



Green Beagle

China chemical safety case study: Qihua PVC plant in Qiqihar, Heilongjiang 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

January 2015

Introduction

PVC plastic has become a major building material as well as a polymer used extensively in household consumer products. According to the PVC industry, more than 35 million tonnes of PVC are used globally each year with an average 5% annual growth.¹ Asia represents about half of the global production capacity and half of the global market for PVC.² China is the single largest demand country in the world due to the use of PVC in construction and is expected to account for almost half of the global PVC demand by 2020.³ Unfortunately the large chlorine content in PVC results in a unique set of harmful properties during production, use, and disposal. In addition, PVC is largely manufactured in China using coal as the starting material and mercury as a catalyst in a highly polluting, energy-intensive process (see Annex 1 and 2).

This case study concerns a PVC manufacturing plant in northern China and a determined effort by the surrounding community to reduce its extensive pollution. The story illustrates key problems with waste management, information disclosure, and corporate responsibility.



Huge slurry storage site of QCG/Haohua Chemical with no pollution protection; photo by Mao Da

ChemChina takes control

In 2004, the Chinese government reorganized five companies affiliated with the Ministry of Industry into China Chemical Group.⁴ Now known as China National Chemical Corporation or ChemChina, the State-owned company is China's largest chemical enterprise and ranks 19th among the world's chemical companies.⁵ ChemChina contains numerous subsidiary companies manufacturing petrochemicals, pesticides, plastics, tires, and more.⁶ Chem China acquired Qiqihar Chemical Group (the subject of this case study) in 2005 and shut it down in 2008. In its place Heilongjiang Haohua Chemical Co., Ltd. (Haohua Chemical) built a new facility as a subsidiary of ChemChina at the location of the Qiqihar Chemical Group (QCG). In 2008, ChemChina was the first company in China to propose a "zero discharge" management strategy.⁷ That strategy does not appear to have been implemented at Haohua Chemical.

Toxic chemicals and processes at QCG and Haohua Chemical

Haohua describes itself as promoting "*harmonious and healthy development*" in its production of caustic soda (350,000 tonnes annual capacity), PVC (380,000 tonnes annual capacity), liquid chlorine, hydrochloric acid, and sodium hypochlorite.⁸ Haohua's quality index sheets describe residual vinyl chloride content in some PVC resins up to 30 ppm and residual 1,1-dichloroethane content as being less than 150 ppm.⁹ Vinyl chloride is a known human carcinogen and 1,1-dichloroethane is classified as a possible human carcinogen.^{10 11} Liquid chlorine rapidly turns into a gas if released and it is the second largest source of chemical injuries in the US.¹² "*Even small exposures can trigger coughing, choking and wheezing, and burn the eyes, skin and throat. Inhaling large amounts constricts the airways by inflaming the lining of the throat and lungs. At the same time, fluid accumulates in the lungs, making it doubly hard to breathe. People can literally drown in their own body fluids. At high exposures, a few deep breaths are lethal.*"^{13 14}

QCG and Haohua Chemical have utilized the calcium carbide method for PVC synthesis. Most of the world replaced this process in the 1960s due to its high energy use and excessive waste production. However, in China this process is favored for economic reasons due to its use of coal as a starting material. In the process, coal-derived coke is heated with caustic at 2000C to create calcium carbide. Calcium carbide is then hydrolyzed with a lot of energy to generate acetylene and enormous amounts of calcium hydroxide wastes. Acetylene is then reacted with hydrogen chloride and a mercury catalyst to make vinyl chloride, which is polymerized to create PVC. The calcium hydroxide slag is often used in cement production but the amount is so large that it inevitably piles up.

There are several major problems with the calcium carbide method of PVC production.¹⁵

- Inferior quality PVC with a lot of impurities; according to a major US PVC producer, the calcium carbide method produces a lot of impurities in the PVC so that, "*It can be used in construction materials, such as in pipes, but you can't make film from it.*"¹⁶
- High energy demand; the high energy demand of the process involves increased use of coal with its accompanying mining and emissions problems.
- Large production of calcium hydroxide slag; the calcium hydroxide slag is often used in cement production but the amount is so large that it inevitably piles up.
- Use of mercury catalysts; this issue emerged in the negotiation and finalization of the Minamata Convention on Mercury

Mercury plays a significant role in vinyl chloride monomer plants in China such as QCG/Haohua. In 2005 the Chinese industry consumed 700-800 metric tons of mercury and the rate of growth of mercury use in this industry has been estimated at 25-30 percent per annum, although this may be affected by economic growth rates overtime.¹⁷ The mercury that is not recovered in VCM processes is combined with hydrochloric acid (HCl) by-product and is not recovered. The eventual fate of this mercury is not clear.¹⁸ Statistics by the China Chlor Alkali Industry Association show that by the end of 2010, China had 94 PVC manufacturing enterprises with a total capacity of over 20 million tonnes and calcium carbide process plants represent approximately 80% of capacity.¹⁹

The Minamata Convention restricts mercury use in vinyl chloride monomer production and requires prohibition of its use, five years from the date that the Conference of the Parties establishes that a suitable mercury-free catalyst is available. In addition, these plants are required to reduce mercury per unit production by 50 percent in 2020 compared to 2010 use. Please see Annex 1 for more information about the Minamata Convention and mercury in the vinyl chloride monomer production process.

