

# UC Davis

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Embrace open-source sensors for local climate studies

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# Correspondence

## There is no silver bullet against climate change

I find the potential solutions to climate change proposed by Lucas Joppa and colleagues unrealistic (*Nature* 597, 629–632; 2021). The scale of the crisis means it cannot be tackled simply by technology, corporations or markets.

Small-scale technology distracts from the urgent need to alter consumption-based lifestyles through the pricing of all aspects of the unsustainable global economic model. The world's largest direct air-capture plant, which came online in September, collects only about 4,000 tonnes of carbon dioxide annually – the amount emitted globally every 4 seconds.

I am sceptical, too, that corporations would deliver global common goods voluntarily. Especially when they can buy their way out of reducing emissions through 'offsetting' – investment in 'climate-friendly' projects such as planting trees.

Moreover, markets have failed to uncouple CO<sub>2</sub> emissions from production, or resource abuse from consumption. Instead, they legitimize economic solutions to climate change that preserve the status quo of high energy use, particularly in wealthy countries, which are in the minority globally.

Efforts to address this planetary crisis should be led by developing countries, which form the global majority. A target of net-zero emissions is impossible for them in my view, because they require energy to build their nations and meet basic needs (see [go.nature.com/3bizrjl](https://go.nature.com/3bizrjl)).

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## Colour blindness: journals should enable image redisplay

Making the data in figures accessible for people with colour-vision deficiency is difficult (see *Nature* 598, 224–225; 2021). For example, a palette optimized for readers with red–green blindness could further disadvantage the smaller group with a blue deficit. And images intended to convey differences in data intensity to colour-blind readers can be problematic for people with full colour vision.

Imaging equipment for visualization of intensities typically has an 8-bit range, which provides 256 intensities. People with full colour vision can differentiate perhaps 16 intensities across an image that relies on colour scales combining the 3 primary colours. The viridis colour map, for example, attempts to improve readability for people with colour-vision deficiency by functionally merging two primary colours, further widening the mismatch between people's different capabilities and the wealth of information present.

Salvation lies elsewhere. Journals should enable users to automatically redisplay images in their preferred palette, brightness and contrast.

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## Embrace open-source sensors for local climate studies

Inexpensive open-source hardware is democratizing science (see *Nature* 587, 509–511; 2020). Open-source sensors, for example, are proving to be game-changers for measuring environmental parameters at a fraction of the cost of commercial equipment. They offer opportunities for scientists in low- as well as high-income countries to address local questions around climate change.

Open-source carbon dioxide sensors can be as effective as high-precision CO<sub>2</sub> analysers (C. R. Martin *et al.* *Atmos. Meas. Tech.* 10, 2383–2395; 2017). We are using these sensors in long-term experiments to measure canopy climate and soil–atmosphere gas exchange in drought conditions. We can deploy 150 sensors in multiple locations for the same cost as a single commercial analyser, and thereby collect more-comprehensive data on the system's spatial and temporal dynamics.

The scientific community's reluctance to embrace open-source hardware might stem from its low cost: investing in expensive equipment is commonly perceived as the route to rigorous scientific research. This over-reliance on commercial technology needs to be examined.

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\*On behalf of 4 correspondents; see [go.nature.com/3ejc1rk](https://go.nature.com/3ejc1rk)

## For NGOs, article-processing charges sap conservation funds

The shift from a 'reader pays' to an 'author pays' model of scientific publishing presents a financial threat to environmental non-governmental organizations (eNGOs). Many of these support, conduct and publish applied research on real-world solutions to the planet's most pressing challenges. Funded mainly by donations, eNGOs must now choose between taking conservation action and publishing more research papers.

A more equitable publishing system is needed. Platinum and diamond open access (see L. Barnes *Open Book Publishers* <https://doi.org/g3tb>; 2018), financed by a third party such as a scientific society, avoid article-processing charges (APCs) for authors and paywalls for readers, and can offer the lowest-cost option for eNGOs. Alternatively, journals could offer APC waivers for authors at eNGOs.

Discussions at this year's United Nations biodiversity conference (COP15) and climate-change conference (COP26) are informed by eNGO research. Mandatory APCs risk pricing eNGOs out of scientific publishing at a time when their research output is most urgently needed.

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The authors declare competing interests; see [go.nature.com/3bkbqco](https://go.nature.com/3bkbqco)