



污染与健康:

中国发展之路上的社会危机

**Pollution and health in China:  
confronting the human crisis**





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chinadialogue is an independent, not-for-profit organisation based in London, Beijing and Delhi.

Alongside a bi-monthly journal, chinadialogue's primary vehicle is our website (<https://www.chinadialogue.net>), a unique bilingual platform which promotes a global understanding of the environmental impact of China's rise by publishing informed articles, commentaries and analysis by writers from inside and outside of China. We aim to inform, educate, and contribute to building a global consensus on fair and workable solutions.

chinadialogue also organises annual press awards in conjunction with the Guardian, Netease New Media Center and Remin University's School of Environment and Natural Resources and School of Journalism and Communication.

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伊莎贝尔·希尔顿  
中外对话总编

# 前言

就在一年前，也就是2013年7月，《美国科学院院报》刊载了一篇报告，报告清晰明了的指出了中国空气污染对人体健康的危害：中国淮河以北5亿居民的预期寿命要比华南地区居民短了整整5年。该报告作者——来自北大、清华以及耶路撒冷希伯来大学的研究员认为，造成这种结果的原因非常简单：在淮河北部，由于政府之前进行煤炭补贴，燃煤供暖系统成为居民度过严冬主要方式。由此造成的不良结果是：煤炭燃烧导致北方的空气污染水平（通过监测颗粒物得出）要比南方高出约55%，从而造成北方居民预期寿命缩短。

除此之外，许多其他严峻的事实也与空气污染有关：例如就健康寿命（并不是简单地指人们的寿命）而言，我们可以清楚地看到，空气污染正侵蚀着过去一百年来中国在延长人们的寿命和增进民生福祉方面取得的进步。（这种趋势正在不断扩大）

中国北方地区的居民都知道，目前糟糕的空气质量对他们的健康具有潜在的危害。然而，还有其他的环境危害正威胁着人们的健康。相比于空气污染，它们并不是那么明显或广为人知，但是某些特定地区人群高发的疾病类型却与这些环境危害息息相关：例如，在某些地区，尤其是化工设施周围地区，通常有癌症村存在；同时还有一些地区，由于电池生产或仅仅因为靠近燃煤发电设备，当地儿童体内铅含量上升。铅中毒可能会损害肝肾，甚至造成永久性智力和发育障碍。7岁以下儿童由于中枢神经系统还未发育成熟，特别容易受到伤害。

中国的卫生统计数据 displays，目前中国肺病发病率居世界前列：肺病发病率居世界第二位，肺癌发病率居世界第12位。同时，中国胃癌和肝癌发病率均居世界第三位。糟糕的健康状况很可能与环境污染相关。

随着环境污染日益严重，尤其是人们使用污水灌溉，食品安全也受到严重威胁。正如本期中外对话杂志中何光伟的文章所说，由于矿业和化工行业靠近农田，加之监管不力，湖南省（中国最重要的大米产地）稻米镉污染问题成为一个难以根治的顽疾。最近几年，包括鱼类，肉类和牛奶在内的其他食物也受到了污染，这给消费者敲响了警钟，同时也使中国民众对他们的食品安全问题表现出深刻的担忧。

这些问题伴随着改革开放以来中国经济的显著增长已经积累了至少30年。总有人认为，发展中国家无法坚持落实环保标准，因为对于正在努力脱贫的它们来说，这些标准似乎代价高昂，它们承担不起。但是未能制定并实施良好的环保标准也给这些国家带来巨大的成本——这些成本通常是由公众买单，造成普通民众个人和家庭生活成本增加。

环境的恶化和污染不仅使人类遭受了巨大的苦痛，而且阻碍了社会的发展，增加了修复成本，同时缩短了人类的寿命，降低了人们的生活质量，人类为此付出了惨重的代价。消除这些痼疾并不容易，也不是一蹴而就的。在本期中外对话特刊中，作者贺珍怡和王五一在他们的文章中也表达了这一观点。他们指出，环境健康“众所周知，对任何国家来说都是一个富有挑战性的政策领域。这是因为与污染相关的健康问题通常因果关系非常复杂，需要政府在多个层面做出反应，进行治理。同时，这些问题还能激起社会群体和污染行业之间，以及司法管辖区和不同地区之间的利益冲突和责任纠纷。”要应对这一挑战，首先必须了解它。我们希望中外对话本期专刊能够在一定程度上帮助读者更好地了解这一挑战。 



Isabel Hilton  
Editor, chinadialogue

# Introduction

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Just over a year ago, in July 2013, a report published in the US journal *Proceedings of the National Academy of Sciences*, put the health impacts of air pollution in China into an unusually clear framework: residents of south China, the report said, could expect to live five years longer than their 500 million compatriots who live north of the Huai River. For the authors, researchers at Peking University, Tsinghua University and the Hebrew University of Jerusalem, the reason was simple: north of the river, the legacy of previous government subsidies is the predominance of coal fired heating systems that see people through the harsh northern winters. The less benign result, however, is a level of air pollution produced by burning coal, measured by particulate matter, that is about 55% greater than in south China and that literally takes years off northern lives.

There are other grim facts associated with air pollution: if we look at healthy years of life (as opposed simply to years of life) it is clear that the gains in longevity and well-being that China has made in the last 100 years are being eroded.

Anyone who lives in north China understands that the air quality that they endure is potentially hazardous. There are other environmental hazards to health that have been less obvious or less widely understood, but that emerge in patterns of illness among populations in certain areas: the cancer villages that can be identified, particularly around chemical industry installations, for example, or elevated levels of lead that are found in children in certain areas, as a result of battery production or simply proximity to coal fired power generation. Lead poisoning can cause damage to the liver and kidneys, as well as permanent intellectual and development disabilities, and children up to the age of seven are particularly vulnerable because of their immature central nervous systems.

China's health statistics reveal that the country ranks second in the world for lung disease and 12th for lung cancer. Chinese people also suffer from the world's third highest rates of stomach cancer and the third highest rates of liver cancer, ill health that is highly likely to have environmental causes.

Then there are the impacts on food safety of widespread pollution, in particular the use of contaminated water for irrigation. As He Guangwei reports in this issue of *chinadialogue's* journal, cadmium contamination in rice grown in Hunan Province, China's most important rice producing province,

has proved to be a persistent and difficult issue to deal with because of the proximity of poorly regulated mining and chemical industries to agricultural areas. Other contaminated foodstuffs that have alarmed consumers in recent years include fish, meat and milk, leaving Chinese citizens profoundly anxious about the safety of the food they eat and feed to their families.

These problems have been accumulating for at least three decades, and they are the counterpoint to the story of China's remarkable economic growth. The argument is often made that developing countries cannot afford to insist on environmental standards, and such standards can seem expensive in a country that is trying to grow out of poverty. But the failure to design and enforce good environmental protection standards also carries huge costs – costs that are paid by the public purse and in the lives and families of ordinary people.

The price of environmental degradation and pollution is expressed in human suffering, in impaired development, in remediation costs, in lost days and lower quality of life. Addressing these ills is neither easy nor straightforward, as Jennifer Holdaway and Wang Wuyi explain in their article in this issue. Environmental health, they point out, “is a notoriously challenging policy area in any country because pollution-related health impacts have complex causality and require a multi-faceted governance response. They also often provoke conflicts of interest and contestation over responsibility not just between communities and polluting industries but also between whole jurisdictions and regions.” Rising to that challenge begins with understanding it. We hope that the articles in this special issue of *chinadialogue's* journal will make a modest contribution to that understanding. 

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# 中国土壤重金属污染之困

工业化高速发展导致的土壤污染无异于一场噩梦，给村民的健康和生计带来了诸多苦难。

何光伟

张均伟（为了保护当事人身份故将其真实姓名隐去）年仅50岁的堂叔2012年2月份过世了。生前，他被癌症折磨了三年，直肠、膀胱全部被切除。回想起这些，张均伟觉得堂叔“生不如死，死亡也许是最好的解脱”。堂叔过世已经两年，张均伟仍然不愿提起他。直到今天，他还害怕谈论堂叔生前所经历的苦痛会给家人带来麻烦。

张均伟堂叔生前所在的江苏省宜兴市分水乡位于太湖西岸，这里

河网密布，人口有7000多。太湖是中国第三大淡水湖，横跨江苏、浙江两省，水域面积2338.1平方公里。自古以来，这里就以风景秀美、物产丰富而著称。

然而，随着上世纪九十年代到本世纪初中国加速工业化进程，一条新修的石子路将原本寂静的分水乡与四通八达的高速路网连接了起来。太湖沿岸的工厂开始增多，分水乡的村民也因为在厂里打工而腰包渐鼓，村里青瓦白墙的传统平房

也逐渐被两、三层的小楼所取代。与许多邻居一样，张均伟的堂叔也在一家工厂打工。

然而，疾病却给这个小家带来了沉重的打击。堂叔生病时，唯一的儿子正在服役。部队工资低，难以负担父亲的医疗费。为了给丈夫看病，堂婶只好去工厂打工。这样一来，工作日里，生病的堂叔身边就无人照料。癌症花光了这个家庭所有的积蓄，但最终也没能换回堂叔的生命。过世前的几天，堂叔都是一人在家自己照顾自己。当他最后一次起身拿水喝的时候，终于支撑不住，瘫倒在地，那一天他便撒手人寰。

张均伟认为，堂叔之所以患上癌症都是土壤污染造成的。土壤污染在中国是个敏感话题，张均伟至今还不敢公开谈论。

张均伟刚刚四十出头，跟他堂叔一样，一辈子都住在太湖边。分水乡8.7公里外的周铁镇就是他的老家。而距周铁镇不到60公里的宜兴市是中国第一大经济区长三角地区的中心。宜兴及周边地区自古以来



土壤污染数据曾被列为“国家秘密”，官员们现已逐渐意识到这一问题的严重性。

就是中国重要的稻米产区。早在公元960年就有诗文记载这一地区气候宜人、土壤肥沃。这里土质细密，色泽棕红，非常适合制作紫砂壶，宜兴紫砂壶在中国享有盛誉。

然而，如今，宜兴及周边地区却成为中国新兴工业版图的一部分。从上世纪九十年代以来，曾经风景秀美的太湖岸边遍布着近3000家工厂。化工行业的蓬勃发展使宜兴成为中国最富裕的县级城市之一，2012年GDP达到了1066亿元人民币。

这里也是农业产区。分水乡和周铁镇之间道路两旁都是一片片平整的菜地。对于这些住在城市周边的农民来说，种菜的收入要比种粮高。但当地很多农民却不吃自己种的菜。因为他们知道，在被镉、铅、汞等重金属物质污染的土壤里种出来的蔬菜，里面肯定含威胁人体健康的物质。张均伟现在也基本不吃当地的农产品，因为“污染太厉害了”。

尽管土壤污染对健康的危害丝毫不逊于波及面更广的空气污染和水污染，但在中国，公众对于土壤污染的关注度却相对较低。政府对土壤污染数据严格保密，甚至将其列为“国家机密”。中国政府不久前还阻挠媒体对新兴工业地区癌症频发的现象进行曝光。直到2013年2月，环保部才最终承认“癌症村”的存在，并公布了一份名录。名录中就包括太湖周边地区，以及分水乡和周铁镇。据中国民间专家估计，中国大陆地区有450个癌症村，且有逐渐扩散的迹象。

癌症热点地区宜兴的案例非常典型。上世纪九十年代开始，当地官员被席卷全国的经济浪潮裹挟

着，迫不及待地引进了大批工厂和化工企业。本就薄弱的环境监管往往被抛之脑后。在张均伟看来，“政府官员唯GDP论，不管什么污染企业都敢引进”。一开始，那些在新开办的工厂找到工作的村民也持欢迎态度。

最早出现反常迹象的是太湖。宜兴市一位名叫吴立红的环保人士为了保卫太湖进行了长期的斗争。上世纪九十年代初，本是渔民的吴立红发现，原本清澈见底的湖水变得混浊不堪。这令他很是担忧。于是，在他的组织下，一个名叫太湖卫士的当地环境监测组织开始收集太湖及其支流的水体样本。

16年来，吴立红饱受当地官员和警察的打压，但仍不断上访，希望太湖不断恶化的水质能够引起上级政府部门的注意。在他的努力下，成功迫使200多家工厂关闭。然而，2007年4月13日，吴立红因涉嫌敲诈勒索被拘捕，并被判处4年有期徒刑，他保卫太湖的活动也戛然而止。在他被捕后的一个月，环保总局授予宜兴市“国家环保模范城市”的称号，而5天后太湖蓝藻暴发。

2007年盛夏发生的这段插曲在国际范围内引起了广泛的关注，也让中央和省政府尴尬不已。据太湖流域管理部门的资料显示，太湖流域53个水源供应着3000万人口。官方媒体《人民日报》引述周铁镇官员的话说，太湖因蓝藻暴发引发供水危机，不少地方湖水像“酱油”一样。这一事件迫使当局不得不采取行动。

2006年底宜兴有化工生产企业1188家。通过6年的整治，截至2013年10月，累计关停并转化工生产企业583家，其中，周铁镇有104家，相邻的太华镇有57家。2013年年底，宜兴对化工行业进行了新一轮整治，并计划在未来两年关停52家化工生产企业。

这一切对于吴立红来说都来得太晚了。如今，吴立红已经出狱，妻女已经出国。但他的诸多行动还会受到一些限制，比如不能公开向媒体发表看法等。他的遭遇也在提醒其他村民，环保是需要付出高昂代价的。

环境污染问题在宜兴当地是个极为敏感的话题，以至于受访者大



受污染的河水又用来灌溉水稻，导致水稻中部分重金属超标。

都不敢透露自己的姓名，担心会遭到当地官员报复。还有些人则认为，官方对污染问题的遮遮掩掩剥夺了他们的知情权，让他们无从了解自己及家人的健康究竟面临着怎样的危险。据张均伟回忆：“老家污染严重的时候，人排出的汗都有颜色，我的亲戚中有几个人年纪轻轻就死于癌症”。

尽管当地政府关闭了一些污染最严重的化工厂，但那些化工厂排放出来的污染物最终通过废水、废渣等进入到了土壤中。多年污染留下的有毒废弃物还在威胁着该地区以及其他地区群众的健康。

当地的癌症发病率在不断攀升。对此，张均伟及其他村民都非常清楚。村民们说，癌症患者大概从10年前开始增加，一些工厂附近的农民因为工厂带来的污染而生病或过世。在被镉等重金属污染的土地上种植的作物肯定会吸收有毒物质。当地农民很清楚污染的危害，但直到今天，他们除了种地之外，别无选择。这些家庭既不能直接从

工业化中受益，也没有其他经济来源。虽然知道当地的农产品受到了污染，但经济条件最差的那些人也只能吃自己种的东西。

然而，从科学角度来看，尚难认定环境污染与癌症之间存在直接联系。江苏省河海大学环境与社会学研究中心主任陈阿江认为，环境污染与癌症之间的关系十分复杂，准确判断两者之间的因果关系十分困难。

2007年，陈教授在政府的资助下开展了太湖、淮河流域“人—水”和谐机制的研究。他与四位研究人员历时五年，对河南、江苏、浙江、江西、广东等省展开实地调查，力求寻找环境污染与癌症之间的关系。他认为，污染导致居民患病，影响了经济发展，诱发贫困，或者导致人口迁徙。虽然目前医学上尚难认定“癌症村”中的“癌症-污染”关系，但陈阿江与他的研究团队发现，“癌症村”作为社会事实已经存在，生活在癌症村里的人们遭受着严重伤害。

化工厂排放出来的污染物以废气、废渣、废水的形式排入太湖以及当地其他水系。如今，这些污染物在土壤中蓄积。但政府却不愿面对问题的严重性。2013年4月，中华人民共和国住房和城乡建设部还曾授予周铁镇“中国人居环境范例奖”。与此前西

宁获得的殊荣一样，这一奖项似乎与周铁镇真实的环境状况不符。

2013年4月江苏省地质调查院所做的一份未完全公开的报告称，2004年以来，苏锡常地区部分土壤的镉、汞等重金属污染范围在逐步扩展，有连点成面的趋势。这份题为《长江三角洲典型地面沉降区水土污染监测与防治技术研发与示范》的报告显示，2005年至2011年期间，苏锡常地区地表土壤中有37.5%的样点镉含量处于增长状态，一般增幅为平均每年0.03毫克/千克左右，最大达到平均每年0.2毫克/千克。

研究人员通过持续监测发现污染在不断恶化。报告称，某地原来只有工业区周围相对独立的区域土壤镉含量超过0.4毫克/千克。然而，到2012年，附近大片农田遭到相同程度的污染，所生产的大米和水稻也被污染。

报告还提及，某乡镇因当地有多家企业直接将排污口对准其厂外的河道，导致一条河流中河泥的镉含量高达1500毫克/千克以上，该地稻米的镉含量一般大于0.5毫克/千克。而根据中国食品安全国家标准的规定，大米的镉含量不得高于0.2毫克/千克，国际通行标准则是不得高于0.4毫克/千克。而该镇稻米镉含量早已超出了这个标准。后经证实，该乡镇就是周铁镇西南29公里的丁蜀镇。

宜兴市下辖的丁蜀镇，因主产陶瓷被冠以陶都明珠的称号，该镇遍布琉璃瓦厂、紫砂壶厂、紫砂作坊。陶瓷制品是宜兴重要的收入来源，但这些工厂同时也严重地破坏了当地的环境，污染了这一地区的土壤。宜兴市从2011年初开始整治



辖区内的琉璃瓦企业，直到2013年6月才彻底关停300余家。

该地区的环境问题表明，中国必将为其30多年快速的经济增长付出高昂代价，而日益严峻的土壤污染问题正在成为中国粮食安全最大的不确定因素之一。官方估算称，中国每年因重金属污染的粮食高达1200万吨，直接经济损失超过200亿元人民币。

然而官方在采取措施应对土壤污染时却是一副遮遮掩掩、含含糊糊的样子。直到今天，人们还需要通过不同的报告才能拼凑出污染影响范围和严重程度的全貌。

例如，2010年，国际专业机构——中国环境与发展国际合作委员会（国合会）在其《中国土壤环境保护政策研究国合会专题政策研究报告》中警告，中国土壤污染的总体形势不容乐观，并引用1997年中国环境状况公报称，中国耕地污染较重，有1000万公顷耕地受到不同程度的污染。而据2000年中国环境状况公报，2000年对30万公顷基本农田保护区土壤有害重金属抽样监测，结果发现其中3.6万公顷土壤重金属超标，超标率达12%以上。

国合会的研究人员对中国的土壤监管体系也不看好，认为土壤污染防治投入严重不足。他们指出，土壤污染会使农作物的质量下降，因此建议开展土壤环境保护和污染控制立法工作、完善中国土壤环境标准体系。

目前，有迹象表明，土壤污染的严重性正迫使中国政府解决累积数十年的环境污染问题，并对过去不计环境代价一味追求增长的政策

重新进行审视。2007年7月，国土资源部与国家统计局启动了全国土地调查。该调查于2009年结束，但直到2013年12月才公布部分调查结果。2014年4月，政府公布了《全国土壤污染状况调查公报》的部分结果。这项2005年4月至2013年12月开展的调查对全国630万平方公里的土地进行了调查。结果发现，全国土壤总的超标率为16.1%，耕地土壤点位超标率为19.4%。

中国目前有耕地1.35亿多公顷，但随着城市化发展和污染的日趋严重，优质耕地数量在不断减少。近期发布的调查结果显示，中国中重度污染耕地超过300万公顷，其中重金属污染的土地所占比重目前还不清楚。早在2011年，时任中国国家环保总局（现环境保护部）总工程师的万本太就曾在一次会上表示，中国约有10%的耕地遭遇铅、锌和其他重金属的超标污染。

据官方估计，全国每年因土壤污染导致粮食减产100亿公斤。另据官方估算，中国每年受重金属污染的粮食高达1200万吨，造成的直接经济损失超过200亿元人民币。

公众越来越担心环境污染造成的影响。这迫使政府的态度也开始发生变化。然而，由上至下态度的转变还需要一定时间。2013年11月，十八届三中全会上，代表们通过了一份有关政府未来优先发展事项的重要战略性文件。

这份题为《中共中央关于全面深化改革若干重大问题的决定》承诺，将在国家和地方官员考核中加大环境保护的权重，地方官员将对污染负直接责任，地方官员晋升过

程中将不再以经济增长为考量，并通过立法和放权严惩环境污染者，承诺制定新的环境保护法。新法已于2014年4月获得通过，其中，取消了对污染企业的处罚上限。

然而，在环保部自然生态保护司司长庄国泰看来，由于土壤问题治理难度大、周期长，所需投资将非常巨大。据他称，有时候，土壤样本中还能检测出可追溯至几十年前的污染物，如1980年代已禁止使用的“666”农药残留。

庄国泰承诺说，土壤环境保护行动计划将综合运用中央政府、地方政府与企业力量，通过市场机制推动土壤污染治理，制定激励机制，吸引公众参与，并且还将制定新的土壤污染防治法。然而，土壤修复是一个耗资巨大、情况复杂的问题。污染无异于一场噩梦，给乡村带来了苦难，让很多人年纪轻轻便失去了生命，造成减产，使粮食成为毒物。然而，要走出这场噩梦却绝非易事。 5

中国土壤污染系列文章由中外对话和耶鲁大学森林与环境研究学院旗下的耶鲁大学环境360共同报道，该合作项目还得到了美国普利策新闻报导中心危机报道的支持。

何光伟，新闻记者，2006年以来为多家媒体报导新闻时事。2012年，他的报道获得了中外对话和《卫报》举办的中国最佳环境报道奖中的“最佳深度报道奖”。

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# The victims of China's soil pollution crisis

Rapid industrialisation has left a legacy of soil pollution that is damaging health and livelihoods in villages across China

He Guangwei

When Zhang Junwei's uncle died in February 2012, he was only fifty. In the three years that he had endured the cancer that killed him, surgeons had removed both his rectum and his bladder. "Perhaps he was better off dead," said Zhang, reflecting on his uncle's ordeal. "It was a release." Two years after his uncle's death, Zhang still refuses to name him, afraid that even now, talking about how his uncle lived – and died -- could bring trouble down on the family.

Zhang's uncle lived in Fenshui, in Central China's Jiangsu Province, a village of some 7,000 people that straddles a network of waterways on the western shore of Lake Tai, China's third largest freshwater lake. Lake Tai boasts 800 square miles of fresh water, shared between Jiangsu and Zhejiang provinces, and has been celebrated throughout Chinese history for its abundant fish and beautiful limestone landscape.

But as China's industrial boom gathered speed through the 1990s and the early years of the 21st century, a new, metalled road connected the once sleepy village of Fenshui to the major highway networks being built across China. Factories began to cluster along the lakeshore and the village's traditional single-story whitewashed houses, with their signature black-tiled roofs, were steadily replaced with two- and even three-story houses, as factory wages brought a surge of prosperity to Fenshui. Zhang's uncle, like many of his neighbours, had found work in one of those factories.

His illness hit the small family hard. His only son was serving in the army when his father fell ill, and the soldier's wage was too small to cover the medical bills. Zhang's aunt took a factory job herself to support her sick husband,

making the difficult choice to leave him unattended during her working day. The cancer was to consume the family's savings entirely, all spent in a fruitless effort to save his life. The patient struggled through his final days at home, getting up to see to his own needs until the day he finally collapsed while fetching a drink or water. He died later that day.

Zhang Junwei (whose name has been changed to protect his identity) believes that the cancer that ended his uncle's life was caused by soil pollution, a subject so sensitive in China that Zhang himself is still afraid to discuss it openly. Zhang has just turned forty and, like his uncle, has lived all his life in Jiangsu, near the lake. His village of Zhoutie is just five miles from Fenshui (8.7k) and less than 40 miles from the county town of Yixing, in the heart of the Yangtze Delta, today China's biggest regional economy. For more than 1,000 years, Yixing and its surrounding countryside was an important source of



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grain for China, celebrated in poetry as far back as 960AD for its benign climate and fertile soil, and famous for the manufacture of a dense, brown pottery that is still highly prized in China as the ideal material for teapots.

But today Yixing and the land around it sit in China's new industrial landscape. Since the 1990s, nearly 3,000 factories have been built on the once-beautiful shores of the lake. The chemical boom made Yixing one of China's richest county-level towns, with a GDP that reached RMB 106.6 billion Yuan (US\$17.06 billion) in 2012.

It is also still an agricultural area: the road from Fenshui to Zhoutie runs between flat, regular fields of vegetables, these days more profitable crops than grain for farmers who live close to urban markets. But many local farmers have given up eating the crops they grow. They know that their vegetables are planted in soil polluted with cadmium, lead and mercury, heavy metals that are dangerous to human health. Zhang confessed that he rarely eats local produce either. "There's too much soil pollution," he said.

Soil pollution has received relatively little public attention in China. Despite the fact that it poses as big a threat to health as the more widely covered air and water



pollution, data on soil pollution has so closely guarded that it has been officially categorised as a "state secret." Until recently the Chinese government also resisted media efforts to draw attention to local epidemics of cancer in China's newly industrial areas. It was not until February 2013 that the Ministry of Environmental Protection (MEP) finally admitted that "cancer villages" existed in China, and released a list that included the area around Lake Tai and the villages of Fenshui and Zhoutie. Some civil society experts have estimated that there are 450 cancer villages in China, and believe the phenomenon is spreading.

The story of the cancer hotspot of Yixing is characteristic: in the rush to develop that engulfed China from the 1990s, local officials were eager to invite factories and chemical plants into the area, and their already weak environmental controls were often disregarded entirely. "Government officials just care about GDP," Zhang complained. "They were happy to welcome any polluting firm." So, for a time, were the villagers who found jobs in the new factories.

The first real signs of the troubles to come were in Lake Tai itself, and were the subject of a long campaign by another resident of Yixing township, the fisherman turned environmentalist, Wu Lihong. In the early 1990s, Wu grew worried about the deterioration of Lake Tai's once famously pure waters. He organized a local environmental monitoring group that he called Defenders of Tai Lake, to collect water samples from the lake and its feeder rivers.

For 16 years, Wu campaigned to draw attention to the lake's declining health, despite harassment from local officials and police and, by appealing to senior government officials, he succeeded in forcing more than 200 factories to close. But his campaign abruptly ended on April 13, 2007, when he was arrested and was sentenced to a four-year prison term on charges of extortion and blackmail. The following month, the Ministry of Environmental Protection named Yixing a "National Model City for Environmental Protection." Five days later, a toxic algae bloom turned the waters of Lake Tai into foul-smelling green sludge.