The production of PVC by QCG/Haohua Chemical also raises concerns due to the toxic lifecycle of the product, including its use of additives and its link to the formation and release of dioxins – a highly toxic class of substances covered under the Stockholm Convention. For more information about this topic, please see Annex 2.

A long history of pollution

Located in Yushutun Village, Ang'angxi District, Qiqihar City, Heilongjiang Province, Qiqihar Chemical Plant, also known as Qiqihar Chemical Group (QCG), was founded even earlier than the People's Republic of China. Pollution by QCG probably began in the early 1980s, according to local villagers. The polluted Yushutun Village was a place where Japanese troops were stationed during Japan's occupation of Northeast China. People's Liberation Army troops also were stationed there after Northeast China was liberated. Ironically, the troops had to leave the village due to "defeat" by equipment corrosion from chlorine routinely leaking from the company.

Over ten households, including villager Wang Enlin's family lived south of the existing waste dump and west of a pond named Dapaozi. Some QCG employees lived near Wang's home before 1980. There was a well about three meters deep outside his house. Since groundwater around this chemical plant was already polluted, Wang shared well water with these employees. Around 1982, however, groundwater around Wang's home also became undrinkable due to pollution. The QCG employees also left. The above-mentioned households then began using tap water supplied by QCG. In 1992, these households moved to the northern part of their village.

Creating a gigantic waste dump

From 1988 onward, pollution from QCG to the surrounding land has been intensifying. That year, the QCG and Yushutun Village signed a "land acquisition agreement" involving 86.29 hectares of land, including over 30 hectares of farmland. Unfortunately, this land has become a gigantic

corporate waste dump as QCG has gradually flooded it with wastewater. QCG transformed Village land into a huge wastewater pond.



Sampling the company's gigantic wastewater dumping pond; photo by Mao Da

Local villagers do not think that this agreement came with legal procedures for land acquisition. Firstly, the QCG, as an enterprise that signed this agreement, is not entitled to land acquisition, which can only be made by the State. Secondly, in accordance with the governing laws and regulations, this land acquisition transaction should have been approved by the Heilongjiang Provincial Government. But QCG has been unable to come up with valid approval documents. Thirdly and lastly, this piece of land remains identified as agricultural land, according to the legally binding *Overall Land Use Plan of the Ang'angxi District, Qiqihar City(1997- 2010)*.

Damaged crops and contaminated drinking water

Villager Wang Fucheng's family is the only one that still lives south of Dapaozi. He has planted about one hectare of corn, but has abandoned about 5.5 other hectares of land because of pollution. He said that because the soil is sandy, higher land is free from the impact of a raised level of groundwater. As a result, crops will stay alive in good weather even without irrigation, according to Wang Fucheng. In contrast, low-lying areas have largely been salinized due to contaminated groundwater and thus are no longer suitable for agricultural purposes.

In the early 1980s, water from the well outside Wang Fucheng's house was already undrinkable. Around 2001, pieces of land around Wang Fucheng's house began to be unproductive, due to salt intrusion, before they gradually expanded into a combined area. Today, low-lying areas south of Dapaozi generally are unproductive, even without grass in some areas. Moreover, gray flakes that look obviously different from normal soil have appeared. Wang Fucheng said that this

land was very good when it was first contracted out. In fact, he became the richest man in Yushutun Village in the 1990s. After the land became unproductive, however, he invested heavily for two consecutive years with no gain, resulting in financial difficulties for many years.



Villager comments on the vast wastewater dump; photo by Xie Xinyuan

In 2001, QCG and Yushutun Village signed a 28.57-hectare land lease agreement for storing calcium carbide-derived slurry from the PVC production process. This agreement remains valid today. Several villagers familiar with the situation are extremely dissatisfied with this arrangement, as 0.13 hectares of land was flooded by slurry overflowing from the chemical plant. Without the consent from the villagers' conference, the head of the village committee of the Communist Party of China (CPC) "leased" the land, including about 5.5 hectares of farmland, to the QCG for 27 years in the name of supporting corporate production. As the main constituent of the stored calcium carbide-derived slurry is slaked lime, this practice has essentially changed the nature of this piece of agricultural land into non-agricultural land. In 2002 the local land resources bureau required the QCG to go through the approval procedures for interim land use and fined this enterprise 300,000 yuan because the company did not follow the appropriate legal procedure. Thirteen years later, however, the company has yet to finish those procedures.

