China chemical safety case study: Metals pollution in Dexing, Jiangxi Province

In the frame of the EU-funded project: Strengthening the capacity of pollution victims and civil society organizations to increase chemical safety in China (China Chemical Safety Project)

IPEN and Green Beagle
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Introduction

Pollution from mining and metals smelting is a significant problem in China. This case study focuses on metals pollution from the Dexing mine; the largest open pit copper mine in Asia and the second largest one in the world.[1] [2] Jiangxi Copper Corp (JCC) is a state-owned company producing more than 900,000 tons of refined copper annually and located in one of the largest copper-gold mining districts in China. Pollution has accompanied the large production output with devastating consequences for local communities. The case study illustrates how a community can be transformed into a "cancer village" as a tragic demonstration of the true cost of these activities. The case study also illustrates the broader issue of metals pollution in China. According to the Ministry of Agriculture, farming on land almost the size of Belgium has been stopped due to metals contamination and approximately 12 million tonnes of grain are polluted by metals every year in China.[3]

The massive open-cast Dexing copper mine – note the full sized digger machines and dump truck; photo by World Ocean Review[4]

A brief introduction to Jiangxi Copper Corporation (JCC)

JCC is a very large state-supported key enterprise of Jiangxi Province with more than 90 affiliates, 34,000 employees, and 26 billion RMB in assets.[5] JCC describes itself as, *"the largest copper producer and copper fabricator in China, also a fundamental supplier for gold, silver, selenium, tellurium, rhenium, as well as sulphide chemicals. The company represents the flagship of China's copper industry."*[6] The company goes on to note that its operations include eight mines, three smelters, six copper fabrication companies, three precious metal and rare earth metal producers, and a variety of financial and logistics companies. [7] The company also operates 200,000 tonnes/yr lead and zinc smelters.[8]

Dexing – Asia's largest open pit copper mine; photo by Jiangxi Province Taxation Bureau[9]

Products are exported to more than 30 countries and include copper cathode, sulfuric acid, gold, platinum, palladium, selenium, rhenium, molybdenum, copper sulfate, arsenic oxide, copper concentrate, lead-zinc minerals, zinc concentrate, pyrite concentrate, copper wire bar, copper rod, bare copper wire, enameled wire, high precision copper foil, and precision copper tubes. [10] The company is also a controlling shareholder in the second largest rare earth mine in China – the world's largest producer of rare earth metals.[11] JCC also owns mines outside of China including in Afghanistan and Peru, and in 2014 purchased controlling interest in Nesko Metal, a Turkish company with a copper mine operating in Albania. [12] [13]

Longstanding problems at the Dexing mine

In 1996, a UNESCO report described several key problems with the Dexing mine:[14]

"Problems associated with mining are: the weathering of waste-rock piles which produces a large quantity of acidic drainage, with a pH <3; and the discharge from the ore-flotation plant, which produces large amounts of alkaline effluent with a high content of fine ore-tailing particles, with a pH >12. Although a big waste-water treatment plant was constructed, it is not enough to purify all the wastes. The non-point sources of pollution and seepage from the tailing impoundment are even more difficult to control. Consequently, a large amount of various

pollutants, mainly metals, has been discharged into the Le An river, which flows through this mining area and flows downstream more than two hundred kilometres to discharge into Poyang lake, the largest freshwater lake in China."

Aerial view of the Dexing mine; photo by DXZSJ[15]

Since the UNESCO report, the scale of production and accompanying pollution has vastly increased. Wastewater generated during ore washing/dressing at the mine has since been discharged into the Dawu River that runs through the mine before meeting the Le'an River north of the mine – an important water source for about 420,000 people living along this river.

