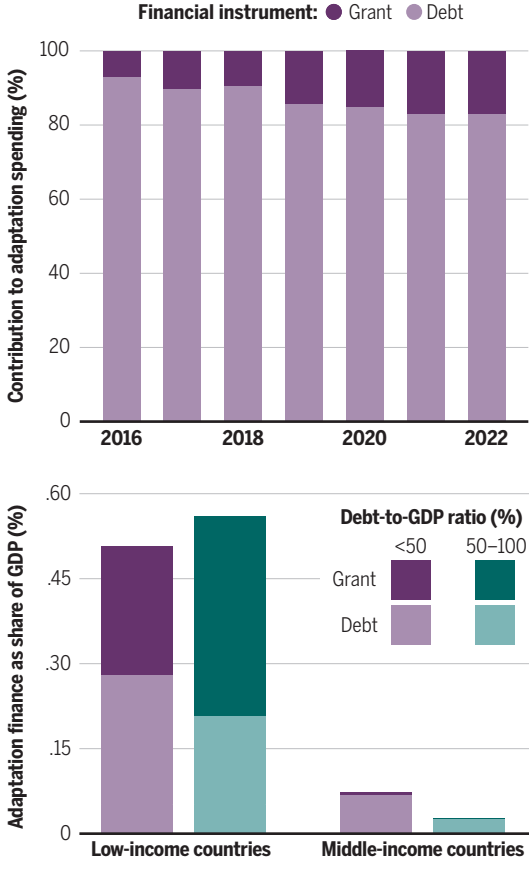
First, targeting effective adaptation actions depends upon comprehensive locally relevant climate risk information, both present-day and future risks under a range of climate and socioeconomic scenarios. This provides a platform upon which different sets of adaptation actions can be evaluated to establish their expected impact in terms of risk reduction. The need for science-based, yet place-specific, climate risk information is widely recognized (*10*). Despite the proliferation of datasets and tools, the provision of future climate data is often detached from adaptation planning (*11*), in part because of the disconnect between those providing climate information and those that have to embed this information into planning and project preparation. We call for strengthened capacity building efforts to enable EMDEs to perform such risk analysis themselves, supported by their own research institutions and building on local data but with globally reproducible tools. The "Global Infrastructure Resilient Index" of the Coalition for Climate Resilient Infrastructure is a good example of such a global tool, which can be a valuable starting point for nationally led risk assessments. These efforts should be supported by a set of guidelines, building on the World Bank's RSS, such that assessments can be standardized and, hence, can be compared. Such guidelines should be regularly updated, so that the evolution of climate risk can be tracked, and scientific advances in modeling climate risks can be incorporated.

Second, countries need to move toward more specific adaptation strategies based on the priority risks identified. At present, the quality of National Adaptation Plans (NAPs), which outline such strategies, is highly variable. Often, there is a mismatch between the aspirations set out in NAPs and the adaptation projects that are eventually financed. Overcoming this mismatch requires adaptation strategies that are specific in terms of their risk-reducing aspirations and the associated costs, and policy reforms needed to achieve them. A national perspective is essential to identify systemic adaptation actions, those that are interregional, cross-sectoral, or transformative in nature and require national coordination. The World Bank's CCDRs have taken a necessary first step in providing such a national, yet cross-sectoral, focus. However, such a national strategy needs to be integrated within sector-specific strategies for the most vulnerable sectors (e.g., water, agriculture, energy, transport, public services), and with local adaptation efforts. For instance, Bangladesh is planning to establish Locally Led Adaptation Hubs under its Mujib Climate Prosperity Plan 2022–2041 that can implement local adaptation projects and monitor progress in reducing the vulnerability of communities.