Starting a legal process

Wang Enlin began work to protect his rights in 2006 and received assistance from the Center for Legal Assistance to Pollution Victims (CLAPV) in 2007. "*Contaminating 28.57 hectares of land, including farmland and grassland, at one time is actually a crime,*" said Professor Wang Canfa, an environmental law expert at China University of Political Science and Law (CUPL) in an interview with the Legal Daily back in 2008.²⁰ Associate Professor Xu Kezhu, another environmental law expert at CUPL, believes that the QCG has violated Articles 45 and 63 of China's land administration law as well as the provisions concerning the crime of illegally

occupying agricultural land in Article 342 of China's criminal law, as it leased the land and has contaminated it by storing industrial waste there for a long period of time.

Wang Enlin and his lawyer visited the local environmental protection, agricultural and land administration bureaus (as well as law enforcement authorities) only to see inaction of the administrative authorities and the local court's unwillingness to hear this case. However, instead of giving up, Wang Enlin collected key evidence such as copies of the land agreement and the overall plan for land use over the past years.

Environmental monitoring reveals damage and pollution

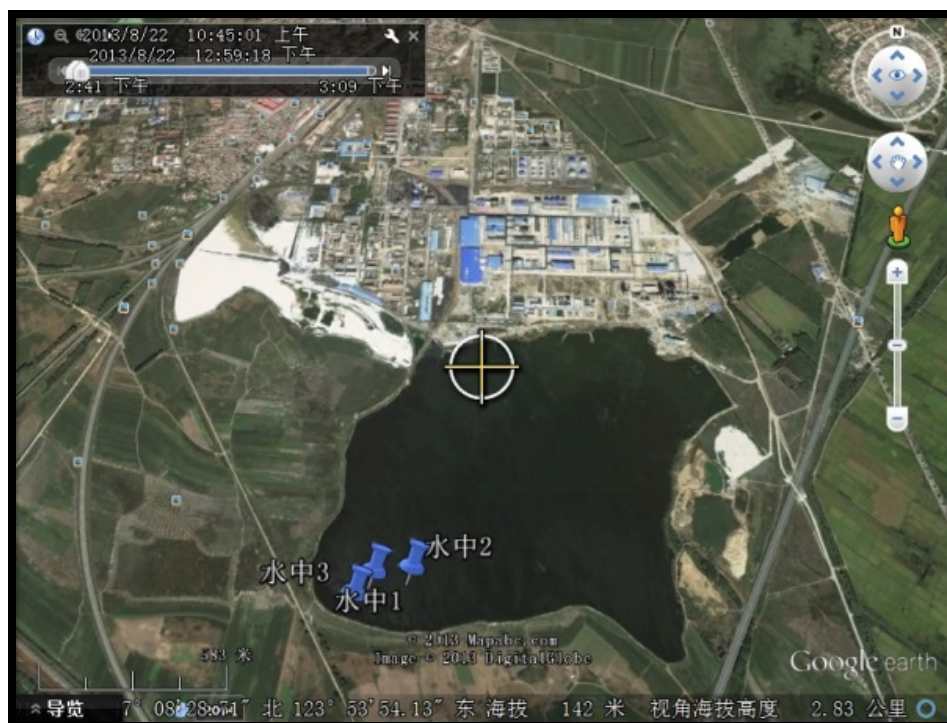
Project personnel surveyed the Haohua Chemical site in May 2013, including both visual observation and environmental sampling. The findings show that both the 86.29-hectare wastewater pond and the 28.57-hectare slurry storage site have produced destructive effects on the surroundings due to a lack of protections and anti-seepage measures. The samples were sent to a university lab for measurement. The resulting figures indicate that the soil from the farmland around the pond or the storage site is alkaline with a salinity of 4g/kg or more; the highest salinity of 38.87 g/kg came from a surface soil sample. In contrast, the soil from control points is acidic with a salinity of about 2.2 g/kg. This indicates that the contaminated land is already severely salinized.



QCG slurry waste next to farmland with no protection; photo by Mao Da

In August 2013, Green Beagle hired a third-party laboratory with China Metrology Accreditation to take samples at the site and test them. The results showed that the sediment in the wastewater pond has a mercury content of 20.9 mg/kg, far beyond the background value of the natural environment. To ensure agricultural production and human health, the highest mercury level in soil must be 1.0 mg/kg, according to China's soil environment quality standard.²¹ Obviously, this piece of land is polluted and not suitable for agricultural use.

The mercury test results have since affected the local court and government in terms of attitude and behavior. After knowing the result, a judge of the Ang'angxi District court called Green Beagle staff and asked about the qualification of the third-party tester and the testing method. The Ministry of Environmental Protection (MEP) also put this case on the list of major environmental cases of August 2014.



