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Sinking land and fissures in Iran could lead to a humanitarian crisis.

Edited by **Jennifer Sills**

Shrinking aquifers and land subsidence in Iran

More than 98% of Iran's 1.648 million km² of land faces land subsidence (*1*, *2*). Internationally, a rate of subsidence greater than 4 mm per year (*3*) is considered a crisis; Iran's land is sinking at an astonishing rate of 6 cm per year (*1*) as a result of 25 years of water level decline in the plains (*2*, *4*). Dam construction, climate change, inefficient water consumption by agriculture and industries, and the use of underground aquifers as sources for illegal agricultural water extraction wells all continue to deplete Iran's water table (*5*, *6*). Iran must address its water levels before subsidence leads to a humanitarian crisis.

In urban areas, subsidence will damage buildings, bridges, transportation lines, and energy transmission lines as well as reduce the earthquake resistance of buildings (*1*, *2*). Historical monuments are also at risk. Moreover, continued water level declines will reduce the ground's water permeability and turn fertile plains into barren deserts.

Subsidence can be managed and controlled with proper monitoring. To address the problem, Iran should save water by adopting mechanized irrigation in agriculture and managing wells to prevent illegal water extraction. Farmers should use cultivation patterns that maximize water efficiency in the production of crops. Where possible, agricultural products should be cultivated in greenhouses, which use less water than traditional farming (*7*). Finally, to protect the aquifers in the plains from further water loss, Iran should facilitate the transfer of industries with high water consumption to the shores of the Caspian Sea or the Persian Gulf, where desalination technologies can provide adequate water (*8*).

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Biotechnology ethics for food and agriculture

In January, the National Bioengineered Food Disclosure Law (NBFDL) went into effect, requiring all US food manufacturers to disclose whether their products contain bioengineered ingredients (*1*). However, the law is the subject of debate, with critics arguing that it inhibits rather than increases transparency around the use of biotechnology in food (*2*). Given the importance of the agbiotech industry, the Biden-Harris administration should develop an agricultural biotechnology advisory commission devoted to inclusive deliberation on ethics and governance in agricultural and food biotechnology.

The NBFDL is consistent with the US Department of Agriculture's (USDA's) Sustainable, Ecological, Consistent, Uniform, Responsible, Efficient (SECURE) rule (*3*), which exempts many gene-edited crop traits from regulation and allows companies to self-regulate. Similarly, the NBFDL grants exemptions from labeling for processed foods with trace percentages (<5%) of genetic material and allows for disclosure through QR codes rather than through a clearly identifiable symbol that can be read directly on a package. Several lawsuits alleging deficiencies in the governance of genetically engineered crops and food animals are making their way through the court system (*2*, *4*).

The United States has appointed a bioethics commission in the past, but no commission has been formed since 2017 (*5*). The urgency of reinstating the commission has been highlighted by National Academy of Sciences President Marcia McNutt and National Academy of Medicine President Victor J. Dzau (*5*, *6*). The need for a commission addressing ethics in public health, biomedicine, and climate science signals that we should also create bioethics commissions for other areas, including agriculture biotechnology.

Commissions focusing on agricultural bioethics have never existed in the United States, but they have been successfully developed elsewhere. The Norwegian Biotechnology Advisory Board has recommended a forward-looking regulatory framework for genetically modified organism use and gene editing in agriculture based on extensive public consultation (*7*). The UK's Nuffield Council on Bioethics, an independent forum funded by the Medical Research Council and the Wellcome Trust, has published a series of reports on the social and ethical issues related to genome editing and farmed animal breeding, elicited public responses to proposed regulation changes, and facilitated public dialogues on genome editing in farm animals (*8*). The United States should use these examples as models for the establishment of a presidential bioethics commission that addresses critical issues and

promotes inclusive engagement around biotechnology in food and agriculture.

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Broaden chemicals scope in biodiversity targets

On 21 June, the next round of negotiations on the post-2020 global biodiversity framework will be held in Nairobi (*1*). In the draft document (*2*) listing 21 targets, target 7 addresses chemical pollution by explicitly mentioning nutrients, pesticides, and plastic waste. Limiting this target's scope to these three groups does not do justice to the immense variety of anthropogenic chemicals polluting the environment (*3*), which also include, for example, toxic metals, industrial chemicals, chemicals from consumer products, and pharmaceuticals (*4*), as well as the (often unknown) transformation products of substances from each group (*5*). We urge the negotiators to broaden the scope of target 7 to reflect the complexity of chemical pollution.

Both direct and indirect impacts of chemical pollutants on organisms in the environment can lead to population instability, possibly resulting in the decline or even extinction of vulnerable species. Chemical pollutants can also cause undesired shifts in community composition and/or function, which can affect ecosystem services (*6*). Biological adaptation to chemical exposure may decrease genetic diversity, reducing resilience to future stressors, such as global warming and other aspects of global change (*7*). Thus, to focus solely on nutrients and pesticides would detract attention from myriad potential interactions, beyond eutrophication and acute toxicity, which could negatively affect biodiversity and ecosystems at large.

Chemical pollution mitigation plans should address pharmaceutical waste.

Understanding environmental exposures and their consequences is a formidable task because of the variety of pollutants and multitude of potential impacts, as well as the fact that chemicals occur in mixtures and act in conjunction with other stressors (*7*, *8*). To comprehensively address these complex interactions, joint efforts by interdisciplinary teams of researchers are essential. Neither the scientific community nor research funders have fully recognized or adequately responded to this necessity yet.

Environmental pollution by anthropogenic chemicals has been recognized as a major agent of global change (*9*). The continuous rise in the creation, production, and use of chemicals far outpaces humanity's capacity to assess their hazards and risks to human health and the environment (*10*, *11*). To tackle the global threats of chemical pollution, countries around the world have recently agreed on creating an intergovernmental science-policy panel on chemicals and waste, charged with consolidating existing knowledge to inform policymakers (*12*). The available evidence already justifies targeting a wider scope of chemical pollutants for strategies and action to be implemented in the post-2020 global biodiversity framework.

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COMPETING INTERESTS

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