Third, NAPs should be supported by fiscal strategies with realistic financing plans and costs, which is rarely done in practice. Doing so is key for the implementation of NAPs, in particular the sequencing of investments, as well as balancing adaptation investments with financial instruments (e.g., insurance, catastrophe bonds). Taking this step requires integrating fiscal impact analysis within climate risk assessments, and vice versa. Such analysis should take a probabilistic view of present and future shocks, akin to traditional fiscal stress testing, and should capture multiple fiscal impact channels, such as impacts to government spending, consumption, tax revenues, and credit ratings. A recent study for Thailand (*12*) captured these impact channels and demonstrated how adaptation investments

A vicious circle: debt and adaptation

Most adaptation finance is through debt (top); grants primarily benefit low-income countries (bottom; middle-income grant funding is minimal and may be difficult to discern). Countries relying on debt, while having a high debt-to-GDP (gross domestic product) ratio, struggle to finance adaptation projects. Between 2016 and 2022, middle-income countries with a ratio above 50% received less than half the adaptation finance as a share of GDP relative to those with a ratio below 50% (bottom). See supplementary materials for details on data.



GRAPHIC: V. PENNEY/*SCIENCE*

...skilled human capacity...needs to be patiently built and retained within the governments and communities where it is most needed.

can reduce the risk of indebtedness. The IMF, through its Resilience and Sustainability Facility, and the Coalition of Finance Ministers for Climate Action have been instrumental in putting climate adaptation on the fiscal agenda but could take a more leading role in promoting efforts to develop fiscal strategies to fund NAPs.

Fourth, the implementation of adaptation strategies relies on robust project design that justifies the investment and its priority over those not undertaken. Yet, the capacity to identify and prioritize sustainable and cost-effective adaptation projects is severely limited in many countries. Too often, project preparation and prioritization are dependent on external consultants with inconsistent methodologies. Planners often lack the knowledge about what adaptation works, for whom, and under what circumstances (*13*). Project prioritization needs to rigorously compare the benefits of adaptation with the costs ex ante, i.e., within the framework of cost-benefit analysis (CBA). Though CBA has been widely criticized, it is a family of methods that can incorporate the risk-reducing benefits and the co-benefits of adaptation, i.e., the "triple dividend" (*14*). The latter is key, as in many cases the co-benefits of adaptation (e.g., carbon sequestration, income generation) can outweigh risk reduction benefits, especially if disasters do not materialize. The rigor of CBA, its flexibility to add new scientific insights, and its applicability across sectors can stimulate careful scrutiny of proposals and provides a framework within which questions of incommensurable value (i.e., cultural losses) and equity can be explored. Planning agencies, whether national or regional (i.e., for larger economies), are central to this, as they are well equipped to embed adaptation in a coherent fashion within long-term planning decisions. For instance, the Planning Institute of Jamaica has a mandate to mainstream adaptation into planning across the island's economy, as well as aligning and coordinating donor support for adaptation.

Fifth, structured monitoring of the benefits of adaptation ex post, in terms of avoided losses and co-benefits, is absent in almost all jurisdictions. Exceptions include those indicators included in the Sendai Framework for Disaster Risk Reduction, such as the availability of early warning systems. More rigorous metrics are needed to track the impacts of climate finance, evaluate value for money, promote learning, and establish ongoing adaptation needs. This, in turn, can refine ex ante assessments. Recent advances in high-frequency survey methods (e.g., phone surveys), remote-sensing data, and text-mining approaches can help build the evidence base for such a monitoring system. Establishing "impact observatories," which monitor a select number of high-risk places in a more continuous manner, can help improve our understanding of the complex interactions between adaptation and the daily lives of climate-vulnerable communities.

All five of the recommendations rely upon much strengthened capacity within governments, economic sectors, and communities. Building capacity for adaptation is a long-term program. It should be supported by global scientific endeavors to provide information on climate risks, the cost-effectiveness of adaptation options, and monitoring systems. Above all, it relies on skilled human capacity, which needs to be patiently built and retained within the governments and communities where it is most needed. Therefore, we urgently call for setting up a dedicated policy financing framework, ideally done jointly by the MDBs, to make the necessary first step in building this human capacity.

The fact that capacity building is a long-term program should not get in the way of early action. The economic investments that are taking place at the moment must be made resilient to climate change, simply because doing so upfront is a lot cheaper than retrofitting, or rebuilding, after a disaster. The climate finance that has already been committed needs to be turned into beneficial projects, without delay, using the tools that already exist, albeit imperfect. Above all, the rapid pace with which we observe increasing climate risks means that adaptation finance decisions still need to be made while we work to reorientate the adaptation finance system toward better outcomes. □

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SUPPLEMENTARY MATERIALS

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