# Effective climate change adaptation means supporting community autonomy

Communities want to determine their own climate change adaptation strategies, and scientists and decision-makers should listen to them — both the equity and efficacy of climate change adaptation depend on it. We outline key lessons researchers and development actors can take to support communities and learn from them.

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At COP26, high-income nations pledged hundreds of billions of dollars for adaptation projects in low-income countries. Even if these pledges are realized, however, this money represents a tiny fraction of the amount needed to reach global targets, leaving open the question as to what projects will actually be funded. While scientists have yet to agree on what kinds of adaptation are the most effective at reducing risk[1], much less what climate change adaptation actually means[2], communities on the frontlines of climate change want to take the lead in choosing their own adaptive strategies[3]. Supporting their autonomy is important not just for equity: the very effectiveness of climate change adaptation depends on it.

When people refer to climate change adaptation, they are loosely referring to change — for example, behavioural, social or economic — meant to reduce risk in response to, or in anticipation of, climate change[4]. Under this broad definition, adaptation can be a process, an outcome or both. It can take place at the individual, community, regional or national levels[1]. Funding can thus be allocated at any scale, and funders may emphasize top-down initiatives, in which outside entities help communities identify vulnerabilities and then offer prescriptive solutions; bottom-up initiatives sometimes called community-based[5] or autonomous adaptation[6]; or initiatives that blend both.

'Development actors' — for example, governmental and non-governmental organizations, businesses and consultants — often prefer to fund initiatives that are more top down than bottom up because of perceived advantages in speed, control and efficiency[7]. Indeed, elements of top-down design can be important when local and national governments need to coordinate[1], for example, or when a climate event devastates several neighbouring communities[2]. However, the effectiveness of climate change adaptation depends on community participation. Communities on the frontlines — who are often rural, Indigenous and/or poor — have existing adaptations to climate and ideas for new ones[2,7,8]. These innovations increase diversity, the driving force of adaptation, widening the state space of potential solutions to learn from and that other communities may wish to adopt[2]. Adaptation also means enabling communities to experiment with these candidate solutions, modify them as needed and transmit those that work[2]. The solutions that emerge are more likely to reduce risk[2,7,9] because they better match local conditions, needs, values and norms[5,10].

Researchers and development actors can do things differently, to better support communities and learn from them. The first step is to recognize that communities have been responding to climate change for a long time. Past climate change has shaped human evolution and, thus, many of the adaptations we have today, from the physical and physiological to the cultural[4]. Cultural adaptation is in fact what most people mean by 'climate change adaptation' — after all, spreading behavioural, social and economic change requires culture — and cultural adaptation to a changing climate has a long history[4], with lessons to be learnt from archaeology and oral traditions[11]. In Southwest Madagascar, for example, elders relate how over the past 2,000 years, their ancestors used mobility, social connections and diversified methods of food production to respond to climate change; these strategies are reflected in archaeological artefacts and even remote-sensing data, which indicate patterns of past settlement[11].

The long history of human adaptation to climate change reminds us that transformative adaptations need not be completely novel practices that change existing values and norms (compare with ref. [1]). Often, communities can experiment with past responses they or others used successfully and adjust as needed[2] (Fig. 1). As an example, Tlingit communities in Alaska and western Canada have a history of adaptive responses to abrupt sea-level rise, the rapid movement of glaciers and ice-dam floods. Contemporary Tlingit leaders cherish these adaptations — many inspired by their worldmaker-culture hero, Raven — for their relevance to an ever-changing climate.

However, not all communities can draw on their past responses to climate change today. In some cases, the transmission of cultural knowledge about past responses has been disrupted — swamped by new ideas from urban areas[2]; degraded, diluted or undermined by colonial or occupying efforts[11]; or displaced by the introduction of top-down adaptations by non-local actors[6,8,11,12]. This can undercut community members' perceptions of their ability to adapt[13]. Development actors should be careful not to disrupt the transmission of cultural knowledge through top-down interventions (Fig. 1), lest these interventions prevent transmission altogether[8].