A bird's eye view of the contaminated area at QGC and the location of sampling by the third-party organization; map capture by Mao Da

Back in 2007, MEP urged the company to make environmental improvements as pollution control facilities were idle and the facility had been discharging wastewater into the surroundings directly. In addition, MEP believed that the company had impeded environmental law enforcement and forcibly held wastewater samples in custody, although it did not mention the presence of mercury pollution. This time around, MEP required the environmental authority of Qiqihar City to measure mercury in the sediment. The results confirmed the data obtained by the Project. At this time, *National Business Daily* covered this story.²² By showing the judge a copy of this newspaper article, the villagers helped the judge understand that their claims were reasonable and that the legal action was completely justified.



SGS personnel conduct sampling near the factory site; photo by Xie Xinyuan

Getting the environmental impact assessment (EIA)

As noted above, ChemChina acquired QCG in 2005 before shutting it down in 2008. A new facility was built by Haohua Chemical as a subsidiary of ChemChina at the location of the QCG facility. Green Beagle sent an open letter to ChemChina in September 2013, asking it to order Haohua Chemical to stop pollution, rehabilitate the contaminated land and compensate the affected farmers. The company did not respond.

Green Beagle followed up by submitting an application to Heilongjiang Provincial Department of Environmental Protection (HLJDEP) in November 2013 for disclosing the full version of the environmental impact report on Haohua Chemical's 300,000 tons/year PVC production and 300,000 tons/year cation-exchange membrane-based caustic soda production projects. The Project did this because public release of the Environment Impact Assessment (EIA) is permitted by Chinese law and authorities have to supply it upon request. The environmental authority replied that these reports were not information that should be disclosed, in violation of Chinese law.

Green Beagle then immediately escalated the process to the national level and submitted an application to MEP for administrative review of the HLJDEP decision to obtain the EIA. Interestingly, Haohua Chemical subsequently published both EIA reports on its website in January 2014. As a result, the provincial environmental authority called Green Beagle, asking it to withdraw the application for review, as the company had published them on its website. Green Beagle asked the authority to give written assurance that the reports published on Haohua Chemical's website were the ones that Green Beagle had asked for. HLJDEP provided this letter so Green Beagle withdrew the application for administrative review. This experience demonstrates that HLJDEP and the company both understood that they were violating Chinese law and that the reports were going to be released one way or another.

Faking and preventing public participation

The EIA report on the PVC operation of Haohua Chemical contained a public participation section with false information. The report described a survey among community farmers approving the project but at least one person mentioned in this section does not even exist. As for



Villagers visit headquarters at ChemChina; the signs say “ChemChina, stop polluting, restore the land”; photo by Xie Xinyuan

the other report, local villagers were not even allowed to participate, in violation of Chinese law. These are typical cases of EIA information falsification, with evidence available from the Ang'angxi District People's Government and the Yushutun Village Committee. In addition, neither report provides comprehensive information on environmental quality, as both the calcium carbide-derived slurry dump and the wastewater dumping pond already existed when these two projects were launched in 2007.

Project personnel went to Qiqihar with two lawyers from the Center for Legal Assistance to Pollution Victims (CLAPV) in December 2013 and prepared three complaints for the villagers: 1) requesting the Court to confirm the unlawfulness of the aforementioned two land agreements; 2) ordering Haohua Chemical to rehabilitate the contaminated land; and 3) compensate 18 households for their financial losses due to pollution in 2012 and 2013.

The long road to Beijing

Villagers living in the community practiced a long-standing tradition for those with grievances and traveled more than 1000 km to Beijing in late April 2014 to bring their complaints directly to national institutions. In Beijing, community residents submitted three documents to MEP: 1) a report on Haohua Chemical's having discharged wastewater containing heavy metals into agricultural land and thus having committed the crime of environmental pollution; 2) a report on Haohua Chemical's having provided false EIA information; and 3) an application for HLJDEP to disclose the 2008 test report on groundwater and soil samples from Yushutun Village. No reply was received, but we later learned that the Qiqihar Municipal Environmental Monitoring Station also sampled the sediment in the wastewater pond to detect mercury in April 2014. The government monitoring confirmed Project results showing that mercury levels exceeded legal limits.

During this period, Project personnel also visited ChemChina along with the villagers, to give a manager an open letter and the test results showing excessive mercury in the Haohua Chemical sediment. The manager immediately informed the management of China Haohua Chemical Group Co., Ltd. (“China Haohua”), a ChemChina subsidiary and Haohua Chemical's parent company, which negotiated with the villagers the next day, but with no result.