That episode, in the high summer of 2007, attracted international attention and was a major embarrassment for the national as well as the provincial government. According to the Lake Tai Basin Authority, more than 30 million people draw their drinking water from the basin's 53 water sources. A Zhoutie local official admitted to the government newspaper People's Daily that the algae bloom had caused a "water supply crisis," and said the lake's water "looked like soy sauce." The authorities finally acted.

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At the end of 2006, Yixing had been home to 1,188 firms producing chemicals. By October 2013, after six years of “rectification,” 583 had been closed down, merged or reopened as other types of businesses, as were 104 chemical plants in Zhoutie and 57 in neighbouring Taihua township. In late 2013, Yixing started a new round of chemical industry clean-up, with plans to deal with an additional 52 chemical firms over the next two years.

It all came too late for the campaigner Wu Lihong: he has now completed his prison term and his wife and daughter have moved overseas, but Wu himself remains subject to restrictions, including a ban on talking to the media. His harsh treatment is a reminder to other villagers that environmental activism carries a high cost.

Pollution remains a highly sensitive subject in the district. Most interviewees were too frightened to give their names, worried about how local officials might react. Others complained that official secrecy about pollution meant that they could not discover what dangers Zhoutie’s toxic legacy might pose to their own health and that of their families. Zhang Junwei recalled that, when the pollution was at its worst, even people’s sweat was discoloured. “Several of my relatives died from cancer very young,” he said.

Although the local government has now closed the worst of the factories, the pollutants those factories had released in their wastewater or sludge ended up in the soil, and the toxic waste from those polluting years continues to threaten the health of the people of the area and beyond.

Zhang Junwei and villagers like him are well aware that cancer rates in their district have risen, and they suspect that pollution was the cause. They say the number of cancer victims started to increase ten years ago, when local farmers began to fall ill and die. Their suspicions were well-founded: when crops are grown in soil contaminated with cadmium or other heavy metals, the grain absorbs the toxins. But even today, despite this awareness of what pollution can do, local farmers have little choice but to continue to plant: these are families that reaped no direct benefit from industrialisation and still have few alternative sources of income. The poorest still eat locally produced food, knowing it is contaminated.

Establishing a clear connection, however, between pollution and cancer is scientifically challenging. At Hohai University, in Jiangsu Province, Chen Ajiang, a sociologist who heads the university’s Institute of the Environment and Sociology, admitted that the link between pollution and



*After initially declaring soil pollution data a "state secret", officials have slowly begun to acknowledge the gravity of the issue.*

cancer is extremely complex, and it is difficult to pin down cause and effect.

In 2007, Professor Chen won a government grant to study the interaction of human and water environments in the basins of Lake Tai and the Huai River. For five years, he and his four researchers carried out field studies in the provinces of Henan, Jiangsu, Zhejiang, Jiangxi and Guangdong, looking for evidence of the health impacts of water pollution. Professor Chen believed that pollution-related illness was damaging economic development, keeping villagers in poverty or driving them away from their native villages altogether. Although he admits that the medical world has not yet identified an undisputed link between pollution and cancer in the villages he studied, his team established beyond doubt that cancer villages exist and that the lives of those who live in them are severely impacted.

The pollution that chemical factories released in gas and sludge, and in the wastewater they discharged into Lake Tai and other local waterways, has now accumulated in the surrounding soil, but the government has been reluctant to acknowledge the scale of the problem: in April, 2013, the Ministry of Housing and Urban-Rural Development awarded Zhoutie a “Habitat Environment Prize,” an award, like the accolade given to Yixing, that seems out of tune with the real state of Zhoutie’s environment.

In April 2013, the Jiangsu Geological Survey published part of a report that showed that heavy metal pollution in the Wuxi, Suzhou and Changzhou areas has increased

continuously since 2004, with once isolated spots of pollution from cadmium and mercury now expanding and merging to form larger, continuous areas. The report, *New Technologies for Monitoring and Preventing Heavy Metal Pollution* resulting from urbanization, revealed that between 2005 and 2011 increasing levels of cadmium were found at 37.5% of the sites sampled, with average increases of 0.03 mg of cadmium per kg of soil. At its highest, the annual average increase was 0.2 mg.

Continuous monitoring revealed an escalating pattern of pollution: In one unspecified area, researchers reported, cadmium levels higher than 0.4 milligrams (mg) per kilogram (kg) of soil were found only in relatively isolated patches in the land surrounding industrial development. But by 2012, large stretches of nearby farmland were polluted to the same levels, and rice and wheat produced in the area were contaminated.

It also described one case -- later identified as the township of Dingshu, 18 miles to the southwest of Zhoutie where, due to a cluster of township enterprises that were dumping their waste, cadmium levels in the river silt had reached 1500 mg / kg, and that rice produced on nearby land was contaminated with cadmium to levels of more than 0.5 mg per kg. China’s food safety standards rule that rice can contain no more than 0.2 mg / kg of cadmium, and the international limit is 0.4 mg / kg. Rice from Dingshu has long been in breach of those limits.

Dingshu is the centre of Yixing’s ceramics industry, home to many glazed tile factories, teapot factories and clay workshops. Yixing’s stoneware is an important source of revenue, but the factories have also badly damaged the local environment and contribute to the area’s soil pollution. Yixing launched a crackdown on ceramic factories in early 2011, but by June 2013 only 300 had been fully shut down.

The area’s problems illustrate the high price China is paying for 30 years of rapid economic development and the risks China’s increasingly serious soil pollution poses to its food. Official estimates say that China produces 12 million tonnes of heavy-metal contaminated grain a year, with an economic cost of more than RMB 20 billion Yuan (US\$3.2 billion).

China’s official approach to soil pollution has been characterized by secrecy and obfuscation. Even now, a picture of the scale and severity of the problem must be pieced together from disparate reports.

In 2010, for instance, a report on soil protection policy from the international expert body, the China Council for International Cooperation on Environment and Development



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(CCICED), warned that overall trends in China's soil pollution gave no cause for optimism. Quoting China's official 1997 Report on the State of the Environment in China, it characterized the pollution of China's arable land as "rather severe", with pollution affecting an estimated 10 million hectares of land. By the year 2000, according to that year's report on the state of the environment, 36,000 of the 300,000 hectares of basic farmland monitored for harmful heavy metals were found to be more than 12 per cent beyond the standard.

CCICED's researchers were no more optimistic about China's system of supervision and management of soil, finding that investment in soil pollution prevention and control was too low. They stressed that soil pollution reduces the quality of crops and recommended legislation to protect the soil and to control pollution, as well as improvement in China's environmental soil standards.

There are now signs that gravity of the soil pollution problem is belatedly forcing the Chinese government to begin to deal with a problem that has accumulated over many decades, and to reconsider its policy of pursuing economic growth at the expense of the environment. In July 2007, the Ministry of Land and the National Bureau of Statistics launched a nationwide soil survey. It was completed in 2009, but partial results were not published until December 2013. In April 2014, the government released partial results of a second soil pollution survey, conducted from April 2005 to December 2013, and covering 630 square kilometres (243 square miles) of farmland. The survey reported that about 16.1 percent of China's soil and about 19.4 percent of farmland were contaminated.

China has 135 million hectares of arable land in total, but the amount of available high quality arable land has been dropping due to advancing urbanisation and pollution. According to the recently released data, the government classifies more than 3 million hectares of arable land as moderately polluted. How much of that is contaminated with heavy metals is still not clear, though in 2011, Wang Bentai, then chief engineer of the State Environmental Protection Agency (now the Ministry of Environmental Protection) put lead, zinc and other heavy metal pollution at 10% of China's arable land.

By official estimates, pollution cuts China's harvests by 10 billion kg every year. In addition, official estimates say China produces 12 million tonnes of heavy-metal

contaminated grain a year, resulting in annual direct economic losses of over RMB 20 billion Yuan. (US\$3.2 billion).

Rising public concern about the impacts of pollution have begun to force a change in government attitudes, but changes at the top can take some time to percolate down to lower levels of government. In November 2013, delegates to the Third Plenary Session of the 18th CPC Central Committee – an important party meeting -- adopted a key strategy document that set out the government's priorities for the immediate future.

The document, prosaically entitled Decision on Major Issues Concerning Comprehensively Deepening Reforms, promised that environmental protection would be given more importance in the performance evaluation of local and national officials, and that local officials would be considered directly responsible for pollution. Economic growth would no longer guarantee promotion for local officials. The government also promises to put in place the legislation and powers to allow polluters to be heavily punished, a promise that began to take shape in the new environmental protection law, approved in April 2014, which removed the caps that had kept fines for polluters low.

However, Zhuang Guotai, the head of the MEP's Department of Nature and Ecology Conservation, has said that cleaning up soil pollution is a difficult and lengthy process that will require huge investment. In some cases, he explained, the pollution the ministry had identified in soil samples could be traced back decades: pollution from the pesticide benzene hexachloride, for instance, a substance banned in the 1980s, was still in evidence. 

*This was part of a series of articles on soil pollution jointly commissioned by chinadialogue and Yale Environment 360, with support of the Pulitzer Center on Crisis Reporting.*

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# 土壤污染威胁中国食品安全

整治稻米大省湖南的土壤镉污染危机将是一个艰巨的任务。

何光伟

对曹福社来说，2013年是个不景气的年头，他为能不能赚够养家的钱而苦恼。曹福社五十出头，家住湖南省株洲市下辖的攸县桃水镇诸家桥村，种有三英亩（18亩）水稻。镉污染正在影响他的收入，虽然之前他并不知道镉是什么东西。

在中国，种植水稻是一项吃力不讨好的营生。12年前，为了赚更多的钱，曹福社与很多小型农业种植户一样，不得不去邻近的广东省省会广州打工，在建筑工地上做包工头。然而，他发现，粮食流通的利润很大，做“粮食经纪人”不比做建筑赚钱少，于是他放弃了做包工头，回攸县老家做起收购粮食的生意。很快他就成为当地大名鼎鼎的“粮食经纪人”，代表国有粮食企业按照国家指导价替收购储备粮。

两辆货车和手下的8个工人，让曹福社的生意在过去还算不错。2012年攸县粮食丰产，也是曹福社生意最好的一年。他收购了近4000吨粮食，也由此获得“株洲粮食经纪第一人”的美称。然而，2013年5月16日，广东省广州市食品药品监

督管理局公布的食物抽检数据称，在抽检的18批次湖南大米及米制品中，有8批次产品镉含量严重超标，其中3个米厂5个批次的大米涉及曹福社所在的湖南省攸县。镉是一种有毒重金属，能够在人体积存，并给肝肾等器官造成损害。而在此前的2013年2月底，湖南大米在广东就被查出镉含量超标。这次镉米风暴，让湖南的大米瞬间名声扫地，价格下跌。

如果不尽早卖出稻谷，一旦霉烂就要影响品质价钱。攸县的农民都知道稻谷价钱一直下跌，而且不只是大米，还有其他作物，但起初他们却很少知道是因为大米被查出镉含量超标。相对农民来说，“粮食经纪人”的损失还不是很大。曹福社每收购1吨大米基本能赚100元人民币，但由于担心大米的销售，他大幅缩减了全年的收粮总量。

曹福社至今仍然不明白大米为何会镉含量超标，但他知道环境肯定被污染了。湖南是中国的稻米大省，年产量约为3000万吨，占全国大米产量的15%，享有“中国粮仓”

的美誉。作为湖南“四大产粮县”之一，攸县在2012年水稻种植总面积是99.5万亩，总产稻谷48.44万吨。随着人口的增长，以及长久以来对国家粮食安全的担忧，政府一直鼓励湖南及其他省份的大米种植户多种粮。

但与此同时湖南同时也是世界闻名的“有色金属之乡”，全省矿年年排废渣近5000万吨。在很多情况下，从矿山中排出的废水往往被直接用来灌溉农田，尾矿也往往管理不善，其中的镉渗进土壤、使稻米受到污染。

该事件一经曝出，攸县官方便予以否认，并通报表示大米镉含量超标企业周围10公里内无重金属企业。然而有人却说，该县土壤重金属污染由来已久，在多年前就是公开的秘密。

早在2006年，株洲市天元区马家河镇的新马村曾发生一起镉中毒事件，致使2人死亡、150名村民慢性轻度镉中毒。随后，该村及相邻两村共计千余亩土地弃耕。

湖南省农业资源与环境保护站

站长尹丽辉此前向官方媒体承认，有色金属开发以后，带来了污染，特别是湘江流域这一带。有政府背景的中国媒体《经济日报》更是表示，湖南的“母亲河”湘江是中国重金属污染最为严重的河流。

按照一位不愿透露姓名的诸家桥村村民的说法，该镇在数年前就存在不少提炼重金属的小作坊，甚至包括一些氧化锌厂。有熟悉那些氧化锌生产流程的村民透露，在提炼氧化锌的过程中，还会产生大量的铜镉渣等副产品。据这位村民说，它们只是被简单地一倒了之。攸县环保部门官员指出，仅2012年一年，该县花在环境治理上的经费就高达2000万元，关停重金属企业24家。政府采取了关停措施，但这些企业排放的污染物中的有毒物质却

留了下来，随着降雨渗入土壤。

2010年11月，中国地质调查局对黄河流域、东北平原、长江流域的土壤状况展开调查，共计采集样品200万件以上，分析组合样品约60万件，结果发现，攸县所在的湖南省株洲市是全国镉污染最严重的地区，其镉污染超标5倍以上的土地面积就有160平方公里以上。

“十五”规划实施以来，湖南省的汞、镉、铬、铅排放量位居全国首位；砷（砒霜）排放量名列甘肃省之后居第二位。官方数据称，湖南全省受到“矿毒”及重金属污染的土地面积达2.8万公顷，占全省总面积的13%。

与很多富裕的沿海城市相比，攸县较为贫困，除了矿产之外，主要收入来源于煤、铁等资源。2012

年，正当当地污染形势浮出水面之时，由于煤铁矿产品降价，攸县的GDP也受到重创。2011年，株洲市官方才试图投入400多亿元巨额资金，对当地长期受有色金属冶炼厂和化工厂影响、污染最严重的清水塘地区进行治理。株洲市清水塘老霞湾港排污口不远处的老霞湾港河床底泥含镉量最高值达359.8克/千克。按照中国的《土壤环境质量标准》一级标准限定值，该处镉含量是该标准的1800倍，底泥含铅量最高值达1827.6克/千克，超标52倍。老霞湾港附近有许多生产氧化锌和硫酸锌的企业。这些企业将工业废水直接排入湘江。当地政府的污染治理项目包括污染防治、污染土地治理、对受影响的村民异地进行安置等。



攸县石羊塘镇南田村的村民在稻田里插秧。2013年，产自这里的稻米被检出镉超标。

湖南省在2012年初就开始摸底稻田镉污染，开展全省稻田土壤镉含量分布状况、镉低吸收水稻品种筛选、稻田土壤镉钝化及耕作技术和稻米镉快速检测技术与装备的研究。湖南省环境监测中心主任罗跃平受命开展本省稻田土壤镉污染分布的研究工作。政府希望这项工作能够有助于对污染程度进行量化，从而为制订行动计划奠定基础。

官方希望藉此实现农田到餐桌全过程的镉污染消减与阻断，引导建立湖南省稻米安全生产与监管模式，这项工作预计在今年内完成。然而，人们对于食品安全的担忧与中央迫切希望能够解决国家粮食安全之间存在着冲突。中央出于粮食安全的考虑，不断要求河南、湖南等农业省份扩大粮食生产。而各省级政府部门迫于压力，即便是在受污染的耕地上，也不愿让农民停止耕作。

中华粮网易达研究院院长、湖南省农产品市场监测预警专家委员会委员孙忠透露，即便查出了部分大米镉含量超标，湖南省官方仍然要求2013年的粮食总产继续实现600亿斤以上。而且据他说，尽管这几年政府的惠民政策一直鼓励农民多种粮，但湖南有不少农民都对种水稻后能不能卖出去表示担忧。提交给湖南省政协的文件也显示，近年来，湖南省出口（外销）农产品因有毒有害物质超标，被拒的次数逐渐增多。

土壤被镉污染不是一两天就能治理好的事情。孙忠建议官方要拿出一套长期的治理方案。然而，2012年底，来自湖南省农业厅的消息称，湖南省农产品产地重金属污染总体呈现出从轻度污染向重度复合型污染发展、从局部污染向区域污染发展、从城市郊区向广大农村发展的趋势。

中国耕地面积仅占世界总面积的约10%，但却要养活全球约20%的人口。作为世界最大的水稻生产国和消费国，中国在过去几十年几乎一直都是水稻净出口国，主要出口地为亚洲和非洲。然而，粮食生产却受到若干因素的威胁。中国国土资源部在2013年底发布的全国土壤报告称，污染以及城镇化和工业化等因素继续导致中国耕地流失。报告指出，截至2009年的三年中，中国的耕地面积减少了0.2%，2.5%的土地可能受到重金属和其他污染物的严重污染而无法种植。中国国土资源部副部长王世元称，中重度污染耕地大体在5000万亩左右。不仅如此，仍在使用的耕地中，重金属污染、以及农药、化肥的大量使用会造成土壤有机质含量下降，土壤板结，导致农产品产量与品质下降。

政府为了维护粮食安全设置了最低18亿亩的耕地面积“红线”，但人多地少的矛盾愈发加剧。很多地区由于缺少监管，或监管不到位，造成废水往往被直接用来灌溉农田，企业还在任意倾倒废渣废料。

政府部门一直拒绝公布土地污染问题的相关数据。2013年，北京律师董正伟向环保部申请公开“全国土壤污染的成因和防治措施方法”等土壤污染信息，则被环保部以“数据属于国家机密”为由拒绝。此举引起了很大的社会反响，从而促使有关方面于2013年底发布了部分数据。尽管这些数据还不够详尽，但依然引起了巨大恐慌。

近期在北京发布的《食品安全在中国：问题、管理和研究概况总结报告》对中国国土资源部公布的上述数据发表了置评。报告认为，这对食品安全和公众健康到底有多大影响实际上却远未明朗。报告还指出，工矿业产生的重金属所造成的农业生产环境污染问题，使得中国食品安全问题比其他许多国家都要严重。

不论采取怎样的治理措施，中国轰轰烈烈的工业化进程势必在未来几年成为萦绕在中国农民和消费者心头的噩梦。☺

中国土壤污染系列文章由中外对话和耶鲁大学森林与环境研究学院旗下的耶鲁大学环境360共同报道，该合作项目还得到了美国普利策新闻报导中心危机报道的支持。

何光伟，新闻记者，2006年以来为多家媒体报导新闻时事。2012年，他的报道获得了中外对话和《卫报》举办的中国最佳环境报道奖中的“最佳深度报道奖”。

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# The legacy of Hunan's polluted soils

Cadmium pollution in the soils of China's largest rice-growing province will take many years to clean up

## He Guangwei

Cao Fushe spent much of 2013 worrying that he wouldn't earn enough money to support his family. Cao is in his early fifties and works a three-acre family rice farm in the village of Zhujiqiao, in Hunan province, central China. His income has been hit by something he had never previously heard of -- cadmium pollution.

Rice-growing is a back-breaking and increasingly unprofitable occupation in China. Twelve years ago, Cao, like many small farmers, was obliged to supplement his income by working on construction sites in Guangzhou, the capital of neighbouring Guangdong province. Then it occurred to him that he could make more money by changing professions. He quit his job and returned home to Hunan's You county to set up as a rice trader. As a trader, he works on behalf of state-owned companies within the government-controlled procurement system, buying rice for the national grain reserves at around the government guide price.

With two lorries and eight employees, business was good: in 2012 the country enjoyed a good harvest, and Cao enjoyed his best year. He bought 4,000 tonnes of grain that year, which made him the biggest trader in his hometown. But on May 16, 2013, food safety officials in Guangzhou announced that, of 18 samples of rice and rice products from Hunan Province, eight were heavily contaminated with cadmium, a heavy-metal that accumulates in the body and attacks the kidneys and other organs. Of the eight most contaminated samples, five had come from three rice mills in You county, where Cao's village is. Similar levels of the metal had been found in rice in February 2013, but it was the second discovery of widespread contamination that was to cement the reputation of Hunan's rice as dangerous. Prices began to fall.

Rice that is not sold quickly decays, and decaying rice fetches lower prices. Local farmers could see that prices were falling, not just for rice but also for their other crops, but at first they did not connect it to the cadmium scandal. The rice traders lost less than the farmers, and Cao still made about 100 yuan (US\$16) on every tonne of rice he sold. But, apprehensive about the effect of rice sales, he cut back sharply on the amount of rice he purchased through the year.

Cao still does not understand exactly how the rice came to be contaminated with cadmium, but he does know that the environment of his village is polluted. Hunan, known as China's granary, is a major rice-growing province, producing some 30 million tonnes a year, or around 15% of the total national crop. You county is one of the province's top four rice-growing counties, with more than 16,000 acres (995,000 mu) of paddy fields under cultivation in 2012, and a harvest of 484,400 tonnes. With a growing population and a long established concern for national food security, the government encourages rice farmers in Hunan and other provinces to produce as much as they can.

But Hunan is also known for the non-ferrous metals mines that produce almost 50 million tonnes of waste a year. Waste-water from mining is frequently used to irrigate farmland, and mine tailings, which contain cadmium amongst other pollutants, tend to be poorly managed. It was cadmium from Hunan's mine waste that had leaked into the soil and contaminated the rice.

## Industrial cost

When the scandal first broke, the You county government responded with denials. An official statement

from the county government stated that there was no heavy metal mining within 10 kilometers of the source of the problem rice, but many say the pollution has been an open secret for years.

As early as 2006, the village of Xinma, in the same municipality, suffered an episode of mass cadmium poisoning in which two people died and 150 were left with lower-level chronic poisoning. More than 66 hectares of land (1,000 mu) in Xinma and neighbouring villages had to be abandoned.

Yin Lihui, who heads the Hunan Agricultural Resources and Environmental Protection Station, admits that pollution from non-ferrous metal mining is particularly grave in the watershed of the Xiang River. The Economic Daily, a national newspaper, has reported that the Xiang, Hunan's 'mother river', is the most polluted by heavy metals of all China's rivers.

A villager in Zhujiqiao, who did not want to give his name, said that there used to be a number of small heavy-metal smelting workshops and zinc oxide plants in the district, and villagers familiar with zinc oxide production recall that sludge containing copper and cadmium is a by-product of the production process. The companies that operated in Zhujiqiao simply dumped the sludge, he said. You county's environmental protection officials point out that the county spent 20 million yuan (US\$3.2 million) in 2012 alone, and closed down 24 heavy-metal plants. Although the government has closed the factories, toxins from that sludge still leach into the soil with each shower of rain.



In November 2010, the China Geological Survey investigated soil conditions in the Yellow River Basin, the Northeast Plains and the Yangtze River Basin, collecting more than two million samples and analysing 600,000 composite samples. They found that the municipality of Zhuzhou, which includes You county, had the highest level of cadmium pollution in China: more than 160 square kilometres (62 square miles) of the land tested had levels five times the permitted limit.

Since the start of the 10th Five-Year Plan in 2001, Hunan has been the country's largest source of mercury, cadmium, chromium and lead, and, next to Gansu province, the second largest source of arsenic pollution. According to official figures, nearly 28,000 square kilometres (11,000 square miles) of land in Hunan, 13% of the total area of the province, has been polluted by mining waste and heavy metals.

In comparison to many richer, coastal areas, You county is relatively poor and depends on coal and iron mining, in addition to minerals. In 2012, just as the scale of contamination became clear, local revenues in You county were also hit by falling prices for iron and coal. The previous year, the city government had begun a 40-billion yuan (US\$6.4 billion) trial cleanup of the most polluted area, Qingshuitang, which had suffered from many years of smelting and chemical production.

The river bed at Laoxia Harbour, not far from the waste-water outlet at Qingshuitang in Zhuzhou, was found to have cadmium levels 1,800 times the limit specified in China's soil environmental quality standard. Lead levels were 52 times the limit. Laoxia Harbour had been home to a number of companies that produced zinc oxide and zinc sulphate, companies that discharged their waste water directly into the Xiang River. The local government's clean-up programme included efforts to prevent further pollution, treat contaminated land and relocate affected villagers.

## Government response

In early 2012, the provincial government started to investigate cadmium pollution of paddy fields. It selected varieties of rice that seem to absorb smaller quantities of the metal, and researched methods of deactivating cadmium in the fields and rapidly detecting its presence in rice. Luo Yueping, the director of the Hunan Environmental Monitoring Center, is tasked with researching the distribution of cadmium in the province's rice paddies. The government hopes that his work will help to quantify the

extent of the contamination and form the basis of an action plan.

The government's plan to set up a system of safe farming practices and monitoring was due to be completed this year. But concerns about food safety are in conflict with the central government's anxieties over national food security, which leads it to press agricultural provinces such as Henan and Hunan to produce more food, pressure that makes the provincial authorities reluctant to discourage farmers from planting, even in contaminated land.

Sun Zhong, the director of the China Grain Yida Institute and a member of the Hunan Agricultural Product Market Monitoring and Early Warning Expert Committee, confirms that, despite the discovery of heavy metals in Hunan's rice, the provincial government still set a production target of more than 66 billion pounds of grain. He said that despite government encouragement to grow more, Hunan's farmers are worried that they won't be able to sell the rice the government wants them to grow. Documents submitted to the provincial People's Political Conference reveal that the number of Hunanese agricultural products rejected by out-of-province buyers due to contamination is increasing.

Cadmium pollution in soil cannot be cleaned up quickly, and Sun Zhong still hopes the government will come up with a long-term plan. But according to a bulletin on Hunan's farmland quality issued by the Hunan Agricultural Department at the end of 2012, heavy metal pollution in the province is still getting worse, with previously isolated patches of contamination spreading to affect larger areas. Pollution is creeping from the outskirts of the cities into the countryside.

## Food security fears

China has only 10% of the world's arable land from which to feed a population that accounts for nearly 20% of the world's people. As the world's biggest rice grower and consumer, China has been a net rice exporter in recent decades, mainly to Asia and Africa. But food production in China is threatened by a number of factors. In late 2013, a national soil report published by China's Ministry of Land said that arable land was continuing to be lost to pollution, urbanisation and industrialisation.

The report pointed out that 0.2% of arable land had been lost from these causes in the three years up to 2009, and pollution by heavy metals or other contaminants had rendered 2.5% of China's land unfit for agriculture.

