



# China's soil and groundwater management challenges: Lessons from the UK's experience and opportunities for China



Frédéric Coulon<sup>a,\*</sup>, Kevin Jones<sup>b</sup>, Hong Li<sup>b</sup>, Qing Hu<sup>c</sup>, Jingyang Gao<sup>c</sup>, Fasheng Li<sup>d</sup>, Mengfang Chen<sup>e</sup>, Yong-Guan Zhu<sup>f</sup>, Rongxia Liu<sup>g</sup>, Ming Liu<sup>h</sup>, Kate Canning<sup>i</sup>, Nicola Harries<sup>j</sup>, Paul Bardos<sup>k</sup>, Paul Nathanail<sup>l</sup>, Rob Sweeney<sup>j</sup>, David Middleton<sup>m</sup>, Maggie Charnley<sup>m</sup>, Jeremy Randall<sup>n</sup>, Martin Richell<sup>n</sup>, Trevor Howard<sup>o</sup>, Ian Martin<sup>o</sup>, Simon Spooner<sup>p</sup>, Jason Weeks<sup>a</sup>, Mark Cave<sup>q</sup>, Fang Yu<sup>r</sup>, Fang Zhang<sup>s</sup>, Ying Jiang<sup>a</sup>, Phil Longhurst<sup>a</sup>, George Prpich<sup>a</sup>, Richard Bewley<sup>t</sup>, Jonathan Abra<sup>u</sup>, Simon Pollard<sup>a</sup>

<sup>a</sup> Cranfield University, School of Energy, Environment and Agrifood, Cranfield, MK430AL, UK

<sup>b</sup> Lancaster Environment Centre, Lancaster University, LA1 4YQ, UK

<sup>c</sup> Engineering Innovation Centre, South University of Science and Technology of China, 1088 Xue Yuan Da Dao, Nanshan, Shenzhen, Guangdong, 518055, China

<sup>d</sup> Department of Soil Pollution Control, Chinese Research Academy of Environmental Sciences (CRAES), 8 Dayangfang BeiYuan Road., Chaoyang District, Beijing 100012, China

<sup>e</sup> Institute of Soil Science, Chinese Academy of Science (ISSAS), 71 East Beijing Road, Nanjing, 210008, China

<sup>f</sup> The Institute of Urban Environment (IUE), Chinese Academy of Sciences (CAS), 1799 Jimei Road, Xiamen 361021, China

<sup>g</sup> The Administrative Centre for China's Agenda21 (ACCA21), 8 Yuyuantan Nanlu, Haidian District, Beijing 100038, China

<sup>h</sup> Department of Science, Technology & Innovation, British Consulate-General Guangzhou, 5 Zhujiang Road West, Zhujiang New Town, Guangzhou 510623, China

<sup>i</sup> Arup, Energy and Resources, 6th floor, 3 Piccadilly place, Manchester M3 1 BN, UK

<sup>j</sup> CL:AIRE, 32 Bloomsbury Street, London WC1B 3QJ, UK

<sup>k</sup> University of Brighton, Environment and Technology, Moulsecoomb, Brighton BN2 4GJ, UK

<sup>l</sup> School of Geography, The University of Nottingham, University Park, Nottingham, NG7 2RD, UK & Land Quality Management Ltd, University of Innovation Park, Sir Colin Campbell Bldg, Nottingham NG7 2TU, UK

<sup>m</sup> Department for Environment, Food and Rural Affairs (DEFRA, UK), Nobel House, 17 Smith Square, London, SW1P 3JR, UK

<sup>n</sup> RAW, Randall and Walsh Associated Limited, 339 Yorktown road, Sandhurst GU47 0PX, UK

<sup>o</sup> Environment Agency (England), Horizon House, Deanery Road, Bristol, BS1 5AH, UK

<sup>p</sup> Atkins, Water Ground and Environment, Epsom, KT18 5BW, UK and Nottingham University, Ningbo, 199 Taikang E Rd, Yinzhou, Ningbo, Zhejiang 315100, China

