

COMMENT

ENERGY Better than big new dams is a mix of small ones with solar and wind **p.330**

BIOETHICS When we cheat death and redo birth, our story shifts **p.333**



ZOOLOGY Empire-building bird board game is beautiful and useful **p.334**

CONSERVATION EU must outlaw ivory trading, before its laxity undermines other bans **p.336**

YASUYOSHI CHIBA/AFP/GETTY



A family shelters from the rain in Mozambique after Cyclone Idai.

Put equity first in climate adaptation

Focusing on the bottom few per cent, not averages, is the best way to tackle poverty, argue **Mark Pelling** and **Matthias Garschagen**.

In September, the United Nations will set out a global agenda for helping communities adapt to climate change through the framework of the Sustainable Development Goals (SDGs). As nations draw up their strategies, we call on them to put equity first.

Poor people face a double burden of inequality — from uneven development

and climate change. In Mozambique, for example, two-thirds of the population lives in extreme poverty, on less than US\$1.9 per day. In March, the nation was hit by Cyclone Idai, followed by Cyclone Kenneth in April. Idai alone killed 1,000 people and left 3 million in need of help. Most were in poor, isolated rural communities and coastal settlements that were cut off from emergency responses.

People on extremely low incomes often live along coasts and riversides that are prone to flooding, and in other exposed areas. In Nigeria, the poorest 20% are 50% more likely to lose their lives, assets, livelihoods or health in a flood than the average Nigerian¹. They are also 130% more likely to be affected by a drought, and 80% more likely to be affected by a heatwave. ►

► Global supply chains spread the impacts of unusual weather in one place to people far away. For example, food riots erupted across 14 African countries when drought slashed wheat yields in Australia, the United States, Russia and the Ukraine in 2007–08, doubling the prices of some commodities².

Those living just above the poverty line will also be badly hit as the world warms. For example, many farmers in coastal parts of Bangladesh have had to abandon their land owing to regular flooding. They are moving to cities, where they find it hard to make a living. If current climate and development trends continue, then by 2030, tens of millions of people will join the 736 million now living in extreme poverty¹.

More of the same kind of development is not the answer. Building infrastructure that ignores local population needs and creating low-skilled jobs perpetuates old patterns that concentrate land, capital and resources in the hands of a few. Nor do targets focused on easy wins solve the problem. For example, the Millennium Development Goals (the predecessors of the SDGs) halved rates of extreme poverty in the developing world by pushing people who were just below the poverty line over it. Tackling extreme poverty is proving difficult. In sub-Saharan Africa, the number of extremely poor people is not expected to fall for more than a decade, despite strong economic growth and development. Extreme poverty is also becoming more concentrated, with nearly 9 in 10 extremely poor people expected to be living in the region by 2030 (see go.nature.com/2phvjkg).

Adaptation must be equitable. Policy-makers must put the needs of the most vulnerable first. They should align development and climate policies and actions from local to global scales, and supply public information about risks and solutions. Scientists must elucidate links between poverty, risk and loss to allow global targets to be reset.

Most of all, we must listen to the voices of impoverished people to realize the aim of the SDGs — to ‘leave no one behind’.

VULNERABLE POPULATIONS

Poor people are less able than others to withstand hazards, and they lose a greater proportion of their wealth when disaster strikes. They have few savings; any dwellings, belongings and equipment they own tend to be fragile. Even minor shocks such as an illness can destroy the economy of a household that is under long-term stress. Private insurance is generally unaffordable. Those who can purchase medicine, rebuild homes or restock farms often pay high prices in the aftermath, which can lead to spiralling debt. When poor people migrate, this is often driven by crisis; they

cannot rely on affluent relatives elsewhere sending remittances home.

It is difficult to get government welfare, such as affordable housing or subsidized health care, to the poorest, who sometimes avoid these schemes for fear of repression. Most of the bottom few per cent (in income terms) rent or live in informal housing, including camps for refugees and displaced people. More than half of the 3.1 million people who live in Nairobi, one of Africa’s richest cities, dwell in informal settlements, for example. Poor people frequently lack access to the information and tools they need to make adaptation decisions and to hold authorities to account.

The losses of poor people tend not to be accounted for in macroeconomic calculations of climate impacts. In Panama, Honduras and Colombia, for instance, the bottom 20% of the population contribute just 4% to the national income, yet their lives are likely to be hit much harder. For the poorest, losing tools, a workshop or a few livestock means the difference between earning a living and becoming destitute. Describing losses not as an absolute number but as a proportion of a household’s savings or assets puts poor communities and countries at the top of economic loss and risk tables.

Current development practices often increase risks, rather than diminish them, for the extremely poor. Most adaptation projects focus on engineering or environmental responses. For example, Salt Lake in Kolkata, India, has been modernized steadily since the 1970s. Sturdy houses, well-planned streets and drainage have turned a swamp into one of the most comfortable and least flood-prone districts of Kolkata. These improvements make Salt Lake a healthy and secure place for its richer residents. But those who serve them — the barbers, rickshaw drivers and maids — live in informal settlements on the outskirts. There is little investment there in land drainage, housing quality is low and waterlogging and flooding are common³.

Adaptation practices also assume that ‘one size fits all’. Yet impoverished women, children, elderly and disabled people, migrants and those from minority groups are over-represented in vulnerable groups. Child protection and safe spaces for women need to become priorities in disaster responses. Early-warning information will be heard only if it is provided in the languages of migrant groups and in culturally sensitive ways. Designs of emergency shelters should consider the privacy needs of women and girls, to encourage use without fear of social stigma or abuse.

“Current development practices often increase risks for the extremely poor.”