An official of Dai village stands on the bank of the polluted Le'an River; photo from CRI[16]

WantChinaTimes reports that government researchers estimate that the mine dumps approximately 60 million tonnes of toxic waste water containing 20 toxic metals and pollutants into the Le'an River annually.[17] In 2012, researchers at Donghua University estimated that 40,000 tonnes of acid mine drainage and 332,000 tonnes of alkaline flotation waste water are discharged out of the Dexing mine each day.[18] Waste water has seeped into the ground, and the seriously polluted river water has long been known as "toxic water" among local villagers. It is estimated that 9,269 mu (617 hectares) of farmland along the river can no longer produce crops.[19] Fish have nearly disappeared from the Le'an River and nine villages dependent on fishing can no longer continue this livelihood.[20]

The devastated Le'an River; photo by Jiangxi Jxnews[21]

One village's toxic experience

Dai Village is located more than 20 kilometers downstream from the mine but still experiences severe mining pollution. A 2011 study of metals in hair of the residents showed elevated levels of cadmium, chromium, copper, lead, and zinc linked to the Dexing mine.[22] Another study found that the considerable copper contamination in the area was vertically mobile and capable of bioaccumulating in plants.[23] High blood lead levels were found in children in Wuxing – a village near the Dexing mine where a JCC subsidiary operates a lead smelter.[24]

In 2013, the Ministry of Environmental Protection released a report expressing concern over toxic chemical pollution and subsequent harms to human health and the environment. The Ministry noted consequences such as, *"…serious cases of health and social problems like the emergence of cancer villages in individual regions."*[25] Many believed the Ministry was only stating the obvious since cancer is now the leading cause of death in China after an 80% rise in mortality rates over the past 30 years.[26] Reporter Deng Fei subsequently created a map of cancer villages.[27]

China cancer village map screen shot[28] Google map of the cancer village map[29]

Unfortunately, Dai Village has joined the growing list of cancer villages in China. A prime suspect is the use of wells for drinking water that are contaminated with metals. According to residents, no one in the village has passed the physical exam for military service in the last 20 years.[30] The village has over 187 hectares of land which has been unsuitable for farming for many years due to pollution. [31] Local villagers estimated that the resulting losses have been over 100 million yuan.

Standing in line for water when normal sources are polluted; photo from AFP/Getty Images

In response to these severe problems, villagers have repeatedly reported the pollution to the competent authorities at the municipal, provincial and even central levels for more than a decade. Representatives elected by the villagers have negotiated many times with the local environmental authority and JCC for adequate pollution compensation but to no avail. Some villagers were even beaten when taking legal action to protect their rights. Years of persistence finally brought the village tap water, but the land remains fallow. JCC has yet to pay the promised 370,000 yuan land compensation. The local Environmental Protection Bureau has fined JCC 180,000 yuan

each year ($29,285 or €23,180) – a figure that the local population has observed does not deter further pollution.[32] While pollution-caused diseases are continuing to spread, neither JCC nor the local government has taken any effective action.

In 2011, after recognizing that 9,269 mu (617 hectares) of arable land in the area had been so poisoned that no crops could be cultivated there, JCC arranged a compensation of 180,000 yuan ($29,285 or €23,180) for the population of Dai Village and others in Leping City.[33] This amount apparently was based on estimates from a 20 year-old survey. Since the affected population numbers 420,000 people, the JCC compensation amounts to 0.43 yuan per person ($0.07 or 0.06 euro).

Polluted reservoir for storing acidic wastewater from the Dexing mine; Photo by ChinaLuxus[34]

Three-part plan

Since publically available data on pollution is relatively thin and difficult to access, the Project proceeded with a plan to obtain and disseminate data on relevant polluted areas in Dai Village in June 2014.[35] The investigation also included gathering information on water pollution and rights protection actions implemented by the local community. To disseminate results and provide publically available information a Sina Weibo account called "@Dai Village Environmental Watch" was created. The Project also filed an application for government information disclosure.

A hand-held XRF device was used to identify and quantify metals using both fixed-point detection and random sampling. With information provided by local villager Dai Bingliang on the water quality of the Le'an River and wastewater from the mine and other upstream companies, 30 valid measurements were obtained in places such as Nancunzhou, Xiahuizhou and Dazhou of the Dai Village along with locations downstream of the outfall of the mine. This pollution mapping provided further understanding of local land pollution.

A hand-held XRF device was used to identify and quantify metals contamination at the site, photo by Pan Qingan

The Project also interviewed major local participants in the previous rights protection actions including Dai Bingliang, Dai Shuigen, and Dai Changhai, and reading documents that they had created in this process, before generating a detailed chronicle of local villagers' efforts to protect their rights from 2010 to May 2014. Stories of environmental refugees were also recorded.

