ENVIRONMENTAL RESEARCH
CLIMATE

PURPOSE-LED PUBLISHING™ Part of the ENVIRONMENTAL RESEARCH SERIES

PERSPECTIVE • **OPEN ACCESS**

Centering equity and sustainability in climate adaptation funding

To cite this article: Nina Berlin Rubin *et al* 2023 *Environ. Res.: Climate* **2** 033001

ENVIRONMENTAL RESEARCH
CLIMATE

OPEN ACCESS

RECEIVED
15 February 2023

REVISED
2 June 2023

ACCEPTED FOR PUBLICATION
4 July 2023

PUBLISHED
18 July 2023

PERSPECTIVE

Centering equity and sustainability in climate adaptation funding

Nina Berlin Rubin[1], **Erica Rose Bower**[2], **Natalie Herbert**[1], **Bianca S Santos**[2] and **Gabrielle Wong-Parodi**[1,3,4,*]

[1] Department of Earth System Science, Stanford Doerr School of Sustainability, Stanford University, Stanford, CA, United States of America
[2] Emmett Interdisciplinary Program in Environment and Resources, Stanford Doerr School of Sustainability, Stanford University, Stanford, CA, United States of America
[3] Woods Institute for the Environment, Stanford Doerr School of Sustainability, Stanford University, Stanford, CA, United States of America
[4] Environmental Behavioral Sciences, Stanford Doerr School of Sustainability, Stanford University, Stanford, CA, United States of America
[*] Author to whom any correspondence should be addressed.

E-mail: gwongpar@stanford.edu

Keywords: climate change, adaptation, funding, frontline communities, equity

Abstract

Climate change poses a growing threat to the lives and livelihoods of more than three billion people living in highly vulnerable areas. Despite recent financing designated for climate adaptation, current support is only a fraction of what is needed and lags behind the accelerating pace of climate impacts. To achieve equitable and sustainable adaptation, we propose four evidence-based guidelines for funding and developing adaptation projects: uphold community autonomy, be transformative, avoid maladaptation, and integrate across sectors. Upholding community autonomy prioritizes bottom-up approaches that support local engagement and decision-making. Being transformative involves funding nonlinear proposals and developing novel funding mechanisms in order to shift away from incremental change. Avoiding maladaptation means ensuring that adaptation projects are proactive, flexible, and supportive of natural ecosystem services to prevent increasing vulnerability and exposure to climate impacts. Integrating across sectors involves addressing the intersections between human and environmental systems and using multiple sources of knowledge when developing projects. We illustrate these guidelines in action by exploring these principles in the context of adaptation to coastal hazards. By adopting these guidelines, funding for climate adaptation can support frontline communities facing the most severe consequences of climate change and address some of the underlying conditions that contribute to vulnerability, delivering broader societal benefits.

1. Introduction

More than 3.3 billion people live in areas highly vulnerable to climate change [1]. Without adequate support for climate adaptation, they face the growing threats of sea-level rise, extreme storms, wildfires and wildfire smoke, heatwaves, and more [1]. The window for action to minimize the impacts on lives and livelihoods is closing [2]. Recent climate adaptation funding agreements signal growing support for frontline communities: the socially and institutionally marginalized, low-resource groups that face disproportionate impacts of climate change [3]. These populations tend to be low-income or racial and ethnic minority communities, at least in part due to historic and enduring injustices [3, 4]. In the United States, the Inflation Reduction Act enacted in August 2022 allocates more than $3 billion to enhance preparation, adaptation, and resilience to weather and climate events, and another $3 billion in block grants to community-led projects in frontline communities. This commitment comes on the heels of a $50 billion investment in climate resilience initiatives as part of the 2021 Bipartisan Infrastructure Law [5], and a pledge that 40% of the benefits from such legislation should flow to disadvantaged communities as a result of Executive Order