The vice-minister, Wang Shiyuan, admitted that a further 50 million mu (8.2 million acres) of arable land was moderately polluted. Land that was still in use, moreover, was suffering from a combination of heavy-metal pollution, pesticides and chemical fertiliser, which reduces organic soil content and impacts both the quantity and quality of harvests.

The government has set a "red line" of 1.8 billion mu (0.3 billion acres) of arable land to be protected in order to ensure China's food security, but the situation continues to deteriorate. Lack of regulation, or lack of enforcement in many areas, allows untreated waste water to be used to irrigate farmland, and the dumping of slag and sludge by industrial enterprises continues.

The government has consistently refused to make comprehensive soil pollution data public. In 2013, a Beijing lawyer Dong Zhengwei requested the data, including information on causes, and methods for dealing with it, from the Ministry of Environmental Protection. The request was refused on the grounds that the data was a "state secret". A strong public reaction to this refusal was one of the factors behind the release of limited information at the end of 2013, and, despite its lack of detail, the data caused widespread concern.

A report recently published in Beijing criticised the Ministry of Land's information, complaining that the information released still leaves it unclear what impact pollution was having on food safety and public health. The report also pointed out that the agricultural environmental problems caused by industry and mining meant that China faces worse food-safety risks than many other nations.

Whatever steps are taken, the legacy of China's hectic industrialisation will haunt the nation's farmers and consumers for many years to come. 

*This was part of a series of articles on soil pollution jointly commissioned by chinadialogue and Yale Environment 360, with support of the Pulitzer Center on Crisis Reporting.*

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# 中国面临土壤修复挑战

中国土壤污染规模史无前例，技术不成熟、资金不足、评估标准模糊三大难题使得防治修复还有很长的路要走。

何光伟

52岁的罗金枝家住湖南省双桥村。为了解决双桥村的污染问题，她加入了中国数以千万的访民队伍，数年来一直在上访。有些人上访是为了寻求司法公正，有些是为了揭露当地的腐败，罗金枝上访则是为了替家乡父老讨个说法，他们居住的村子、生活的土地和种植的庄稼已经被严重污染。

上访过程充满艰辛，而且不一定能成功。访民千里迢迢、不惜代价前往北京，但他们经常无功而返，被那些不负责任的官员当做皮球踢来踢去。今年四月份，罗金枝不远千里踏上进京之路，目的就是请求信访局和环保部能够采取措施。信访局是上访人员到京后首先会去的地方。然而，罗金枝得到的回复却是回家等待当地政府解决。时至今日，她也没有收到任何有关部门的回复。

对于罗金枝和她的乡邻们来说，第一次看到污染的可怕是在2009年6月28日，湘和化工厂年仅44岁的锅炉工罗柏林镉中毒死亡。死亡时，左腿上有大面积紫色瘀痕。而罗柏林的死亡仅仅是开始。此后，位于双桥村的镉中毒死亡名单就在不断加长。而且，越来越多的证据显示，一场有可能使环境治理工作付之东流的全国性土壤污染危机正在逼近。

罗柏林生前所在的厂子名叫湘和化工厂。该厂2004年投产，距浏阳河仅50多米。浏阳河是湘江的一级支流，不仅是中国共产党的成长地之一，更是1927年9月中国共产党的主要缔造者毛泽东领导秋收起义、建立湖南苏维埃政权的地方。革命歌曲《浏阳河》就是为了纪念这段历史而作。

双桥村有50多名村民在这家工

厂打工。工厂年产饲料添加剂粉状及颗粒状硫酸锌3000吨。2006年，该厂在显然没有取得政府批文的情况下，开始生产比黄金还贵重的稀有金属铟，而镉则是副产品。2008年4月，双桥村村民开始注意到一些令人不安的细微变化。据罗金枝回忆，当地的井水喝起来开始有股奇怪的铁锈味，烧水器皿的颜色也发生了变化。

2009年6月27日，罗柏林死亡前一天，浏阳市政府突然关闭了工厂，并且安排厂区方圆1.2公里内3000余名村民体检，结果500人的尿镉含量超标。在政府的调查期内，又有4人先后死亡，这也让双桥村成为了全国闻名的“镉村”。

罗金枝手中有一份包括双桥村及相邻的洞口村、普花村在内的不完全统计的死亡名单。据她说，从2009年罗柏林开始，到2013年已有

技术不成熟、资金不足、评估标准模糊这三大问题使得修复中国被重金属污染的土壤注定是一场持久战。

26人死于镉中毒引发的各种疾病。

虽然政府向受害者家属支付了1万元到5.9万元不等的赔偿金，但却从未承认村民的遭遇与镉或其他金属有关。例如，2008年12月，罗金枝年仅5岁侄子开始出现呼吸困难、倦怠的症状，被诊断为铅中毒。此外，截至2009年3月，还有14名儿童被查出铅中毒。随着一连串死亡的降临，村民们开始展开抗议活动。2009年7月29日，数百名村民前往镇政府请愿，反映工厂的镉污染仍然威胁着他们的生命。次日，政府大楼被数千名村民包围。长沙市委书记陈润儿不得不赶赴浏阳处理此次事件，并向村民承诺将对此事展开调查。然而，8月5日，浏阳有关部门却下令部署数百名警察带犬把守

政府大楼。最终，企业法人骆湘平被捕，工厂被永久关闭，浏阳市环保局正副领导被免职。

湘和化工厂虽然已被永久关闭，但污染仍在。工厂关停后，留下一个用2米高围墙圈起的60亩厂区，其间的一座巨大“废渣堆”如同一枚炸弹笼罩着双桥村。一下雨，厂区内的渗滤液就会不停地渗入50米外的浏阳河。厂区周围3000余亩土地以及地里种植的作物都受到了镉的污染。村民认为，唯一的解决办法就是搬走，并委托罗金枝与镇政府进行协商。

欧盟亚洲环境支持常德项目联络办公室协调员刘波在今年1月份调研湘和化工厂土壤治理情况后，同样得出结论认为“污染危害正在持续

扩大”，不仅对当地环境造成危害，而且对浏阳河流域特别是长沙地区以及湘江构成严重的环境威胁。而湘江是两千多万人的饮用水水源。

湖南省是重要的重金属之乡。2011年，湖南省1003家有色金属企业生产的10种有色金属总产量达到266万吨，居中国第3位，产值达到3795亿元。而官方在几年前就提出希望将湘江治理成东方的“莱茵河”，要让其变得更加漂亮、清洁、生机盎然。

湖南省有色金属管理局官员陈超在今年一月份的一次非政府组织会议上发布报告称，仅湘江流域内渣场和尾矿库就有近1000个，含铅、汞、镉等重金属固废总堆存量有4.4亿吨之多。陈超的报告



攸县石羊塘镇南田村的村民在稻田里插秧。2013年，产自这里的稻米被检出镉超标。

还披露，湖南省的镉、砷、汞、铅排放量在中国“三废”（废水、废渣、废气）排放中分别占到32.1%、20.6%、58.7%、24.6%。

这场生态灾难规模之大令人生畏。中国国土资源部2002至2008年所做的地球生态化学调查显示，从湘江株洲朱亭段至洞庭湖出口城陵矶，出现一条面积约2058平方公里的巨大土壤重金属元素异常带。调查还显示，该地区出产的大米、蔬菜、以及芦苇和贻贝中，重金属含量都有所提高。其中大部分为镉含量超标。

长沙曙光环保公益发展中心是一家成立于2013年的非政府组织。理事长刘曙是一名90后的环保工作者。在走访了湖南的株洲、长沙、湘潭等重金属污染区后，她认为湖南重金属污染情况十分严重。刘曙和她的团队发现，常宁市一冶炼厂旁稻田土样镉超标49.5倍，衡南县工业园区湘江边土样镉超标331倍。

当地村民们与政府之间由于土地污染问题存在很深的矛盾，这让

刘曙深感忧虑。她担心，如果不加以解决，冲突还会升级。以湘和化工厂为例，刘曙和她的团队发现，村民一直在等待有关方面解决他们的赔偿和搬迁问题。

按照镇政府的承诺，受害村民们依据《人民调解协议书》可获得赔偿，全村赔偿金总额8519800元源于湘和化工厂资产的拍卖款项。然而，协议书要求村民领取赔偿后不得以任何形式再向原湘和化工厂或政府索取任何赔偿。全村3000余亩土地无法种植粮食和蔬菜，生活压力加上死亡威胁让双桥村的村民们喘不过气来。当政府提出按每年每亩350公斤稻谷的商品粮价支付土地租金时，一些村民接受了。

然而，对于罗金枝和其他村民来说，这并不是长久之计。厂区附近的村民获得的赔偿只有3000多元，而稍远的村民则只有1000多元。这些钱远远不能帮助他们开始新的生活。而且村民要求官方安排他们整体搬迁的念头愈发坚定了。

与此同时，政府却将希望放在

土壤修复上。永清环保股份有限公司是经环保部认证的中国为数不多的土壤修复上市企业之一。该企业拿到了湘和化工厂污染修复合同，并于2012年8月宣布修复工作完成，且检测结果达标。

然而，村民却对此表示怀疑。2012年9月，他们将一份土样送到了南京大学现代分析中心。该中心出具的检测报告显示：在废渣堆高处提取的土样镉含量6.89mg/kg，取自附近田地的土样镉含量高达93.8mg/kg。按照国家《土壤环境质量标准》，浏阳当地土壤的镉限制值是0.3mg/kg。而其中一个样本的镉含量超标了300多倍。

尽管官方不认同村民自行检测的数据，但两个样本的镉含量相差300多倍，足以让村民们怀疑土壤修复的效果。永清环保股份有限公司只是治理了湘和化工厂的厂区，而未治理附近被其污染过的农田等土地。此后，双桥村的村民们与当地政府和永清环保之间，一直保持着一种特殊的关系，而湘和化工厂的土壤修复工作也陷入僵局。

2014年1月，刘波在给中共湖南省委书记徐守盛的建议书中说“污染没有得到有效控制”。他发现，湘和化工厂的污染土壤没有得到有效固化，对于土壤中镉、锌、砷等多种重金属复合污染，永清公司所采取的治理措施单一，并不成功。刘波建议，重金属污染治理还应包括原厂区周边农田田地以及整个流域。

土壤重金属污染在中国并非湖南独有，中国环境保护部此前公布的数据显示，据不完全调查，早在2006年中国受污染的耕地约有1.5亿亩，占18亿亩耕地的8.3%。然而，面对如此严峻的问题，政府的反应



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却很缓慢。直到2014年2月，中国农业部才要求启动重金属污染耕地修复和种植结构调整试点，“加强产地安全管理”将会放在首要位置，对污染较重的农产品产地，加快探索建立重金属污染区域生态补偿制度。

然而，在很多官员看来，中国土壤重金属污染是个严峻的挑战。去年，环保部生态司司长庄国泰曾在一次环保上市公司会议上表示，“与大气、水污染治理相比，我们的土壤污染治理几乎没有起步。一旦市场打开，规模将远远大于大气和水污染的治理。”

如果说中国土壤污染规模史无前例，那么，土壤修复生产的规模也必然很大。庄国泰预计，土壤治理投入规模可能会达到十万亿元。然而，资金、法律、技术是土壤污染防治面临的三大难题。而据私营行业机构——江苏省环保产业技术研究院预测，从2014年至2020年，中国国内土壤修复市场规模可达6856亿元。

然而，目前来看，资金还是很紧张。2013年，中国启动土壤修复试点项目总计42个，项目中涉及资金总量亿元以上的仅2个。已披露的16个项目总计涉及资金量约为6亿元，资金来源几乎全为政府专项补贴资金。

在广东省生态环境与土壤研究所土壤修复专家陈能场看来，这些数据除了“规模大”，其实没有太多实际意义。他认为，中国土壤的主要问题并不完全在土壤污染，更在于土壤退化和土壤侵蚀，尤为迫切

的是必须要改良土壤，提高土壤有机质和土壤酸碱度。陈能场表示，可以通过在中度污染的土地上种植非粮食作物的办法来修复土壤。

然而，还有一些专家仍然为土壤污染的规模和程度等问题纠结不已。中国环境保护产业协会重金属污染防治与土壤修复专业委员会秘书长刘阳生曾表示，受技术不成熟、资金不足、评估标准模糊三大问题影响，修复中国被重金属污染的土壤注定是一场持久战。中国土壤重金属污染“量大面广”，这就意味着一方面成本高昂的技术都难以大规模推广，另一方面也使国外主要针对小块土地修复的技术在国内难有用武之地。

近期一些新的研究成果也为中国遭受重金属污染的土地带来曙光。佛山金葵子植物营养有限公司研发声称，他们针对中国农田土壤重金属污染研发出治理重金属污染的微生物产品——“金无踪”。该技术能够降低重金属的活性，消除重金属对农作物的毒害。按照企业的说法，该技术具有成本低、使用方便、易于操作、不会造成二次污染等优点，目前“金无踪”已经实现了商品化生产和应用。

四月份，广东省地质实验测试中心宣布研制出一种具有突破性的土壤修复材料——Mont-SH6。据称，该材料对主要毒性重金属镉、铅、汞、铜、锌有强烈的吸附能力。该中心总工程师刘文华说，该产品降镉有效率达90%以上，材料制备成本很低。用这种技术，每亩

镉米的修复成本为3万元左右。大规模生产后，成本可降至两三千元。

然而，这些技术仍有待检验。目前，政府面临着一些亟待解决的问题。很多地产开发商盼望着污染土地能够被政府确定退耕，然后争相拿地。中国农业部副部长牛盾表示，工商资本会推动政府划拨更大面积的重金属污染土地用于开发。

在牛盾看来，这是一场利益的博弈，是很痛苦的抉择。将受到污染的农田变成商业用地或住宅用地，这一政策本身就存在风险。在污染土地上盖楼有可能会使建筑工人和居民的健康受到影响。2007年就发生了这样一起案件。武汉一处农药厂旧址被划为住宅用地，施工过程中，有工人因化学中毒入院。而后，该项目被叫停。政府不得不返还土地出让金，并向开发商支付1900万元的赔偿款，以及4400万元的土壤修复费用。中国建在污染土地上的居民区究竟还有多少，没人知道。

中国土壤污染系列文章由中外对话和耶鲁大学森林与环境研究学院旗下的耶鲁大学环境360共同报道，该合作项目还得到了美国普利策新闻报导中心危机报道的支持。

何光伟，新闻记者，2006年以来为多家媒体报导新闻时事。2012年，他的报道获得了中外对话和《卫报》举办的中国最佳环境报道奖中的“最佳深度报道奖”。

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# China faces long battle to clean up its polluted soil

Low-quality technology, lack of funding and unclear evaluation standards mean that cleaning up China's toxic soils will be an ongoing struggle

He Guangwei

Luo Jinzhi is 52, and lives in the village of Shuangqiao, in China's Hunan province. For the last few years, Luo has been a petitioner, one of millions of Chinese people who find themselves appealing directly to higher authorities in the hope of resolving a problem. Some petition to rectify a legal injustice or to expose local corruption. Luo is

petitioning on behalf of her fellow villagers for a remedy for the catastrophic pollution that has afflicted her home village.

Petitioning is a demanding and difficult process in which success is not guaranteed: it involves a long and expensive journey to the nation's capital, where



*As well as growing rice, Hunan is also known for its polluting metal mines*

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petitioners are frequently sent on fruitless journeys from one unresponsive official to another. Luo Jinzhi made this thousand-mile journey most recently in April this year, to plead for action with the Bureau for Letters and Calls, the first stop for petitioners in the capital, and the Ministry for Environmental Protection, only to be told to go home and wait for the local government to take care of her complaints. She has yet to hear from any of them.

## Lives blighted by pollution

For Mrs Luo and her neighbours, the first sign of a serious problem in Shuangqiao was on June 28, 2009, when Luo Bolin, a worker at the Xianghe Chemical Factory, died of cadmium poisoning. When he died his left leg was marked by large purple contusions; he was only 44. The list of cadmium-related deaths in Shuangqiao has since grown longer, and evidence is mounting of a national soil pollution crisis that threatens to overwhelm efforts to put it right.

The Xianghe Chemical Factory, where Luo had worked, opened in 2004, on a site just 50 metres from the Liuyang River. The Liuyang flows directly into the Xiang River and is celebrated in Chinese Communist mythology as the symbol of an historic milestone in the Communist Party's long struggle for power. It was here, in September 1927, that Mao Zedong led the first armed Communist revolt, the brief Autumn Harvest Uprising, and set up the short-lived Hunan Soviet, an episode that is still commemorated in songs in praise of the river.

The factory employed 50 Shuangqiao villagers and produced an annual total of 3,000 tonnes of powdered and pellet zinc sulphate, an animal fodder additive. In 2006, apparently without government approval, it began to produce indium, a rare metal more valuable than gold, but the processing of which produces cadmium as a by-product. Starting in April 2008, the villagers of Shuangqiao began to notice small, but troubling changes: the local well water began to taste of rust, Mrs Luo recalls, and saucepans used to boil water changed colour.

On June 27, 2009, the day before Luo Bolin's death, the government of Liuyang municipality suddenly closed the factory and arranged health checks for more than 3,000 villagers who lived within 1.2 kilometres of the plant. Five hundred were found to have high levels of cadmium and a further four were to die during the government investigation. Shuangqiao became known nationwide as a 'cadmium village'.

Luo Jinzhi has collected what she believes to be a still incomplete list of the names of the dead in Shuangqiao and the neighbouring villages of Dongkou and Puhua, starting with Luo Bolin. In all, she says she has identified 26 deaths from cadmium-related illnesses between 2009 and 2013.

Although the government paid compensation of between 10,000 and 59,000 yuan (US\$1,600 to US\$9,000) to the victims' families, it has never admitted a link with cadmium or other metals that have affected the villagers. In December 2008, for example, Luo Jinzhi's five-year-old nephew began to have breathing difficulties and became listless; he was found to be suffering from lead poisoning. By March 2009, 14 more cases in children had been identified.

## A village protests

When the deaths began, the villagers started to protest: on July 29, 2009, hundreds of them went to the township government to complain that the factory's cadmium pollution still threatened their lives. The next day, thousands of villagers surrounded the government building and Chen Run'er, the party secretary from the provincial capital, Changsha, had to be called in to address them. He promised the villagers that their complaints would be investigated, but on August 5, the Liuyang authorities ordered in hundreds of police with dogs to guard the township government. The confrontation ended when the head of the plant, Luo Xiangping, was arrested, the factory was permanently shut down, and the director and a deputy director of the Liuyang Environmental Protection Bureau were fired.

Although the factory has now been closed, the pollution is still affecting the village. The nearly 10 acre site (60 mu) that the business occupied is surrounded by a two-metre (6 foot) wall. Behind it lies a large pile of toxic sludge. When it rains, contaminated water seeps from the sludge into the Liuyang River, just 50 metres away. Some 659 acres of land around the plant have been polluted with cadmium, and any crops grown there are contaminated. The villagers believe that moving offers their only guarantee of safety, and so they asked Luo Jinzhi to negotiate their relocation with the township government.

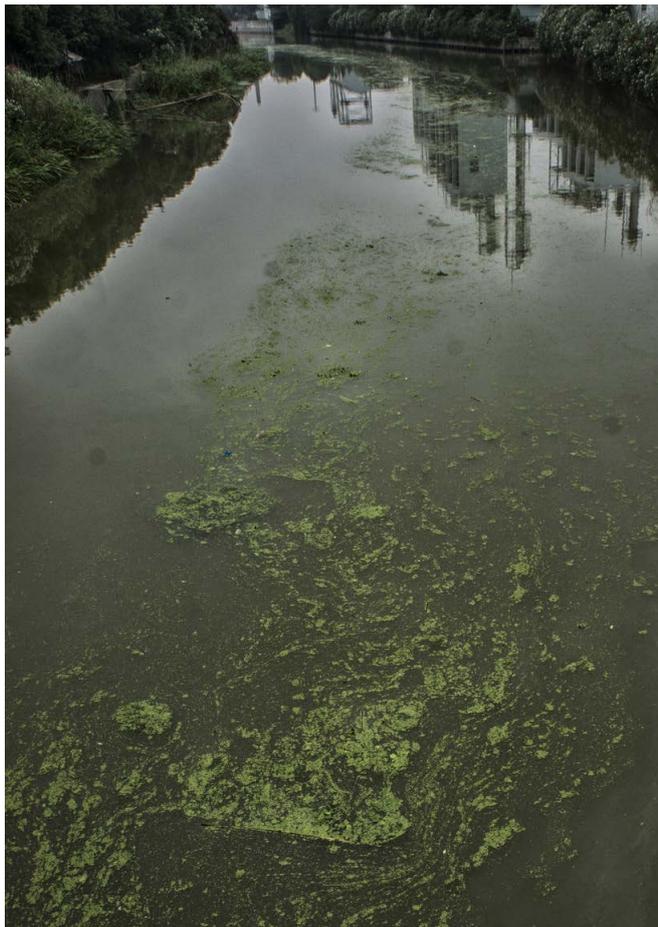
Liu Bo is coordinator of the liaison office of the EU-Asia Environmental Support Chengde Project, a European Union-funded dialogue on urban river pollution, and investigated the factory site in January this year. He also concluded that "the pollution is continuing to do harm,"

damaging the local land area and threatening the Liuyang River basin. The basin includes Changsha, as well as the Xiang River, the source of drinking water for 20 million people.

## Cleaning up a toxic past

Hunan province is an important centre for heavy metal production. In 2011 the province's 1,003 non-ferrous metal companies produced 2.66 million tonnes of 10 different metals – the third highest production in China and worth 379.5 billion yuan, (US\$60 billion). Several years ago the government said it hoped to turn Hunan's Xiang River into the "Rhine of the East": beautiful, clean and prosperous.

But in a report to an NGO conference in January this year, Chen Chao, an official with the Hunan Non-Ferrous Metals Management Bureau, admitted that the Xiang basin also had nearly 1,000 sludge sites or tailings stores which contained 440 million tonnes of solid waste that is contaminated with lead, mercury and cadmium. Chen



Chao's report also revealed that Hunan accounts for 32.1% of China's emissions of cadmium, 20.6% of arsenic, 58.7% of mercury and 24.6% of lead, in its wastewater, tailings and waste gases.

The scale of this ecological disaster is daunting, and the potential cost of any clean-up would be formidable. According to a geochemical survey conducted by the Ministry of Land and Resources between 2002 and 2008, 2,058 square kilometres (794 square miles) in the area is polluted by heavy metals, an area that stretches from Zhuzhou, on the Xiang River, to Chengjingji. The survey report revealed that the area's rice and vegetables, as well as reeds and mussels, all contained elevated levels of heavy metals, mostly of cadmium.

Liu Shu is chair of the Shuguang Environmental Protection Organization, an NGO founded in 2013 in Changsha that works on soil pollution. This young environmentalist has investigated soil pollution in Zhuzhou, Changsha and Xiangtan, and confirms that the situation is extremely grave. Her group found cadmium levels 49.5 times the recommended limit in soil samples taken from the vicinity of a smelting plant in the municipality of Changning. At another site, an industrial park in Hengnan County, by the Xiang River, they found levels 331 times the limit.

She is also concerned about the social conflict between local people and government that soil pollution has caused, conflict that she predicts will worsen if not resolved. In the case of the Xianghe factory, Liu and her team noted, the villagers are holding out for compensation and relocation.

The township government has offered the Xianghe victims a share of the 8.5 million yuan (US\$1.4 million) that they raised in an auction of the chemical company's assets, but only on condition that the villagers seek no further compensation from the company or the government. With 659 acres of village land no longer fit to grow food, the villagers are struggling to make a living. When the government offered to pay them the market price for the 350 kilogrammes of rice that could have been grown on each 0.16 acres, some accepted the offer.

For Luo Jinzhi and many other villagers, however, this is not a long-term solution. The share of the compensation for villagers who live close to the factory is only US\$600, and it is US\$250 for those living further away. It is not enough to finance a new life, and the villagers remain determined that the government should also relocate them.

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## The government's role

The government, meanwhile, has put its faith in remediation. Yonkers Environmental Protection company is one of China's few listed soil remediation companies that is approved by the Ministry of Environmental Protection for remediation work. The company won the contract to clean up the Xianghe Chemical Factory site and, as early as August 2012, it announced that the site had been cleaned to standard.

The villagers are sceptical, however. In September 2012, they sent a soil sample to Nanjing University's Centre of Modern Analysis. Concentrations of 6.89 milligrams (mg) of cadmium per kilogram (kg) were found in a sample taken from the sludge pile, and 93.8mg per kg in a sample taken from a nearby field. According to China's Soil Environment Quality Standards, cadmium levels in Liuyang should be no higher than 0.3mg per kg. One sample was found to breach that by a factor of 300.

Although the government has not officially recognised these results, villagers question the effectiveness of the remediation. The 300-fold difference between the two samples, they say, is because Yonkers treated the land within the factory site, but not the surrounding land, where their polluted rice fields lie. Relations between the villagers, the government and the company are now so strained that remediation work has stalled.

In January 2014, Liu Bo, the coordinator of the EU project, wrote to Xu Shousheng, the provincial party secretary, confirming the villagers' complaints that "pollution has not been effectively controlled". Liu found that soil at the site had not been solidified, while the limited range of techniques that Yonkers had applied had failed to address the range of pollutants – including cadmium, zinc and arsenic – on the site. He also recommended that remediation should include the surrounding fields and the entire river basin.

Hunan is only one of many provinces in China that have suffered heavy-metal pollution. Incomplete figures from the Ministry of Environmental Protection (MEP) revealed that in 2006, 150 million mu (24.7 million acres) of arable land was polluted, 8.3% of China's total, but the government has been slow to understand the seriousness of the problem. It was not until February this year that the Ministry of Agriculture ordered a series of remediation trials that aim to give priority to safe management of farmland and to experiment with crop adjustment, as well as possible compensation mechanisms in cases where land or products

have been badly contaminated.

Many officials admit, however, that China's heavy-metal soil contamination is an enormous challenge. Last year, Zhuang Guotai, the head of the MEP's Department of Nature and Ecology Conservation, told a conference of market-listed environmental-protection companies, "In comparison with efforts to clean up air and water pollution, we've hardly got started with soil. But once the market is opened up, soil remediation will be on a far bigger scale than either air or water clean up."

