

Unite against this attack on scientific evidence

US environment agency must desist from a course that could harm the health of people and the planet.

The US Environmental Protection Agency (EPA) last week surpassed its own recent record of getting publicity for the wrong reasons.

The New York Times revealed that the agency's leadership is still actively discussing a rule that would require scientists to supply it with the raw data for studies if the findings are to be taken into consideration in the drafting of environmental regulations (see p. 420). The EPA announced its desire for such a rule, which it is calling Strengthening Transparency in Regulatory Science, in April 2018. It is needed, the EPA says, so that the agency can independently reanalyse and revalidate scientific data and models. The EPA says that it will not recognize studies unless scientists agree to supply such data.

Let us consider the implications of such a rule, were it to be adopted. Many of the data that underpin public-health and environmental studies include information about people who will not have consented to disclosing their confidential data, including where they live; their travel habits; their age and gender identity; and the state of their health.

Many such data were integral to the Six Cities study, published in 1993 by what was then the Harvard School of Public Health in Boston, Massachusetts. This work revealed that people living in polluted cities have shorter lives than people in cleaner cities (D. W. Dockery *et al.* *N. Engl. J. Med.* **329**, 1753–1759; 1993). The results of the Six Cities study led directly to the imposition of life-saving limits on fine particulate matter from emissions. But this research would have been inadmissible under the EPA's proposed rule.

So the question has to be asked: is there a problem in how science is assessed that needs fixing? Why would the EPA wish to create a rule that could risk worsening human and planetary health? Why would the EPA's leaders choose to override their own science advisers, who questioned the rule? Even the US Department of Defense said in August 2018 that the absence of underlying data "should not impede the use of otherwise high-quality studies".

Answers might be found by considering the rule in the context of the wider actions of the administration of President Donald Trump on the environment so far. Whether it's cancelling the Clean Power Plan – the previous administration's signature climate policy – withdrawing from the Paris climate agreement, weakening fuel-efficiency standards or cutting back on environmental research, the US administration is choosing to act against the consensus

of the scientific community. The Strengthening Transparency in Regulatory Science rule needs to be viewed against the backdrop of this reality.

The EPA has denied that the rule would be applied retrospectively, or to existing environmental standards. That might be true up to a point. But what would happen when existing standards needed to be reviewed – as most periodically are? Would the rule be applied because the reviewed version would be a future standard? And, if so, would any science – new or old – become inadmissible unless the underlying data and models were supplied? The EPA has yet to clarify what would happen in such a scenario, but last week's revelations had the result of once again uniting the United States' scientific, medical and health communities, and culminated in a crescendo of opposition.

The scale and volume of this response should rattle the EPA's leadership, and the response needs to get bigger and louder still. That will compel the agency to conduct more of the discussion around its rule in public, as it is now doing. Institutions and individuals must redouble their efforts. They must write to their elected representatives to call out this attempt to undermine accepted scientific practice in public-health and environmental standards.

The EPA was created to protect the nation's environment. As it approaches its 50th birthday next year, it must not be allowed to continue on a course of action that will weaken its ability to fulfil that role.


Why would the EPA choose to override its own science advisers?"

Germline editing needs one message

Science academies and the World Health Organization must speak with one voice on human germline genome editing.

A year ago this week, geneticist He Jiankui made the shocking announcement of the birth of twin girls in China whose genomes had been edited to prevent HIV infection. Undeterred by the global opprobrium heaped on He, Russia's Denis Rebrikov told *Nature* last month about more experiments involving gene editing of human eggs, to help deaf couples give birth to children who would lack the genetic mutation carried by their parents that impairs hearing.

At the same time, every month seems to bring another gene-editing advance. The latest tool, a precision 'search and replace' technique called prime editing, was described in *Nature* last month by David Liu at the Broad Institute of MIT and Harvard in Cambridge, Massachusetts, and his colleagues (A. V. Anzalone *et al.* *Nature* <http://doi.org/dczp>; 2019). Randall Platt at the Swiss Federal Institute of Technology (ETH) in Basel called it a "giant leap" towards the goal of making specific changes to the blueprint of life.