Instead, development actors should enable communities to choose their responses to the contemporary, human-made climate emergency. Because rapid responses that efficiently use public or donor funds are important[1], it may be tempting to seed top-down candidate adaptations: these can be deployed quickly and often perform well in benefit–cost calculations, which can heavily discount future payoffs[6]. However, if these candidate adaptations are not sustained, even in modified form, by community members, the speed and financial efficiency are wasted[10]. Candidate adaptations that emerge locally, or that community members help design or

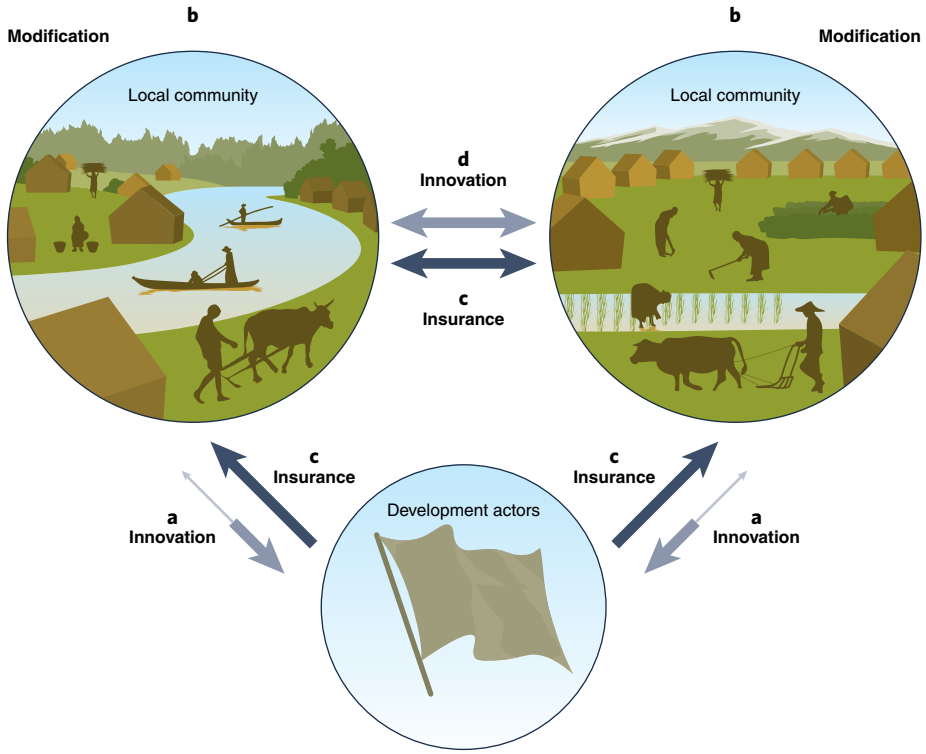


**Fig. 1 | An illustration of our major points. a–d**, Development actors should: be careful not to crowd-out the transmission of local knowledge with top-down solutions and be open to learning about candidate adaptations (**a**; the asymmetric, grey arrows); enable communities to experiment with and modify candidate adaptations by removing barriers to experimentation and funding the solutions they choose (**b**); provide or support 'insurance' (for example, micro-insurance, universal basic income) to buffer experimentation (**c**, blue arrows); and foster horizontal connections between communities, which facilitate the selective adoption and the 'scaling out' of candidate adaptations (**d**, grey arrow between communities).

choose (for example, ref. [12]), are more likely to be adopted and sustained[9] and are more likely to work within existing institutional frameworks, which can be difficult to modify[9,11,14]. For example, under Namibian law, local communities can create their own self-governing boards and constitutions for wildlife conservancy; communities then repurpose these institutions for managing their land rights and collaborating with non-governmental organizations on sustainability projects.

Further, the climate emergency itself underscores why we need cultural continuity (for example, ref. [8]). Contrary to calls for letting experts choose adaptations in the face of the emergency[15], more candidate adaptations mean more variability in potential effectiveness — which means more options on the 'very effective' end of the distribution[2,15] (Fig. 1). Data from the Pacific Islands highlight this variability: locally led community-based adaptation varied in its persistence, but tended to be more sustainable than top-down approaches[9].

