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Brace for impacts

The latest instalment of the Fifth Assessment Report from the Intergovernmental Panel on Climate Change lays out the state of the world — and the challenges ahead.

When the Intergovernmental Panel on Climate Change (IPCC) released its previous report in 2007, some scientists and many environmentalists were still loath to talk about adapting to climate change. The policy focus was squarely on reducing greenhouse-gas emissions, and even talking about adaptation was often seen as defeatist. Thankfully, that sentiment has faded, and, although reducing emissions remains a paramount issue, climate-adaptation efforts are now under way in the private and public sectors in many countries. But as the latest instalment of the IPCC's Fifth Assessment Report — covering climate impacts, adaptation and vulnerability — makes all too clear, humanity has a long way to go in preparing for the effects that are already inevitable owing to our history, let alone for a future in which emissions continue to rise.

The report documents a range of potential impacts, from reduced agricultural yields to increased water shortages and often-unpredictable stresses on ecosystems around the globe. None of these comes as a surprise, and citizens and policy-makers would be wise to act sooner rather than later. There is no going back, regardless of the policies that might be enacted at the next United Nations climate summit in Paris in 2015, or at the meetings that follow. In that sense, this is not just a report about climate impacts. It is a comprehensive assessment of the state of the world in which we live and the direction in which it is inevitably headed. The alternatives to rapid, coordinated adaptation will be even more costly.

The latest assessment makes broad statements about the probable impacts of a warming climate on agriculture, but significant uncertainties remain at regional and global scales. Most model projections indicate reduced yields for major food crops such as rice, wheat and maize (corn) in many regions, but more than 25% of projections indicate that yields could rise by mid-century and beyond. Time does not stop in 2050, and the IPCC assigns a high confidence level to its statement that longer-term temperature increases in excess of 4°C above late-twentieth-century levels, when combined with increasing demand, would pose significant risks to food security at regional and global scales.

Scientists have their work cut out. They must continue to collect data about the ever-changing world while seeking to understand how diverse landscapes — both wild and tamed — will respond to global warming. And they must drill down to the regional level to help governments and people to make good decisions. The IPCC should consider working with local experts and bodies on detailed assessments that could then be vetted by the agency itself — a process that would engage more people and counter the impression of paternalism that sometimes shades the IPCC's work, dominated as it is by Western scientists.

In addition to filling in the knowledge gaps, scientists and the IPCC must also work to communicate clearly what is not known, be it the cause of extreme weather or the relative benefits of the suite of policy options facing governments. The current report, to the IPCC's credit, casts doubt on the models that are used to estimate economic impacts, suggesting that they are based on “disputable” assumptions. Such

projections are important when it comes to deciding who should pay which bills and when; researchers and economists must tackle these questions and more reliably determine the extent to which climate change will diminish wealth and economic growth in the long term.

“Policy-makers would be wise to act sooner rather than later.”

There is no single approach to adaptation, and strategies range from basic economic diversification to improvements in irrigation and fertilizer use. Certain regions might pursue flood protections, early-warning systems and insurance programmes, whereas others might focus on

maintenance and restoration of coastal vegetation. In the poorest countries, international financial support will be necessary. But to make it all come together, scientists and policy-makers urgently need to invest extra resources to improve environmental observations and to determine what actions make the most sense. ■

Natural decline

Few biology degrees still feature natural history. Is the naturalist a species in crisis?

What has become of the naturalists of yesteryear — the vicar with the magnifying glass and pressed flower collection, or the gentleman scientist with butterfly nets and a shotgun? Those dedicated observers of the natural world in all its complexity are still among us. But they are harder to pick out now; they are men and women, students and citizens. And they clutch not sample jars but smartphones.

In an article published late last month (J. J. Tewksbury *et al.* *BioScience* <http://doi.org/r5g>; 2014), Joshua Tewksbury, a naturalist at the University of Washington, Seattle, and 16 colleagues issue a call to arms. They chronicle the dismaying diminution of support for natural history — that branch of science that encompasses the careful observation and description of organisms and their relations to their environments. Like all good scientists, they offer the data to support their assertion.

In the United States of 1950, an undergraduate degree in biology generally required two or more courses in natural history. Today, the average number of required natural-history courses for the same degree is zero. The amount of natural-history content in biology textbooks has dropped by 40% over the past six decades. PhDs granted in natural-history-related fields are becoming ever rarer. Biological collections are on the wane as well. The number of herbaria — research collections