<sup>q</sup> British Geological Survey, Keyworth, Nottingham NG12 5GG, UK

<sup>r</sup> Chinese Academy for Environmental Planning, 8 Dayangfang BeiYuan Road, Chaoyang District, Beijing 100012, China

<sup>s</sup> School of Environment, Tsinghua University, Haidian, Beijing 100084, China

<sup>t</sup> AECOM, Bridgewater House, Whitworth Street Manchester, M1 6LT, UK

<sup>u</sup> KTN, Innovation Suite, The Heath, Runcorn, Cheshire WA7 4QX, UK

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## ABSTRACT

There are a number of specific opportunities for UK and China to work together on contaminated land management issues as China lacks comprehensive and systematic planning for sustainable risk based land management, encompassing both contaminated soil and groundwater and recycling and reuse of soil. It also lacks comprehensive risk assessment systems, structures to support risk management decision making, processes for verification of remediation outcome, systems for record keeping and preservation and integration of contamination issues into land use planning, along with procedures for ensuring effective health and safety considerations during remediation projects, and effective evaluation of costs versus benefits and overall sustainability. A consequence of the absence of these overarching frameworks has been that remediation takes place on an ad hoc basis. At a specific site management level, China lacks capabilities in site investigation and consequent risk assessment systems, in particular related to conceptual modelling and risk evaluation. There is also a lack of shared experience of practical deployment of remediation technologies in China, analogous to the situation before the establishment of the independent, non-profit organisation CL:AIRE (Contaminated Land: Applications In Real Environments) in 1999 in the UK. Many local technology developments are at lab-scale or pilot-scale stage without being widely put into use. Therefore, a shared endeavour is needed to promote the development of technically and scientifically sound land management as well as soil and human health protection to improve the sustainability of the rapid urbanisation in China.

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\* Corresponding author. Tel.: +44 (0)1234 754 981.  
E-mail address: [f.coulon@cranfield.ac.uk](mailto:f.coulon@cranfield.ac.uk) (F. Coulon).

## 1. China's rapid urbanisation and the contaminated land debate

China's fast urbanisation, along with huge expansion of its manufacturing industry over the last three decades, have brought great wealth and transformed the lives of Chinese people. At China's current urbanisation rate, it is estimated that 350 million people, almost 6 times the current population of the United Kingdom, will be added to its total urban population by 2025 (Woetzel et al., 2009). As cities continue to expand, many older industrial facilities along the edge of, or within, the city boundaries are being relocated or closed, leaving behind derelict, underused and abandoned land contaminated by the former industrial activities. These sites can be valuable land for re-development, but require special intervention to bring them back into beneficial use. At the same time, the continuous outward shift of urban boundaries and the expansion of territorial jurisdictions of cities, primarily through the expropriation of surrounding rural land and its integration into urban areas, means that land use patterns have changed significantly over the last few decades (World Bank Organisation, 2014, Chap. 4). These prevailing land use changes are reflected in three key environmental issues (Fig. 1) that need to be addressed:

1. the rehabilitation of contaminated post-industrial urban sites that may be re-used for housing or amenity;
2. the clearing up of legacy mining and industrial sites outside cities, to prevent further contamination and/or to return to ecological or agricultural function;
3. the decontamination of farmland that is affected by legacy contamination, from the uncontrolled spreading of industrial waste, use of contaminated water for irrigation, atmospheric deposition or dumping of contaminated soils from urban or industrial areas.

Re-zoning to relocate industrial facilities away from residential areas, to segregate manufacturing from where people live, and the reuse of redundant sites for residential, retail and commercial land uses mean that China is potentially a strong market for solutions and

services in contaminated land characterisation, assessment and remediation. There are several reasons for this: (1) avoiding the use of scarce Greenfield land resources; (2) mitigating the legacy impacts of contamination for both the sites and their locality; and (3) creating new opportunities for land use for business, housing and renewables such as energy, but also for green infrastructure, amenity and leisure; and (4) equally, if legacy of contaminated land remained untouched due to legal concerns or lack of financial resources, or not properly remediated, they can present a serious threat to public health and the environment and become a barrier to local and national economic development. For example, creation of new urban parkland may have substantial benefits on the liveability of cities, the value of its land and the health of its residents.