Cases are opened 8 years after initial complaints were filed

Fortunately, all the efforts made by the villagers, lawyers and Project personnel have finally paid off. On June 27, 2014 the villagers received the first ever case opening notice, saying that the competent court would first open cases for three of the 18 households that have filed civil

lawsuits for the land being made unproductive. Both Caixin and the *China Economic Weekly* have reported this.²³²⁴



The moment of a villager's lifting a case opening notice is recorded by documentary filmmaker Wang Jiuliang; group is standing in front of the Haohua waste water pond; photo by Wang Jiuliang

Green Beagle staff members invited documentary filmmaker Wang Jiuliang to visit Qiqihar in early July 2014, where interviews took place with Wang Enlin, Wang Baoqin, Li Diankui, Yang Zhenqing and other active participants in the pollution issue. They film crews gathered information and filmed other pollution victims in the village. In addition, they collected four sediment samples (one surface water sample and two groundwater samples) for testing, further determining the main pollutants as evidence in the upcoming civil damages trial. According to the results of this sampling, the mercury levels in the sediment vary between 7.76mg/kg and 110mg/kg. In addition, both surface water and groundwater contain more carcinogenic vinyl chloride than is allowed by China's drinking water standard. Finally, the chloride levels are all higher than China's water standard for agricultural irrigation.

In China's judicial practice, the court is most likely to adopt the results of forensic examination, followed by test results from government departments. In contrast, public confidence in third-party testing is often inadequate. Nonetheless, forensic examination generally takes hundreds of thousands of yuan and thus is not affordable for Yushutun villagers. On the other hand, the competent government department has conducted relevant tests but has never informed the villagers of the test results. While applying for information disclosure, Green Beagle has been taking measures to increase the credibility of testing so that the court will accept the results. The Project shared all test results with the community.

Third-party tests meet challenges

Green Beagle hired a testing laboratory to collect samples and test them as planned at the site in late August 2014. The plan included comparing the results with relevant national standards (such as the *Technical Specifications for Soil Environment Monitoring* (HJ/T166-2004) after marking the latitudes and longitudes of sampling locations on an electronic map. At the same time, Green

Beagle asked the villagers to invite the local environmental authority and the competent court to witness the sampling process, which Project personnel recorded. We learned in our talk with the officials of the local environmental authority that the municipal environmental monitoring station came to Yushutun Village and collected groundwater and soil samples in April and June 2014 respectively. Therefore, after the end of sampling, Project personnel went with community residents Wang Baoqin and Wang Enlin to the HLJDEP to apply for disclosing their prior test results and report Haohua Chemical as having provided false EIA information on its PVC and caustic soda projects.

Unfortunately, all the samples collected by the third-party test organization were largely damaged in the mailing process. Surprisingly, the testing laboratory said that this was quite unusual and raised concerns about evidence tampering. In addition, the identity information of the third-party laboratory representative was recorded by the local police while he took the samples. These tactics had an effect. Later on, we wanted re-hire this laboratory to once again collect samples at the site, but the company refused to do so.

With further efforts, we finally found a testing laboratory in late September 2014 that was willing to go the site for sampling. Before this, the other organizations we had contacted all refused to collect samples at the site and include the sampling method and locations into the report, when they heard that the results would be used in litigation. Instead, they said that they would only send samples for testing, with a typical reason that pollutant concentrations will significantly vary with time, weather and other factors and that it is very easy for the court to find a reason to deny the test results. If the court does deny the results, the testing lab may face the risk of being disqualified. Unfortunately, the second hired lab did not provide information on the testing method, did not use consistent unit values, and did not even correctly match the title and the contents. Consequently, the results are not usable as evidence in court proceedings.



Locations of first sampling at the site; note that red stands for soil samples, blue for water samples and green for sediment samples; map capture by Mao Da

Urging the court and the environmental authorities to act

With Project assistance the villagers have applied for information disclosure by MEP and HLJDEP. This triggered continued communication between the villagers, the Qiqihar municipal environmental authority and the HLJDEP. As a result, the environmental authorities have

disclosed to the villagers the 2006 groundwater test report and the 2014 groundwater and sediment test report. Some sampling points in 2014 were not in the contaminated area, according to the villagers, but overall these can be used as evidence for civil litigation. The environmental authorities also have begun urging the company to control pollution.

In August 2014, MEP included the QCG/Haohua Chemical pollution case in its list of major environmental cases. The Ministry pointed out problems with the company, such as a lack of anti-seepage measures at the slurry storage site except for tamping; non-compliant pH values and total mercury levels of the sediment in the wastewater pond; and the once non-compliant chloride and COD levels of groundwater. Haohua Chemical has since made some improvements to address these problems: wastewater is no longer directly discharged into the surroundings, but instead into a municipal oxidation pond after it is treated at the new sewage treatment plant; and Qiqihar Haoyuan Cement Co., Ltd. is now treating the new and legacy calcium carbide-derived slurry, of which the amount of the latter has been reduced from 400,000 tonnes to somewhat more than 200,000 tonnes.

MEP has also addressed recommendations to local environmental officials. MEP has ordered the HLJDEP to urge the local government to properly solve legacy problems; supervise the company such that it will finish treating the remaining calcium carbide-derived slurry and restore the land by the end of 2016; urge ChemChina to develop a comprehensive program for treating the wastewater pond and complete the treatment in a timely manner, or future ChemChina projects will not be approved; and urge the local environmental authority to handle environmental violations, conduct rectification, regularly carry out environmental monitoring and provide the public with information on environmental cases and rectification progress.