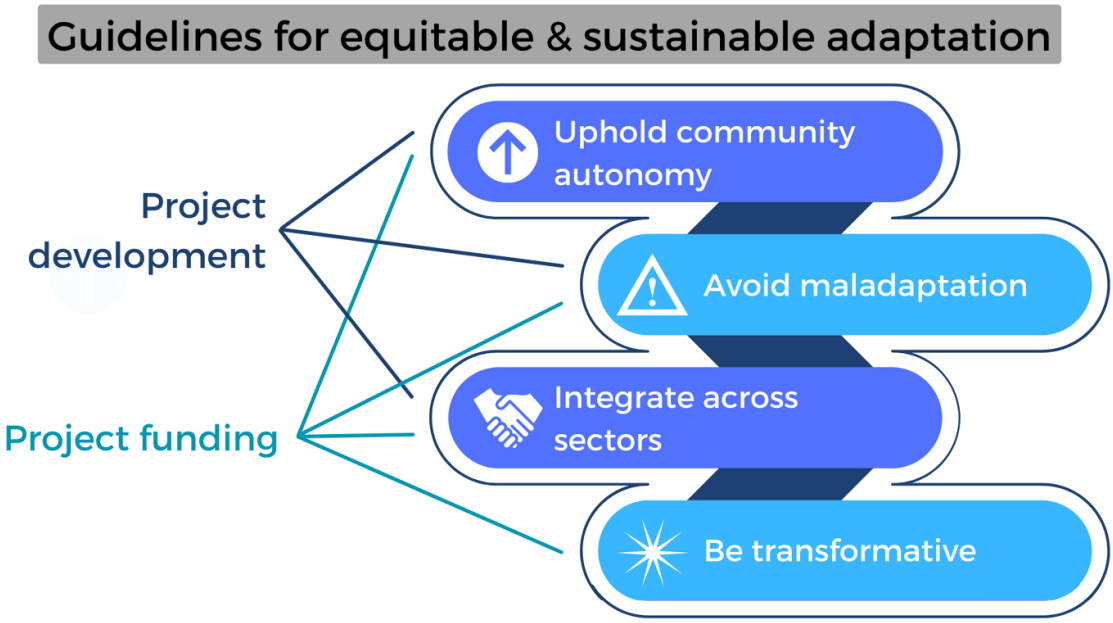

Figure 1. Four guidelines (right) to promote the principles of equity and sustainability in climate adaptation funding, and the stages in which they may be applied for climate adaptation (project funding and project development).

14008 [6]. Internationally, nations at the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change in November 2022 agreed on a 'loss and damage' fund for the highest carbon-emitting countries to compensate nations suffering the greatest climate impacts, though how this fund will be operationalized has not been determined. This period between the allotment of adaptation financing and its implementation provides an opportunity to critically consider which adaptation strategies are most effective in reducing climate impacts and which communities should be prioritized for investment.

While these investments in adaptation financing are meaningful, they lag behind the accelerating pace of climate impacts. Current funding provides only one-tenth of the support needed for adaptation [2], despite the fact that, even in an economic sense, adaptation is typically less costly than recovery ($1 invested in adaptation could generate $2-10 in net economic benefits) [7]. Climate adaptation has the potential to yield triple the benefits by preventing future losses, promoting economic growth through innovation in specific areas where growth is needed, and providing social and environmental improvements [7]. Successful adaptation mitigates the harms of climate impacts to human systems [2], avoids maladaptation (when measures increase exposure and vulnerability to climate impacts) [8], and, perhaps most challengingly, simultaneously strives to address the underlying social conditions that make certain populations vulnerable to climate impacts. To achieve this, calls for proposals and chosen projects must be equitable and sustainable. First, adaptation funding must be equitable by serving frontline communities who 'bear the burden of hazards first, most, and for the longest' [3, p 48]. Prioritizing investment in these communities is not only justified by normative considerations, but also given the potential for an equitable return on investment that ultimately pays dividends across society [4]. Second, projects must be sustainable, both in terms of the longevity of the adaptation strategy's effectiveness and in terms of human behavior. Well-meaning but ill-conceived or poorly developed projects may fail to adequately protect populations on a longer time scale and create inadvertent impacts when local contexts and the intersections between human and environmental systems are not taken into account [8, 9]. Therefore, we propose four evidence-based guidelines (figure 1) when funding and developing adaptation projects: (1) uphold community autonomy, (2) be transformative, (3) avoid maladaptation, and (4) integrate across sectors. We consider the concrete case of coastal hazards to assess these considerations in action.

