

Climate change will increase local government fiscal stress in the United States

Climate hazards can compound existing stresses on the revenues and expenditures of local governments, revealing potential risks to fiscal stability. Incorporating these risks into local budgeting and strategic planning would encourage a more complete accounting of the benefits of climate adaptation and risk reduction efforts.

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The impacts of climate change are increasingly visible and threaten our wellbeing through complex pathways^{1,2}. One overlooked but critical route is the undermining of the fiscal health of local governments³. There is currently limited understanding of how climate changes may negatively alter the fiscal condition of local governments, and how public officials can best focus their resources to moderate these increasing risks. For local governments to continue to provide essential place-based public services, such as education, police and fire protection, and housing and community development, they need to manage the increasing risks of declines in certain sources of revenues and growing expenditure related to climate hazards, including emergency response, defensive expenditures and increased infrastructure operating costs. In

this Comment, we will use the United States as an example to highlight the consequences of climate risks for local government budgets and provide a forward-looking framework to anticipate the fiscal risks of climate change and identify the comprehensive budgetary benefits of adaptation efforts.

Local government budget pressures

One of the primary functions of governing bodies at the local level is to pass the annual or biennial operating budget. The operating budget — or appropriations budget — allocates resources among departments and gives local government officials the authority to incur obligations and pay expenses. Despite the central role they play in the provision of public services, the long-term fiscal outlook for local governments is poor, primarily as a result of growing health

care expenditures and unfunded pension liabilities⁴. According to the Government Accountability Office, over the next 50 years, state and local governments in the United States will face a fiscal gap — a difference between operating revenue and operating expenditures — of approximately 3.6% of gross domestic product; for subnational governments to maintain their current level of expenditures, they will need to raise revenues by approximately 4.2% each year⁴. This will be particularly challenging for local governments, which face limits to their taxing authority; for example, although the property tax is the single largest source of revenue for local governments, accounting for 72% of tax revenues on average, 44 states place constraints on the ability of local governments to increase property tax revenue⁵. These non-climate budget

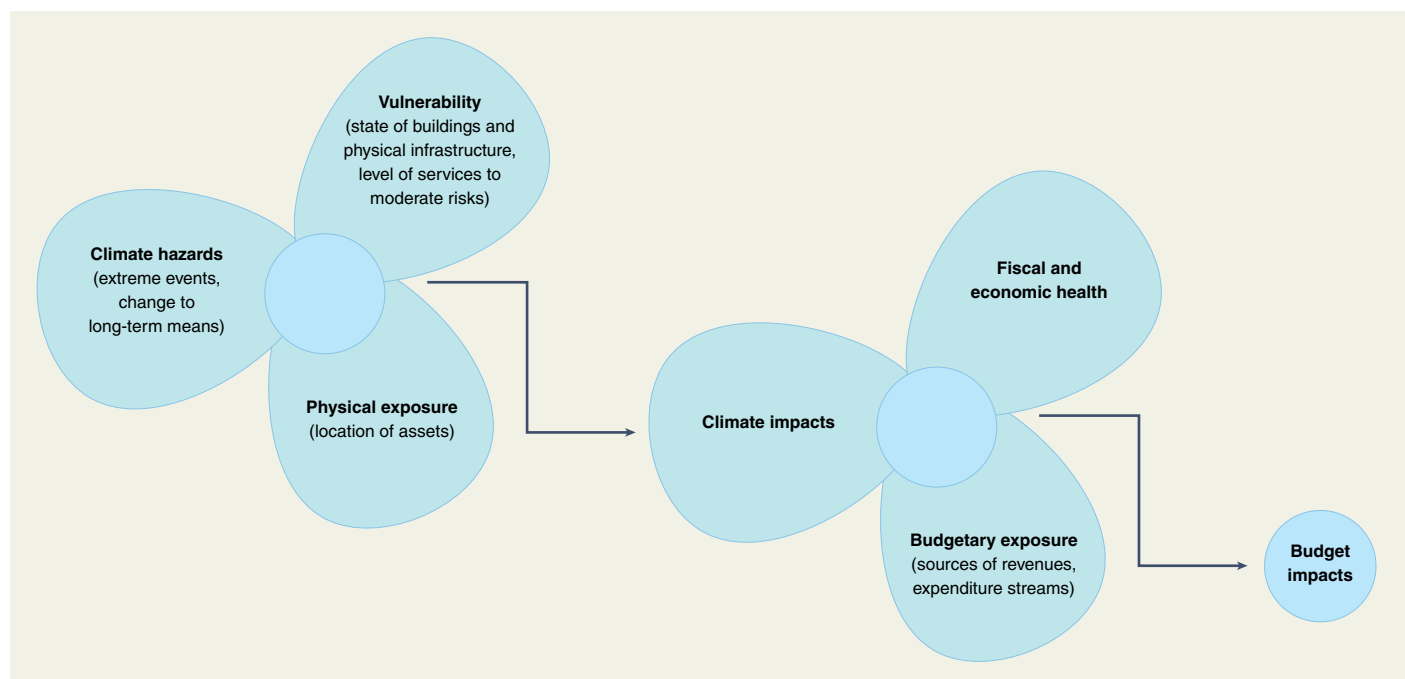


Fig. 1 | The intersection of physical risks that arise from climate hazards are translated into budget impacts through the exposure in the budget and the fiscal health of a locality. The figure represents a high-level model of the relationship between climate hazards and budget impacts.

