



## LETTERS

edited by Jennifer Sills

## China's Soil Pollution: Farms on the Frontline

CHINA'S SOIL POLLUTION IS MUCH WORSE THAN PREVIOUSLY THOUGHT ("CHINA GETS SERIOUS about its pollutant-laden soil," C. Larson, *News & Analysis*, 28 March, p. 1415). A report released on 17 April admitted that 16.1% of the Chinese soil was polluted, including 19.4% of farmland, 10.0% of forest land, 10.4% of grassland, and 11.4% of unused land (1). Of the contaminated soil samples, 82% contained toxic inorganic pollutants, the most common being heavy metals such as cadmium, mercury, arsenic, chromium, and lead, which can cause chronic health problems. Moreover, levels of organic pollutants such as dichlorodiphenyltrichloroethane (DDT), polycyclic aromatic hydrocarbons (PAHs), and hexachlorocyclohexanes (HCHs) are also very high, and samples above established safety levels account for 1.9%, 1.4%, and 0.5%, respectively, of all tested soil samples, which covered 6.3 million square kilometers. Aside from industrial plant waste and mining operations, the report states that the unsustainable use of chemical fertilizers and pesticides is a main human cause of widespread soil pollution (1).

China's food production is affected by soil pollution but also creates much pollution itself. China consumes nearly one-third of the world's fertilizer, and the pesticide usage per unit area is 2.5 times the world average (2). The quality of cultivated land should be guaranteed. Farmers should be subsidized to improve fertilizer use efficiency and encouraged to adopt organic and biodynamic farming methods that are not reliant on heavy input of chemicals. Soil remediation projects should be implemented to improve the polluted soil gradually. Finally, there is a need to change cultural habits relating to consumption so as to reduce food waste nationwide.

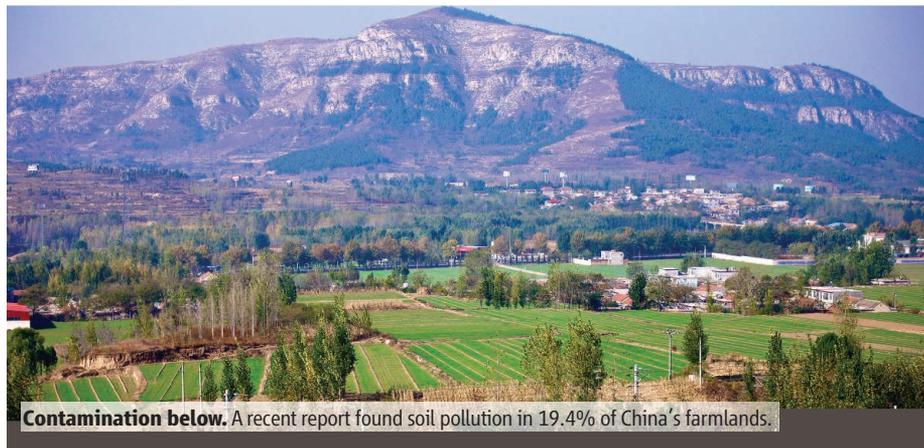
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### References

1. Ministry of Environmental Protection and Ministry of Land and Resources of P.R. China, "Reports on China's Soil Pollution Survey" (2014); [www.zhb.gov.cn/gkml/hbb/qt/201404/t20140417\\_270670.htm](http://www.zhb.gov.cn/gkml/hbb/qt/201404/t20140417_270670.htm) [in Chinese].
2. "Establish a long-term mechanism for sustainable agricultural development," *China People's Daily* (22 January 2014); [http://paper.people.com.cn/rmrb/html/2014-01/22/nw.D110000renrb\\_20140122\\_1-02.htm#fin](http://paper.people.com.cn/rmrb/html/2014-01/22/nw.D110000renrb_20140122_1-02.htm#fin) [in Chinese].



**Contamination below.** A recent report found soil pollution in 19.4% of China's farmlands.

## China's Soil Pollution: Urban Brownfields

CHINA'S PLANS TO TACKLE FARMLAND POLLUTION and improve food safety are to be welcomed ("China gets serious about its pollutant-laden soil," C. Larson, *News & Analysis*, 28 March, p. 1415). However, the country faces equally serious urban soil and water pollution.