2. Guidelines for equitable and sustainable adaptation

2.1. Uphold community autonomy

Adaptation funding should prioritize bottom-up approaches that support community autonomy, with local representatives leading decisions about whether, what, where, when, and how adaptation occurs [10]. Top-down initiatives with prescriptive recommendations from external actors (e.g., governments and non-governmental organizations) may be perceived as more efficient, however evidence suggests that

community-initiated and led projects are more attuned to local 'conditions, needs, values and norms', and therefore are ultimately more effective at reducing hazard risk [10, p 213]. When communities have autonomy, they can iterate on existing adaptation ideas based on local or traditional knowledge, innovate new ideas aligned with local needs, and selectively adopt and modify these solutions. Evidence from the Pacific suggests that autonomy leads to increased ownership and projects that tend to be more sustainable over time [11]. Community-led adaptation may be limited in success when there are insufficient financial and human resources and when the focus is on speed rather than time-intensive relationship-building between funders and communities or between communities themselves. Therefore, governments and other development actors should focus on upholding conditions for community autonomy through funding the (a) iterative process of adopting, innovating, and modifying solutions; (b) sustainability of community-selected solutions; and (c) opportunities for relationship-building and horizontal transmission of lessons learned between similar communities [3]. Additionally, (d) setting up and funding community advisory boards, where community members are paid and granted voting rights, can ensure local representatives are meaningfully and inclusively involved. For example, the San Francisco Bay Conservation and Development Commission uses community advisory boards to develop guidelines for coastal adaptation planning, which provide input on issues ranging from racial equity to zoning requirements. These efforts align with environmental justice movements in the United States and global initiatives that focus adaptation funding on justice and human rights considerations. Upholding community autonomy requires consistent attention to ensure that community voices are included continuously throughout the decision-making process.

2.2. Be transformative

Scientific research and adaptation funding processes have become increasingly risk-averse and incremental over time [12]. Grant applicants are often asked to list past funding successes and explain how proposed funds will complement ongoing work in ways that privilege slow progress. This traditional approach can prevent new applicants and novel ideas from being funded, thereby limiting the potential for transformative change [13]. Being transformative in science and adaptation requires nonlinear and novel proposals and funding mechanisms that may involve more risk, but also have the potential for more equitable and sustainable success. Transforming project selection may include a community searching process, by which relevant communities who are unaware of funding or climate risks are contacted and supported to develop community-led efforts. Such processes may find 'riskier' investments (e.g., communities without demonstrated grant success), but the risk of project failure can be managed and reduced by a deeper investment in co-production. Funders can support communities in defining projects with transformative potential by demonstrating necessity and urgency, understanding that often the status quo is the most risky for frontline communities. Essential maintenance and development projects (e.g., green infrastructure, drainage systems) should also be considered under this transformative funding selection process. These types of projects—though they may be smaller and less likely to capture public attention—are crucial for the long-term sustainability and well-being of frontline communities, yet are often underfunded in disadvantaged areas [2]. It is critical to provide support for these types of projects where the groundwork for transformative change has not been laid to comprehensively respond to the diverse needs of these communities. In terms of the funding process, transformative thinking includes reconsidering how grants are administered given the resource constraints faced by frontline communities that may lack traditional grant application and management infrastructure. To support long-term sustainability, grants can provide administrative support to increase adaptive capacity (e.g., having local, trained personnel to carry on efforts post-funding cycle) and to help develop mechanisms to improve monitoring and evaluation. Funding mechanisms such as 'pass-through' models within established programs like the U.S. Environmental Protection Agency's Environmental Justice Small Grants Program offer promising possibilities to fund communities that decrease both the burden for applying and the lag time from award to project start. These types of approaches could inform the implementation of current and future adaptation funding agreements, providing a framework to achieve more transformative, just adaptation.