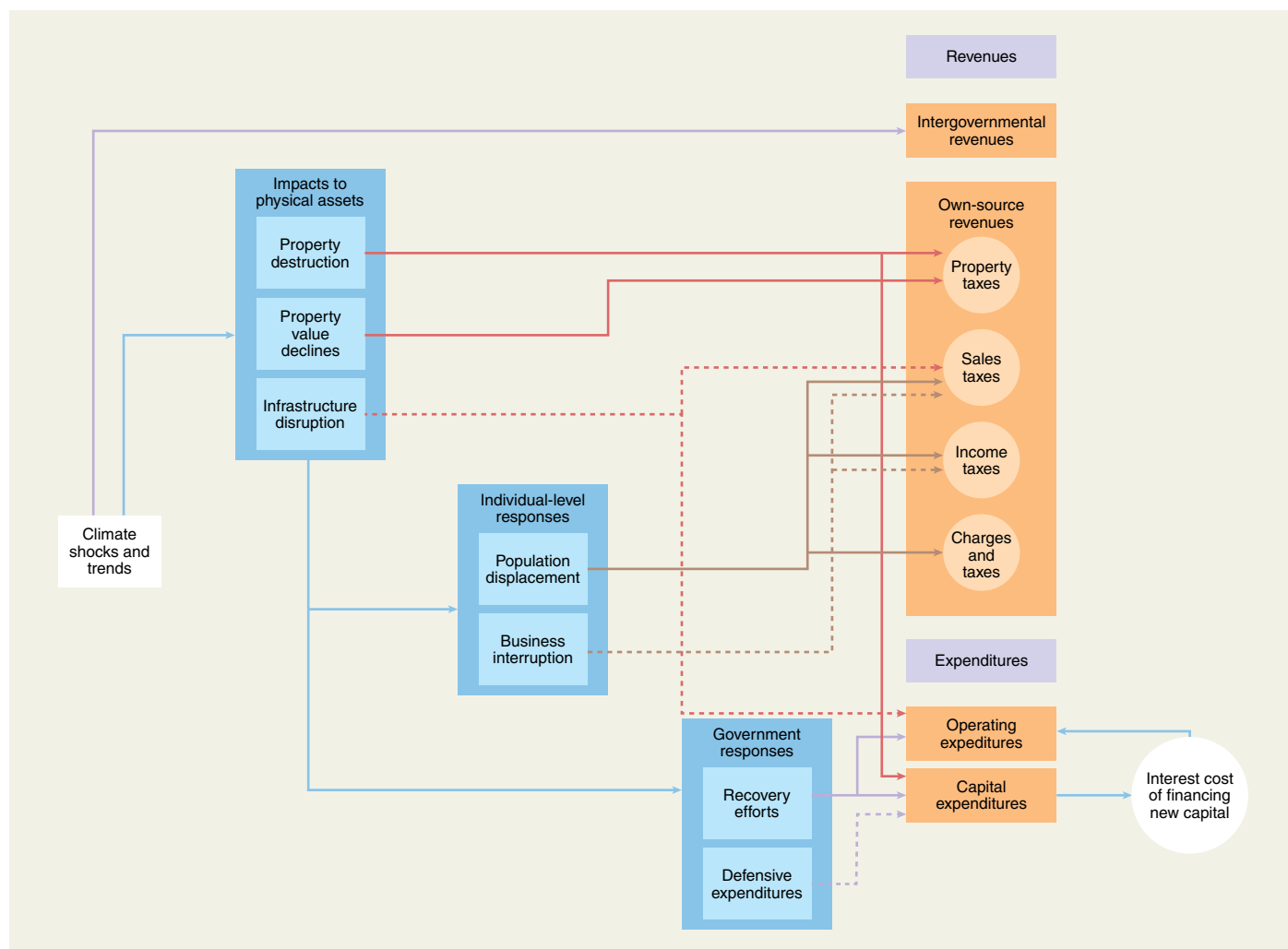


Fig. 2 | Pathways by which climate shocks and trends affect specific categories of revenues and expenditures in the budget. We classify the consequences from climate shocks and trends into three groups: impacts to physical assets, individual-level responses and government responses.

pressures are already threatening the ability of local governments to provide services.