These advances in the QCG/Haohua Chemical case were hard-earned. Next, we will continue to help the villagers apply for information disclosure, urge the local environmental authority to conduct effective rectification as required by the MEP and invite certain experts to participate in the development of a practical rehabilitation program.

Humanitarian aid to pollution victims

While helping the local villagers report pollution, Green Beagle has also provided humanitarian aid. The flood in Heilongjiang in the autumn of 2013 added to the misfortunes of villagers who had already been faced with farmland made unproductive by pollution. We raised 4,905 yuan for the poorest villagers to get through the winter. As environmental activist Wang Enlin is suffering from tuberculosis, we raised 3,950 and about 5,000 yuan for him in March and October 2014 respectively, in addition to 8,000 yuan received from the Yirenyizhu Fund in August 2014, for his medical treatment at Tianjin Tuberculosis Hospital.

Conclusion

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

Implementation and enforcement of waste management laws

Waste management laws need both implementation and enforcement. Rigorous enforcement of Chinese law would have identified this problem much sooner rather than letting it continue for years. This case illustrates how a State-owned factory violated the law with impunity while local

environmental authorities ignored the matter. The company costs of waste management were simply externalized onto local villagers. This is unacceptable. Chinese law must be obeyed and enforced.

Information disclosure

Public right to know is a key principle of chemical safety. However, this case demonstrates refusal to provide EIA reports as required by law, and when they were finally obtained, the EIA showed falsification of information and refusal of participation – both violations of Chinese law. This highlights the importance of the intervention of the central government on the duties of provincial and local environmental protection departments or bureaus to conduct necessary investigations on the content of EIA statements and enforce violations when they occur. In addition, public access to plant emissions including wastes should be regularly provided via an accessible, free, pollutant release and transfer registry.

Polluter pays

ChemChina may be 276 on Fortune 500's global list, but it has a very low environmental standard and social responsibility record.²⁵ In the conversation with the victims of its pollution, company representatives said that they will not take any responsibility until the court makes judgment. This shows that they do not take responsibility for their pollution or its impacts on the victims seriously and demonstrates poor social responsibility. Ironically, as noted above, the company website takes pride in claiming that ChemChina was the first company in China to propose a “zero discharge” management strategy.²⁶ ChemChina could use Qihua as a test case for implementing this policy. As a State-owned corporate leader, ChemChina should carefully evaluate its environmental impacts, stop illegal waste dumping and communicate with victims and help them to improve their livelihood.

Liability and compensation

Liability and compensation is another key principle of chemical safety.²⁷ In 2010, the Governing Council of the United Nations Environment Programme (UNEP) developed guidelines for national legislation on liability and compensation.²⁸ 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. In this case, the judge expressed that both sides should raise evidence to some extent, partly complying with the law requirement. However, it is still uncertain that the polluter will fully take the responsibility to prove the crop loss has no relation to its operation.

Ratification and implementation of the Minamata Convention

The Qihua case study directly links this village to global mercury pollution and the Minamata Convention on Mercury. China participated actively in the negotiations of this treaty and signed it – but now needs to ratify the agreement. The Minamata Convention restricts mercury use in vinyl chloride monomer production and requires prohibition of its use, five years from the date

that the Conference of the Parties establishes that a suitable mercury-free catalyst is available. In addition, these plants are required to reduce mercury per unit production by 50 percent in 2020 compared to 2010 use. Work should accelerate to meet these obligations before these dates.

Re-evaluation of PVC as an appropriate building material

Architects and developers should re-evaluate the appropriateness of using PVC as a building material as its actual cost is highly externalized due to its toxic lifecycle. PVC utilizes toxic substances in manufacturing including chlorine, mercury, phthalates, and lead. As a predominant chlorine donor, PVC is a major dioxin source, which conflicts with national obligations under the Stockholm Convention. PVC is extremely difficult to recycle and considered to be a contaminant by recycling companies. Finally, PVC requires large energy consumption in production. Many alternatives to PVC building materials are available and many companies and governmental bodies have taken action to substitute it for more sustainable materials.

Media reports

“The SEPA discloses the first batch of listed environmental cases in 2007,” the MEP website
http://www.mep.gov.cn/gkml/hbb/qt/200910/t20091023_180072.htm

“Why is it so difficult to hold people criminally responsible for environmental violations,” The
Legal Daily

<http://news.sina.com.cn/o/2008-10-22/074914611528s.shtml>

The Oriental Horizon (August 23, 2010, 20:41-20:47)

<http://news.cntv.cn/program/dongfangshikong/20100823/104612.shtml>

The Oriental Horizon (August 24, 2010, 20:24-20:28)

<http://news.cntv.cn/china/20100824/104415.shtml>

“The QCG pollution survey: the contaminated farmland has been left unproductive; 12 years later, the procedures for interim land use for slurry storage have yet to be finished,” the *National Business Daily*