2.3. Avoid maladaptation

Maladaptation can result from top-down, short-sighted adaptation planning approaches. It occurs when vulnerability is transferred to other populations, when adaptation measures create negative externalities, or when the onset of impacts is merely delayed rather than mitigated [8]. This presents the problem of being both a waste of resources—as measures are unsuccessful in effectively reducing net risk—and a disservice to frontline communities by producing additional challenges to be dealt with. For example, wealthy donor countries often finance the construction of seawalls as a coastal protection measure in Pacific Island Countries to address coastal hazards like flooding and erosion, despite the fact that seawalls have been shown

to be largely ineffective in reducing risk and potentially maladaptive [8, 9]. A study following the construction of seawalls in Fiji found that the seawalls not only inadequately protected the villages from flooding, but actually trapped water in the community, which had cascading economic impacts [9]. In addition, seawalls may provide a deceptive sense of protection that encourages continued habitation in areas that may become uninhabitable due to sea-level rise [8] and may degrade coastal ecosystems, reducing the resilience of these environments to storms [9]. To avoid maladaptation, future funding selection and project implementation must be proactive, taking into account future climate risks and uncertainty, anticipating cascading risks, remaining flexible for future adjustments, and maintaining the supportive role of natural ecosystems in buffering risks [14]. More large-scale, transdisciplinary empirical research is needed to better understand the downstream implications of adaptation strategies and to identify proactive measures that can be successfully implemented in partnership with communities [14]. On-the-ground assessment of the in situ and displaced effects of adaptation strategies is necessary to determine what type of measures would more effectively address long-term, cross-sectoral concerns. Aligning with the guidelines discussed earlier, such as upholding community autonomy and aiming to be transformative, may help mitigate the risk of maladaptation, as voices from the communities affected are often best positioned to identify the externalities and human costs associated with a given adaptation strategy.

2.4. Integrate across sectors

Climate change poses complex social and environmental challenges, and more research is needed to inform the selection and development of climate adaptation projects. However, research typically focuses on individual climate impacts, and interdisciplinary research is consistently less likely to be funded than disciplinary research [15]. Moreover, a lack of cross-sectoral collaboration in adaptation planning can result in ineffective, siloed strategies that are difficult to implement and that may produce behaviorally-unrealistic solutions. It is necessary to ensure that adaptation funding and research prioritize cross-sectoral approaches to focus on strategies that are sustainable rather than temporary fixes for current issues. Funders should select research proposals using a transdisciplinary, systems-approach to sustainability where tools and expertise from diverse branches of knowledge are incorporated. Research plans should include integrated assessments of climate impacts that consider its social, political, economic, and natural dimensions, as well as active engagement and participation from frontline communities, such as through co-production and the use of participatory action research methodologies. For example, the National Academies Gulf Research Program's offshore energy program not only strives to advance our scientific understanding of the ecological impacts of energy exploration, development, and storage, but also aims to assess its impacts on community health and the economy. This integrated approach is rooted within the funding organization's strategic planning and prioritizes collaboration across industry, policymakers, scientists, and community stakeholders at all levels of education and expertise [16]. Funding agencies should call for projects that are fundamentally focused on integrated and action-oriented solutions to more fully, effectively, and sustainably address climate change and its impacts on communities.

3. Conclusion

Climate change is a present reality disproportionately impacting marginalized and vulnerable communities worldwide. The need for effective climate adaptation is urgent, and with limited funding available, we must make every dollar count. We have a moral responsibility to ensure funding is used not just to avoid future losses, but also to deliver social benefits and address the foundations of vulnerability to future losses. To achieve this, we propose four guidelines for adaptation funding to shape how the research-policy interface approaches adaptation, and to ensure that funding is directed equitably while measures are implemented sustainably. The guidelines here do not offer a comprehensive list of how to avoid pitfalls in adaptation, as much empirical research is needed to answer remaining questions on effective adaptation.