Investigating drinking water in Dai Village

An investigation of the drinking water issues was conducted. Water samples were taken to a testing laboratory Greennovation Hub. The result showed that there was obviously visible matter in the sampled tap water and that the nitrate indicator of the sampled well water was at 20, or slightly above the allowable limit. A visit to Leping Runquan Xingfu Waterworks, the tap water supplier of the Dai Village, revealed that the Village water source was simply surface water from the roadside. Measurement with a simple water-testing kit showed that the quality of such surface water was at Grade IV, indicating that it was disqualified as a water source for tap water supply under Chinese law.

Local government officials understand quite well that safe drinking water is essential to protect local villagers from heavy metal pollution. This was also one of the reasons why the government invested in setting up Runquan Tap Water Company as part of its efforts in building a rural water supply network. Our activities and sincerity drew the attention of the competent government

authority in Leping City, which then interacted with us through its official microblog. The Leping municipal government held an emergency meeting to initiate an investigation into problems with drinking water in the Dai Village. With this top-down intervention, reasons for water turbidity were quickly identified. Local tap water quality has been significantly improved since the valve connecting to the Liufang Village was closed.

To facilitate further documentation of pollution we realized that villagers needed to be able to actually photograph dumping. We launched an online donation so as to obtain a second-hand camera, so that local villagers could record upstream wastewater discharge that typically occurs when it rains. We successfully obtained a camera and sent it to Dai Shuigen. The Project is working now to develop a successful communication process for the visual evidence.

The Project convened a meeting to discuss the heavy metal pollution survey in Dai Village on June 29, 2014. The meeting focused on three points. First, pollution caused by the Dexing mine has long been the subject of a survey about how this copper mine relates to the Le'an River, although its persuasiveness has faded over time. We visited the head of this survey project and were given information including raw data for a relevant paper. Corporate environmental impact assessment (EIA) information is the cornerstone for public interest litigation. Second, we launched an assistance program regarding drinking water safety. Specific actions included applying for water quality information and a water pipe repair schedule, monitoring pipe replacement, maintaining the environment of areas upstream Guanzhuang as a water source through activities such as garbage removal. Third, we met with the water authority in Leping City and persuading the local government to publish handbooks and posters about drinking water safety.

Villagers are watching Seven Wonders of the Industrial World: the Sewer King; a BBC documentary about the construction of the London sewer system and how it positively impacted public health; photo by Pan Qingan

For the other purpose of this trip -- receiving feedback about tap water quality and other issues, we went to the water authority in Leping City with Dai Changshui and Dai Binggen as the villagers' representatives for a meeting with Chen Guangqing, Director of the Water Authority. We presented him with a flag saying "Preserve clean water with clean hands." This was intended to praise the local water authority for its effective efforts, on the one hand, and improve interactions with the local government especially in terms of the waterworks, on the other. This meeting has laid a good basis for further communication and collaboration between the local government and the environmental NGOs.

Metals contamination in soil

A survey of metals contamination downstream of the Dexing mine revealed levels of metals far exceeding Chinese regulatory limits. Table 1 shows the fraction of samples exceeding regulatory limits in four locations for seven metals. Nancunzhou, Xiahuizhou and Dazhouwan are located within Dai Village and contain more than 187 hectares of farmland. The outfalls were located along the Le'an River. Sampling included both soil from the surface and from depths of 10cm and 20cm. A detailed data set is shown in Annex 1for all seven metals and four locations.

Table 1. Fraction of samples above the upper range of soil regulatory limits in China in four different locations

Metal	Nancunzhou	Xiahuizhou	Dazhouwan	Near outfalls of mining sites
	N=7	N=5	N=7	N=11
Arsenic	0%	0%	71%	55%
Cadmium	0%	20%	57%	18%
Copper	86%	100%	86%	55%
Lead	0%	0%	43%	18%
Mercury	43%	60%	86%	55%
Nickel	0%	0%	0%	18%
Zinc	0%	0%	57%	27%

Regulatory limits from Reference to Grade II values (i.e., soil ingredient limits for assuring agricultural production and human health) in the Soil Quality Standard (GB15618-1995); Cadmium 0.3 – 0.6 ppm; Nickel 50 – 100 ppm; Copper 50 – 100 ppm; Mercury 0.3 – 1.0 ppm; Lead 250 – 350 ppm; Zinc 200 – 300 ppm; Arsenic 20 – 40 ppm; Note that for nickel, the value used is for farmland. There is a separate nickel regulatory level of 150ppm-200ppm for orchards.