For communities to find solutions that work best for them, they must be able to generate or selectively adopt ideas and try them out, modifying them as needed and filtering out those that do not match local conditions, needs, values and norms[2,9] (Fig. 1). For example, the Miami-Dade County, Florida Sea Level Rise Strategy encourages neighbourhoods to reflect on their priorities and to try solutions such as elevating structures, densifying on high ground and expanding waterfront parks. Modification and selective retention create feedbacks between previous and current conditions, again underscoring the importance of not interrupting the accumulation and transmission of local knowledge[8].

To enable communities to develop or choose their responses, development actors must first minimize constraints to experimentation[14] — for example, by minimizing rules and bureaucracy and eliminating barriers to self-authorized management[2,8]. For communities such as pastoralists, foragers and fishers that traditionally rely on mobility as an adaptation to climate, minimizing constraints may involve meaningful return of land or resource-use rights[16]. Such return of rights can bolster community members' perceptions of their ability to adapt[13].

Second, development actors should provide the 'insurance' that enables communities to take risks and try out candidate adaptations (Fig. 1). Communities can participate in between-community risk-pooling that promotes resilience — like paying a small, subsidized premium to a micro-insurance scheme, which pays out if an adaptation fails during a climate event[17]. Alternatively, universal basic income is especially effective at buffering risk, for example, in farming, which can encourage experimentation[18].

Third, development actors can fund the adaptations community members develop or choose[8]. Taken together, these three actions can bolster equity in who gets to decide how communities respond[5,8,11,12], community members' perceptions of their ability to respond[13] and, potentially, the overall effectiveness of climate change adaptations.

However, it is not enough to foster innovation: researchers and development actors should support opportunities for transmission — for communities to learn from one another through direct communication[4,8,14] (Fig. 1). For example, pastoralists in the Far North Region in Cameroon learn about environmental variability by observing and communicating with one another[16]; linkages like these, including horizontal linkages between communities, permit the cultural evolution of climate change adaptations[2,14].

Horizontal linkages can enable the 'scaling out' of solutions to the regional or even the global scale[1]. For example, Mexican fishing cooperatives are nested in federations of cooperatives; when one cooperative generates an innovation that works, the federation transmits the innovation to other member cooperatives and may relay it at assemblies of federations, such that successful experiments can be adopted regionally and beyond. Through horizontal linkages and the self-determination outlined above, solutions that work well can thus increase in frequency, and adaptations may be modified as they are transmitted to better fit local conditions, needs, values and norms[2].

This process — of innovation, modification, selective retention and transmission — should remind us that adaptation is continuous and contingent with no obvious endgame[4]. When a candidate climate change adaptation fails to work as expected, instead of despairing that we are running out of time, we must

acknowledge that failure is a crucial component of adaptation. As was true in the past, climate change adaptation today will require imagination, experimentation (including that resulting in failure) and self-determination[2,7].

Researchers and development actors should anticipate that adaptations will morph as the climate continues to change[8] and should support communities as they pivot to another candidate solution. Sometimes this may involve meeting communities in the middle, working with them to design solutions that draw on traditional institutions to meet contemporary demands[5,6].

In summary, even if climate change is happening faster now than it has since the Pleistocene[4], the effects of the climate emergency are not so novel that researchers and development actors need to supplant the cultural innovation, modification and borrowing that happens within and between communities. That said, communities may need enabling support to adapt. This is exactly what many stakeholders argued for at COP26: enabling support for adaptation and respect for their experience, knowledge and ideas. To provide this support, development actors should minimize constraints to experimentation, provide 'insurance', fund locally emergent solutions, foster horizontal linkages and support communities as they modify existing solutions to respond to ongoing change. We may find that communities do not need to be led towards adaptation, but only need the autonomy to take the lead in their own futures. ❐

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## Competing interests

The authors declare no competing interests.