Data availability statement

The data that support the findings of this study are available upon reasonable request from the authors.

Acknowledgments

We thank members of the Behavioral Decisions and the Environment Group at Stanford University for a discussion that inspired this article.

Funding

Stanford University (graduate funding to N B R, E R B, B S)
Stanford University (start-up grant to G W P).

ORCID iDs

Nina Berlin Rubin https://orcid.org/0000-0002-0810-6155
Erica Rose Bower https://orcid.org/0000-0002-3437-6300
Natalie Herbert https://orcid.org/0000-0003-3172-950X
Bianca S Santos https://orcid.org/0000-0002-1293-8149
Gabrielle Wong-Parodi https://orcid.org/0000-0001-5207-7489

References

[1] IPCC 2022 *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* ed H -O Pörtner *et al* (Cambridge University Press) pp 3–33
[2] United Nations Environment Programme 2022 Too little, too slow—climate adaptation failure puts world at risk Adaptation Gap Report 2022 (available at: www.unep.org/adaptation-gap-report-2022)
[3] Sanders M C 2021 Equity in addressing climate change: using law and policy to serve frontline communities *Traumatology* **27** 48–51
[4] EPA 2021 Climate change and social vulnerability in the United States: a focus on six impacts Report No.: EPA 430-R-21-003 (U.S. Environmental Protection Agency)
[5] The White House 2021 The bipartisan infrastructure law advances environmental justice (available at: www.whitehouse.gov/briefing-room/statements-releases/2021/11/16/the-bipartisan-infrastructure-law-advances-environmental-justice/)
[6] White House 2021 Exec. Order No. 14008: tackling the climate crisis at home and abroad Federal Register 86 No. 19 (available at: www.energy.gov/sites/default/files/2021/02/f83/eo-14008-tackling-climate-crisis-home-abroad.pdf)
[7] Global Commission on Adaptation 2019 *Adapt Now: A Global Call for Leadership on Climate Resilience* (World Resources Institute)
[8] Schipper ELF 2020 Maladaptation: when adaptation to climate change goes very wrong *One Earth* **3** 409–14
[9] Piggott-McKellar A E, Nunn P D, McNamara K E and Sekinini S T 2020 Dam(n) seawalls: a case of climate change maladaptation in Fiji *Managing Climate Change Adaptation in the Pacific Region* (*Climate Change Management*) ed W Leal Filho (Springer International Publishing) pp 69–84
[10] Pisor A C *et al* 2022 Effective climate change adaptation means supporting community autonomy *Nat. Clim. Change* **12** 213–5
[11] McNamara K E *et al* 2020 An assessment of community-based adaptation initiatives in the Pacific Islands *Nat. Clim. Change* **10** 628–39
[12] Park M, Leahey E and Funk R J 2023 Papers and patents are becoming less disruptive over time *Nature* **613** 138–44
[13] Wilson R S, Herziger A, Hamilton M and Brooks J S 2020 From incremental to transformative adaptation in individual responses to climate-exacerbated hazards *Nat. Clim. Change* **10** 200–8
[14] Magnan A K, Schipper E L F, Burkett M, Bharwani S, Burton I, Eriksen S, Gemenne F, Schaar J and Ziervogel G 2016 Addressing the risk of maladaptation to climate change *WIREs Clim. Change* **7** 646–65
[15] Bromham L, Dinnage R and Hua X 2016 Interdisciplinary research has consistently lower funding success *Nature* **534** 684–7
[16] Entwisle B and Melillo J 2020 *Gulf Research Program: 2020-2024 Strategic Plan* National Academy of Sciences (available at: https://nap.nationalacademies.org/read/25959/chapter/4)