As suspected, copper exceeded regulatory limits in many samples in all four locations. Of particular concern is that a significant number of samples exceeded regulatory limits for both copper and mercury in the farmland areas of Nancunzhou, Xiahuizhou and Dazhouwan. The farmland along the Le'an River is flooded once or twice a year. Since the flooding periods bring good opportunities for discharging wastewater, surface soil also contains excessive heavy metals. The measurements from soil 20-30 cm deep tended to double, suggesting that this layer has been metal-rich for many years. And this layer happens to be where crops absorb substances (please see data tables in Annex 1).

Soil restoration initiatives have been implemented in Nancunzhou and Xiahuizhou – poplar trees have been planted in both areas -- as opposed to Dazhouwan that is overgrown with weeds or in

some places just contains sparse weeds. Metals are also concentrated in Dazhouwan for geographic reasons. In Nancunzhou and Xiahuizhou poplar trees appear to help absorb certain amounts of metals.

However, other metals also exceeded regulatory limits raising further concerns about combined hazards. Metals exceeding regulatory limits in at least one site included arsenic, cadmium, lead, mercury, nickel, and zinc. Surprisingly, a significant number of samples exceeded regulatory limits for mercury in all four sites.

Policy approaches to metals contamination

In February 2011, the State Council approved the 12th Five Year Plan for Heavy Metals The Plan emphasizes various aspects of metals pollution including: integrated pollution sources control, phasing out of out-of-date production capacity, emergency services for civil services, technological demonstration, clean production, basic capacity building and pilot on historical pollution site clean-up. Unfortunately, the Plan neglects restoration of metals-contaminated soil – a major problem in China.

In 2010, the Jiangxi provincial government promulgated the Implementation Plan for Heavy Metal Control of Jiangxi Province. The Plan highlights a new project of Heavy Metal Contaminated Site Control and Restoration, and its responsible departments include municipal governments, polluting companies and the provincial department of agriculture. On 17 March, 2010, the Jiangxi provincial government further promulgated a Heavy Metal Pollution Control Plan and prepared to comprehensively investigate the pollution situation and environmental risk, and establish a database for heavy metal pollution monitoring and phase-out of out-of-date production capacity. Interestingly, the provincial policy has more content and detail than the national one. It highlights restoration pilot projects and specifies responsible departments.

In 2011, the environmental protection department of Jiangxi Province organized a meeting to which Dexing Copper Mine and several departments of Dexing government participated. With regard to Le'an River problem, the meeting had some conclusions and the most important one was controlling new pollution sources and phasing out old production capacity.

In March 2012, the environmental monitoring central station of Jiangxi Province finished a report entitled: "A Survey of the Heavy Metal Pollution in Le'an River Watershed." The surveyors processed 1588 data points, and produced 30 pollution maps, 17 monitoring and analytical sheets, and wrote a 15000-characters report. The report covers heavy metal pollution in soil, sediment, water bodies and ground water, as well as pollution sources. As a result, the Dexing government invited domestic and foreign experts to draft implementation plans for heavy metal pollution control in Le'an river watershed, and promulgated several other relevant policies.

In 2013, Jiangxi Province invested 35 million CNY in six projects involving heavy metal pollution control and contaminated site restoration in the Le'an river watershed.

Mercury contaminated-sites are covered under the recently finalized Minamata Convention on Mercury. China is a signatory to the treaty but has not yet ratified it. According to Article 12, Parties "shall endeavor" to take action on contaminated sites – meaning that countries are

expected to make a serious effort to address them. Article 12 obligates the Conference of the Parties (COP) to develop guidance on how to manage mercury contaminated sites which includes site identification and characterization, public engagement, evaluations of human health and environmental harms, and options for management.