Compounding climate risks

Climate hazards will stress local budgets following the intersection of hazard, exposure and vulnerability, drawing on the IPCC framework⁹ (Fig. 1). In the first propeller, climate impacts with potential fiscal consequences emerge primarily through interactions with the physical and social infrastructure that underpins local economic activity. Climate hazards from shocks, such as hurricanes and wildfires, and long-term trends, such as drought and sea-level rise, interact with exposure (assets at risk) and existing vulnerabilities. For example, physical exposure includes whether properties are concentrated in the floodplain or in areas at higher risk of wildfires. The physical vulnerability of a region is a function of the state of its building

practices and infrastructure, which is itself determined in part by prior protective actions or climate adaptation.

The second propeller shows how these climate impacts are then experienced through a fiscal and budgetary lens. Budgetary exposure captures risks to the overall budget, as well as the level of diversification in revenue streams and the capacity to shift the revenue portfolio in the short-term. The government's fiscal and economic health mediates the risks to the budget as these conditions underpin the capacity to respond in the short-term. These budget impacts may be modified through spending on adaptation, which would reduce the climate impacts, but at some cost that may or may not be larger than the avoided budget impacts.

Multiple pathways to fiscal stress

We now elaborate the pathways by which climate shocks and trends affect specific

categories of revenues and expenditures through the impacts on physical assets and responses by individuals and government (Fig. 2). Evidence is emerging that there may be substantial budgetary pressures from climate hazards, affecting both revenue streams through changes in housing stock and losses of economic activity, as well as expenditures^{6,7}. Impacts to physical assets occur when property is damaged or destroyed; when the value of existing property declines as it becomes more difficult to insure, and as the surrounding neighbourhood loses amenities; and when critical infrastructure, such as transportation, electricity or water treatment facilities, is damaged or disrupted. Individuals' responses to these physical impacts include changes to their buildings or relocation, either temporary or permanent. Businesses are also impacted, leading to interruption of business

operations due to damage or loss of water or electricity, or because employees or customers are impacted. In the extreme, businesses may shutdown permanently or relocate. All of these pathways can lead to short-term or more permanent declines in various revenue sources. Additionally, governments are increasing expenditures for response to extreme weather events, primarily for emergency services, as well as chronic stresses with ongoing or cumulative impacts.

Local governments must also be prepared to invest in climate adaptation. This may require a major shift in budgetary allocations. However, unlike the costs described above, these expenditures will lead to improved fiscal health in the future. Local governments currently spend a very small portion of their budgets on climate-related defensive expenditures. In previous work, we showed how challenging it can be to identify these expenditures in budgets as climate-related expenditures are obscured by existing categories³. An indication of this gap can be found in the Census of Governments, where it is reported that only 15% of local governments in the United States spent any money at all on the category of 'natural resources' in 2017, which encompasses "flood control, soil and water conservation, drainage, forestry and forest fire protection, agricultural fairs, and any other activities for promotion of agriculture and conservation of natural resources"⁸. Adaptation spending also goes far beyond this category and will often manifest as increases or changes to the allocation or use of other spending categories. Tracing all the budgetary risks from climate hazards, while a difficult task, highlights larger benefits from adaptation spending.

Although we focus primarily on own-source revenues (that is, those revenues that a government is able to raise from sources that it collects independently), an important source of revenue for local governments in the wake of climate extremes is assistance from higher-level governments, as well as federal granting programmes for adaptation or risk reduction investments. When local governments

receive federal or state appropriations, the longer-term fiscal impact of the disaster is significantly reduced. Nonetheless, there is a great deal of uncertainty regarding the future reach and scope of such governmental transfers.

Fiscal resilience and climate change

Despite the mounting body of research on the consequences of climate change, climate risks remain insufficiently internalized in planning and budgeting at the local level. We offer the following recommendations to local government administrators:

- (1) Investment in adaptation is key to fiscal resilience. Even governments with healthy balance sheets and credit ratings will find themselves in precarious positions if they do not pre-emptively invest in risk reduction and upgrading of infrastructure. This 'spending' will result in large savings by reducing both direct and indirect economic impacts over the long-term (for example, see ref.¹⁰).
- (2) All capital spending should be informed by climate projections (for example, see ref.¹¹). This serves to more closely link budgetary decision-making and climate risks, and to account for avoided costs in the cost-benefit and financial analysis of investments.
- (3) Local governments must establish new long-term strategic planning approaches for meeting climate challenges. These strategic plans could include elements of 'disaster' budgeting, for example, setting aside reserves for extreme weather events, and planning for transition to an alternative budget model in which a share of the operating budget is more permanently devoted to defensive expenditures consistent with the expected risks.

Without a plan to coordinate climate projections and the operating budget, not to mention insulate revenues from climate risk, local governments may find themselves responding to climate shocks in an ad hoc manner that quickly leads to cascading deficits. More hopefully, at the local level,

budgets not only allocate scarce resources and coordinate action among different units of government, but they also serve as a reflection of a community's goals, values and priorities. Thus, local budgets could function as a key arena for citizens to undertake climate action in line with their other priorities. □

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Competing interests

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