If the scale of China's soil pollution is unprecedented, remediation must also be large-scale. Zhuang admitted, however, that as well as legislative and technological difficulties, funding for soil remediation was the largest challenge in a market that he predicted would eventually be worth 10 trillion yuan (US\$1.6 trillion). A private industry body, the Jiangsu Institute of the Environmental Industry, has predicted that between 2014 and 2020 China's soil remediation market could be worth 685.6 billion yuan (nearly US\$110 billion).

For now, however, finance is tight. In 2013 the Chinese government launched 42 soil-remediation trials, but only two involved funding of more than 100 million yuan (US\$16 million). Funding for the 16 projects unveiled so far totals about 600 million yuan, (US\$96 million), almost entirely from government subsidies.

Chen Nengchang, a soil remediation expert with the Guangdong Institute of Eco-Environment and Soil Sciences, does not believe these numbers mean much, beyond that fact that money is being spent. China's soil problem, he said, is not only one of pollution but also soil quality and soil erosion, and improving soil quality with increased organic matter and better pH levels is particularly urgent. On moderately polluted land, he argues, planting non-food crops would eventually clean the soil.

Other experts, however, continue to grapple with the combination of the scale and severity of soil pollution. Liu Yangsheng, the secretary of the China Association of the Environmental Protection Industry's Heavy Metals and Environmental Remediation Committee, has said that immature technology, lack of funding and unclear evaluation standards mean that restoration of heavy-metal polluted soil will be an ongoing struggle. The severity and extent of heavy-metal pollution in China, he said, mean that expensive techniques are unlikely to be widely applied, while techniques from overseas that may be effective for small plots of land are of limited use in China.

Recent research findings offer some hope to China's

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beleaguered soil. The Foshan Jinkuizi Plant Nutrition Company claims to have developed a soil-remediation technology specifically designed for China's heavy-metal polluted soil: a microorganism that can change the ionic state of heavy metals in the soil, deactivating the pollutants so they do not harm crops. The company claims that the method is cheap, convenient, easy to use, does not produce any secondary pollution, and is already in commercial production and use.

In another possible breakthrough, in April, the Guangdong Geoanalysis Research Center announced a new product, Mont-SH6, which they claim is a powerful absorber of toxic heavy metals such as cadmium, lead, mercury, copper and zinc. Liu Wenhua, chief engineer at the center, claims that the product can reduce soil cadmium levels by over 90%, and that materials and manufacturing costs are low: remediation of one mu (.06 hectares) of cadmium-contaminated rice fields with this technique costs about 30,000 Yuan (US\$4,800). Mass production, claimed Liu Wenhua, could bring this down to between 2,000 and 3,000 yuan (US\$320-US\$480).

These claims have yet to be tested. For now, the government faces more immediate decisions. Many property developers are hoping that polluted land will be re-classified as non-agricultural, so it can be earmarked for development. And, according to vice-minister for agriculture Niu Dun, business interests are pushing the government to classify even more land as polluted by heavy metals so that they can build on it.

This is a clear battle of interests, says Niu, and the choice will be hard. Turning polluted farmland into commercial or residential land is a policy that carries its own risks. When houses are built on contaminated land, construction workers and residents can be exposed to health risks. In one notorious case from 2007, a construction site in Wuhan, the capital of Hebei province, a site that had previously been occupied by a pesticide factory was reclassified for residential development.

The project was halted when a construction worker was hospitalised with chemical poisoning and the government was obliged to return the purchase price of the land, pay US\$19 million in compensation to the developer and spend an additional US\$44 million to clean up the site. As for how many other residential districts in China have been built on contaminated land, nobody knows. 

*This was part of a series of articles on soil pollution jointly commissioned by chinadialogue and Yale Environment 360, with support of the Pulitzer Center on Crisis Reporting.*

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# 加强执法仍不足以解决 环境和健康问题

解决地区差异和消除不平等综合纳入政策考量，才能真正推进环境问题的改善。

詹妮弗·霍德威

王五一

在过去的一年，人们每天都看到大量关于污染对健康影响的报道，包括水、土壤和空气等环境污染对健康的危害，还有各种触目惊心的食品安全问题。

公众关注度的迅速升温标志着中国环保事业的转折点。但我们将走向何方？对健康的关注能带来什么改变？未来要解决这些问题还需要什么？

在任何一个国家，环境健康都是个充满挑战的决策领域，因为污染对人体健康的影响极为复杂，需要政府不同部门协同管理。环境健康问题还常常在不同层面引发利益冲突和责任纷争，一是在社区和污染企业之间，二是在国家不同的地方和管辖区域之间。在中国，第一个层面的问题由于缺少数据和公共信息以及监管、执行不完善而变得更为复杂；第二个层面的矛盾，则因为发展不平衡以及中央、地方政府责任和财政分配的方式而凸现。

现在中国面临的一大挑战是制定有效的政策以减轻环境恶化对健康的危害。然而，污染物对健康的

影响因其种类、时间跨度和地域而异。从长期来看，减少污染物排放总量对整个国家来说肯定是有益的，但要在短期内降低某一类健康风险还需要更有针对性的政策和精心的资源配置。比如，食品对健康的影响就因种类而异，而且由于污染源不同（如重金属、农药、兽药等），对人类健康的危害也不同。空气和水污染也是如此，污染物的类型、来源和影响都各不相同，既有短时间内直接接触污染物造成的危害，也有由于气候变化和生态系统恶化造成的长期累积效应。

要弄清楚各种污染对不同地区和群体的影响，中国的环保和卫生部门需要调整其工作重点和资源分配方式。目前，环境监测侧重于单一介质（如水、土壤或空气），另外由于监测站点的设置未考虑人口密度，所以不能反映影响人口的数量。尽管排放标准日趋严格，但标准制定及执行依然以总量控制为重点，没有特别关注对健康危害最大的污染物。

卫生部门对监测和应对污染的

健康危害同样准备不足。卫生政策的重心已由关注和贫困相关疾病转至与生活水平提高有关的非传染性疾病。这些疾病中很多都与环境因素有关（如癌症、呼吸系统和心血管类疾病），但与其他国家一样，中国卫生系统关注的多是吸烟、饮食、锻炼等生活习惯方面的问题。中国地方卫生部门未得到授权也没有资金来监测污染对健康的危害。

中国人口众多，经济发展不平衡，地区之间差异较大，各地面临的问题与其环境条件和发展方式密切相关，因此也各不相同，这使得建立更好的监测体系变得更加困难。考虑到这一点，再加上目前还无法迅速提高全国整体的监测水平和执行力度，所以很多专家呼吁因地制宜地采取更有针对性的措施来保护环境、监测公众健康水平和提供相关服务。

以预防为主的长期措施需要环境和卫生以外的部门参与，特别是资源利用和发展规划部门。要估计和预测环境健康风险的分布，最好的方式是关注产业集群和人们的谋

生方式。经验表明，如果措施不能与地方政治经济相契合，很难发挥长期作用。

很多人认为腐败和地方保护主义是有效执行政策的主要障碍，但它们绝非问题的全部：人们需要工作和收入，地方政府需要税收来提供公共服务。如果在向可持续健康发展转型的过程中，制定政策不考虑这些问题，就无法得到地方官员和居民的配合。北京一直难以在河北推行排放标准就是例证，该省在经济上依赖高能耗型产业。

中国已进入新的发展时期，即在城镇化快速推进的同时进行产业结构调整 and 转移，此时把环境和健康影响纳入地方发展政策和规划显得尤为重要。在很多方面，中国不同地区之间的关系类似于国际上发

达国家和发展中国家之间的关系。虽然中国GDP中工业的比例在整体下降，但是富裕沿海地区的居民开始关注污染问题，企业在寻找土地和劳动力成本较低的地区，国家也制定新政策旨在实现各地区平衡发展，这些会使工业向内陆和西部转移。这一趋势也将使污染引发的健康问题呈现新的分布模式。

中央政府不能要求贫困地区放弃东部沿海居民已享有的经济发展。中国一直致力于跨跃式发展，但在这个过程中可能遇到的挑战不容低估。尽管一些地区能够从维持温饱的农业“跳跃”到清洁工业、有机农业、旅游业及其他服务业，但有些地区却很难或者根本不可能完成转变。中国西部省份在迅速发展工业。要控制污染和健康危害就需要

严格执行相关环保法规，同时也需要制定积极的绿色发展策略。

未来，在某些较早进行工业化的地区，居民过去长期暴露于污染中而受到的健康危害会显现出来，给医疗服务和社会稳定带来新的挑战。在很多地方，造成污染的企业早已迁址或关闭，问题是谁来为医疗费用买单、补偿丧失劳动力的损失，修复土壤以及治理水污染。很多时候可能根本无法认定污染对居民健康的损害、确定责任方，那么各种成本就要由政府承担。

前景似乎不容乐观，但是中国面临的这个问题可能会转化为动力。因为若污染得不到控制，中国人民的健康就会受到影响，中国政府或个人将承担相应的经济负担。因此，人道主义与经济上的考虑都



污染若得不到控制，无论是政府还是个人都将承担相应的经济代价。

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激励中国迎头解决这些其他国家有幸转移或推延的问题。对中国政府来说，社会稳定和权威性方面的考虑会进一步增加解决问题的动力。

但要制定有效的措施，政府还要杜绝“搞运动”的方法，而应精心评估不同地区和群体面临的问题以及工业重组和城市化的影响，进而制定有针对性的政策。

政策制定会在公众的高度关注下进行。但这也有一定的风险。公众平时会把注意力集中在容易发现的问题上，而不考虑其它相对难觉察但有更严重或长期的健康影响的

问题。另外，强势力的社会群体一般会有更大的发言权。北京的空气污染确实很严重，但它受到不相称的过分关注，是因为北京是中国最有特权的城市。食品安全方面，像“地沟油”等令人恶心的问题或者涉及腐败等犯罪行为的问题更容易受到媒体和公众的关注，而滥用兽药造成的耐药菌增多等对公众危害大的问题却可能会被忽视。

当然，这并不是说公众应该被动地要把这些问题留给政府官员和专家。问题在于，如果缺乏关于不同健康风险的影响范围和严重程度的

公共信息，媒体的报道可能会造成公众恐慌，并使决策者优先处理得到关注最多而非亟需解决的问题。



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# Fixing China's environmental and health woes

Real progress in improving China's health and environment will take integrated policies that address regional differences and inequalities

Jennifer Holdaway

Wang Wuyi

Over the last year or so, people living in China have been bombarded almost daily by media reports about the health impacts of environmental pollution, including air, soil and water pollution, as well as an alarming array of food-safety problems.

This groundswell of public attention marks a turning point for environmental protection in China. But where do we go from here? What difference does the new focus on health make? And what will it take to deal with these problems over the long term?

Environmental health is a notoriously challenging policy area in any country because pollution-related health impacts have complex causality and require a multi-faceted governance response. They also often provoke conflicts of interest and contestation over responsibility not just between communities and polluting industries but also between whole jurisdictions and regions.

In China, the first set of problems is compounded by a lack of good data and public information, and by inadequate monitoring and enforcement capacity. The second set of problems is exacerbated by uneven development and by the way in which responsibilities and fiscal resources are distributed across central and local government.

The challenge now is to design effective policies to reduce the health impacts of environmental degradation. But different pollutants have different effects on health over different time frames and geographies. Although overall reductions in emissions will have benefits across the board in the long run, reducing specific health risks in the shorter term requires targeted policy and careful allocation of resources.

For example, risks to health from food vary widely from product to product and present very different kinds and levels of threat to human health from sources including heavy metal contamination, pesticides and veterinary drugs. The same is true of different types of air and water pollution, which have different composition, sources and impacts, from short term acute exposure to long term cumulative effects through climate change and the degradation of ecosystems.

## A health-based approach

To get an accurate understanding of different kind of problems and their distribution over places and populations, China's environmental protection and health systems will need to make significant change to their priorities and resource allocations. Currently, environmental monitoring still focuses on one medium (water, soil or air) at a time and because many monitoring points are not related to population concentrations they cannot capture exposure levels. Although emissions standards are getting progressively stricter, standards and enforcement are also still focused primarily on achieving aggregated reductions rather than on controlling pollutants most damaging to health.

Similarly, China's health sector is ill-equipped to monitor and address the health effects of pollution. The focus of health policy has been shifting from problems associated with poverty towards non-communicable diseases associated with growing affluence. Many of these diseases (cancer, respiratory and cardiovascular diseases)

are also affected by environmental factors, but as in other countries, China's health system concentrates mostly on lifestyle factors such as smoking, diet and exercise. Local health authorities currently have no mandate and no funding to monitor exposure to pollution.

China's size, uneven economic development and regional diversity make establishing better monitoring more difficult because different localities face very different bundles of problems that are related to their specific environmental conditions and development pathways. Because of this, and also because it will be impossible to scale up monitoring and enforcement uniformly and quickly, many experts are calling for a more locally tailored and targeted approach to both environmental protection and health monitoring and service provision.

Longer term solutions focused on prevention will require the engagement of other agencies beyond environment and health; particularly those responsible for land use and development planning. The best way to estimate the prevalence of environmental health risks – and to anticipate them - is to look at clusters of industry and livelihood strategies. Experience also shows that unless enforcement efforts have traction with the local political economy, they are not effective over the long run.

## Relocating pollution

Corruption and local protectionism are often cited as the main barriers to enforcement but they are not the only issue: people need jobs and income, and local government needs revenue to provide public services. If policies do not support them in moving onto more sustainable and healthy development pathways, local leaders and communities have little incentive to cooperate with environmental protection policy. The inability of Beijing to consistently enforce emissions standards in Hebei is an example of this problem; the province is economically dependent on polluting industries.

Integrating considerations of environmental and health impacts into development policy and regional and local planning is particularly important now, as China enters a new period in which rapid urbanisation is accompanied by industrial restructuring and the transfer of industry. In many ways, processes of regional development within China mirror relations between developed and developing countries at the global level. Although the share of industry in China's GDP is falling overall, public concern about pollution in rich coastal areas, the search for lower land and labour costs, and policies to promote more balanced



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*If pollution is not controlled, the financial burden of health costs will fall upon Chinese people and the government*

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regional development are all encouraging the movement of industry into the hinterland and west. These trends will produce new patterns of pollution-related health problems.

The central government cannot ask that poor areas forgo the benefits of economic growth already enjoyed by residents of coastal regions. In principle, China is committed to a leapfrog development strategy, but the challenges involved in doing this should not be underestimated. Although some areas may be able to “leap” from subsistence agriculture into clean industries, organic agriculture, tourism or other service industries, there are many places for which these options will be difficult or impossible. Industrialisation is already proceeding apace in China’s western provinces and a combination of strong enforcement and positive green development policies will be needed to keep pollution and negative health effects in check.

Meanwhile, the latent health effects of cumulative previous exposure will continue to manifest themselves in earlier industrialising areas for years to come, creating challenges for healthcare provision and social stability. In many cases, the polluting industries will have moved or closed, and the challenge will be determining responsibility for the costs of healthcare and lost earning capacity, as well as cleaning up soil and water pollution. Establishing causality and attributing responsibility will be impossible in many cases, and the costs of remediation will probably fall on the government.

## The costs of failure

If the outlook seems grim, China’s biggest problem is in another sense a powerful motivator. If pollution is not controlled, its health effects will fall upon Chinese people and the government or private citizens will have to bear the financial burden. Both humanitarian and financial concerns therefore provide strong incentives to address head-on problems which the early industrialising nations had the luxury of displacing or deferring. For the Chinese government, these motivations are further bolstered by concerns about social stability and legitimacy.

But if this head of steam is to translate into effective policy, the government needs to resist a campaign-style approach to these problems and develop targeted policies based on careful assessment of the problems facing different regions and populations; and the way in which these will be affected by industrial restructuring and urbanisation.

It must do this under the scrutiny of public opinion, which brings its own dangers. The public has a tendency to focus on easily detected risks over others that may be more serious over the long term; and privileged social groups usually have the strongest voice. Beijing’s air pollution is indeed bad, but it receives a disproportionate amount of attention because it is a highly visible problem that affects the most privileged city in China. In the universe of food safety, problems that have a high “yuk factor,” like “gutter oil”, or that involve corrupt or criminal behavior attract more media and public attention than others that are a bigger threat to public health, such as the emergence of antibiotic resistant bacteria due to overuse of veterinary drugs.

Of course, this is not to say that the public should be passive and leave these issues to government officials and experts. But the danger is that in the absence of good public information about the actual severity and prevalence of different risks, media reports fuel a kind of free floating public anxiety, and contribute to the danger that policy will respond to problems that have the most vocal constituencies.



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# 污染何时尽？爱河事件和美国不断缩水的超级基金计划

历史本不该重演，但一切还是发生了。

潘若思

2月14日，美国纽约州尼亚加拉瀑布城爱河附近的居民对负责清理化学污染物的企业和政府提起15起新诉讼，该事件的原告已达到1000人，涉及的健康问题之多令人心惊，包括牙齿碎裂、心脏病、新生儿缺陷、癌症等。

卢埃拉·肯尼也曾住在爱河附近，现在已投身环保运动。她说：“我在工作中跟很多正受此污染影响的人打过交道，他们有很多共同点。”肯尼说的污染事件发生在1977-1978年，那年冬天的雪下得特别大，积雪融化后渗入面积有16英亩的爱河河道，使有毒化学物质进入地下水，又涌到地面，流入居民的地下室和院落。这些污染物还要追溯到1942-1953年期间，当时胡克化学公司（后被石油天然气巨头西方石油公司收购）向废弃的运河道中倾倒了近2.2万吨有害化学废物，最后把河道填平，使这个垃圾填埋场看起来像普通的荒地一样。后来这里建起住宅区，包括约800座独栋房和240套公寓，在其中心位置甚至还有一所小学。

很多人搬到这里时都像肯尼一样，根本就不知道地下埋有化学物质。1978年，肯尼年仅7岁的儿子因肾病夭折，同年，州政府及联邦官员宣布爱河为重污染区，开始转移当地居民。其实1977-1978年冬天的污染事件并不是首例，但对污染情况和居民健康问题的报道引发了全国性的批评抗议。爱河事件成为美国污染问题和普通人遭受的健康危害的代名词，也使新的环保运动得以顺利开展。

在美国，环境被污染而未能完全恢复的居民区不止爱河一个，但不同的是，爱河的居民一直没有停止抗争，如洛伊斯·吉布斯创办了非营利组织“健康、环境和正义中心”。吉布斯说：“赢得正义的唯一途径就是人们站出来为自己说话。”爱河的居民几乎在一夜间就成长为

有经验、有组织的环保斗士，他们不仅吸引了媒体的注意，还与势力庞大、不承认存在污染问题的企业和政府官员直接抗争。这与电影《永不妥协》中的故事非常相似，只不过电影讲述的环保维权行动发生在加利福尼亚州。

居民撤离后，清理人员在40英亩污染区周围竖起10英尺高的铁丝网，为运河挖掘排水渠（与水泵和污水处理系统相连），还铺了一层防渗漏的粘土。但吉布斯和仍然住在这里的居民说，这些措施根本就不管用：运河与附近的尼亚加拉河相通，因此水会随季节涨落。吉布斯还说：“整个居民区里到处都是污染物，他们根本没有清理，什么都没做！”污染物流进居民的院落和地下室，渗到土壤中。西方石油公司拿出几亿美元用于清理污染和进行

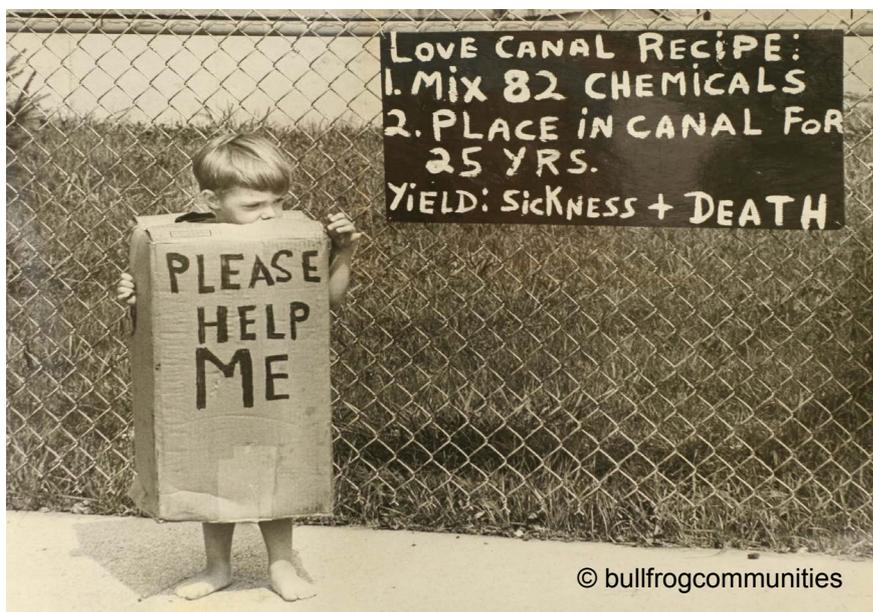
在美国，环境被污染而未能完全恢复的居民区不止爱河一个，但不同的是，爱河的居民一直没有停止抗争。

赔偿，操作过程由政府管理。纽约州环保局的发言人称：“补救措施已经按计划展开，我们还定期检查以保证取得预期效果。”

20世纪90年代，爱河附近一个曾被划为不适宜居住的区域重新开放，更名为“黑湾村庄”，新的居民开始搬进来。第一批新住户还了解污染事件，但肯尼说，没过多久危险标志就被拆除了。肯尼指着一户离过去撤离范围仅有一个街区的人家说，他们搬到这里时甚至都不知道爱河的存在，后来他们的第一个孩子降生了，这个孩子的染色体严重损伤，还患有其他疾病。人们发现院子里有化学污染物，很多新居民还得了原来流行过的疾病，但从传染病的角度很难证明这与化学污染物有直接关系。

爱河再次出现问题，像20世纪70年代时一样成为了典型。吉布斯说：“现在这样的地方很多，我们是最早发现问题的，人们意识到要解决这些问题可能需要很多很多钱。”公众再次愤怒了，政府终于开始着手解决，1980年联邦“超级基金”计划通过，为污染者不明或无力清理的区域提供资金援助。该计划的资金来源于专向石油、天然气、化学公司等主要污染者征收的一种税，直到1995年共和党领导的国会宣布该税种到期。

现在联邦政府认定的“超级基金区域”有1300多个，虽然有人将此视为耻辱，但这个标签意味着能得到资金援助。美国环保局每年用于此项计划的资金约为12亿美元（现



图片英文为“爱河配方：1. 82种混合化学物质，2. 在爱河沉淀了25年，产出为疾病和死亡”。

在来自一般税收收入），环保局说已有375个区域清理完毕（包括爱河），移出名单，其他区域还在进行修复工作。2000年政府估计，约有一半美国人居住在超级基金区域方圆10英里内，清理完毕后，这些地区可作为办公场所、商业区，甚至是像“黑湾村庄”那样的居民区。

开始人们认为“超级基金”计划非常奏效，但现在环保人士对它提出了批评。吉布斯说，如果没有大笔资金“工作就很难取得进展”，新的“超级基金区域”的认定也反映出这个问题，现在美国各地有几千个“棕地”，但没有得到关注。最近，《卫报》和调查性报告中心的一项研究表明，超级基金区域也有“意想不到的遗留问题”，如环境足迹（美国环保局最近才开始监测这个指标）和来源于其自身的废物增加（甚至是在原污染物减少之后）。

报告重点调查了约三分之一像爱河一样地下水被挥发性有机物污染的超级基金区域，指出，在最糟糕的情况下，这个计划就像“猜豆子游戏一样，看上去消除了这里的污染，其实污染又以新的形式出现在其他地区”。对一些区域来说，要真正修复环境需要更多资金、更长时间，以及人们不愿做出的选择。爱河地区环境的修复工作留给美国一个大大的问号。 ☞

潘若思，作家、语言学家，他的新书《实习生之国：如何在美丽新经济中分文不赚并所学甚少》已于今年面世，纸质版和电子版均有verso出版社发行。

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# US grapples with the legacy of its polluted lands

Polluted sites – such as Love Canal in New York state – are a toxic burden the US has yet to resolve

Ross Perlin

On February 14, former and current residents of Love Canal, near the world-famous Niagara Falls in the state of New York, filed 15 new lawsuits against the city government and the companies responsible for containing and cleaning up the toxic mess that has plagued the neighbourhood. The total number of plaintiffs now stands at exactly 1,000, and the range of health issues they allege is daunting: crumbling teeth, heart problems, birth defects and cancer.

“I’ve been working with a lot of the people that are currently affected,” says Luella Kenny, a former Love Canal resident turned environmental activist, “and I see a lot of similarities.” Kenny is referring to the events of 1977 and 1978, when snowmelt from an unusually brutal winter seeped into the buried 16-acre canal, causing toxic chemicals to enter the groundwater and bubble up to the surface, then into basements and yards. Between 1942 and 1953, the Hooker Chemical Company, later bought by the oil and gas giant Occidental Petroleum, had dumped nearly 22,000 tonnes of hazardous chemical waste into an abandoned old canal. Filled in and covered over, the resulting landfill looked like any other grassy field, and a whole residential neighbourhood had been developed on top of it: some 800 family homes and 240 apartments, with an elementary school right at its heart.

Residents like Kenny moved in having no idea the chemicals were there. Her 7-year-old son died of kidney disease in 1978, the same year that state and federal politicians declared Love Canal a disaster area and evacuations began. The winter of 1977-78 wasn’t the first time residents had experienced the toxicity right beneath their feet, but the resulting revelations about the extent of the pollution and the severe health problems among

residents prompted a national outcry. Love Canal became an infamous symbol of America’s pollution problem and the devastating direct effects it could have on ordinary people—and then a lightning rod for the new environmental movement.

Love Canal was far from unique as a site of unrestored environmental degradation in a residential neighbourhood—what made it different was the relentless activism of its residents, including Lois Gibbs, an activist who now runs the non-profit Center for Health, Environment & Justice.

“The only way to win justice,” says Gibbs, “is by people standing up and speaking out.” Besides drawing the media spotlight, Love Canal residents became seasoned, well-organised activists almost overnight, directly confronting powerful corporate and government figures who denied the problems even existed. Theirs is very much the kind of story portrayed in the movie *Erin Brockovich*, concerning a similar case in California which also refuses to go away.

Following the evacuation, clean-up crews built a chain-link fence 10 feet high around the 40-acre containment area, a drainage trench around the canal itself (connected to a pump and treat system), and a supposedly impermeable clay cap on top. According to Gibbs and many current residents, it simply hasn’t worked: the buried canal is connected to the adjacent Niagara River, with which it rises and falls seasonally. Moreover, says Gibbs, “they did nothing, absolutely nothing, to remove the contaminants that were throughout the neighbourhood”—in yards and in basements, permeating the soil.