Conclusion

The Dexing case study provides opportunities for improvements in several areas:

National and provincial laws governing metals need full implementation and further development

It is very clear that metals pollution has caught the attention of policy makers at municipal, provincial, and national levels. However, implementation of these policies needs improvement. Government authorities at various levels have realized that they need to manage polluting industries and bad technologies, rather than only focus on waste treatment and contaminated site restoration. In other words, more attention needs to place at the front end, instead of end of the pipe efforts that do not address the root of the problem.

On the level of technical control, the current projects in Le'an river watershed are still shallow. There are three reasons: (1) botanic restoration technology is still not mature enough; (2) six projects are all deployed in a lightly polluted area and the heavily polluted area has not been addressed; and (3) higher-level government bodies did distribute a lot of money to supposedly address the pollution, but on the project level it appears that this money is not all used for what it is supposed to be. This needs immediate attention.

Heavy metal pollution control must be addressed in the long-term with attention to front-end solutions, viable techniques for restoration, and true accountability for both the financial and environmental aspects of the problems. Finally, soil restoration should be clearly addressed in the next five-year plan.

Mercury contamination and the Minamata Convention

The metals survey undertaken by the case study showed that a large fraction of sites contained mercury contamination in violation of Chinese law. The Minamata Convention obligates countries to make a serious effort to address these contaminated sites. China will likely ratify the treaty and then Dexing should become part of an inventory of mercury-contaminated sites. The data described here among others can help contribute to the characterization and identification of the size of the site. Since JCC is a state-owned company the provincial government should be liable for remediation costs.

Legal reform

Jiangxi Province makes a significant profit as owner of JCC and the Dexing mine. However, this economic arrangement creates a conflict of interest that can never truly address the rampant pollution the mine has caused. This is because there is no economic motivation to reduce pollution. Even in cases where the government does not own the company, local governments provide the budgets for environmental regulation by revenues obtained from polluters – and the money can be significant and not easy to give up. This eliminates economic motivation to reduce pollution. Since citizen lawsuits are restricted, the result is a situation that will never be resolved

without a newly revitalized set of institutions that can impartially address these types of pollution and subsequent harms. This case like many others illustrates the urgent need for effective legal reform that creates truly impartial administrative and legal institutions to regulate pollution.

Information disclosure

Public right to know is a key principle of chemical safety, and this needs significant improvement as this case illustrates. Provincial environmental departments publicized very little useful information about the Dexing mine, despite it being such an obvious pollution source, and despite the requirement to provide disclosure. The Project submitted information disclosure applications and received a project report about the mine from the Jiangxi provincial office. However, the Dexing Environmental Protection Bureau failed to provide pollutant emission data about the mine as required by law. Communities can demand better, more informative websites of the local government Environmental Protection Bureaus. However, ultimately, Chinese law should be obeyed and the information disclosure requirements need to be enforced at appropriate governmental levels.

Polluter pays

JCC is profitable because it has effectively externalized the huge cost of harm to human health and the environment. This is visible in the grotesque metals contamination and the designation of Dai Village as a cancer village. The presence of widespread mercury contamination should bring Dexing into an inventory of contaminated sites with accompanying obligations to address them. However, beyond mercury, the gross contamination at the site and the devastation to the health of surrounding communities cannot continue without causing costly harms. Since JCC is owned by the province, then ultimately the government will be responsible for paying the costs of cleanup and remediation.

Liability and compensation

In this case, JCC made a liability payment amounting to 0.43 yuan per person ($0.07 or 0.06 euro) based on a 20-year old assessment of harm. Meanwhile, Dai Village gets added to the increasing list of China's cancer villages and the region is completely contaminated with toxic metals. Without an effective liability and compensation mechanism, the situation will not be effectively resolved. Liability and compensation is a key principle of chemical safety.[36] In 2010, the Governing Council of the United Nations Environment Programme (UNEP) developed guidelines for national legislation on liability and compensation.[37] China participated in the meeting and its consensus decision to endorse the guidelines. The decision acknowledges Rio Principle 13 and seeks to operationalize Rio Principle 16, the polluter pays principle. Company responsibilities include strict liability for damages either by commission or negligence. The Guidelines grant both individuals and public authorities the right to claim compensation including for damage to property and economic loss. According to Chinese Civil Law, for environmental pollution cases if the plaintiff can prove the existence of polluting activities and damage to property and health, then the defendant should take the responsibility to disapprove the causal relationship between the pollution and damage. Since the provincial government owns JCC, they should be responsible for compensating community members for damages relating to the excessive metals contamination at the site and surrounding communities