Although the scale of China's urbanisation and the number of growing large metropolitan regions where this urbanisation is concentrated are globally unprecedented, the issues of urban transformation and associated issues of contaminated land are not novel and unique (OECD, 2010). For example, the UK has already gone through this urbanisation and industrial restructuring process and over the past 40 years has developed pragmatic and effective policy and practices to manage this land contamination legacy. These practices have evolved over time, due to different drivers and needs (Fig. 2). They continue to help return many thousands of hectares of land to beneficial use. Such experience can help inform Chinese decision makers.

## 2. China's developing prioritisation and policies for soil and water and the scale of the challenge

China is starting to release details of its 13th five-year plan, where a number of environmental challenges are addressed, including contaminated land which has again been highlighted as an immediate priority (Fig. 1). Under China's current 12th Five-Year Plan, the Ministry of Environmental Protection (MEP) has earmarked 30 billion RMB from central finances (equivalent to £3bn) to support national land remediation

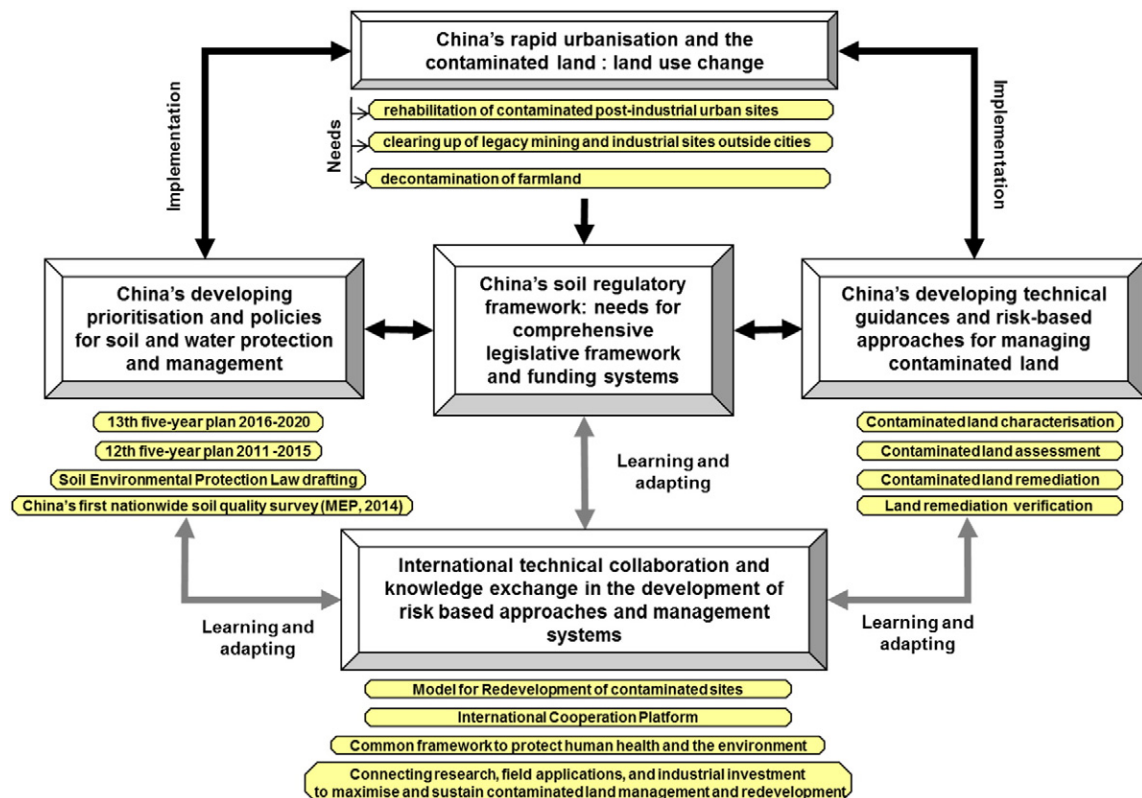


Fig. 1. Overview of China's soil and groundwater management challenges and opportunities for technical collaboration and knowledge exchange.

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