Occidental paid several hundred million dollars in clean-up costs and damages, while government managed the process. According to a spokesman for New York’s

Department of Environmental Conservation, “The remedial system in place is working correctly and as designed, and is monitored regularly to ensure effectiveness.”

In the 1990s, a section of Love Canal once called uninhabitable was reopened under the name Black Creek Village, and new residents started moving in. The first group was aware of the issue, but Kenny says that signs indicating a hazardous area were subsequently taken down. Kenny points to a family that moved in one block from the former evacuation area, unaware that Love Canal even existed, until a child they had was born with severe chromosome damage and numerous other physical problems. Chemicals are being found in people’s yards, and many of the new residents are noticing troubling health patterns like those that came before, though proving direct causation (as opposed to “reasonable association”) remains challenging in the complex field of public epidemiology.

## Superfunds and the US clean-up plan

The resurfacing of problems at Love Canal may be a bellwether, just as its problems were in the 1970s. “We were the first of thousands of sites across the country,” says



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*Toxic waste forced state officials to evacuate residents from Love Canal in the US*

Gibbs, “and there was a recognition that the cost of fixing these problems is prohibitive... billions and billions and billions of dollars.” At the time, the public furor was such that vital steps were at least taken in the direction of fixing things, with the creation in 1980 of the federal Superfund programme, which designated a pool of money to remediate toxic sites where the polluter was unknown or incapable of cleaning up. Until it was allowed to expire by a Republican-led Congress in 1995, a special tax funded the programme, paid by oil, gas, and chemical companies, the principal polluters.

Today there are over 1,300 “Superfund sites” recognised by the federal government—though seen by some as a stigma, the label is supposed to mean that help is on the way. The Environmental Protection Agency, which runs the programme on just US \$1.2 billion a year (now out of general tax revenues), says that 375 sites (including Love Canal) have been fully cleaned up and deleted from the list and that significant fixes are in place at most others. Half of all Americans live within 10 miles of a Superfund site, according to a government estimate in 2000, and remediated sites can end up as offices, commercial sites, or even residential neighbourhoods like “Black Creek Village”.

Initially seen as effective, the Superfund programme is now under fire from environmentalists. Without significant funding, says Gibbs, “it’s just barely limping along” and the identification of new sites has slowed considerably—indeed, there are thousands of “brownfield” sites across the country that are just as polluted, but languish from lack of attention. A recent study by The Guardian and The Center for Investigative Reporting found that Superfund sites have “their own legacy of unintended consequences”, between their environmental footprint (which the EPA has only recently started measuring) and the increasing amount of waste they produce (even as its toxicity is reduced).

The report highlighted the one-third of all Superfund sites where the groundwater is polluted with volatile organic compounds, as at Love Canal, saying that the programme at its worst is “a shell game in which one environmental danger appears to be addressed, yet is moved somewhere else in the form of a new problem.” In some cases, real restoration of a site may involve more money, longer periods of time, and harder choices than many people are willing to swallow. Across America, a question mark now hangs over the legacy of Love Canal. 🌀

*Ross Perlin is a writer and linguist based in the US.*

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# 污染负担分配不均 弱势群体更易受害

缺乏严格的环境保护政策，中国和美国的边缘化阶层都承受着比富裕阶层更严峻的污染负担。

罗拉·温赖特  
安娜

无论是国际上还是在一国之内，工业化和污染的地理分布都是十分不均匀的，不同地区之间产业的分布和污染治理的水平有着千差万别。

交叉学科领域的环境公正学研究早已表明，环境污染的负担并非均匀分配，弱势群体更容易受害，而这往往是政府和企业有意选择的后果。臭名昭著的1984年赛雷尔报告，就曾建议美国企业将厂房建在受教育程度较低的乡下少数族裔聚居区，以避免或更易应对阻力。

在美国，这些分化通常以种族为界线，从而催生了所谓的“环境种族主义”。“环境种族主义”指的是那些导致有毒有害污染物被集中倾倒在低收入的少数族裔聚居区、造成人造环境不平等现象的不公正的政策或者行为，这个词因罗伯特·布拉德所著的《迪克西垃圾场》而变得家喻户晓。这种不公正清晰地反映在地图上。比如，一份洛杉矶郡的地图清晰地反映了有毒设施和少数族裔聚居区之间存在联系。在这

些地区，污染已经成为了居民生活的一部分，而类似哮喘等由污染所导致的疾病尤其常见。

环境种族主义最著名的案例就是路易斯安那州的“癌症街”。所谓癌症街，指的是密西西比河位于巴吞鲁日和新奥尔良之间的一段，这一地区遍布着化工厂、塑料厂、化肥厂、发电厂和炼油厂（芭芭拉·艾伦和史蒂夫·莱尔纳都曾出版过有关这一地区的书籍）。这一地区成为了化工重镇，在长达85英里（约合136.8公里）的密西西比河段上共有135家工厂，生产的石化产品总量占全美总产量的五分之一。癌症街这个词是20世纪80年代由环保人士创造出来的，意指这些工厂排放的有毒污染物造成当地居民癌症（特别是幼儿患癌症）发病率极高。

尽管贫困的黑人群体所受污染影响的程度明显高于其所占人口比重，但他们并非默默忍受。赛雷尔报告认为，弱势群体重生计而轻环保，因此担心失去就业机会的当

地人不敢对污染企业有半句怨言。从某种程度上说，这种说法是对的，但导致这种现象的因素却十分复杂：一个社区的社会、文化和政治结构决定了其反抗污染企业的意愿和采取行动的效果。另外一个主要障碍就是，弱势社区通常无法获得必要的信息以向有关企业或者政府部门证明污染影响到了当地居民的健康，而这样的问题在社会上、政治上和经济上均处于弱势的群体来说尤为突出。当污染企业被曝光之后，他们往往会强调当地居民基因、饮食和生活习惯等因素在诱发癌症中的作用超过了污染，或者强调污染并非唯一可能造成疾病的因素。

当然，这一现象背后的问题在于，从科学上来讲很难决定疾病的起因。癌症是由吸烟和高脂肪饮食引起的，还是由污染引起的？答案极其复杂。在这种情况下，各方可以提出各种可能与致病有关的因素。强调导致癌症的是行为或者基因因素而非污染的做法，可以保护



污染问题若得不到整治，无论是政府还是个人都将承担相应的经济代价。

政府和企业的正当性，避免工业发展和获利驱动造成的不公正社会秩序受到质疑。这样一来，导致部分人受害严重的宏观经济力量也无法得到纠正。

公民逐渐开始对抗这种不公正，有时他们还与科学家联手。这个日益发展且引人关注的领域通常被称为“公民科学”，它承认公民在科学辩论（包括就污染企业安置所展开的辩论）、挑战现状以及推动重新定义科学边界的进程中发挥的重要作用。在许多案例中，对官方的污染监测渠道失去信心的公民，将科学手段掌握在自己手中。比如在最早诞生“桶队”（Bucket Brigade）的美国，市民就采用相对简单的技术手段独立监测空气质量，并以他们获得的数据为证据要求政府对空气污染制定更严格的监管措施。

中国也有类似的行动。不过与以种族作为分界线的美国不同，中国社会在承担环境污染方面是以阶级和城乡为分界的。社会经济的差异造成人们获取知识（可以用于证

明污染危害）、进行有效动员的权力和能力不均衡。近年来，城市中产阶级有房人士在抗议环境污染，如2012年什邡、启东和宁波等地就发生了这类抗议活动。如今这类活动越来越多，而且采取了“公民科学”型的策略。相比之下，无数受到污染侵害的乡村仍然沉默着，存在的问题更是远没有解决。农村地区的环保行动通常不依靠司法体系、媒体和非政府组织的力量（虽然很多研究认为上述三者是环保行动兴起的主要驱动力），而是更多地采取直接向地方官员或污染企业申诉或小规模抗议的形式。

当然也有例外。2013年，一份环境保护部的文件承认癌症村存在之后，许多有关癌症高发地的报道涌现了出来。这些地方的居民也试图收集数据，以此向企业施压，要求企业清理，数据收集方式包括整理患病人员名单，通过拍照及与环保组织合作来记录污染的严重性，以及要求披露官方数据等。比如前记者霍岱珊创立的、记录并对抗淮河流域污染行为的非政府组织淮

河卫士就是一例，另一例则是纪录片《仇岗卫士》中描绘的安徽仇岗村。不过，这样的例子仍在少数。

城乡环保人士倡议联盟的出现给人们带来了希望。2013年，我与同事托马斯·约翰逊博士、陆继霞博士共同对农村地区抵制垃圾焚化炉的行动做了研究。我们走访了河北省潘官营，这里可以说是乡村争取环境公正方面的一个突破：三位村民带头抵制当地修建垃圾焚化炉的计划并达到了目的。他们的成功在很大程度上归功于他们与来自北京的达尔问自然求知社、自然大学等机构的环保活动人士联手，并获得了曾经成功延缓北京六里屯垃圾焚化炉建设的律师夏军的帮助。

虽然他们的努力目前取得了阶段性成功，但他们的经历还是让我们不得不对污染负担的分配提出疑问。抵制活动的一位领导者感到最寒心的一点就是，官方明明说垃圾焚化炉“远离居民区”，但实际上离他们的房子不过数百米。他反问道：“难道我们农民就不是人吗？”他的问题直指污染地理分布和环境不公正问题的核心。在中国，污染项目向农村地区的迁移伴随着另外一个趋势，即那些更有财力的人正在慢慢远离污染，购买瓶装矿泉水，安装空气净化器。中国大多数农村居民还买不起这些东西。随着科技水平更高、更富有的群体对清洁的环境的要求提高，工业化和城市化持续向西发展。除非执行严格的环境保护政策，污染分配的不均只会有增无减。 ☞

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# How the rich escape the burden of pollution in China and the US

In the absence of stricter environmental protection policies, it is marginalised groups that bear the larger burden of pollution in both China and the US

Anna Lora-Wainwright

The geography of industrialisation and pollution is uneven – people's level of exposure to pollution varies both globally and within countries.

Marginalised communities are often particularly affected, and this can be the result of deliberate choices by governments and industries. For example, the notorious 1984 Cerrell Report, commissioned by officials in California, advised firms in the United States that they could avoid or overcome opposition to the siting of facilities by locating them in poor, relatively uneducated, rural and ethnic minority communities.

In the US, these divisions often follow racial lines, giving rise to “environmental racism”, a term which became widely known with the publication of *Dumping in Dixie*, by Robert Bullard. It refers to biased policies and practices which result in inequalities in the built environment whereby toxins and other hazardous waste and pollutants concentrate in low-income ethnic minority communities. Several maps illustrate these inequalities clearly. A map of Los Angeles County (see below), for instance, shows the correlation between toxic facilities and ethnic minority areas. In these areas the ailments which result from pollution, such as asthma, are particularly frequent.

One of the most infamous cases of environmental racism is Louisiana's “cancer alley”, a stretch of the Mississippi river between Baton Rouge and New Orleans covered with chemical plants, plastic plants, fertiliser manufacturers, electrical power plants, and oil refineries (Barbara Allen and Steve Lerner have both written books on this region). This area became a prime setting for the

petrochemical industry. There are 135 plants along 85 miles of the Mississippi, producing over one-fifth of US petrochemicals. The name 'cancer alley' was coined by activists in the 1980s to suggest that the toxins that are being released by the plants have led to an extremely high rate of cancer (childhood cancers in particular) among locals.

While poor black communities are disproportionately affected by pollution, they do not put up with its effects in silence. The Cerrell report assumed that marginalised communities would prioritise earning a living over fighting pollution, and therefore they would not complain for fear of losing their jobs in the local industries. To some extent this is true. But the dynamics of such scenarios are also more complex: the social, cultural and political texture of communities affects their willingness and their capacity to complain and to do so effectively. Access to information necessary to make a case to the relevant company or to higher authorities that pollution affects a community's health is also a key hurdle, which tends to be bigger among those who are socially, politically and economically marginal. More often than not, when polluting firms are

“ Unless strict environmental protection policies are implemented, inequalities in the distribution of pollution and harm are only likely to increase in China. ”

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in the spotlight, they emphasise the role of genes, diet and lifestyle in disease causation over the role of pollutants, or stress that the latter alone cannot be blamed.

Of course, the underlying problem is that it is scientifically very hard to determine what causes illness. Is cancer caused by smoking and fatty diets? Or by pollution? The answer is extremely complex. And as a consequence there is vast disagreement about what might be blamed. The politics of blaming behaviour or genes, instead of pollution, serve to maintain the legitimacy of both state and industry instead of questioning inequality.

Citizens, sometimes in collaboration with scientists, have increasingly taken a stand against this injustice. This growing and fascinating field is often called ‘citizen science’, to recognise the important role that citizens play in scientific debates (including those over the siting of polluting industries), in challenging the status quo, and pushing science to redefine its boundaries. In many cases, having lost trust in official channels for pollution monitoring, citizens have strived to take science into their own hands. “Bucket brigades” for instance first emerged in the US among communities which used relatively simple technologies to monitor air pollution independently and used their data to demand stricter regulation.

## China's marginalised victims

In China, similar processes seem to be at play - socio-economic differences are reflected in uneven power and capacity to gather knowledge that could serve as evidence of pollution’s harm and to mobilise effectively. In recent years, urban middle class homeowner protests against pollution, such as those in Shifang, Qidong and Ningbo in 2012, have become increasingly visible and adopted citizen science-style strategies. By contrast, countless villages are suffering from pollution without being able to gain attention, let alone redress. Rural environmentalism typically takes place far from the legal system, the media and NGOs (which are often studied as key forces in the rise of environmentalism) and rests more firmly on direct appeals to local officials, polluting firms and small protests.

There are of course exceptions. 2013 saw a spike in reports on “cancer villages”, clusters of high cancer incidence, following the publication of a ministry of environmental protection document which acknowledged their existence. There too, local residents attempted to gather data – including cancer name lists, documenting the severity of pollution through pictures and collaboration

with campaigners, and demanding release of official data – to put pressure on companies to clean up. The NGO Huai River Warriors founded by former journalist Huo Daishan to document and combat pollution in the Huai River Basin and the case of Qiugang village (Anhui), portrayed in the documentary *The Warriors of Qiugang*, are two such examples. These cases however remain in the minority.

The emergence of advocacy coalitions between rural and urban activists gives some grounds for hope. In 2013 I carried out some research with colleagues Dr Thomas Johnson and Dr Jixia Lu on rural resistance to waste incinerators. We visited the village of Panguanying in Hebei, which potentially presents a breakthrough for rural environmental justice: three villagers have taken the lead in opposing the construction of a local incinerator and, so far, they been able to halt it. Much of their success is owed to their ability to team up with campaigners in Beijing from Green Beagle and Nature University, and to enlist the help of Xia Jun, the lawyer who successfully halted the incinerator in Beijing’s Liulitun.

While their efforts have so far succeeded, their experience also raises questions about the distribution of harm. One of the protest leaders was most upset that the incinerator planned for their village was described officially as “far from residents”, and yet it was less than a few hundred metres from their homes. He asked rhetorically, “are we, peasants, not people too?”

This point goes to the core of questions over the geographies of pollution and environmental injustice. The movement of polluting projects into rural China is coupled with another trend, whereby those with more financial means move away from pollution, buy bottled water and install air purifiers. Most rural Chinese cannot afford to do this. Unless strict environmental protection policies are implemented, inequalities in the distribution of pollution and harm are only likely to increase as industrialisation and urbanisation continue to move West and as tech-savvy wealthier communities demand a cleaner environment.



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# 中国污染土地尚无修复标准

大量工矿企业排污、事故和泄漏导致中国城乡土壤均受到污染，亟需修复。专家告诉中外对话，当前中国污染土地没有修复标准，急需有效的法律约束。

张春

2013年底，国土资源部首次披露全国土壤污染数据，称中国约有5000万亩耕地受到中重度污染。3月下旬，中国《土壤污染防治行动计划》经环保部审议通过，进一步完善后将报国务院审批。

那么，中国土壤污染源头在哪里？治理难点在哪？即将出台的“行动计划”有多大效力？对此，中外对话采访了中国环境修复产业联盟秘书长、中国环境修复网主编高胜达先生。

中外对话：中国的土壤污染源头在哪里？为什么近年来土壤污染事件频繁爆出？

高胜达：土壤污染问题主要是工矿活动的结果。中国经过30年经济的高速发展，必然留下了许多的环境问题。欧美经济高速发展的时期，也是他们污染累积的过程。

中国的耕地污染，在湖南、广西、江西、贵州、甘肃这些矿业发达地区较重。城市用地的污染，以重金属、石油化工类用地最重。污

染不仅来自为满足国内需求进行的生产，这几十年国外各种制造业在中国安家，也是重要污染源。

之所以近年来问题频发，有三个原因。一个是因为土壤和地下水的污染更具隐蔽性，大家之前不太关心。环保问题的暴露，从可见的、可感受的大气、地表水，再到隐蔽的土壤、地下水，世界各国都是这样一个规律。过去二十年，中国关注的主要是地表水和空气。

第二个原因，是土壤和地下水也具有一定的环境容量，污染积累到一定程度时才会显露出来。

第三个，中国城区土壤污染问题暴露，主要是在“退二进三”（退出第二产业，进入第三产业）后。伴随着2007年以后房地产大规模开发，很多城区的工矿企业要么搬走，要么倒闭退出，城区的污染才凸显，中间出了一些标志性的事件。2004年左右，北京十号线宋家庄地铁修建，工人在挖场地的时候被熏倒了，那里以前是一个农药厂，这就引发了环保系统和公众对此的认识。后来北京化工三厂、北京红

狮涂料厂、北京染料厂、北京焦化厂，以及首钢，都面临类似的问题。

但是城区尚无证明土壤污染和人群健康间存在因果关系案例。因为问题暴露的时间还短，中国大规模的搬迁开发迄今大概有10年左右，证明因果关系需要更多时间观察。除非是污染特别集中的状况，如上世纪70年代美国纽约州拉夫运河河谷，因为在工业废渣场地建设住房，几十年内致畸致癌的情况很集中。

中外对话：当前土壤污染的评定和治理标准是怎么样的？

高胜达：土壤标准，要分为工矿用地和耕地两类来说。

耕地，国家有“土壤环境质量标准”，但是这标准目前只有2种有机物（六六六，DDT）和8种重金属（镉、汞、砷、铜、铅、铬、锌、镍），这还是1995年出的标准。当前正在作修订，增加新的污染物标准。这个标准针对每种用地类型对

上述污染物设定了标准值，高于标准值就定义为污染。可以形象地称为“一刀切”。

现在中国耕地污染比较严重了，但是没有相应的修复制度，所以很多污染农田不能得到修复。

工矿场地的修复还没有统一的标准，城市用地也没有土壤质量标准。目前城区土地修复大多是为了再开发。只有上海为世博园用地做了一个标准，叫做《展览会用地土壤环境质量评价标准（暂行）》，因为这个地方原来是一个工业区。一些省份就用此来做比照，作为修复的标准。

北京等地区不同，是借鉴国外的风险评估模型。就是需要先对风险因子进行调查，根据场地污染状况和未来用途，确定可以接受的风险系数，例如要保证一百万人中只有一人因污染致癌，然后再倒推污染的修复水平。风险系数越低，修复的标准就越严格。

因此，风险评估模型根据场地需求不同，定义为污染的标准也不同。如医院、幼儿园用地标准更高，工业用地就要低一些。

目前，按照世界各国的模式和经验来看，也有用“一刀切”修复标准的，比如亚洲的台湾地区、韩国和日本。基于中国的状态，最好是从“一刀切”起步。等大家对污染场地的危害有认识以后，再用风险评估比较好。风险评估是一个弹性的模型，有些场地可能以模型为借口，减少修复量或不修复。当然这个也有两面性。

二月底环保部出台了针对污染场地调查、评估、修复、监测的四个技术导则和污染场地术语，规定了污染治理过程的标准程序，给市

场更多的信心，也具有很好的规范引导作用。

中外对话：影响着治理效果的因素有哪些？

高胜达：第一个是土壤的异质性。

土壤和大气、水是不同的。一公里外的大气和采样点的大气质量很接近，但是一米外的土壤就完全不同。所以，当前我们公众或公司用大气或者水污染治理的思路去对待土壤污染是行不通的。

同时，每一块土地都有特殊性。例如，同样是化工厂，你运行的时间比我还长，但是如果你的清洁生产搞得不好，我搞得不好，那我的污染可能更严重；南北方的差异：北方的地下水很深，南方地下水很浅，污染迁移程度不一样；土质差异，沙土和粘土的治理难度是不一样的。此外，还有污染物差异，修复商水平的差异。

医生看了病人以后会开药方，告诉你该吃什么药，吃一片还是两片，需要经验。调查修复商需要一个项目去积累，而国内的企业毕竟还是进入行业的时间短，其技术、人才、经验、案例的储备需要时间去提升，这也是一个制约因素。

对产业来说，产业的技术支撑还是要提升。近十年房地产开发带动的修复，因为开发进度的要求，所以一般是将污染土壤挖走，再异地处理。这种情况下，可选的技术很少，妨碍了中国土壤修复技术多样性的发展。国外采用原位修复较多，其成本低，但是时间长。少则一年两年，长的十年二十年。

中外对话：最近即将出台的《土壤污染防治行动计划》有何意义？对土壤污染治理未来方向，您怎么看？

高胜达：当前针对土壤污染没有什么法规条例，只有去年国务院办公厅下发了一个《近期土壤环境保护和综合治理工作安排》，环保部也曾发过一个相关通知。这个行动计划的出台是很有必要的，和去年出的大气污染防治计划一样，正是时候。

但是，行动计划主要针对的还是农田，因为国家关注粮食安全比较多。另外，这是一个五年计划，无法起到长期的制度作用。所以，还是需要更有强有力的法律约束，例如大家正在热议的《土壤污染防治法》。正在修订的《环境保护法》会加入土壤治理内容，但是它是综合法，不可能太具体，土壤的专项法可以规定更多治理的细节。

由于中国幅员广阔，各地土壤水文地质差异性很大，下一步中国可能根据不同的地方，将污染进行分级分类，以便于区别治理。

此外，中国需要加强污染源监管，随时治理。例如加油站，你不能等它漏了或者搬迁了再去做调查。加油站漏油了，会污染危害地下水，及时处理的修复成本较低。等它漏了十年八年，地下水早就被污染了，污染物也已经迁移转化，不仅危害加大，而且修复成本也会很高了。☺

张春，中外对话北京办公室编辑

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# China "lacks experience" to clean up its polluted soil

China's polluted land is in urgent need of cleaning up, but at present there is a lack of both experience and legislation, says Gao Shengda, secretary of the China Environmental Remediation Association

Zhang Chun

In late 2013, the Ministry of Land and Resources revealed that approximately 50 million mu (3.3 million hectares) of farmland was "moderately" polluted. In response, in late March, the Ministry of Environmental Protection (MEP) proposed its "Action Plan for Prevention of Soil Pollution".

In an interview with chinadialogue, Gao Shengda, secretary of the China Environmental Remediation Association, talks about the challenges of cleaning up China's soil.

**Zhang Chun (ZC): Where does soil pollution come from and why have we seen so many cases in recent years?**

**Gao Shengda (GS):** Soil pollution comes mainly from mining and industrial activity. China's 30 years of rapid economic growth have inevitably caused many environmental problems. Europe and the US saw the same thing during their periods of quick growth.

Polluted farmland is more serious in provinces with mining areas: Hunan, Guangxi, Jiangxi, Guizhou, Gansu. In urban areas pollution is mainly due to heavy metal and petrochemical production. But that pollution isn't just due to output for China's own needs. In recent years many overseas manufacturers have moved to China and become major sources of pollution.

The increased frequency of incidents is down to three

reasons: first, soil and groundwater pollution is hidden, and previously it wasn't a matter of concern. Environmental concerns start with what can be seen or felt: surface water pollution, air pollution. Only later does soil or groundwater pollution come to light. That's been the experience in any country. Over the last two decades China has mainly been concerned with pollution of surface water and the air.

Second, soil and groundwater have a certain environmental capacity – problems don't become apparent until a certain degree of pollution has accumulated.

Third, in urban areas soil pollution only came to light as industry moved out to make way for the service sector. In 2007, many urban industrial or mining concerns were relocated or shut down to make way for property development, but this exposed urban pollution. For example, in 2004, workers on Beijing's Line 10 subway fell ill while working a site previously occupied by a pesticide plant. That made the public and the environmental authorities aware of the issue. Then there were similar cases with the Beijing 3rd Chemical Plant, Beijing Hongshi Paint Factory, Beijing Dye Factory, Beijing Coking Plant and Shougang Steel.

But in urban areas there are no confirmed cases of soil pollution causing public health issues. The problem hasn't been known for very long – it's only in the last 10 years that this process has started, and identifying a causal relationship requires a long period of observation. That is unless there is a case of very concentrated pollution, such as the Love Canal case in New York, where homes were built on an

industrial waste site, leading to a cluster of cancer cases over the following decades.

**ZC: What standards do we currently have for assessing and remedying soil pollution?**

**GS:** There are two types of soil standard, one for industrial and mining land, and one for farmland.

There is a Soil Environmental Quality Standard for farmland, but this only covers two organic pollutants, Hexachlorocyclohexane and DDT, and eight heavy metals – cadmium, mercury, arsenic, copper, lead, chromium, zinc and nickel – and dates back to 1995. That’s currently being revised to include new pollution standards. It will set standards for levels of different pollutants in different types of land, and if that level is breached the land will be classed as polluted. So that single standard will apply in all cases.

Soil pollution in China is quite serious, but there’s no remediation system and much polluted farmland goes untreated.

There is no single standard for remediation of industrial and mining sites, or for urban land. Currently remediation of urban land is usually done to allow further development.

The only standard was set in Shanghai, for the World Expo in 2010, whose site was formerly industrial land. Some provinces have used that as a point of reference for soil remediation efforts.

Other places, such as Beijing, have opted to look to international risk models. This means first assessing risk factors and determining, based on the state of the pollution and the future use of the site, an acceptable risk index: for example, one case of cancer per million people might be deemed acceptable. You then work backwards, to see what level pollution must be reduced to. The lower the acceptable level of risk, the higher the standards for remediation.