Media reports

http://www.jx.xinhuanet.com/news/fmbd/2013-03/01/c_114850752.htm
http://newspaper.jfdaily.com/xwwb/html/2013-02/25/content_978062.htm
http://www.wantchinatimes.com/news-subclass-cnt.aspx?id=20130303000032&cid=1105
http://english.cri.cn/6909/2011/12/08/189s670654.htm
http://www.minesandcommunities.org/article.php?a=11382
http://www.youtube.com/watch?v=84nTqiMQnO4

Annex 1. Data on metals contamination

Survey of metals contamination in Dai Village - Nancunzhou

Values shown in ppm or mg/kg and vary by 10% - 20%; values in bold exceed the upper range of regulatory limits

Sample	Cd	Ni	Cu	Hg	Pb	Zn	As
Regulatory limits in China[a]	0.3-0.6	50-100	50 - 100	0.3-1.0	250-350	200 - 300	20 - 40
2. On a piece of barren land where sugar canes were planted; 70 meters from the Le'an River; flooded in 2012; 10-cm sampling	ND	ND	**183**	ND	41	126	14
3. On the bank of the Le'an River	ND	ND	**243**	ND	32	168	8.6
4. In Nancunzhou where poplars are planted; 10-cm sampling	ND	ND	**171**	ND	30	114	7.4
5. In a collapsed area; 40 cm	ND	ND	34	**4.0**	23	83	6.8
6. In a collapsed area; 20 cm	ND	ND	**220**	**3.5**	45	124	10
7. In a collapsed area; surface soil	ND	ND	**103**	**5.5**	35	132	13
8. On the bank of the Le'an River; 10 cm	ND	ND	**303**	ND	23	102	12

[a] Reference to Grade II values (i.e., soil ingredient limits for assuring agricultural production and human health) in the Soil Quality Standard (GB15618-1995); Note that for nickel, the value shown is for farmland. There is a separate nickel regulatory level of 150ppm-200ppm for orchards.

Abbreviations: Cd, cadmium; Ni, nickel; Cu, copper; Hg, mercury; Pb, lead; Zn, zinc; As, arsenic; ND, Not detected

Survey of metals contamination in Dai Village - Xiahuizhou

Values shown in ppm or mg/kg and vary by 10% - 20%; values in bold exceed the upper range of regulatory limits

Sample	Cd	Ni	Cu	Hg	Pb	Zn	As
Regulatory limits in China[a]	0.3-0.6	50-100	50 - 100	0.3-1.0	250-350	200 - 300	20 - 40
9. On a piece of barren land; 20 meters from the Le'an River; surface soil	ND	ND	**173**	ND	37	154	17
10. On a piece of barren land; 20 meters from the Le'an River; 10-cm sampling	ND	ND	**166**	**5.0**	31	134	15
11. On the bank of the Le'an River	**6.0**	15	**158**	ND	32	143	14
12. On a piece of land	ND	ND	**114**	**2.8**	36	127	11

which was barren but now is a woodland; 100 meters from the Le'an River; surface soil							
13. On a piece of land which was barren but now is a woodland; 100 meters from the Le'an River; 10-cm sampling	ND	ND	**230**	**4.0**	39	132	11

[a] Reference to Grade II values (i.e., soil ingredient limits for assuring agricultural production and human health) in the Soil Quality Standard (GB15618-1995); Note that for nickel, the value shown is for farmland. There is a separate nickel regulatory level of 150ppm-200ppm for orchards.
Abbreviations: Cd, cadmium; Ni, nickel; Cu, copper; Hg, mercury; Pb, lead; Zn, zinc; As, arsenic; ND, Not detected

Survey of metals contamination in Dai Village - Dazhouwan
Values shown in ppm or mg/kg and vary by 10% - 20%; values in bold exceed the upper range of regulatory limits

