Getting involved

Public participation in climate change research is reaching new-found heights due to an explosion in the number and diversity of citizen-science projects. These offer distinct opportunities for scientists to encourage education and outreach whilst maximising scientific gain.

Education and outreach are becoming an increasingly important requirement in research. In the UK and US, for example, public engagement is a condition for any major research council funding. At its core is the desire to expand communication of research outcomes, and in doing so, generate awareness. For climate change science, engagement is particularly relevant, not least due to demonstrable impacts, but to also promote and encourage mitigation efforts. The revitalization of a century-old concept offers one such solution to contemporary funding stipulations: public participation. Or, as it's now termed, citizen science.

Citizen science describes the collaborative participation of amateur scientists — usually volunteers — in research projects, through providing observations, data analysis, or loaning of tools. As evidenced by the past — take Darwin's pivotal voyage aboard HMS Beagle, for example — the concept lends itself intuitively to the natural world, and has become a mainstay in environmental and ecological research. While the notion of amateur participation may not be new, however, technological advances, especially widespread expansion of the internet, GPS systems, smartphones, and appropriate infrastructure, have improved project dissemination and streamlined data collection and analysis. As a result, a new dawn has risen on citizen science.

But initially, progress was slow. The validity of citizen-led data was often heavily scrutinised, and thus people-powered research frequently had a hard time getting through peer review. Nevertheless, the aforementioned technological advances also allowed for improved verification procedures — predominantly efficient expert-led data corroboration — which have now become an important step whenever the public is involved in science. As a consequence, a wealth of climate-related citizen-science projects are now available for public involvement.

Data collection and observation projects are perhaps the most frequently participated in. As can be expected, they have strong applications to ecology, and have been used extensively to quantify observable impacts of climate change on species distribution, numbers, range and life cycles (for example, ref. 1). While birds (http://go.nature.com/2uXwOx4), butterflies (http://go.nature.com/2vF4nGp) and plants (http://go.nature.com/2vFdFCc) are the most commonly monitored by the public, and often epitomise climate-related citizen science, a suite of alternative observation projects are available. GLOBE Observer (http://go.nature.com/2i1MdLw), for example, is an international NASA-led app-based project in which volunteers take photos of clouds and record observations of the sky, the aim of which is to help validate satellite data and improve understanding of clouds and their impacts, one of the largest uncertainties in future climate projections. On the other end of the spectrum, as part of the research program on Climate Change, Agriculture and Food Security, farmer observations of effective technologies, crop varieties and management practices are being shared to inform location-specific climate change adaptation strategies in regions of Africa, Asia, and Latin America (http://go.nature.com/2w6AMZc).

In addition to public participation in data collection, citizen science increasingly involves the crowdsourcing of analysis. These projects rely on the superior pattern-recognition ability of humans over computers, allowing for the rapid and accurate assessment of a multitude of data. In the climate sciences, citizen-led analyses often involve the identification of species in remote locations, including penguins (http://go.nature.com/2vEHm65) and seals (http://go.nature.com/2x04gEP) in an attempt to diagnose their changing habitats under anthropogenic warming. However, like in data collection, the publics' involvement in data analysis is not constrained to ecological applications. CycloneCenter (http://go.nature.com/2i1v0SG), for example, used citizen science to analyse and interpret 35 years of tropical cyclone infra-red data to better estimate how the intensity of storms may change in the future[2].

The final broad categorisation of citizen projects involves resource sharing. The most prominent example is that of climateprediction.net and its subsidiary weather@home, which involve citizens sharing spare personal computing power to run more, and quicker, climate model ensembles. While user engagement is fundamentally lower than in observation or analysis-centred projects, such resource sharing has vastly improved our understanding of, amongst others, extreme event attribution (for example, ref. 3).

However, resource sharing is not limited to physical resources, but has now also been expanded to include collaborative sharing of ideas. The Climate CoLab (http://go.nature.com/2vFf5ww), for instance, fosters cooperative engagement and collective development of ideas by encouraging users from diverse backgrounds to submit and mutually develop proposals to tackle key aspects on climate change, recognising that 'non-experts' can provide valuable insight.

The full scope and extent of climate-related citizen-science projects is vast. It is apparent, however, that countless opportunities now exist for the public to participate in the collection and analysis of data, as well as to share their ideas and spare resources, all to contribute to enhanced understanding of the climate system. The scientific benefits of public engagement are clear; obtaining, analysing, and managing data at a scale unachievable by individual researchers, crucial in times of research funding cuts. At the same time, citizen science offers exemplary prospects for education and outreach, improving participation and thus scientific literacy, and allowing the public to feel that they have contributed to real science. With such an explosion in the number of people-powered projects, as well as maximised research and outreach possibilities, it seems likely that mutual collaboration between experts and non-experts alike is marking a new era in climate research and education. ❐

References

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