As a result of unparalleled urbanization over recent decades, many polluting and energy-intensive activities, including steel, coke, pesticide, and chemical industries, have relocated from urban areas to peripheral or rural areas (1). The legacy is more than 5000 brownfields—sites polluted, or potentially polluted, by hazardous substances—in China's major cities (2). A recently released ambitious urbanization plan will move more polluting plants from cities, leaving more brownfield sites (3). Brownfields pose health and environmental hazards in densely populated cities and are obstacles to urban and economic development. Soil concentrations of pollutants, including heavy metals, persistent organic pollutants, and benzene, can be hundreds of times the regulated limits (4). Seepage will also result in groundwater contamination.

Many brownfields have been used for housing. Without adequate survey and remediation of toxic brownfields, construction has already resulted in acute poisoning incidents. For example, workers were hospitalized during construction on sites at former pesticide factories in Beijing and Wuhan (4). Residents of newly built houses are often unaware of pollution beneath their properties. The Guangzhou Asia Games Village site was changed due to soil pollution from fertilizer factories, but housing for local people is being built in the area (5).

The Chinese Premier vowed to declare "war on pollution." However, government spending on environmental protection and energy conservation decreased by 9.7% between 2012 and 2013 (6). Funding and

technology may limit remediation of Chinese brownfields, but information should be made publicly available to raise awareness and facilitate wider participation in brownfield management. Experience from elsewhere, such as the U.S. “Brownfield Act” (7), should be deployed to demonstrate commitment to tackling the growing problem of soil pollution.

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#### References

1. H. Yang, R. J. Flower, J. R. Thompson, *Nature* **490**, 342 (2012).
2. East Asia Infrastructure Division of the World Bank, *China Waste Management: Problems and Suggestions* (World Bank, 2005).
3. The Central People's Government of the People's Republic of China, 2014 ([www.gov.cn/zhengce/2014-03/16/content\\_2640075.htm](http://www.gov.cn/zhengce/2014-03/16/content_2640075.htm)) [in Chinese].
4. M. Jin, *Ecol. Econ.* **258**, 18 (2012).
5. S. Gao, K. Wang, *Caijing Mag.* **323**, 1 (2012).
6. Ministry of Finance of the People's Republic of China,

2014 ([www.mof.gov.cn/zhengwuxinxi/caizhengxinwen/201403/t20140306\\_1052323.html](http://www.mof.gov.cn/zhengwuxinxi/caizhengxinwen/201403/t20140306_1052323.html)) [in Chinese].

7. Y. Gong, *International Experience in Policy and Regulatory Frameworks for Brownfield Site Management* (World Bank, 2010).

## Scientific Justification for Animal Capture

IN THE NEWS & ANALYSIS STORY “COURT slams Japan’s scientific whaling” (4 April, p. 22), V. Morell recounts the recent judgment of the International Court of Justice that the second Japanese scientific whaling program in the Antarctic (JARPA II) shall cease. This decision has given extra weight to a principle that is already contained in most existing scientific and ethical guidelines for research involving the taking of wild animals: Sample sizes (numbers of animals taken) must be justified in advance in relation to the specific objectives of the research.

Wisely, the court did not try to answer the broader question of what constitutes legitimate scientific research, but it faulted the absence of explanation or analysis as to how the specified numbers of whales to be

caught would have contributed to the objectives of the JARPA II program. The ruling has implications for Japan’s whaling program in the North Pacific (JARPN II). An Expert Panel appointed by the International Whaling Commission to review Japan’s whaling in the North Pacific, which targeted up to 100 sei whales, 50 Bryde’s whales, 220 minke whales, and 10 sperm whales a year (1), also noted the absence of a scientific justification for the number of whales killed in relation to quantifiable research objectives (2).

While not restricting the freedom of scientific research, the International Court of Justice ruling highlights the importance of careful analysis and clear justification of the study duration and of the sample sizes required to meet research objectives, in advance of any take of wild animals.

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