

XUEYAN HU



China's soil plan needs strong support

The government must accompany its action plan on soil quality with effective laws and remediation measures, says **Hong Yang**.

The impact of the booming Chinese economy on the quality of the nation's air and water has garnered a lot of attention recently. Now, focus is turning to another polluted realm: the very ground beneath China's feet.

Chinese researchers are still digesting the implications of a national action plan on soil quality released in May. But two problems are already clear, neither of them unique to China. The first is that remediation of polluted soil is very expensive. The second is that binding legislation must be in place to make sure the necessary money is spent.

The consequences of failing to act properly were graphically demonstrated in April. Nearly 500 teenagers at a school constructed near three former chemical plants in Changzhou, east China, were found to have developed health problems ranging from nosebleeds to lymphoma and leukaemia. Preliminary investigations found the soils and groundwater to be laced with heavy metals and organic pollutants. In particular, chlorobenzene was found at concentrations nearly 10,000 times the safe level.

Ironically, problems like this are the consequence of concerns about pollution. Dirty factories and industrial plants moved from urban areas to the suburbs and rural locations. Their former sites were demolished, and schools and houses were built in their place.

There are thousands of brownfield sites across China, and many are heavily polluted. Serious pollution risks were confirmed by the authorities in China's soil-pollution survey, once guarded as a national secret but publicly released in April 2014. It claimed that 16% of China's soils exceed national standards for pollution with heavy metals and pesticides and, remarkably, that 34.9% of brownfields exceeded national pollution standards.

But a lack of transparent detailed information on locations and pollution levels at specific sites hinders public awareness and efforts to tackle the problem. Unlike the often visible pollution of air or water, soil contamination is difficult to detect without professional equipment. Many brownfield sites have already been used for businesses or housing with insufficient remediation. And until something changes, seriously polluted sites will continue to imperil the environment.

The nationwide action plan calls for new laws to monitor, prevent and remediate the soil pollution. It is very ambitious, aiming to curb new soil pollution by 2020 and incrementally improve soil quality across the country by the middle of this century.

To implement the plan fully would be extremely costly, at more than 7 trillion yuan (US\$1.06 trillion) according to one estimate. To put that into perspective, the Chinese government's investment in soil remediation this year is around 9 billion yuan.

How can the gap be closed?

The common 'polluter pays' principle applies in China, but soil

pollution can take a long time to emerge and be detected. That makes it difficult to track and locate responsible parties, and these historical polluters often have no means to pay. Other funding mechanisms have to be considered, for example from the World Bank and Global Environment Facility. Land developers also need to meet more of the clean-up cost before they are granted the rights to use and sell brownfield sites. Even then, the costs will probably be too high to remediate properly, so China must consider a range of other funding instruments, from environmental taxes and clean-up subsidies to loan guarantees and insurance.

The new plan does not specify which technologies should be used for soil remediation, and this is a problem. At present, many projects try to shorten the treatment period and reduce costs by removing just the polluted topsoil, and so the contamination remains in

deeper ground and water. The removed topsoil is landfilled, which just moves the problem somewhere else, or incinerated, which releases contaminants into the air. Soil-washing is an option, but it generates secondary wastes that require additional decontamination. Improper decontamination measures can even make a site worse by releasing buried pollutants. This seems to be what happened at the Changzhou school.

Low-cost and effective new technologies are urgently needed. Plant-based bioremediation approaches have been developed to treat arsenic and cadmium pollution in China. More research on other biological approaches (use of

earthworms, nematodes and phytoremediation) should be launched.

In common with previous environmental efforts in China, success of the soil action plan will depend on the strength of the law that supports it. Legislation in this area is outdated, and a replacement has been promised by 2020. It should include firm criteria and measures to determine the effectiveness of remediation. (At present, some areas in China use guidelines prepared by the US Environmental Protection Agency, which often do not properly apply to local circumstances).

China is not alone in facing risks caused by soil pollution. Similar major problems have occurred in other developing countries undergoing rapid urbanization, including India and Brazil. As a world laboratory for new technology to decontaminate brownfields, China's approach to managing the problem could benefit other countries. By 2050, another 2.5 billion people are expected to be living in cities. The brownfields must be treated effectively to give these new urban residents clean land. ■

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