Under this model, the purpose of the site determines what level of pollutants will be classed as "polluted". For example, lower levels of pollutants might be required for a hospital or kindergarten, than for a factory.

Currently this approach is common worldwide – for example in Taiwan, Korea and Japan here in Asia. And that would be the best way for China to get started. People are now aware of the risks of polluted sites, and now we should evaluate those risks. This is a flexible approach: the model may allow for some sites to be subject to less remediation, or to be left untreated. So it works both ways.

At the end of February, the MEP published guidance



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In China there is no single standard for remediation of industrial and mining sites, or for urban land. Much polluted farmland goes untreated

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on the survey, evaluation, remediation and monitoring of polluted sites, providing a standard procedure for dealing with pollution. This boosted market confidence and provided a good norm to follow.

**ZC: What factors contribute to the effectiveness of treating soil pollution?**

**GS:** First, is the particular nature of soil.

Soil is unlike air or water. If you take an air sample, you can be confident that the air one kilometre away is more or less the same. But soil can change hugely within just a metre. So neither the public nor companies can approach soil pollution in the same way they think about air or water pollution.

And each site is different. One chemical plant might have been operating for longer than another, but if its environmental standards are stricter then its site may be less polluted. In the north groundwater is very deep, in the south nearer the surface, and that changes how pollution migrates. There are differences in types of soil – sandy soil and clay need to be handled differently. There are also differences in the types of pollutants, and the abilities of the companies doing the work.

It takes experience for a doctor to be able to write a prescription and tell you what medicine to take, how much, how often. Soil remediation companies also need to gather experience in assessing and treating soil, and in China these companies are only just getting started. It will take time for them to build up the technology, the personnel, the experience and the background. That's a limiting factor.

At the industry level, we need better technological skills. In the last ten years soil remediation work has mostly been carried out to allow for property development – usually soil is dug up and taken away for treatment elsewhere. That has prevented the sector developing a diverse range of approaches. Overseas it is more common for pollution to be dealt with in situ. That's cheaper, but takes longer – from one or two years, up to 10 or 20.

**ZC: How significant is the soon to be released Action Plan? What future trends do you expect to see?**

**GS:** Currently there are no laws or regulations on soil pollution, just a document from the Office of the State Council on short-term arrangements for protection and remediation of the soil, and there was also a circular from the MEP. There's a real need for this action plan, just like there was for the air pollution action plan last year.

But the action plan is still focused on farmland, as the state is mostly concerned with food security. And it's a five-year plan; it won't help put long-term systems in place. So there needs to be more powerful legislation, such as the Soil Pollution Law that there's been so much debate about. The revision of the Environmental Protection Law will include soil pollution, but this is an overall law, it won't be very specific. A specific law for soil pollution would be able to provide more actual detail.

And China is huge, with big differences in soil, hydrology and geology. China could categorise pollution differently across regions, to allow for a differentiated approach.

Also, China needs better monitoring of soil pollution, and to take action at any time. For example, with filling stations: you can't wait until there's a leak, or until the station is closed, to investigate. If fuel leaks it will pollute groundwater, and it's cheaper to deal with that as soon as possible. If you wait a decade the pollution has spread. That means it does more harm, and is much more costly to clean up. 

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# 湖南发展有色金属产业是亏本生意

绿色和平污染防治项目武毅秀认为，发展有色金属产业是湖南政府做的一个亏本买卖，未来在土壤污染治理上的投入可能远超其所带来的税收收入。

林娜

国际环保组织绿色和平于四月底发布了《“有色”米——湖南衡东县稻米重金属污染调查》，该调查对以有色金属企业为主的湖南省衡阳市衡东工业园周围的稻谷、稻田土壤及地表水样本进行了检测。

检测结果显示：13个稻米样本中有12个样本的镉含量超标，超标最严重样本镉含量为国标近21倍，稻米样本中还检测到不同程度的铅、汞、砷等其他重金属。除稻米样本外，稻田土壤样本的镉含量也全部超过土壤环境质量二级标准。

调查团队结合当地主导风向、实地检测结果等多因素的综合分析，得出该工业园有色金属企业是当地重金属污染的重要来源的结论。

中外对话就此调查报告内容及更广泛的土壤污染问题，专访了负责本次调查的绿色和平组织污染防治项目主任武毅秀。

中外对话：您对近期环保部和国土资源部联合发布全国土壤污染状况调查公报有何评论。

武毅秀：从信息公开层面来说，本次公开是环保部的一个正面的举动。此前，土壤污染的公报一直都被列为是国家机密，环保部对外秘而不宣，因此本次公开值得肯定。

但同时，本次公布的信息非常有限。一个经历了7年的全国普查，最后只公布了5页纸的pdf文档，其中必然存在关键信息缺失。（注：4月中旬发布的全国土壤污染状况调查公报显示，中国土壤污染形势严峻，逾16%的土壤点位污染超标，其中超过八成的污染类型为无机物污染。）

已公开内容中没有标明其中污染的点位的集中地区或集中类型，污染源的信息缺失，对于公众和

科研工作者来说借鉴的价值就很小——我们只是知道一个很大的情况。

因此，我们呼吁进一步公开更详细的信息，包括采样点位、污染所在地。2006年的污染公报的方案里曾提出检测地表水和农作物，但是现在的公报里面没有体现农作物和地表水的检测结果，我们也呼吁向公众公开此类信息。

此外，我们还建议把公布结果和1995年的土壤本底值调查做一个对比，看现在土壤污染的趋势究竟是什么样的。

总之，更多的信息公开，一方面有助于学者展开相应调查，另一方面也将提高公众自我防护意识和对土壤污染的认知。

“经济发展和环境的矛盾固然存在，但有色金属产业可以通过更严格规范及优化产能，来将对环境的危害降到最低。”

中外对话：湖南为有色金属产区，可能存在土壤重金属背景值高，你们这次调查是否考虑到了这方面的因素？

武毅秀：这次考察排除了背景值高的因素。我们有对照样本，是在距离工业园10公里的地方采集的，而对照样本重金属含量并没有超过国家标准，由此可说明工业园周围土壤中重金属是有其他来源，土壤超标不是因为背景值高导致的。

另外，政府颁布的土壤调查报告提到，在我国的一些地区，与1995年公布的本底值比较，土壤一些重金属含量增加50%，说明更多的污染是由工业排放和外来污染造成的。

中外对话：湖南是重要有色金属产区，关闭有色金属产业并不现

实，应该如何解决有色金属产业发展和生态环境的矛盾呢？

武毅秀：经济发展和环境的矛盾固然存在，但有色金属产业可以通过更严格规范及优化产能，来将对环境的危害降到最低。首先，应当淘汰落后产能、设立严格的准入标准、对在生产企业的排放进行严格的监督，更精细化地管理产业。湖南现在土壤问题其实是历史遗留的环境债，和当年疯狂上马小冶金企业、采用落后的冶炼技术有关。

另外，通过采用先进的污染处理工艺也能减少重金属的排放。同时应当对有色金属冶炼企业进行监控，鼓励企业自行申报污染数据，完善公众监督。

有色金属产业并不是不能发展，但要通过合理的规划来降低其对环境的危害。

中外对话：如你所说，湖南的有色金属行业的继续发展需要不少投入才能保证其对环境不会造成危害，这笔帐是否划算？

武毅秀：发展有色金属产业可能是湖南地方政府做的一个亏本买卖。湖南省曾测算，在未来二十年，仅湘江治理费用超过四千亿，而在2011年，有色金属对湖南的纳税总值才350多亿。治理费用远超税收收入。

发展有色金属产业虽然对GDP有拉动，也会带来税收，但在短期的利益前，政府需要更长远的眼光看待问题。湖南政府过去几年存在目光不够长远的问题。有色金属的盲目扩产冲动造成的环境债，也许需要很多年才能还上。

现在湖南政府已经开始意识到这个问题，其在湘江治理中也提到



究竟全国有多大面积的耕地被污染还需要进一步更加详细的调查。

了要控制有色金属，关停小厂，但我们希望湖南政府能走得更远，不仅是关停小厂，而是要对有色金属行业有更合理的规划。

**中外对话：**湖南乃至全国现有的土壤污染严重，是否会对中国的粮食安全构成威胁？

**武毅秀：**究竟全国有多大面积的耕地被污染还需要进一步更加详细的调查。湖南省也对自己的耕地污染情况做过调查，但是结果没有公布。但公报所调查的耕地点位有19.4%超标，这多少反映了目前耕地污染的情况。耕地污染对于粮食的产量和质量都有影响。一方面会导致粮食大量减产，我们在衡阳调查有农户反应粮食减产约50%，而另一方面生产出的粮食镉超标，一旦流入市场也会对健康产生威胁。如此大量的耕地污染势必会影响中国粮食安全。湖南是我国最大的稻谷

生产省份，有很多原本质量很好的高产田，遭到污染会带来严重的损失。

**中外对话：**有学者建议，可以通过改变作物结构来解决土壤中重金属超标的问题，您对此怎么看？

**武毅秀：**通过种植不同作物消化污染是一种思路，但要避免富集了重金属的作物成为转移污染的途径。即使是要改变作物结构，首先也还是要把土地污染情况摸清，然后把不宜种植的作物情况告知当地农民。

另外，改变作物结构必然导致大米减产，仍然难以解决粮食安全问题。大米是中国的主粮，不能过度依赖进口。

**中外对话：**据媒体报道，土壤污染的治理涉及的资金将是万亿级别的，这个钱应该由谁来出？

**武毅秀：**由政府出钱治理污染其实是不合理的。当前国际上治理土壤污染的总原则是污染者付费。

欧盟的土壤污染指令里第一条原则就是污染者付费，谁污染谁治理。在英国有两个原则：第一步先确定污染源，如果是工业污染，则由这个地方的污染源去付费治理；如果无法确定污染源，则由土壤的使用单位来支付土壤修复和治理的费用。

总的原则是把土壤修复的费用转移到对这个土壤有破坏和有利用需求的这些人身上，我觉得这才是一个正确的方向。

现在我们国家很多时候是企业污染政府买单，企业污染造成的环境损失和经济损失由所有纳税人来承担，无法对企业形成有效的压力。🌀

林娜，前中外对话北京办公室记者

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# Taxpayers to bear costs of polluted Hunan soil

The cost of cleaning up metals pollution in Hunan, south China, will outstrip tax revenue from the smelting industry, says Greenpeace campaigner Wu Yuxiu

Luna Lin

The impact of heavy-metal pollution on crops in Hunan province, south China, was highlighted by a Greenpeace investigation published last month, which tested soil, water and rice taken from villages near a cluster of industrial smelters in Hengdong county. The NGO found cadmium levels above legal limits in 12 out of 13 rice samples – in the worst case, quantities of the heavy metal exceeded accepted levels by a factor of 21.

Wu Yixiu, head of toxics campaigns at Greenpeace, talked to chinadialogue about the findings.

**Luna Lin (LL): What do you make of the Chinese government's national soil survey, released in April, which revealed that the country is suffering from severe soil pollution?**

**Wu Yixiu (WY):** In terms of openness of information, this publication is a positive move by the Ministry of Environmental Protection. In the past such reports have remained undisclosed, classed as state secrets.

But at the same time, only very limited information has been made available. This was a seven-year, nationwide survey, and only a five-page PDF document has been published so far.

The data published does not say where the polluted sites are, what types of pollution were found, or where the pollution comes from. We've called for more detailed information to be released, including the locations of sampling sites and pollution.

We also suggest a comparison between the baseline

established by a 1995 national survey and the new data, so we can see what the trends are.

Overall, more openness would help academics carry out related studies and also increase the public's awareness of what soil pollution is and how to protect themselves.

**LL: Hunan may have a high background level of heavy metals in its soil. Did your survey take this into account?**

**WY:** We accounted for that factor. We took control samples from a site 10 kilometres away from the industrial zone, and those control samples did not breach national standards. The government also says that heavy-metal pollution in some regions is up 50% on the 1995 baseline. That shows that the contamination is coming from industry and external sources.

**LL: Hunan is a major producer of metals. How can the province balance the needs of industry with environmental demands?**

**WY:** The conflict between economic growth and the environment remains, but a more efficient and compliant metals industry would minimise future environmental risks. First, out-of-date processes should be eliminated, and high thresholds for market entry put in place, along with strict monitoring of emissions and more careful supervision of the industry. The soil pollution problem in Hunan is the legacy of widespread building of small-scale smelters using out-of-date technology.

Adopting advanced pollution-control techniques could

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also help to cut heavy-metal emissions. Meanwhile smelting firms should be monitored and encouraged to report pollution data, in order to allow for better public oversight.

It's not that we can't have metals production. But it needs to be properly planned in order to reduce environmental harm.

**LL: You say that the industry in Hunan will require considerable investment if it is not to harm the environment. Is it a good financial investment?**

**WY:** At present, the provincial government may make a loss. It once calculated that it would spend 400 billion yuan [US\$675 billion] in the next two decades just on cleaning up the Xiang River. In 2011, the non-ferrous metals sector contributed just 35 billion [US\$59 billion] in taxes to the province. Clean-up costs far outstrip tax income.

Developing the sector will drive GDP and increase tax income. But the government needs to take a longer-term view, and we've seen a failure to do that in Hunan in recent years. Rampant expansion of metals production has created environmental debts that will take years to pay back.

The provincial government has started to realise this, and has mentioned the need to control this sector and shut down smaller firms as part of the Xiang clean-up. But we hope they can do better: close down the smaller plants, but also plan better for the development of the sector.

**LL: Does China's soil pollution pose a threat to its food security?**

**WY:** More detailed surveys are needed to assess how much farmland around the country has been polluted. Hunan has carried out such a survey, although the results have not been published. However the provincial authorities did announce that 19.4% of farmland sampling sites breached standards.

Soil pollution affects both the quantity and quality of crops: yields are lower – farmers in Hengyang county reported a drop of 50% – and cadmium levels are high

enough to endanger health if those crops reach the market. Pollution across such large areas of farmland will inevitably impact food security. Hunan is China's biggest rice-grower – pollution there would be a heavy blow.

**LL: Do you agree with academics who have suggested that switching crops would resolve the soil pollution problem?**

**WY:** Planting different crops to absorb the pollution is one idea, but we need to avoid a situation where crops that absorb high levels of heavy metals simply move the pollution elsewhere. And if we do change the crop structure, we need first to be clear on what pollution is present, and tell the local farmers what they shouldn't plant.

This will inevitably result in reduced rice harvests, so it won't help food security. Rice is China's staple food; we can't rely too much on imports.

**LL: Who should pay to clean up China's soil pollution?**

**WY:** It isn't actually reasonable to expect the government to pay. Internationally, the "polluter pays" principle is often used.

The EU's soil pollution directive establishes this principle in its very first article. In the UK, two principles are applied: first, identify the source of pollution. If it's industrial, the polluter pays. If the source can't be identified, then the user of the soil pays the costs of remediation.

Overall, the costs are incurred by those who damaged the soil, or those who use it. I think that's the right approach.

Very often in China, the government picks up the bill for corporate pollution, meaning all taxpayers pay for the environmental and economic harm those companies inflict. There is no pressure on the companies to change. ☹

*Luna Lin is a former reporter in chinadialogue's Beijing office.*

# 有害的炊烟—— 燃煤危害中国农村公共健康

煤炭依然是中国很多农村地区的主要生活用能来源，但其潜在的健康危害却鲜为人知。

孟斯

在陕西省南部的紫阳县蒿坪镇，人们牙黄已经成为远近皆知的事实，以至于有了专门的称呼——“蒿坪牙”。

这不仅仅是外表的尴尬，严重的牙齿会断裂、脱落。在科学上，这被称为“氟斑牙”，背后是燃煤污染型氟中毒。清华大学教授杨旭东说：“农村的PM2.5污染很厉害。以前我们认为城市空气不好，现在其实是农村更不好。”他说，包括煤炭燃烧在内的农村能源使用方式，产生的空气污染也会影响城市空气质量。

蒿坪产煤，带动了当地经济发展，但当地的煤含氟量高。据陕西省政府地方病防治办公室2005年的数据，包括蒿坪镇所属的紫阳县，陕南秦巴山区中南部居民的生活燃料，主要是当地出产的石煤，含氟量在2000mg/kg左右，这是辽宁工程技术大学齐庆杰教授同年给出的中国煤中平均氟含量的近10倍（在他的论文《中国煤中氟燃烧排放特征与排放限值》中，该值为208mg/kg）。

中科院地理所王五一教授得出的数据显示，陕南农户室内空气氟浓度最低值是标准的近3倍，而最高值超过标准的97倍（国家标准浓度限值是0.007mg/m<sup>3</sup>）。燃煤释放的氟等有害物污染了室内空气和食品，使生活在这一环境的人群发生慢性蓄积性中毒，病症就是氟斑牙和氟骨症。

相对于氟斑牙的尴尬，氟骨病对人们生活的实际影响更大。镇上东关村的村民杨元勤说：“我们这里

很多人从四五十岁就开始腿疼。”对此很多当地人知道“蒿坪人骨头脆”。有些严重的患者已经出现了腿的变形。

中国疾病预防控制中心CDC地方病控制中心地氟病防治研究所的数据显示，燃煤污染型地氟病病区分布在中国的14个省，病区人口多达3300余万多人。

齐庆杰教授的研究显示，中国煤在各种设备的燃烧过程中，大部分煤种的氟含量是超标的，若在燃



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山西村民依靠煤炭炉灶来煮食及取暖。

烧过程中不采取相应措施，将会对环境造成一定程度的大气氟污染。他呼吁在《锅炉大气污染物排放标准》中加入对燃煤氟化物的排放限值，目前该标准只对烟尘、二氧化硫和氮氧化物做出了限制要求。

氟中毒也并不是唯一的燃煤引起的地方病。2001年-2003年在陕南进行的燃煤型砷中毒调查显示：煤砷检测最高值达到488.1mg/kg，是国家标准的近5倍。被调查的400多人中，砷中毒者近半。

中国燃煤污染型砷病病区主要分布在贵州和陕西。CDC的数据显示，目前在贵州省查明的病区有3.8万人，而陕西省的病涉及区县5个，但病情状况尚没有做全面的调查。

除了导致中毒者皮肤损害、龟裂，砷中毒还有可能导致神经系统疾病、视力障碍，甚至损害呼吸、消化、循环、泌尿等多种人体系统，导致癌症。

由于各地产出的煤品质不一，燃烧中对健康的影响也不同，但一些普遍成分如颗粒物、硫化物、可挥发的有机物以及重金属对健康的损害不容忽视。世界卫生组织估计，在中国农村每年由于使用固体燃料（尤其是含氟或含硫高的煤炭）有约40万人过早死亡，主要是妇女和儿童。

## 更新炉灶的困难

2004年，政府开始推广防氟炉灶，替代当地人祖辈使用的地炉子。

地炉子在蒿坪一带几乎家家都有。在室内的水泥地面上打出一个长方形的坑，深度大概有半人高，

旁边打出一个比巴掌略大的圆口地洞和它连起来。生火时往炉里填满了石煤，烧剩下的煤灰顺着通道掉到坑里。平时，长方形的坑被用木板盖着，炉口则常常是敞开着。

冬天人们只要在家，几乎全家人一整天都呆在有地炉子的房间。很多老人喜欢在地炉边烤火。在陕南，人们家里的地炉子每年从9月烧到3月。它一直被看做一项了不起的实用性发明。在阴暗的泥土房里，一家人围坐在烧红的炉旁烤火，地面的热气直接温暖了双脚，全身很快就热起来。但研究人员却发现这种地炉子对健康造成危害：它既没有炉盖，也没有烟道。石煤燃烧发出的烟气通过人的呼吸附着在食品上，最终进入人体，造成燃煤污染型氟中毒。

在村民徐女士家里，记者看到了被改造的地炉子，炉口被加了铁圈和铁盖，侧面打出了排烟通道，通向室外烟囱，用来导出燃煤的烟气。这些改造得到了政府补贴。

而政府补贴的防氟炉灶，是一个有炉盖的铁炉子，还有一个平坦的灶台以供烧水做饭。从炉子通往室外的金属烟道需要用户自行购买。研究证明：这种炉灶明显提高了燃烧效率，减低了空气污染。

然而蒿坪镇的一些家庭根本没有购买政府补贴的这种炉子，即便有，很多也是闲置着。

陕西省地方病防治所高级工程师李跃说：“除了因为人们的生活习惯很难改变，还有一个原因，当地的石煤的含硫量高，很容易损坏铸铁的炉子和烟道，而人们往往不愿意再花更多的钱维修和更新。”王五一说：“因为这些后续的问题跟不上，近几年全国的氟中毒人数虽然

在下降，幅度却不大。”

同时，由于燃煤开采和使用的扩大，上世纪末陕南的燃煤污染型氟中毒病患开始出现上升趋势。陕西省政府地方病防治办公室早在1980年调查，当时陕南秦巴山区安康、汉中市病区人口近15万，其中氟斑牙患者一万多人，成人氟骨症患者五千人。2001年再次调查，病区受危害人口上升到113万人，成人氟骨症患者达近10万人，是20年前的20倍。在调查的14万8-12岁儿童中，患氟斑牙病的有近8万人，患病率达到56.54%。

陕西省政府地方病防治办公室认为：主要是因为近年来石煤开采规模迅速扩大、开采量大幅度增加，再加交通运输业的发展，不仅在产煤区生活燃用石煤的范围扩大，而且大量的石煤由产区流向不产煤的纯销区。

一位运煤的司机告诉记者，石煤虽然是低质量的煤，但销量并不发愁。很多煤炭商人把它掺在好煤里卖，以降低成本。另外，石煤还是制砖的重要原料。

此外，随着中国近年来加大退耕还林、封山育林的规模，原来生活燃用柴禾或以燃用柴禾为主的农村农户，也陆续改用石煤。由此扩大了高氟危害的范围。

太原科技大学的何秋生教授研究中国大量分散的家用炉灶，他的论文中介绍，煤的燃烧过程伴随二氧化硫、氮氧化物、氟化物、汞等无机物质的释放；家用炉灶使用过程中总悬浮颗粒物中有50%-80%是粒径小于2.5微米的细粒子，且这些细粒子组分中其多环芳烃(PAHs)含量很高。燃煤过程中除无机气体和半挥发有机物(如PAHs)释放以外，

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还伴随挥发性有机物释放。

在东关村，一些年轻村民和到大城市打工回来的村民家庭已部分或全部的改用电取暖和做饭，电饭锅和电磁炉已经非常普遍。就算仍用煤的，也不像老年人那样抗拒使用新的防氟炉灶，因为它更干净。

但大量的农村居民在长时间内

还是离不开燃煤。清华大学杨旭东教授说，10年前中国每年的农村用煤只有3千万吨，但现在已经达到每年1.9亿吨原煤。

加州伯克利大学科克·史密斯则建议中国政府在农村推广更先进的炉灶，多年研究中国燃煤与健康问题，他提出，在中国，最简陋的

煤炉从成吉思汗时代就没有改进过。我们现在有技术、知识和资金，到了应该解决这些问题的时候了。 

孟斯， 中外对话特约记者

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# Rural China hit by fluorine poisoning from coal-burning

Government attempts to introduce cleaner stoves into rural homes have failed to stem a public health disaster caused by the burning of poor quality coal.

Meng Si

The locals of Haoping, a township in the south of Shaanxi province, are known for their yellow teeth. The condition is even referred to as “Haoping Teeth”.

It isn't just a cosmetic concern. Badly affected teeth often break and fall out. The scientific term for the condition is dental fluorosis, and in Haoping it's caused by fluorine pollution from coal. “PM2.5 levels in rural areas are very high,” explains Tsinghua professor Yang Xudong. “We used to say that city air was bad, but it's worse now in the countryside.” Rural energy habits, including the burning of coal, produce pollution which can also affect air quality in the cities, he adds.

Haoping's economy is based on coal mining, but the local seams are high in fluorine. In the central and southern parts of the Qinba mountains, where Haoping is located, residents burn locally mined anthracite coal containing about 2,000 milligrammes of fluorine per kilogramme, according to 2005 figures from the provincial disease control office. This is 10 times the national average.

Data obtained by professor Wang Wuyi of the Chinese Academy of Sciences' Institute of Geographic Sciences shows that in rural Shaanxi, fluorine levels inside homes were up to 97 times the permitted standard. Fluorine is among the harmful pollutants released from coal into the air and food, leading to chronic cumulative poisoning – the symptoms of which include dental and skeletal fluorosis.

Skeletal fluorosis has a graver impact on the lives of sufferers, as Yang Yunqin from the nearby village of Donguan explains: “Many of us suffer from leg pains once we reach 40 or 50.” Locals know that “Haoping folk have

weak bones,” Yang adds. In severe cases, victims' legs become deformed.

Figures from the China Centre for Disease Control (CDC) show that endemic fluorosis due to coal-burning is found in 14 of China's provinces, affecting areas with a combined population of 33 million people.

The scale is so great because most kinds of coal in China produce fluorine above acceptable limits, regardless of how it is burned, according to professor Qi Qingjie of Liaoning Technical University. He has called for limits on fluorine compounds to be included in emissions standards for boilers – current regulations only limit smoke and dust, sulphur dioxides and nitrous oxides.

Fluorosis is not the only endemic disease caused by coal burning. A study of arsenic poisoning carried out in Shaanxi between 2001 and 2003 found that coal burned in the province contains up to 488.1 milligrammes of arsenic per kilogramme – almost five times the permitted level. Of 400 people examined, almost half had been affected.

Arsenic can cause a range of serious health problems in humans, including cancer and diseases of the central nervous system, as well as problems with eyesight, breathing, digestion, the metabolism and the urinary system. Cracked and damaged skin is also common.

Cases of arsenic poisoning linked to coal are mainly found in Guizhou and Shaanxi. The CDC has identified 38,000 cases in Guizhou. No full study has been carried out in the five counties affected in Shaanxi.

As the kind and quality of coal burned in China differs across regions, the health impacts also vary. But particulate

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matter, sulphur compounds, volatile organic compounds and heavy metals are commonly present and the damage these cause to health cannot be overlooked.

A study of domestic fuel use by Taiyuan University of Science and Technology found that 50-80% of the floating particular matter released from domestic stoves is under 2.5 microns in diameter – small enough to enter the lungs and blood – and high in polycyclic aromatic hydrocarbons, a human carcinogen.

The World Health Organization estimates that use of solid fuels (in particular coal rich in fluorine and sulphur) causes 400,000 premature deaths every year in rural China, mostly of women and children.