The speed of technological advance, coupled with some

scientists' determination to press ahead with editing human germline cells – eggs, sperm and embryonic cells – has been sounding alarm bells for nearly five years. Editing could produce unpredictable changes that an individual's descendants will inherit – with potentially wide-reaching societal implications. Academies, governments and ethicists have been considering how to regulate this. But the manner in which it is being done is suboptimal.

In 2018, the World Health Organization (WHO) set up an independent expert panel to advise on the oversight and governance of human genome editing. A separate international commission on the clinical use of human germline genome editing gathered for its second meeting in London last week. This commission was established by the US National Academy of Science, the US National Academy of Medicine and Britain's Royal Society, to recommend standards and criteria for germline genome editing. Both will report next year, and the commission's report will feed into the WHO process.

But the WHO panel has already recommended setting up a public registry for genome-editing experiments. It has also made an interim recommendation that “it would be irresponsible at this time for anyone to proceed with clinical applications of human germline genome editing”, which has been accepted by the agency's leadership. The international commission has yet to say what it thinks, but it would make little sense for it to disagree.

It isn't entirely clear why separate initiatives are needed, and it is unfortunate that representatives of people with disabilities are not part of the decision-making process. However, it isn't too late to rectify these issues, and the two initiatives must, in the end, converge.

There are very real risks that unregulated clinics claiming to be able to eliminate inherited conditions will use untested, possibly harmful procedures. A sure-fire way to give such clinics the green light is an absence of agreed global standards. When the two groups report next year, they must speak with one voice and have more inclusive representation.

A shock to the system

California's universities must help to design and build a clean and resilient power grid.

Confusion reigned the first time that the University of California, Berkeley, lost its connection to the city's electricity grid, on 9 and 10 October. Campus officials were unable to say how long the university's power plant could provide emergency electricity for crucial facilities – such as freezers containing valuable research specimens. Some scientists didn't even know which electric plugs to use to access back-up power. As a precaution, researchers

packed freezers with dry ice, and some sent their most important samples to other institutions.

This chain of events can be traced back to last November, when a faulty transmission line sparked the deadliest wildfire in California's history. The Camp Fire tore through the town of Paradise, killed 86 people and levelled thousands of homes and businesses.

Faced with an estimated US\$30 billion in insurance claims from that fire and others in 2017, the state's largest utility provider, San Francisco-based Pacific Gas and Electric Company (PG&E), filed for bankruptcy in January. Then, when hot, dry winds raised the fire danger in early October, the company cited legitimate liability concerns and shut down major sections of the electricity grid to prevent more blazes from breaking out.

Evidence that global warming is promoting more frequent and severe wildfires has been mounting for decades, and the fact that electrical equipment can start fires, and contribute to their spread, is hardly news. But few could have predicted that vast stretches of California – the world's fifth-largest economy and a global hub for research and innovation – would be paralysed by a combination of wildfire and electricity blackouts.

Safeguarding lives and habitats from these catastrophes has to be the top priority for the state's decision makers. Solutions for upgrading the grid range from the obvious to the technological. Electrical equipment should be kept clear of vegetation, with power lines buried underground, where feasible. Cameras, sensors and other systems could allow grid operators to detect and isolate problems with speed and precision. There are also measures that Berkeley and other institutions can take, such as reducing their energy demands and allocating limited emergency power to only the most urgent needs.

At the same time, California's research and technology institutions, and its decision makers, could harness more of the state's considerable research muscle in energy and energy policy to address the bigger picture: creating a more resilient, cleaner grid for the whole state.

Researchers at Berkeley and elsewhere have spent years developing smart-grid technologies that allow more control of where electricity goes and when. Economists are calculating the costs and benefits of different kinds of energy infrastructure, such as installing solar panels, or using fuel cells powered by renewably produced hydrogen.

More of this pioneering work should be deployed to solve problems in the institutions' home state. Like the back-up power system that Berkeley used when the grid failed, a wider network of increasingly smaller grids that can be isolated or boosted as needed might be the future.

California's fires are now a chronic problem. A safe, clean, efficient and resilient grid has to be a shared responsibility, and not something for politicians alone to fix. The state's dynamic research, technology and innovation communities must step up to solve the problems in their individual organizations and at the same time craft wider solutions that help California – along with regions worldwide – adapt to our thirst for more energy in an increasingly warmer world.

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