<http://www.nbd.com.cn/articles/2013-08-05/763650.html>

“Countryside pollution remains a perennial headache: EIA reports contain false information, according to a chemical pollution survey in Yushutun Village, Qiqihar City,” the Heilongjiang Channel of Xinhuanet

http://hlj.xinhuanet.com/news/2014-06/24/c_133433936.htm

“Cases are opened 8 years after villagers first complained about pollution to nearly 60 hectares of land,” Caixin

<http://china.caixin.com/2014-06-30/100697374.html>

“37 hectares of farmland have become unproductive due to wastewater from a ChemChina subsidiary; villagers are still awaiting case opening 8 years after they first complained,” the *China Economic Weekly*

<http://www.ceweekly.cn/2014/0714/86965.shtml>

“The MEP includes the QCG case into major environmental cases of August,” the *National Business Daily*

<http://www.nbd.com.cn/articles/2014-10-08/867287.html>

“The MEP discloses information on the handling of major environmental cases of August 2014,” the MEP website

http://www.mep.gov.cn/gkml/hbb/qt/201409/t20140929_289716.htm

Annex 1. The Minamata Convention on Mercury and the vinyl chloride process used in China²⁹

Mercury catalysts are in large-scale commercial use due to their use in vinyl chloride monomer production in China (VCM). VCM, whose chemical formula is C_2H_3Cl , is the main feedstock in the manufacture of polyvinyl chloride plastic (PVC), also known as vinyl. VCM is produced using acetylene (C_2H_2) as a raw material. The acetylene is combined with hydrogen chloride (HCl) and flows through a mercuric chloride catalyst to produce the VCM. VCM manufacture from acetylene and a mercuric chloride catalyst was in use in the United States as recently as 2000. However, the only remaining large-scale use of mercury for this purpose is in China.

The production of VCM in most countries does not use any mercury catalysts but instead uses a different manufacturing process. In most countries, acetylene is not used as the hydrocarbon feedstock in VCM production, but rather, ethylene is used. An important difference between these two feed stocks is that ethylene is produced from petroleum or natural gas while acetylene is produced from coal.

Until recently, the use of ethylene as the feedstock was considered to be the state-of-the-art process for VCM manufacture. However, as the prices of petroleum and natural gas have increased relative to the price of coal, the acetylene process has become more attractive. This is especially the case in countries such as China that must import petroleum but which have large coal reserves that are mined with low-cost labor. Another factor that has discouraged building new plants using ethylene as a feedstock is the wide fluctuations in the price of petroleum. Enterprises building PVC plants in northwest China near coal mines feel confident they can count on a steady supply of cheap coal at stable prices. These considerations have not only led to the rapid growth of VCM plants using mercury catalysts in China, but they could also apply elsewhere and encourage the further expansion of this industry in other countries and regions

Based on information provided to the NGO, Natural Resources Defense Council (NRDC), by the Chemical Registration Center (CRC) of China's Ministry of Environment, total PVC production in China was 1.9693 million metric tons in 2002 and rose to 3.0958 million metric tons in 2004, with 62 PVC manufacturing facilities known to be using mercury catalysts. Statistics by China Chlor-Alkali Industry Association show that by the end of December 2010, China had 94 PVC manufacturing enterprises, with a total capacity of 20.427 million tons per year. In 2012, the output volume of PVC totaled 13.181 million tons in China and is expected to continue to grow until 2017. By the end of 2010, the scale of calcium carbide process-based PVC plants had made up 80.9 percent of gross domestic capacity

The catalysts used in the plants are in the form of activated carbon that has been impregnated with mercuric chloride. When the catalysts are installed, they are between 8 percent and 12 percent mercuric chloride. Over time, however, the catalyst is depleted and the amount of mercuric chloride in the catalyst decreases. When the amount drops to about 5 percent, the catalyst is replaced. The fate of the mercury that is lost from the catalyst is not well understood. VCM production using coal and a mercury catalyst is unique to China and a potentially enormous source of mercury releases.

According to CRC estimates, the amount of mercury present in catalysts that were used and subsequently replaced in 2004 was 610 metric tons. These spent catalysts were sent to recyclers, who processed them and were able to recover approximately 290 tons of elemental mercury. This suggests that in 2004, the manufacture of VCM in China resulted in as much as 320 metric tons of mercury losses to the environment. The Chinese government estimated that at PVC production of 8 million tons in 2010, mercury catalyst and mercury used in the industry amounted to about 9,600 tons and 781 tons respectively. On this basis it is estimated that at least 800 metric tons of mercury is consumed each year and must be replaced

The international community currently has no data on the mercury emissions from VCM plants that use mercury catalysts or from the recycling facilities that process their spent catalysts. Because the experts who prepared the report had no reliable emissions data to work with, UNEP's "Global Mercury Assessment 2013" treats VCM plants as if they release zero mercury emissions into the atmosphere. This means that the UNEP estimate of 1,930 metric tons of total global anthropogenic mercury emissions per year from all sources does not count any emissions associated with VCM manufacturing as part of the total. The information that is available is of great concern. A report by The China Council for International Cooperation on Environment and Development predicted that by 2012, China's VCM/PVC production would reach 10 million metric tons with associated mercury consumption exceeding 1000 metric tons. The reality is that 13 million metric tons were produced in 2012 and PVC production is planned to double between 2010 and 2020. There has also been conflicting reports as to whether mercury from these catalysts is recycled, with the most recent reports suggesting it is recycled.