## Problems replacing stoves

Almost everyone in Haoping has the same stove. Coal is burned in a cylindrical hole, about the width of a hand, dug into the concrete floor. Ash is swept into a larger, neighbouring pit. The ash-pit is usually covered with wood, while the mouth of the stove is left open.

In winter a family might spend the entire day around the stove, and in southern Shaanxi the stoves burn constantly from September to March. They have always been seen as a valuable and practical invention: in a dark home a family gathers around the glow of the stove, the heat warming the ground beneath their feet. But research has found these stoves to be dangerous – with no cover or chimney, the pollutants in the smoke are breathed in or settle on food, leading to fluorosis.

In 2004, the Chinese government started to promote the replacement of the traditional burners with new models, which cut indoor pollution.

Mrs Xu showed me her new stove. An iron cover had been set on the top, with a chimney jutting out from the side to carry the smoke away. Research has shown that these stoves are much more efficient and clean. Like in many homes, Mrs Xu's upgrade was subsidised by the government. But despite the help on offer, some families in Haoping have opted not to buy the new stoves, or have made the purchase but not installed them.

One reason for this, says Li Yue, senior scientist with the provincial disease prevention authorities, is simply that it's hard to change people's habits. But in addition, the high sulphur content in the anthracite damages iron stoves and chimneys – “nobody wants to spend more money on repairs and replacement,” says Li.

Such policy failures have meant limited progress: “Although the incidence of fluorosis has fallen, it hasn't gone down by much,” says Wang Wuyi.

In fact, greater mining and use of coal triggered an upsurge in fluorosis rates in southern Shaanxi at the end of the last century. In 1980, the provincial disease control office identified 10,000 sufferers of dental fluorosis and 5,000 adults with skeletal fluorosis in a population of almost 150,000 in Anding and Hanzhong in the Qinba mountains. In 2001, another study identified 1.13 million people living in affected areas, with almost 100,000 cases of adult skeletal fluorosis. Among the 140,000 eight- to 12-year-olds examined, almost 80,000 (57%) had dental fluorosis.

Increased mining of anthracite and better transportation, making the coal more likely to be burned elsewhere, was largely responsible for the spread of the disease, according to the provincial disease control office. And as China has returned farmland to forestry and fenced off hillsides to allow regeneration, rural households have been forced to buy in coal, rather than collect firewood.

Anthracite is still popular. One coal-transportation firm told me that it sells well despite being a poor quality coal. Some merchants mix it in with better fuel to reduce costs, and it is still used to make bricks.

Back in the village of Dongguan, some of the younger locals and those who have spent time in the cities use electricity for heat and cooking. Electric rice cookers and induction hobs are very popular. Even when they burn coal, the youngsters tend to prefer the newer, cleaner stoves that older generations reject.

But many rural residents will be using coal for years to come. Ten years ago, 30 million tonnes of coal were burned annually in rural areas of China, says professor Yang Xudong. Today, that figure is 190 million tonnes.

For many, the intimidating numbers mean the government must promote modern heating equipment more aggressively. Kirk Smith of the University of California, Berkeley, an expert in coal and health issues says: “The simplest kind of coal stove you see, I don't think it's changed since Genghis Khan. This is the time to solve the problem.” ☺

*Meng Si is a special correspondent for chinadialogue.*

# 《汤姆斯河》作者访谈： 环境问题大到无法视而不见

普利策奖得主、记者丹·费金接受中外对话采访，阐述了毒物污染、中国以及在环境问题上政府如何失灵等内容。

普提尔·柯瑞恩

柯瑞恩·普提尔（以下简称柯）：你的《汤姆斯河》中很有意思的一点，就是揭示了美国国家环境保护局（EPA）把大量工作委托给了污染者自身，从自愿排放报告到进行毒理学检测。管理机构真的能像我们期望的那样来保护我们吗？

丹·费金（以下简称费）：我想这个答案是否定的。人们对EPA抱有一些巨大的误解，把它当作一个“白大褂”机构，以为这里会进行大量的检测。实际上，这个工作几乎都是由人们所说的“被管理者”来做的，即排放者自身及它们雇用的实验室。

这就是我们美国的行事方法，因为我们在公共领域的投入并没有人们认为的那么大。扣除通货膨胀因素，EPA的预算和70年代一样少，甚至比那时还少。

第二个巨大误解是人们以为EPA有很大的强制权力，就像某种“超级警察”似的。但凡和EPA打过

交道的人都知道这种想法有多傻。总的来说，EPA的本质就是让一群相对很少的人去干一大堆的工作，还要尽其所能地干好，但实际上却干得不是那么好。简而言之，EPA就是个架子机构。但这不是它本身的错，而是决策者的问题，他们让EPA用那么少一点预算去做那么多事情。

柯：美国这样的情况，和其他国家的环境保护相比怎么样？

费：一些北欧国家在管理部门的资金上比美国好得多。它们没有像美国这样被政治瘫痪所困，法规也远比我们灵活，能够反映出当前情况。

而在美国，我们还在忙着消除40年前制定的法规。我们的法律与现今的时代严重脱节，所以我们非但不能管控应该得到管控的风险，而且就连管控的方式也是无声的、低效的，成本却是不必要地高昂。

如此看来，发展中国家很可能



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“我写《汤姆斯河》这本书，就是因为我认为这是一个普遍性问题。”

以一种我们绝难具备的方式做到这一点。第一步就是培养环境意识，我从多个角度看到了中国的这一动向。毫无疑问，中国人民正在非常适时地意识到他们身边正在发生的环境问题，他们不愿看到这样的情况。

柯：2007年访华的时候，你对中国的印象如何？

费：在中国看到的对于环境卫生的关心度让我深受打击。看到实地人们所受的环境威胁，再看见从地方到中央各级政府的“鸵鸟”态度，工业化的危险并没有得到切实处理，这让我深感忧虑。根据我读到的资料，从那之后中国的污染问题有所增加，但同时中国人改善环境的决心也在增强。

柯：如果把今天的中国和五十年前的美国做个比较，你会得到什么结论？

费：有一些类似之处，但也有一些重要的差别。当然，对于经济发展和提高生活标准（至少在短期内衡量）的渴望在汤姆斯河是至关重要的。我在中国也看到了这一点。这是一个非常体现人类本性的情境：高速工业化带来了巨大的长期成本，但也带来了短期收益。

但二者之间有一个重要的差别：互联网的存在。即使在中国这样一个权威国家，信息分享的能力也是无处不在的。这是一个巨大的优势，它意味着人们可以更容易地吸取过去的经验教训。尽管国家掌

控的媒体很难报道像癌症村这样的事情，但个人博客并不会受到同样的限制，所以它们能够切实发挥重要作用。

柯：你发现政府对环境危机反应中的变化了吗？

费：至关重要的第一步是承认存在（环境）问题。我确实认为中央政府已经走出了否认阶段，开始重视环境，因为这个问题实在太大了，无法视而不见。就我看到的资料而言，中央政府的这个变化还没有影响到省级和地方政府，它们还在走着生产目标和快速增长高于一切的老路。既注重工业化带来的收益又要正视工业化所付出的代价似乎还未真正成为共产党内激励制度的一部分。但是，至少人们已经有了对于环境问题的公共认知。

柯：你对全球环境未来最关切的是什么呢？

费：毒物问题正与能源发生直接联系。这对我来说是一个非常让人担心的地方，因为我们在毒物问题上犯过的错误正在人为全球变暖上重演。我们必须承认两者的相同性：和我在《汤姆斯河》中指出的的一样，我们用短期的增长换来了长期的危险。在能源体系去碳化问题上，我们同样面临着不顾长期后果的问题。

一场脱离化石燃料的痛苦转型是不可避免的。无论发展中还是发达国家，都将面临极端的紊乱。化石能源通过非常复杂的方式影响人

类健康。它是今天大多数问题性有机和人造分子的根源。我们拖得越久，痛苦就越大，当转型到来的时候就越致命。

柯：汤姆斯河如今是个什么样的地方？

费：汤姆斯河的空气和水已经比大多数城市地区都要安全了，因为那里的环境质量受到了如此巨大的关注。汤姆斯河成了一个完美的宜居地，证据很清楚，就是儿童癌症病例数已经不再异常了。

不可避免地，人们看了这本书会认为那是一个“别处”的问题，在“本处”不会发生。但这决不是我想看到的。我写《汤姆斯河》这本书，就是因为我认为这是一个普遍性问题。

环境风险无处不在，我们的反应不应该只是看到表面然后变得疑神疑鬼。我们应该对什么是环境风险以及如何应对有一个全面而深入的认识。要做到这一点，就需要个人充分掌握信息，再进一步，我们需要共同想出一种完善的风险评估方法，制订出共同的风险降低策略。而要做到这些，我们还需要坚定的政府。 ☺

注：丹·费金的《汤姆斯河：科学与救赎的故事》一书获2014年普利策非虚构类作品奖。

柯瑞恩·普提尔，前中外对话美国项目副主编

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# US small town pollution case is "universal story"

The tale of a New Jersey cancer town shows how the US and China struggle with similar institutional failures, says Pulitzer-prize winning journalist Dan Fagin

Corinne Purtill

**Corinne Purtill (CP): An interesting revelation in your book, *Toms River*, is how much work the US Environmental Protection Agency (EPA) entrusts to polluters themselves. Do regulatory agencies protect us as well as we think they do?**

**Dan Fagin (DF):** I think the answer to that is

no. People carry a few big misunderstandings about the EPA. They think of the agency as a white coat agency, an agency that conducts a lot of tests. It's not. That work is almost entirely done by what's known as the "regulated community" – emitters themselves and the labs that they hire.

That's the way we do things in the US, because we do not invest in public sectors nearly as much as I think we should. The EPA's budget in inflation-adjusted dollars is as low or lower than it was in the 1970s.



© Mike Rastello

*Dan Fagin's book highlights the parallels between pollution in the US and China*

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The second big misunderstanding people have about the EPA is that they think of it as a big oppressive force, as some kind of super police. Anybody who's ever had dealings with the EPA knows how silly that is. Basically, the nature of the EPA is you've got a relatively small number of people doing a massive amount of work and trying to do the best they can, but not doing it very well. The EPA is basically a paper agency. It's not the fault of the agency itself, it's the fault of the policymakers, who have given it too much to do and with too little budget.

**CP: How does this compare with environmental protection elsewhere?**

**DF:** Some northern European nations do a significantly better job than the US does funding their regulatory sectors. They're not afflicted with the political paralysis we have here in the US. They're much more nimble with regulations that reflect the current science.

Here in the US, we're working off statutes that are 40 years old. Our laws were written in a parts per thousand era, and now we're living in a parts per trillion era. Not only are we failing to regulate risks that ought to be regulated, but we're regulating them in a dumb, inefficient and needlessly expensive way.

In that sense, the developing world has a potential opportunity to get this right in a way we really haven't. The first step is to develop an environmental consciousness. I certainly see multiple occasions of that happening in China. There's no doubt that Chinese people are, very appropriately, recognising what's happening around them, and they don't like it.

**CP: What were your impressions of China when you visited in 2007?**

**DF:** I was struck by the depth of concern I saw about environmental health. I was concerned about the kind of exposures I saw on the ground and what I saw as a head-in-the-sand attitude by local, regional and national government – not really coming to grips with the risks of industrialisation. Based on what I've read, the [contamination] problem has grown since then, but the determination among people in China to make things better has also grown.

**CP: What comparisons can you make**

**between China today and the US half a century ago?**

**CF:** There are some parallels but also some important contrasts. Certainly, the thirst for economic development and an improved standard of living, at least as measured in the short run, was crucial in Toms River. I see that in China as well. That's a very human story: that rapid industrialisation brings tremendous long term costs, but it also brings short term benefits.

There's an important difference, though: the existence of the Internet. Even in an authoritarian state like China, the ability to share information is ubiquitous. That has huge advantages. It means that it is a little bit easier to learn from past experience. It's difficult for state-controlled media to write about [issues like cancer villages], but individual bloggers are not as constrained and are able to do really important work.

**CP: Have you observed changes in the government's response to the environmental crisis?**

**DF:** The first, absolutely crucial step is to recognise that there's a problem. I do think the national government is past the denial stage. This problem is way too big to pretend it doesn't exist. From what I've read, that message has not trickled down to the provincial and local governments, which are very much operating under the old system where advancement in the party is determined by production goals and achieving rapid growth. Looking at the costs of industrialisation as well as benefits doesn't appear to have really infiltrated the incentives system that seems to operate in the Communist party. But at least there is public acknowledgement.

**CP: What most concerns you about our global environmental future?**

**DF:** The issue of toxics is going to be tied directly to energy. It's a tremendous area of concern to me that the same errors we made with toxics we're now making with anthropogenic global warming. We should all recognise the parallels here: the same trade off of short term growth for long term risk that I outline in Toms River. We're having the same problem

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of being unable to look at the long-term consequences when it comes to decarbonising our energy system.

It is inevitable that we are going to have to make this wrenching transition away from fossil fuel. We're going to face extreme dislocation, in both the developing and developed worlds. It is going to affect human health in very profound ways. Fossil energy is the root of most of the synthetic molecules that are so problematic today. The longer we wait, the more painful, the more deadly that transformation is going to be when it comes.

**CP: What kind of place is Toms River now?**

**DF:** The air and water in Toms River is probably safer than most parts of the urban world because so much attention has been lavished on environmental quality there. Toms River is a perfectly nice place to live. The evidence is pretty clear that there is no longer an unusual number of child cancer cases.

Inevitably, people read this book and assume that this is about a problem that's there, not a problem that's here. That is not what I intended at all. I wanted to tell the story of Toms River because I think that it's a universal story.

Environmental risk is everywhere, and we should react to that not by only looking at the obvious big emitters like factories. We should develop a well-informed sense of what environmental risk is and what we can do about it. In order to do that, we need individuals to be well informed, and even better than that, we need to come up with a smart way of assessing risk collectively and with reduction strategies that are collective in nature. And to do that, we need robust government. 

*Dan Fagin is the author of 'Toms River: A Story of Science and Salvation' published by Random House International, 2014*

*Corinne Purtill is a former associate editor at chinadialogue.*

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# “汞都”的代价

曾有着亚洲第一汞储量的“中国汞都”——贵州万山，因资源枯竭被关闭。楚寒访问这里的汞矿职工，发现他们承受着离异、失业、吸毒、汞中毒、汞污染和死亡的困扰。

楚寒

在像一辆庞大的超级马车，行驶600多年后，“中国汞都”贵州万山的汞矿戛然而止。2001年10月，贵州汞矿因资源枯竭，被宣布政策性关闭。

作为曾经国内最大的汞工业生产基地，汞矿曾承载万山特区疾驰，给万山带来巨大的物质财富、悠久的工业闻名，并将其推向“小香港”、“小深圳”的繁荣巅峰。

此后，为了进一步整治汞矿给当地留下巨大的环境创伤，2009年3月国务院将万山列为全国第二批资源枯竭型城市。2011年初，万山特区政府开启了一场“产业原地转型，



西村民依靠煤炭“中国汞都”的转型似乎没有给这些失去工作的矿工群体带来太多改变和欣喜。

城市异地转型”的双转型艰难之旅。

3年后，早报记者来到这里，重新审视、打量这座转型中的城市，发现在这场转身中，仍有部分原贵州汞矿职工，正承受着企业关闭带来的困扰和创伤：离异、失业、吸毒、汞中毒、汞污染甚至死亡。

汞矿关闭后，55岁的黄亚平和其他被一次性买断工龄的职工一样，开始在万山特区经营三轮车客运生意。

黄亚平说，这10余年里，三轮车的起步价从1元涨到了3元。汞矿关闭时，整个万山城只有150多台三轮出租车，现在已增至246台。其中，有近一半左右的经营者身份是贵州汞矿前矿工。

2014年6月，黄亚平再婚了。这是他与前妻离婚10年后的又一场婚姻。2001年贵州汞矿关闭前夕，前妻与黄亚平离婚。那时，汞矿败象早显，他的月薪只有100元左右。

这不是个例，电焊工曾丽娜也是离婚者之一。2001年汞矿关闭时，她和在下属安装公司工作的丈夫被买断工龄。之后，丈夫去临县做摩托车修理。她却因身体诸多不适，无法再工作了。

2009年，丈夫提出离婚。理由是她的身体越来越差，负担越来越重。现在，曾丽娜每月靠1000多元的养老金生活。但钱太少，“根本不敢乱用”。

多位贵州汞矿的退休职工说，汞矿关闭后，离婚已成矿工二代中的普遍现象。这与贵州汞矿鼎盛时期的上世纪70-80年代相比，反差巨大。汞矿关闭后，微薄的收入和沉重的生活压力，让矿工们的腰杆不再像当年直了。而那些当年冲着过美好生活而嫁到汞矿的部分姑娘，

正渐次离去。

这里像极了中国大多数县城在90年代初期的样子。城市的任何核心地带之间，步行不会超过20分钟。晚上10点左右，街道就变得很冷清。

三轮车夫杨明轩说竞争太激烈了，每天的收入很少能达到100元。三轮车客运的生意越来越难做。

## 吸毒的失意群体

和黄亚平住同一社区的71岁老妇申玉珍，是矿工家属。

2001年，她36岁的大儿子姚本发在矿上当了8年冶炼工后，汞矿关闭，只领到1.9万元买断工龄安置费。第二年，失意落魄的姚本发开始吸食海洛因，1.9万元很快就被花光。他后来成为低保户，每月只有230元低保金。家里值钱的物什全都变成他的毒资。

三角岩是贵州汞矿工人的一个聚居地。汞矿关闭后，待业青年们喜欢在这些社区里晃荡。后来，海洛因也开始进入这个社区。姚本发也是这个失意群体中的一员。

姚本发曾在戒掉毒瘾后，在万山找过工作，但对方说他吸过毒，名声不好，不愿聘他。他也曾拿着母亲给的1500元去湖南、浙江和广东等地找工作，工厂招工的人都说他年纪太大，不愿录用他。

2004年，妻子吴某跟他离婚后，他开始复吸，直到2013年12月6日被抓去万山戒毒所强制戒毒。

毒瘾越来越大时，有的吸毒者开始选择注射吸食海洛因。万山一位公务员说，曾有人因过量注射致死，尸体被发现时已开始腐烂。

## “鞋穿重了就走不动”

1965年，袁仁纯开始在汞矿工作。1989年9月，他被查出汞中毒，鉴定为8级工伤，后来被送去贵州汞矿技校附近的疗养院疗养。袁仁纯说，汞中毒后，走上坡路时双脚乏力，经常性头晕。

当年，贵州汞矿红火时，袁仁纯曾在五坑做过冶炼的大班班长。那时生产压力和工作强度都较大，他们与汞接触的频率很高。之前，贵州汞矿的冶炼一直采用土灶，回收率仅为50-60%，这意味着有40-50%的汞呈蒸汽逸入空气中，汞蒸气浓度超过标准460倍。

另一位汞中毒者刘黑子，两年前已去世。

2011年，记者采访他时，这位79岁的矿工，正艰难地往嘴里扒饭粒，一双手不停地颤抖。导致他双手颤抖的，正是多年从事汞矿工作所带来的汞中毒。刘黑子行动迟缓，走路都不能穿厚重的鞋子。

在刘黑子的记忆中，他6岁开始接触汞。他的汞中毒是发生在1960年和1961年。那时，他还在贵州汞矿五坑装罐。后来，矿上要求矿工中的共青团员和共产党员在矿洞的逼仄空间里洗矿。作为党员，他因此成为了一名洗矿工人，一洗就是好几年。

1963年7月25日，贵州汞矿在对矿工做体检时发现，汞中毒者有151人，患病率为6.6%。刘黑子正是这6.6%中的一名。24年后的1987年，这个数字增加至274人。他们仍在继续承受着手脚颤抖、易怒、烦躁和精神错乱等带来的痛苦和烦恼。

## “以前是汞污染， 现在是锰污染”

在下场溪村，40岁的村民吴从玉，正坐在家看管两个孩子。稻田里的秧苗长势不错。几个月后，这些成熟后的稻谷又将被卖给前来收购的外乡人。约7年前始，吴从玉家就再也没吃过自己种的大米。那年，他们家种出的稻谷上开始出现黑点，有的还是空壳。也是从那年开始，他们家稻田旁用来灌溉的河流开始变黑。

污染来自上游的万山镇。

2003年，在万山镇创建的万泰锰业，将生产中产生的废水从万山镇注入大水溪，一直流淌至吴从玉家门前的溪流。

2012年11月7日16时许，万泰锰业尾渣库底部导洪管破裂，库内锰渣随溪水排放至下溪河，造成下溪河污染。

从7年前开始，万泰锰业开始以每百斤稻谷80元的青苗费，补贴沿溪一带村民。到了2013年，这笔费用不再发放，官方给出的理由是：2012年的污染事件后，这家企业已停止生产。

“以前是汞污染，现在又是锰污染。”吴从玉无奈地摇摇头。

万山区环保局曾向《每日经济新闻》透露，以土壤环境质量标准三级标准值汞含量1.5mg/kg作为对比值，下溪乡两岸受污染农田土壤汞含量278.5mg/kg，超标185.6倍。

吴从玉不知道，他们家稻田里的土壤何时才能变得安全。4、5年

前，有贵阳的专家来他们这里取过污染的土壤样本去化验，但吴至今并未获知化验结果。

“中国汞都”的转型，在五年后进入了实质性阶段。

2011年以来，万山启动了总面积30平方公里的“万山转型工业园区”，目前已入驻51家企业。2014年底，万山区政府将搬迁到铜仁市的谢桥新区，这里将成为铜仁市经济发展的“两翼”之一。

这两大转型之举，似乎没有给这些失去工作的矿工群体带来太多改变和欣喜。🌀

本文原载于7月15日《东方早报》

楚寒，《东方早报》见习记者

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# The human cost of living in the 'mercury capital' of China

Journalist Chu Han visits Wanshan, in south-west China, once home to Asia's largest reserves of mercury, and finds miners suffering from high rates of divorce, unemployment, drug-taking and mercury poisoning

Chu Han

Six hundred years of mercury mining in Wanshan, in southwestern Guizhou province, ended in October 2001 when officials closed the mine because reserves had run low.

The mine was once China's biggest producer of mercury, driving the economy of Wanshan Special Zone, and bringing huge material benefits to the area. Wanshan was lauded as 'little Hong Kong' or 'little Shenzhen', nicknamed after the industrial boom town neighbouring Hong Kong where China's experiment with capitalism was launched.

To help deal with the huge environmental damage wrought by the mine, the State Council in 2009 included Wanshan in a second group of cities to be classed as 'resource-depleted'. In early 2011, the Wanshan Special Zone government embarked on a program to relocate and transform Wanshan city, while redeveloping industry on its original site.

Three years later the Dongfang Daily newspaper's reporter visited Wanshan to assess that process of transformation. Former miners are still suffering the consequences of working at the mine and its subsequent closure: high rates of unemployment, divorce, mercury poisoning, pollution, and death. Despair has also driven some to take drugs.

## The former miners

Many retired miners struggle to make a living, and say that after the closure divorce became a common problem. This is in stark contrast to the glory years of the mine in the 1970s and 80s, when girls flocked here to marry mine

workers. But after the closure, money pressures and stress wore the locals down and those women gradually left.

After the mine closed Huang Yaping, 55, started driving a three-wheeler taxi, a cheaper and more popular option than a conventional taxi cabs. His marriage broke up in 2001 as the mine was about to close. At the time, he earned only about 100 yuan (£9) a month. He finally remarried in June this year, though money remains tight.

In the last 10 years the starting fare for a three-wheeler has gone up from 1 yuan to 3 yuan (30p), but the number of drivers operating them has increased from 150 to 246. But most places in Wanshan are within a 20 minute walk, and the streets are deserted after 10pm.

About half of the new three-wheeler drivers are former mine workers. Another driver, Yang Mingxuan complained of fierce competition, saying he rarely makes 100 yuan (£9) a day and business is getting harder.

Huang's money and marriage problems are not an isolated case. Welder Zeng Lina and her husband, who worked for an installations subsidiary of the mining company, were laid off in 2001. Her husband left for a nearby county to work as a motorcycle mechanic. She has been too ill to work again.

In 2009 her husband asked for a divorce as her health was worsening and she was becoming an increasing burden. She survives on a 1,000 yuan (£90) pension, but it's not enough: "I don't dare spend too much."

Drug-taking has also become commonplace. Shen Yuzhen, 71, is part of a mining family in the same part of town as Huang Yaping.

Her oldest son, Yao Benfa, had worked at the smelter for eight years but was given only a 19,000 yuan (£1,800)

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pay off when he lost his job in 2001. Frustrated and out of work, he started using heroin the following year and the 19,000 yuan quickly disappeared. He receives only the minimal welfare payment of 230 yuan (£22) a month, and anything of value has already been sold off to buy drugs.

Many of the miners lived in Sanjiaoyan, and the unemployed youngsters hung out here – and then heroin started to appear. Yao was one of those youngsters.

He did try to find work once after quitting the drug, but nobody was willing to employ a former drug user. His mother gave him 1,500 yuan (£140) to try and find work elsewhere and he travelled to Hunan, Zhejiang and Guangdong – but the factories told him he was too old.

He started using again after his wife left him in 2004. On December 6, 2013, he was forcibly placed in rehabilitation.

The very badly addicted started to inject heroin. One local civil servant told of addicts who had overdosed and not been found until the bodies had started to rot.

## The mercury poisoning victims

Yuan Renchun started working in the mine in 1965. In September 1989, he was found to be suffering from mercury poisoning and was sent to a clinic for treatment. Yuan said that after his diagnosis he became too weak to walk up hill and was often dizzy.

Back then the mercury mining industry in Guizhou was booming, and Yuan used to work as a smelter foreman. There was intense pressure to maintain production and the workers often came into contact with mercury. The furnaces in use at the time had a reclamation rate of 50-60% - meaning 40-50% evaporated into the atmosphere. Mercury in the air could be 460 times the permitted level.

Liu Heizi, another victim, died two years ago.

When interviewed in 2011 Liu, 79, was struggling to feed himself – his hands were shaking too much, a symptom of the mercury poisoning acquired during years of mine work. He moved slowly and had to wear lightweight shoes to be able to walk.

Liu started working in the mines in 1938, as a child aged 6. He traces his mercury poisoning back to 1960 or 61. Back then he was a loader at the mine's fifth shaft, but the mine bosses asked for Communist Youth and Party members to work in the cramped spaces of the mine itself, washing ore. Liu, a Party member, washed ore for years.

