

Community contributions to sustainability science



As the pace of global change quickens, traditional means of data collection may fall short in monitoring its impacts. To ensure a sustainable future, we need all hands on deck in observing our changing planet.

Information is critical for ensuring the sustainable development of our shared future, whether it be accurately capturing the impact humans have on the environment or, as we see increasingly in today's headlines, the impact that environmental and climate change is having on human development and well-being. Scientists, managers and policymakers need to not only understand global environmental change impacts, where they happen and how severe they are, but they must also keep an ear (and an eye) open to learn what emerging challenges are faced by communities at local and regional levels. As the rate of global change increases, so does the importance of accurately monitoring its effects, from mapping the occurrence of mudslides following an unseasonable extreme rainfall event to tracking the decline in pollinator biodiversity. In 2017, the UN General Assembly adopted the Sustainable Development Goal (SDG) indicators to monitor and review progress towards the 2030 Agenda for Sustainable Development and to inform policy-making and ensure accountability¹. This framework consists of more than 200 indicators that are collected by international, national and regional organizations. In 2019, *Nature Sustainability* published a Perspective by Steffen Fritz and colleagues discussing the worrying gaps in the traditional avenues of data collection for the SDGs², which mainly consist of non-governmental organizations, government ministries and international agencies. First and foremost, official data gathering can be expensive, requiring funding for equipment, personnel and other materials. This can make data collection infrequent or unfeasible, particularly in nations with limited financial resources.



Concerns were also raised about the potential lack of openness and transparency in official data, as well as possible biases in the agencies doing the data gathering.

Fritz and colleagues make the case for bridging these gaps with community science, also often referred to as citizen science, and proposed an innovative framework for how data collected by citizen science initiatives can be integrated into the formal SDG indicator reporting mechanisms. In an [interview](#) in this issue of *Nature Sustainability*, Omar Seidu of the Ghana Statistical Service and Dilek Fraisl of the International Institute for Applied Systems Analysis discuss the first successful integration of community science data into the monitoring of plastic debris density by the Ghanaian government. We learn that institutional willingness to adopt and adapt to new data sources is key to successfully integrating community science data into formal reporting schemes and read how Ghana went from having no official data on plastic debris density along its coasts to using community-derived data to shape new policies. The emerging contributions of community science go beyond official SDG indicator monitoring. Platforms like iNaturalist and SciStarter are connecting researchers with interested community members across the globe. In New York City, a consortium of media and community groups has formed

the Harlem Heat Project to map the human impact of the urban heat island effect in the midst of the rapid rise of dangerous indoor air temperatures³. A recent initiative from the University of Arizona Department of Environmental Science is calling upon concerned residents to participate in a study of potential contaminant spread resulting from widespread wildfires following the devastating 2021 Telegraph Fire⁴. These initiatives are able to produce data at spatial and temporal scales that would often be unfeasible for researchers or government agencies to perform on their own, and evolving standards for collecting community science-derived data in environmental and ecological sciences ensure that data are robust and reliable, despite not being collected by professionals⁵.

Recently, non-traditional data sources have expanded beyond the contributions of interested community members to combing social media platforms like Telegram and Twitter, sometimes called 'social sensing'⁶. Social media data can help to paint a near real-time picture of the where and when natural disasters such as flooding and landslides are occurring, as well as their socio-economic impact on local communities. In one case in India, social media data were even used to generate real-time flood maps⁶. Integrating data from a broad spectrum of sources provides new potential to aid disaster response and shape future resilience measures. Community science initiatives can often be biased towards urban and suburban communities, but social media can bridge the gap to increase data in rural and remote regions⁷. Our interview with Dilek Fraisl and Omar Seidu, furthermore, challenges the common conception that community science is predominantly a hobby for the affluent and educated in the Global North. Taken together, it is becoming clear that integrating new data sources provides invaluable insight into regions and communities that have previously been under-studied and underserved.

Whether derived from Twitter and Telegram or from local communities working directly with researchers, we at *Nature Sustainability* believe that the current scale

of global change – from unprecedented droughts and devastating floods to dangerous urban temperatures and air quality – requires adaptive and agile integration of all available data sources for successful monitoring. We welcome submissions using new, innovative and unexpected data sources to tackle today's pressing sustainability questions. But we also believe that community science offers benefits beyond harvesting data. Participatory community science engages stakeholders in thinking about how sustainability, environmental quality and climate

change affect their everyday lives, and vice versa. By engaging with community members, be they eager amateur natural scientists or concerned families, scientists and managers can gain vital insight into the questions and problems that are most pressing to communities that they may have overlooked. Effective and engaged community science is an opportunity for learning and exchange in multiple directions to ensure a sustainable future on our finite planet.

Published online: 17 October 2022

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