Sample	Cd	Ni	Cu	Hg	Pb	Zn	As
Regulatory limits in China[a]	0.3-0.6	50-100	50 - 100	0.3-1.0	250-350	200 - 300	20 - 40
14. On a piece of land now planted with cotton; surface soil	ND	ND	**96**	**7.8**	31	103	12
15. On a piece of land now planted with cotton; 10-cm sampling	ND	ND	61	**3.6**	20	78	8.2
16. On a piece of land which was cultivated but now is barren; low-lying; surface soil	**30**	ND	**938**	**4.3**	333	**511**	**195**
17. On a piece of land which was cultivated but now is barren; low-lying; surface soil	ND	ND	**554**	ND	237	181	**191**
18. On a piece of land which was cultivated but now is barren; low-lying; 10-cm sampling	**7.0**	ND	**805**	**7.1**	**420**	**440**	**196**
19. Beside farmland and road; surface soil	**23**	ND	**804**	**6.5**	**385**	**682**	**168**
20. On the bank of the river; surface soil	**53**	ND	**1240**	**4.7**	**366**	**877**	**324**

[a] Reference to Grade II values (i.e., soil ingredient limits for assuring agricultural production and human health) in the Soil Quality Standard (GB15618-1995); Note that for nickel, the value shown is for farmland. There is a separate nickel regulatory level of 150ppm-200ppm for orchards.
Abbreviations: Cd, cadmium; Ni, nickel; Cu, copper; Hg, mercury; Pb, lead; Zn, zinc; As, arsenic; ND, Not detected

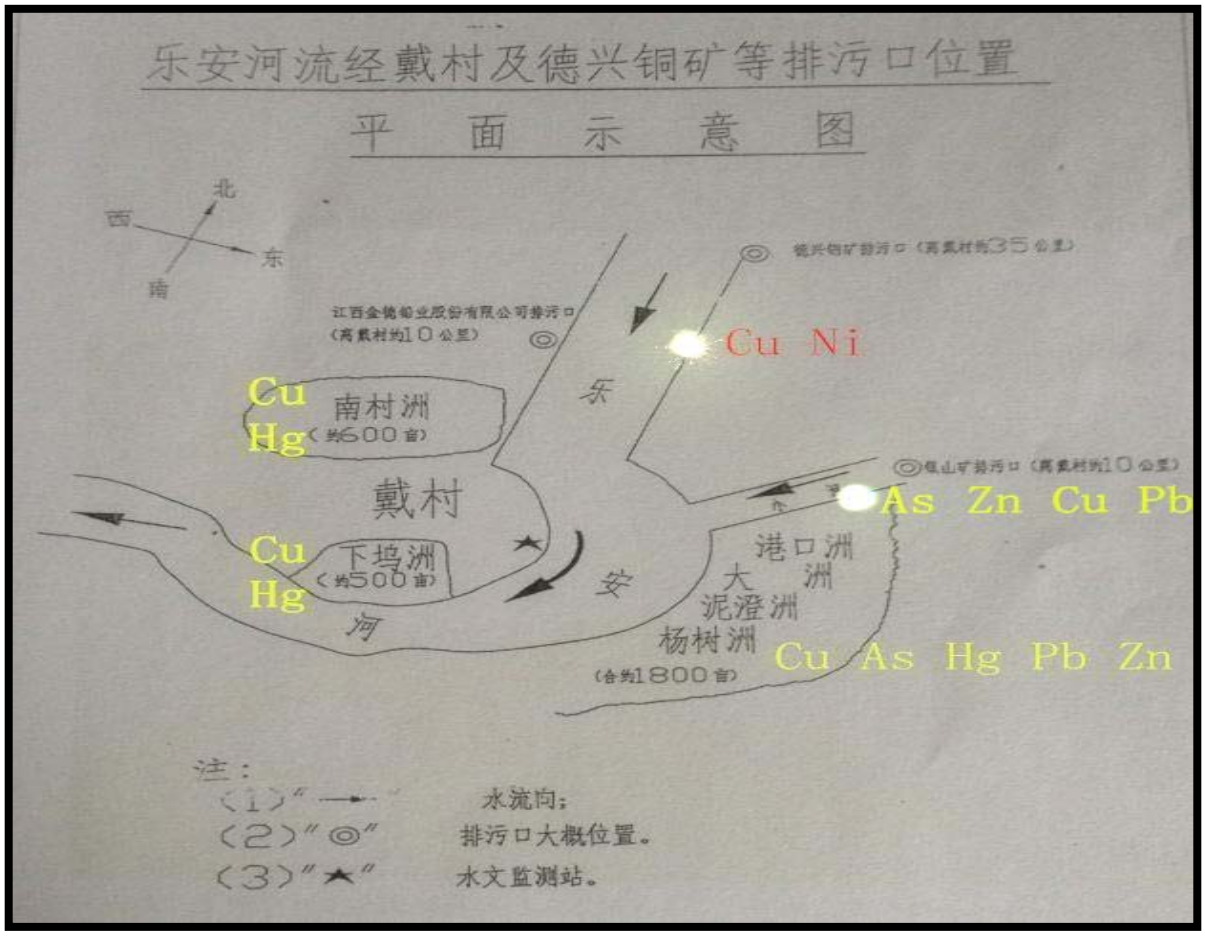
Survey of metals contamination in Dai Village – Near outfalls of mining sites along the Le'an River in Dexing City