On July 25, 1963, tests by the mine company found 151 workers suffering from mercury poisoning – an

incidence rate of 6.6%. Liu was among them. By June 1987 the number of identified cases had risen to 274.

They still suffer from tremors of the hands and feet, and are prone to anger, agitation and confusion.

In the village of Xiachangxi Wu Congyu, 40, sits watching two children. The rice in the fields is growing well and in a few months it'll be sold to traders who come for the harvest. But Wu and her family haven't eaten the rice they grow for seven years – they started to notice black spots on the grain, or empty hulls. That was the same year the stream they use for irrigation turned dark.

The pollution was coming from Wanshan. In 2003 Wantai Manganese was founded in Wanshan, and the waste water from that operation flows into the Dashui Stream – which continues all the way to Wu Congyu's house.

At about 4pm in the afternoon of November 7, 2012, a pipe in the company's tailing ponds burst and manganese tailings flowed into the stream, causing pollution downstream.

The company started to pay compensation of 80 yuan per 100 jin (50kg) of rice to growers along the stream. But that stopped in 2013, with the official reason being that the company was closed down after another pollution incident in 2012.

The Wanshan Environmental Protection Bureau has previously told the National Business Daily that land on the banks of the stream contains 278.5mg of mercury per kilogram, compared to a standard of 1.5mg per kilogram.

Wu has no idea when their land will be safe again. Four or five years ago an expert came from Guiyang to take a soil sample – but they were never told the results.

After five years, the transformation of China's "mercury capital" is well underway.

In 2011 Wanshan created a 30 square kilometre "Transformational Industrial Park", and 51 companies have moved in. At the end of 2014 the Wanshan government will move to the Xieqiao New District in Tongren – becoming one of the "two wings" of Tongren's development.

But these transformations do not seem to have brought much change or improvement for the miners who lost their jobs.

*This article was originally published by Oriental Morning Post*

*Chu Han is an intern reporter at Oriental Morning Post.*

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# 中国在危机时刻的环境治理

势力庞大的利益集团对公众力量的限制阻碍了可持续发展转型。

山姆·吉尔  
希尔顿·伊莎贝尔

“生态文明”和“美丽中国”是中国领导人提出的两大口号。然而，隐藏在光鲜口号背后的却是一个复杂、危险、不断恶化的问题。中国的环境治理和气候治理正处在危急关头：国家正努力地向着可持续发展的方向转型。对于一个占世界人口五分之一的国家而言，其难度可想而知。然而，在民众参与环境保护这个问题上，中国的政治结构和势力庞大的利益集团采取的方式却是限制而非利用，这让改革难上加难。

从最新各大媒体的头条新闻就可以看出，要想建设一个“美丽中国”绝非易事：据环境保护部最近的一份报告称，中国目前有五分之一的土地遭到污染。而国土资源部的资料显示，全国近60%的地下水污染严重或极为严重。中国西北地区兰州市政府最近承认，某石化企业发生的原油泄露使当地的饮用水受到了污染，然而关于报告程序及有关方面是否一直在掩盖问题仍然存在诸多疑问。

对很多中国人来说，这些可怕

的评估并不意外。政府官员也承认，污染问题有可能已经成为影响中国社会稳定的头号因素。去年，中国南部省份广东省地方政府在示威者的抗议和人们不断高涨的不满情绪面前不得不低下头来，取消了价值六十亿美元的钕处理厂建设计划。抗议活动，以及当地政府最后时刻的妥协都让政府高官愈加感到担忧：弥漫在城市里的不满情绪随着新媒体和移动技术的发展而扩大，让中国决策者们备感压力，因为这有可能让经济发展脱离原计划轨道。而经济增长一旦停滞，则很有可能引发社会的动荡。

新闻和观点比过去更容易在公众中传播。环境成为人们关注的一个重要问题。新媒体让这一代公民有了发声的渠道。然而，他们中的很多人虽然经济上不再窘困，但却苦于没有足够的政治资本，无法左右那些能够影响到他们及子孙后代健康的规划和决策。用唐昊在发表在中外对话的文章中的一句话来概括就是，“好的环境在中国越来越成为一种稀缺资源。稀缺一般来说会

导致竞争或斗争。而在环境资源竞争逐缺乏基本规则的中国，稀缺所导致的结果是针对环境资源的无规则斗争。”

伴随着建设“生态文明”的口号，中国政府自上而下制定了大量宏伟的环境目标、法律法规和政策，尤其是在2011年至2015年的“十二五”规划中制定的目标。尽管中央采取的这些举措值得赞赏，但如果据此认为中国的政治架构会为这些政策快速有效的实施提供便利的话，那你就错了。实际上，在中国，权力是有很大的协商余地的。各项政策、法律、法规不仅被官僚权贵们冗长的讨价还价过程所削弱，在向下落实的过程中也经常会遭到忽视。

过去三十年，中央将大量权力下放在很大程度上推动了中国的快速发展，促使地区政府领导班子之间展开了经济竞争。然而，这种方式的后果之一就是生态的逐底竞争，在地方权钱勾结互利面前，环境法规不堪一击。中央推行的重大绿色项目往往雷声大雨点小。例

如，姜克隽2010年曾对中外对话表示，中国大部分的“低碳”城市项目都不是“真”的。这些城市中，很多仍然沿着高碳的轨迹发展。

决策程序不透明、决策实施机制限制公众参与，都给发现此类问题、预测特定政策有效与否增加了难度。官方历来的保密传统也扩展到互联网领域，妨碍了环境的有效治理，再加上民间团体力量薄弱。成立非政府组织仍然需要经过非常严格的注册程序。针对公众参与环境决策的问题，中国已经出台了相关法律法规。令人感到鼓舞的是，修订后的《环境保护法》规定，有权提起公益诉讼的绿色环保组织约有300多家。然而，与其他环境法律一样，仅仅把法律法规印在纸上并不能确保其能够得到有效执行。

另外，广东省围绕铀处理项目发生的冲突表明，中国为了实现气候目标所做的种种尝试很有可能会越来越多地与其他生态、社会问题发生碰撞。“十二五”规划中不仅涵盖了环境和气候变化方面的问题，而且还承诺推动核工业和西南部流域水电事业的发展。对它们的反对催生了一批环境非政府组织。换言之，中国面临的社会和环境冲突不太可能在短时间内达成一致。政府所面临的挑战就是扩大公众的环境决策参与，并使之制度化。如此一来，不仅能够有益于绿色发展，还能够有助于解决政策反应不良所导致的不断深化的社会冲突。

虽然前景“雾霾”笼罩，但依然透射出些许希望的曙光。一大批新的举措纷纷出台。发起人中有绿色环保组织、记者、网民。有时，他



中国目前有五分之一的土地遭到污染，建设“美丽中国”任重而道远。

们还会与那些已经认识到政府有必要采取更加开放的响应措施推动可持续发展的官员展开协调。网民为了推动PM2.5实时信息发布通过微博在互联网上掀起的“风暴”就是一例。同样的例子还有FLOAT北京和环保非政府组织达尔问自然求知社等发起的全民科学活动。而马军等先驱所做的工作为这些活动奠定了基础。马军所在的机构通过搜集公开信息，绘制包括空气、水源污染在内的环境数据地图，甚至还为各个不同城市的数据透明度水平绘制了相应的地图。

中国最大的希望之一就在于可以通过这些新的公众参与方式及信息公开，尤其是新媒体领域的信息公开，解决其面临的环境问题。环保部的举报热线已经开通多年，市民可以通过这条热线举报污染事件和环境侵害问题。如今，中国各级环境部门中有很多已经开通了微博账户，通过双向沟通来听取公众的意见。在许多情况下，这是对举报

热线的一个很好的补充。令人感到振奋的是，中国西南部城市重庆市环保局下属的40个区均开通了微博账户。

经济的清洁低碳化转型是一个复杂而艰巨的过程。若想在这一过程中完善环境治理，中国需要对这些新的基层民众参与形式加以引导，这就需要增强透明度，允许公众在环境决策初期就全面参与进来，为群众打开一个能够表达自己对生态文明看法的空间。

本文在世界观察研究所《2014年世界现状：可持续发展管理》“中国面临的环境治理挑战”一章基础上整理而成。

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# The culture of secrecy behind China's pollution crisis

Powerful interest groups are holding back the transition to a more sustainable model by constraining the role of citizens

Sam Geall

Isabel Hilton

China's leaders have made "Ecological Civilization" and a "Beautiful China" two of their most prominent slogans. But underlying these buzzwords is a complex, unenviable and worsening problem. China's environmental and climate governance is at a crisis point: while China attempts a transition to a more sustainable model of development, a difficult enough process for one-fifth of the world's population, political structures and powerful interest groups have made necessary reforms all the more difficult by restricting, rather than harnessing, the potential for citizen participation in environmental protection.

As recent headlines have illustrated, creating a "Beautiful China" will be no easy task: one-fifth of China's land is polluted, according to a recent report from the Ministry of Environmental Protection. Nearly 60% of the country's groundwater is of poor or extremely poor quality, according to the Ministry of Land and Resources. The government in the city of Lanzhou, in northwestern China, recently admitted that oil from a petrochemical plant had leaked into local water supplies, but questions remain over the reporting process, and whether an ongoing problem had been covered up.

For many people in China, such dire assessments will not have come as a surprise. Chinese officials admit that pollution may have become the nation's single greatest cause of social unrest. Last year, local authorities in Guangdong province, in southern China, bowed to this rising discontent when they cancelled the construction of a US\$6-billion uranium processing plant, after protesters took to the streets. The protests, and the local government's last-minute turnaround, are phenomena that increasingly worry senior government officials: the spectre of urban

discontent, amplified by the growth of new media and mobile computing, looms large for China's decision-makers – as does its potential to derail economic development plans – and the social unrest that is feared if economic growth were to falter.

More than ever before, news and opinions can be shared among the public with ease – and the environment has become a key issue of concern. New media have given voices to a generation of citizens, many of whom are becoming economically enfranchised, but are frustrated by their lack of a meaningful political stake in planning and other decisions that will affect their and their children's health. Tang Hao summarised the situation well on chinadialogue, noting that in China, "pleasant living environments are getting harder to find – and scarcity leads to competition and conflict." But, since the country has no mechanisms in place for managing such competition," Tang wrote, "the outcome is unruly conflict."

China's rhetorical push for an "Ecological Civilisation" accompanied an ambitious raft of top-down environmental targets, regulations and policies, not least those launched under China's 12th Five-Year Plan, for 2011 to 2015. But despite the laudable ambition of such moves from the top, it is a common misunderstanding to assume that China's political structures facilitate rapid and effective policy implementation. In reality, power in the People's Republic is highly negotiated: policies, laws and regulations are not only weakened through protracted bargaining among bureaucratic elites, but also frequently ignored further down the system.

China's phenomenal growth over the past three decades was unleashed in large part through the considerable

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devolution of power from the centre, which spurred economic competition between regional government chiefs. But one of the costs of this arrangement has been an ecological race to the bottom, where collusive alliances of money and power at the local level commonly trump environmental regulations. Prominent green projects launched from the centre have often turned out to be less impressive than the rhetoric accompanying them. For example, Jiang Kejun told chinadialogue in 2010 that most of China's "low-carbon" city projects were not "genuine" and that many of these cities were still very much on high-carbon development pathways.

Opaque decision-making and restricted public access to implementation mechanisms add to the difficulty of uncovering such problems, and indeed of predicting whether any given policy will be effective. A culture of official secrecy, one that extends into the realm of the Internet, hampers effective environmental governance, as does a weak civil society, with NGOs still facing a highly restrictive registration process. China has introduced laws and regulations that provide for public participation in environmental decision-making – encouragingly, the country's revised Environmental Protection Law gives around 300 green NGOs the right to bring public interest lawsuits – but, in common with other environmental laws, the existence of such laws and regulations on the books is no guarantee of their effective implementation.

Furthermore, conflicts like the one over uranium processing in Guangdong point to the likelihood that China's attempts to meet its climate goals may increasingly clash with other ecological and social concerns. The 12th Five Year Plan, while incorporating concerns about the environment and climate change, also promises a kickstart for China's nuclear industry and a push for energy from big hydro on the country's southwestern rivers – opposition to which gave birth to many of the current generation of China's environmental NGOs. In other words, China's social and environmental conflicts are unlikely to reach consensus any time soon. The challenge for government is to institutionalise greater public participation in environmental decision-making not only to benefit green development, but also help to address a deepening social conflict that is being exacerbated by poor policy responses.

## Harnessing public participation

Still, there are hopeful glimmers in the smog, including a flourishing of new initiatives by Chinese green

NGOs, journalists and networked citizens, sometimes in coordination with officials who have recognised the need for more open and responsive government approaches to sustainability. The online "storm" of citizen complaints on microblogs for the release of real-time information about airborne concentrations of PM2.5 was one such example, as are citizen-science efforts, like those advanced by FLOAT Beijing and the environmental NGO Green Beagle. These campaigns have built on the efforts of pioneers like Ma Jun, whose organisation collects publicly available information to build maps of environmental data, including air and water pollution, and even of the levels of data transparency in different cities.

One of China's best hopes is that it might harness these emerging forms of public participation and open information, particularly in the new media context, to help address its environmental woes. For a number of years, China's Ministry of Environmental Protection has operated a hotline for citizens to phone in tip-offs about pollution incidents and environmental infractions. Now China's environment authorities have started to use microblog accounts at many different levels – in many cases to complement this approach, by engaging in two-way communication and listening to public opinion. Encouragingly, the Environmental Protection Bureau in Chongqing, in south-western China, has a microblog account for each of its 40 districts.

China will need to navigate these new forms of grassroots public engagement if it is to improve environmental governance during its complex and ambitious transition to a cleaner, low-carbon economy. This will require a commitment to greater transparency and to full and early public participation in environmental decision-making, opening a space for citizens to express their own visions of an "Ecological Civilization".

*This article is based on the chapter "China's Environmental Governance Challenge" in the Worldwatch Institute's State of the World 2014: Governing for Sustainability.* 

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# 中国土壤污染：从调查到防治行动

中国首次发布了全国土壤污染调查报告，但离全面了解当前的土壤问题还很长的路要走。

徐安琪

安德鲁·莫法特

3月17日，中国首次发布全国土壤污染调查报告，受到国际社会称赞，但也引发了更多质疑。尽管有媒体评论此举意味着土壤污染数据不再是“国家机密”，但若深入研究这份报告，就会发现还有更多问题无法通过官方提供的这些表面数据得到解答。

在调查样本中，有五分之一的土地受到了污染，污染物主要是镉、砷、镍等重金属，但是这些土地到底在哪里？位于中国东北部的黑龙江省工业生产总值占全国的6%，耕地面积占9%，这里的居民应该担心工业产生的重金属污染了他们的耕地和粮食吗？广州几乎一半的大米都受到了镉污染，这里的居民该为此担心吗？污染发生在哪里，调查使用的取样方法是否具有代表性，这些问题尚未得到解答。如果政府不做进一步跟进，人们依然无法知道中国土壤污染的严重程度和危害性。

另外，中国政府为解决土壤污染问题做出了哪些努力，目前还

不得而知。“十二五”规划承诺为防治土壤污染投入300亿元（48亿美元），但要彻底解决这一问题需要的资金却数以万亿计，定于今年年底发布的《土壤污染防治行动计划》有望解决资金缺口问题。2013年7月，中国宣布将投入1.7万亿元（2770亿美元）治理大气污染，国务院总理李克强向污染“宣战”主要针对的也是空气污染。相比之下，目前治理土壤污染的资金还远远不够。不过，《土壤污染防治行动计划》一旦通过，土壤污染防治的投资力度可能超过大气和水。

考虑到中国土壤修复相对复杂，存在数据不完整、技术落后和经验缺乏等种种问题，因此下面几个方面需要特别关注。《土壤污染防治行动计划》原则上已于3月获得通过，但国务院迟迟不公布细节，这意味着中国政府官员可能还在研究如何解决这个问题。目前公布的信息显示，该计划包括开展6个“土壤保护和修复试点项目”，每个项目的预算约10-15亿元。计划还提出了

减少重金属污染物排放的目标，但目标的设立并不能解决已经造成的污染问题。

中国政府邀请外界人士参与修复土壤的举动受到各方欢迎。十八届三中全会提出要支持在土壤修复中发挥市场作用，鼓励公众参与环境监督工作。发挥市场作用的一个方法是允许房地产开发商通过修复重要地块获益，修复后土地将实现增值，利润超过修复成本。然而，在修复土地上建设住宅或商业用房，可能给人体健康带来风险。2007年，武汉一处化工厂旧址未经环境影响评价就用于建设容纳2400户居民的住宅小区，后来发现居民健康可能受到影响。

现在可能需要通过一个类似于美国超级基金的模式，要求污染者负责清理有害废物。中国已就此计划的利与弊展开讨论。但是，在中国，地块往往几经倒手，找到“污染者”来负责并非易事。在制定综合责任政策时，要考虑到这样的复杂性。现在，已有提案建议提高资源

税和环境保护税，从而将企业的土壤污染等影响转化为其运营成本。

武汉的例子表明，污染者应受到更严格的监管，政府可以通过鼓励公众参与促使民间社会发挥重要作用。居民才是污染的最终受害者，让他们在维护自己利益的活动中发挥更大作用非常关键。网民曾在新浪微博上给政府施压，要求公布更详细的空气质量数据，这表明公众已经准备好了。近期通过的（1989年首次颁布）新环保法已允许环保民间组织就环境污染发起公益诉讼。

另外，中国最近还在清理包括环保法庭在内的地方法院的腐败法官，这也使人们有理由保持乐观。然而要使这真正发挥效力，还需要改进数据收集工作，加强监督活动，从而使法庭获得更多详细信息证实其证据可靠。

尽管公布土壤污染调查报告是政府向提高工作透明度迈进的重要一步，但在完整的数据公布前，我们还是无法了解全部情况。中国地形多样，如果数据透明度不足，相关人员就无法确定最需要关注和修复的地块。即将发布的《土壤污染

防治行动计划》将是人们了解政府如何应对土壤污染等问题详情的关键。土壤污染问题到底有多严重，我们才刚刚开始了解。

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许多土壤污染问题无法通过官方提供的这些表面数据得到解答。

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# China's soil pollution crisis still buried in mystery

Despite the recent release of data on soil pollution, we are far from having the complete picture, argue Angel Hsu and Andrew Moffatt

Angel Hsu

Andrew Moffatt

China's release of a first nationwide soil pollution survey earlier this year was met with international praise but also raised further questions. While domestic media asserted soil pollution was no longer a "state secret," deeper examination of the survey unearthed even more questions that could not be answered from the surface-level details provided in official statements.

One-fifth of China's surveyed soil is contaminated, with heavy metals like cadmium, arsenic and nickel as prime culprits. But where exactly is this polluted land located? How worried should people be in Northeastern China's Heilongjiang province, which generates roughly 6% of China's industrial GDP and has 9% of the country's arable land, about whether these industrial heavy metals are polluting their arable land and food? Should residents of Guangzhou, where almost half of the rice has been found contaminated with cadmium, be alarmed?

Questions about where the pollution is happening and how representative the soil sampling methods used remain unanswered. Without further follow-up on the part of the government, the true extent and dangers of China's soil pollution are still unknown.

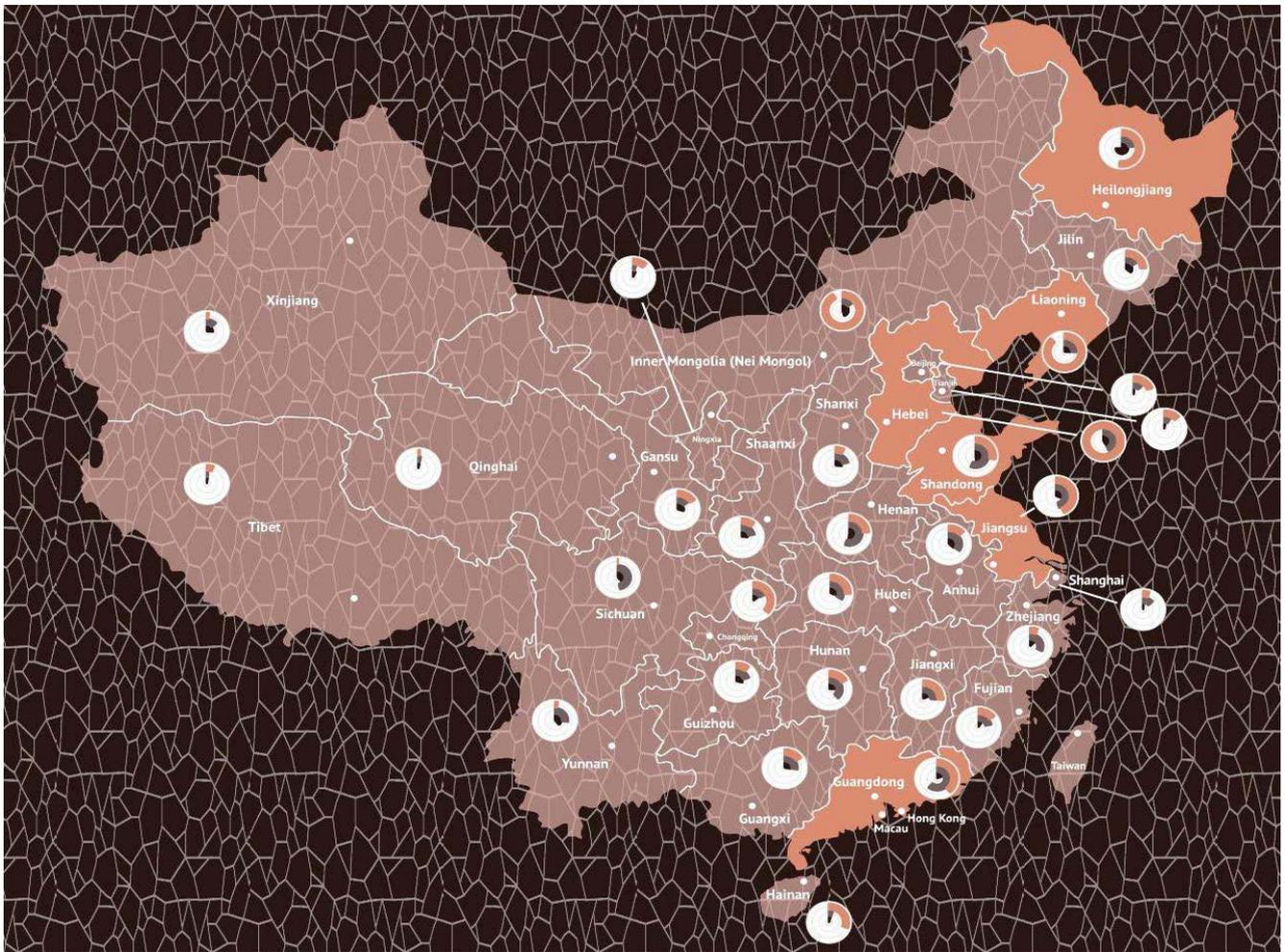
Moreover, details as to how the Chinese government is currently working to address its soil pollution problem remain far from transparent. China's Soil Pollution Action Plan, scheduled for release by the year's end, will likely address serious funding issues. For example, the 12th Five Year Plan committed \$30 billion yuan (\$4.8 billion), compared to the trillions of yuan estimated to be needed to clean up the soil.

Compared to July 2013's release of a \$277 billion USD air pollution plan and Premier Li Keqiang's announcement of a "war on pollution" primarily targeting air quality, the amount invested so far for soil hardly seems adequate. However, the Soil Pollution Action Plan, once passed, may actually allocate more investment (in Chinese) for prevention and remediation than either the Air or Water Action Plans.

Given the relative complexities of soil remediation in China, including incomplete data, lagging technology and inexperience, there are several points of concern. The State Council's delay in disseminating the details of the Soil Pollution Action Plan, which was passed in principle in March, suggests that Chinese government officials may still be trying to get a handle on how to tackle the problem.

What has been revealed already is that the Soil Pollution Action Plan will establish six "soil protection and remediation pilot" projects, each budgeted at between \$1 and 1.5 billion RMB (\$160-240 million USD). Targets for reducing emissions of heavy metal contaminants are also included in the Plan, though establishing a target doesn't address the heavy metals that are already present in the soil.

To remediate soil, the Chinese government's engagement of external parties is a welcome move. The Third Plenum showed support for market-based approaches to pollution remediation and encouraged the public to act as an environmental watchdog. One such market-based approach is to allow private property developers to benefit from the remediation of prized plots of land, the value of which may increase after restoration and outweigh any



*Without further follow-up on the part of the government, the true extent and danger of China's soil pollution is still unknown.*

costs.

However, constructing residential or commercial properties atop recovered soil may pose potential health risks. In 2007 in Wuhan, proper Environmental Impact Assessments (EIAs) were not carried out when land that was previously an industrial chemical compound was rezoned for a 2,400 unit apartment complex. Residents were later found to be at risk.

What may be needed is a model akin to the United States' Superfund program, which holds polluters responsible for hazardous waste clean-up. Arguments have been made for and against such a framework in China. Assigning blame over pollution, however, turns out to be much more difficult in China. Finding the "polluter" is rarely an easy task. Moreover, many plots of land have been transferred several times.

Such complexities need to be accounted for when developing a comprehensive liability policy. Already, proposals are being made for increased resource and

environmental protection taxes that would increase operating costs to better incorporate externalities like soil pollution.

The Wuhan example demonstrates that more oversight of polluters is needed, and civil society can help through increased public participation. Giving citizens, who ultimately suffer the most from polluting activities, a more substantial role in protecting their own interests is key. And the public is ready, as is shown by netizen activism on Sina Weibo pressuring the government to provide more transparent air quality data.

Recent amendments to China's Environmental Protection Law - the first since 1989 - now provide provisions for environmental NGOs to submit public interest litigation cases related to environmental degradation.

In addition, China's recent move to delink local courts, including environmental courts, from corrupt officials gives reason to be optimistic. For civil cases to be effective, however, better data collection and monitoring activities are

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still needed to provide courts with detailed information to substantiate evidence.

While the release of the preliminary soil survey results are a step towards greater government transparency, the complete picture is unknown and won't be clear until complete data is made available. With a geography as diverse and disparate as China's, it will be nearly impossible to collaboratively address the areas that require the greatest attention and resources for remediation without greater data transparency.

The upcoming release of the complete Soil Pollution Action Plan will be a key signal to watch for specifics on

how the government will tackle its soil pollution problem, the extent of which is only beginning to be understood.

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