EQUITABLE ADAPTATION

Adaptation must meet the needs of the poorest directly, putting them at the centre of decision-making with funding. The case for equitable adaptation is clear: it is a moral duty, and it improves economic productivity, social cohesion, health and peace.

Adaptation projects should create opportunities as well as reduce risk. For example, Costa Rican coffee farmers are being encouraged to grow more citrus to boost their incomes as the climate warms. And in the Dominican Republic, flood evacuation routes in the urban slums of Santo Domingo provide safer access to schools and build social cohesion.

More emphasis should be placed on the rule of law, security of the person, equality of opportunity and inclusivity. For example, the Salt Lake service workers could have been given formal contracts and affordable homes with drainage, clean drinking water and sanitation.

An exemplar of equitable adaptation is the Mukuru Special Planning Area in Nairobi. This urban upgrading scheme of 138,000 households was planned jointly by Nairobi City County and the Muungano Trust, a collaborative of community-based organizations. Local residents are being provided with information and leadership training. Decisions on land-use planning, environmental standards, drainage, water and security are taken in partnership. Community-run microcredit and loan schemes help locals to establish small businesses and build buffers against poverty and risk.

SCIENCE CHALLENGES

To roll out equitable adaptation worldwide, greater understanding is needed on how rights, justice and entitlements reduce risks and promote resilience. Scientific studies face three challenges.

First, researchers and practitioners rarely ask poor people what concerns them most or what solutions they prefer. For example, there can be disagreement in a community over who is most at risk, or how support should be prioritized. Risk assessments and resilience plans fail to capture the richness of local experience. Researchers typically deploy data and maps to convince locals that more infrastructure is the answer. They assume locals’ lives and attitudes must change, not theirs. Local people tend not to be offered skills training or leadership roles.

Second, adaptation is often falsely presented solely as a local agenda. But local livelihoods and building designs rest on national and international norms, standards and policies in economics, land-use planning and building codes, for example. Adaptation policies must align on all scales to achieve their potential. Fostering community-based adaptation will be ineffective



A woman checks flood-water levels in Bogura, Bangladesh.

if it runs counter to national policies and a political economy that disadvantages the most vulnerable in the first place.

Third, policy progress is measured mostly in averages and aggregates. These measures don't capture the needs and realities of the most vulnerable. For example, indicators of disaster risk and impacts, such as those shared by the SDGs and the Sendai Framework for Disaster Risk Reduction, are focused on reducing sizes of economic losses and the number of people affected by disasters. Those closest to the threshold of these targets are easiest to lift out, repeating the Millennium Development Goals trap.

THREE AXIOMS

Researchers and practitioners should thus be guided by these three axioms:

Invest in relationships. For adaptation to be consensual and progressive, researchers must stop talking about the most vulnerable and provide room for them to speak for themselves. In Nairobi, for example, organized groups of the urban poor work with city authorities to facilitate urban planning. One focus is on reducing the health impacts of polluted air, soil and water and other risks from solid waste, including flooding and fires.

Researchers and funders should develop formal processes for scientists and locals to co-produce knowledge, such as mapping risks in informal settlements or harnessing local ecological expertise to fine-tune

climate forecasts. The United Kingdom's £1.5-billion (US\$1.95-billion) Global Challenges Research Fund, for example, prioritizes funding for projects that are based on equitable partnerships.

Support local innovation. Researchers need to combine data and methodologies from political, social and Earth-systems sciences to model risk holistically from local to global scales. They should integrate inequality concerns into climate impact modelling, for example⁴, and assess how multiple factors magnify risks for certain groups. For instance, how do global climate, weather and local coasts, lakes and rivers interact to produce flooding in certain areas? Risk factors that are linked over large distances must be considered, such as how floods and droughts influence food prices globally (see go.nature.com/2mvkwre).

A global fund oriented at tackling the root causes of risk and poverty would be a major step forward. The Climate Action Summit to be held in New York in September is a clear opportunity to turn such ambitions into global action.

Measure success in the most vulnerable. Adaptation interventions should focus on social vulnerability, rather than broader resilience, to bring disparities to the foreground. Strategies can then be targeted at supporting the people who will suffer most, rather than shifting statistical averages for

people who are better able to adapt.

The many factors that contribute to resilience need to be unpacked, along with the impacts of different choices and behaviours. For example, in Niamey, Niger, many extremely poor boys work in food markets, where they receive tips in food. So the closure of markets after flooding disproportionately affects them, compared with girls who work in domestic service in areas less prone to risk⁵. Knowing this, the markets might be flood-proofed or food aid targeted at children. Unexpected failures might also be predicted; for example, pressures on hospitals in Paris and London rose during heatwaves in 2003 as many elderly people became ill.

Climate change is transforming our world. We will have to adapt. Let's combat poverty and inequality at the same time. ■

Mark Pelling is a professor of geography at King's College London, UK. **Matthias Garschagen** is a professor of geography at Ludwig-Maximilians-University Munich, Germany.
e-mails: mark.pelling@kcl.ac.uk; m.garschagen@lmu.de

1. Hallegatte, S. & Rozenberg, J. *Nature Clim. Change* **7**, 250–256 (2017).
2. Berazneva, J. & Lee, D. R. *Food Policy* **39**, 28–39 (2013).
3. Rumbach, A. *Habitat Int.* **43**, 117–124 (2014).
4. Rao, N. D., van Ruijven, B. J., Riahi, K. & Bosetti, V. *Nature Clim. Change* **7**, 857–862 (2017).
5. Boubacar, S., Pelling, M., Barcena, A. & Montandon, R. *Environ. Urban.* **29**, 33–50 (2017).