Values shown in ppm or mg/kg and vary by 10% - 20%; values in bold exceed the upper range of regulatory limits

Sample	Cd	Ni	Cu	Hg	Pb	Zn	As
Regulatory limits in China[a]	0.3-0.6	50-100	50 - 100	0.3-1.0	250-350	200 - 300	20 - 40
2. Outfall A; surface soil on the riverside	ND	ND	17	**2.9**	10	60	4.6
3. Outfall A; surface soil on the riverside	ND	ND	21	ND	19	80	8.4
5. Outfall A; 20-cm deep soil 500 meters downstream on the riverside	ND	ND	12	ND	11	50	ND
6. Outfall B; surface soil on the riverside	ND	ND	67	**2.5**	22	88	6.4
8. The location where a streamlet flows into the Le'an River in a mining field in Dexing; surface soil	ND	ND	**387**	**5.4**	44	84	21
9. The location where a streamlet flows into the Le'an River in a mining field in Dexing; 10-cm sampling	ND	**4015**	**2037**	**642**	83	**1108**	**122**
10. The location where a streamlet flows into the Le'an River in a mining field in Dexing; 10-cm sampling	ND	**4786**	**2471**	**718**	87	**1306**	**145**
12. Beside a streamlet in a lead-zinc mine in an urban area of Dexing; 10-cm sampling	**14**	ND	**885**	ND	**367**	**3283**	**732**
14. Beside a streamlet in a lead-zinc mine in an urban area of Dexing; 10-cm sampling	ND	ND	**169**	ND	**813**	202	**816**
15. Farmland in Wangjiashan, the Dai Village; 10-cm sampling	**6**	ND	**337**	ND	147	228	**71**
16. On the riverside in Wangjiashan; 10-cm sampling	ND	ND	64	**6.5**	106	87	**49**

[a] Reference to Grade II values (i.e., soil ingredient limits for assuring agricultural production and human health) in the Soil Quality Standard (GB15618-1995); Note that for nickel, the value shown is for farmland. There is a separate nickel regulatory level of 150ppm-200ppm for orchards.

Abbreviations: Cd, cadmium; Ni, nickel; Cu, copper; Hg, mercury; Pb, lead; Zn, zinc; As, arsenic; ND, Not detected



Locations of outfalls of the Dai Village along the Le'an River and which metals are commonly there

About the China Chemical Safety Project

This is an EU-funded project of IPEN with partner Green Beagle that aims to strengthen the capacity of civil society organizations and communities impacted by pollution to increase chemical safety in China. The Project (also known as the China Chemical Safety Project) is being implemented in China over two years with total EU funding of €344,580 and EU contribution of 77.84% of the total cost.

The Project includes:

- Improving capacities of impacted communities and civil society organizations for involvement in policy making
- Training on public participation in environmental impact assessment
- Generating new publicly available data about pollution and impacted communities that contribute to increased implementation of local and national chemical safety policies
- Raising awareness on emissions-related pollution

European Union

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