Because VCM production in China using mercury catalysts appears to be expanding, it is likely that unreported mercury losses from VCM manufacture will grow with time. In addition, if the VCM manufacturers that use mercury catalysts are able to achieve significant savings in their feedstock costs compared with VCM manufacturers who do not use mercury catalysts, this might over time create market pressures on manufacturers in other countries to convert from PVC manufacturing using petroleum and natural gas as feed stocks to the possibly less costly acetylene/mercuric chloride manufacturing process

The mercury treaty addresses this issue by prioritizing research and development into mercury-free catalysts for coal-based VCM production under Article 5. Mercury will also be prohibited from use in VCM manufacture five years from the date that the COP establishes that a suitable mercury-free catalyst is available. VCM plants are also required to reduce mercury per unit production by 50 percent in 2020 compared to 2010 use (i.e. increase the efficiency with which they use mercury). Additional measures include promoting measures to reduce use of mercury from primary mining and supporting research and development of mercury-free catalysts and processes.

Annex 2. PVC – the poison plastic

PVC is the only major building product that contains significant amounts of chlorine (~50% by weight). This results in some uniquely negative environmental and human health hazards³⁰:

- Largest use of highly toxic chlorine gas in the world
- Large-scale production of chlorine-rich hazardous wastes
- Hazardous by-products including vinyl chloride monomer, PCBs, hexachlorobenzene, dioxins, and octachlorostyrene
- PVC is a predominant chlorine donor and therefore a major dioxin source
- PVC often requires use of toxic additives such as phthalates, lead, other metal stabilizers
- Large energy consumption in production
- PVC is extremely difficult to recycle and considered to be a contaminant by recycling companies

In 1997, the US EPA noted that, “*chlorinated precursors [of dioxins] include...polyvinyl chloride (PVC).*”³¹ This indicates that PVC will act as a key chlorine donor for dioxin formation. Since PVC acts as a primary source of chlorine for dioxin formation in materials burned in municipal and medical waste incinerators, trash fires, landfill fires, some secondary metal smelters, and others, it can be considered the single largest contributor to the global dioxin burden.³² The Stockholm Convention BAT/BEP Guidelines provide advice to governments about how to reduce formation and release of dioxins, furans, and other substances formed unintentionally. The Guidelines recommend avoiding waste loads that contain high chlorine content, “*such as PVC.*”³³

PVC requires toxic additives to make useful products. These include up to 60% by weight phthalates to make flexible PVC including flooring, roofing membranes, and wall coverings.³⁴ The high chlorine content of PVC leads to the use of metal stabilizers. These include lead, cadmium, and organotins among others. For example, lead is the most commonly used stabilizer in PVC pipes in China and represents 95% of the PVC pipe use in India.³⁵ Since none of these additives are chemically bonded to the polymer they emerge over normal use of the product causing exposure and pollution. There are many reports outlining harmful PVC products in use.³⁶ There are also many alternatives to PVC, including in building products.^{37 38 39}

As a result of PVC’s harmful properties, there are numerous policies to ban its use in construction. These include:⁴⁰

- 274 communities and six states in Germany have written policies to phase-out or restrict PVC
- 4 largest cities in Netherlands (Amsterdam, Den Haag, Rotterdam, and Utrecht) have specifications to avoid PVC whenever possible in construction
- 52 cities in Spain declared themselves PVC-free
- 7/9 states in Austria have restrictions on PVC

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

Strengthening the capacity of pollution victims and civil society organizations to increase chemical safety in China (China Chemical Safety Project) is funded by the European Union. The contents of this report are the sole responsibility of the IPEN and Green Beagle and can in no way be taken to reflect the views of the European Union.

The European Commission is the EU's executive body. "The European Union is made up of 27 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development while maintaining cultural diversity, tolerance and individual freedom. The European Union is committed to sharing its achievements and its values with countries and people beyond its borders."

Delegation of the European Union to China, 15 Dongzhimenwai Dajie, Sanlitun, 100600, Beijing Telephone: + 86-10-84548000 Fax: + 86-10-84548011
www.eu-in-china.com

In addition, IPEN would like to acknowledge that this document was produced with financial contributions from the Swedish International Development Cooperation Agency through the Swedish Society for Nature Conservation (SSNC), along with other donors. The views herein shall not necessarily be taken to reflect the official opinion of any of these donors, including SSNC or its donors.

References

- ¹<http://www.pvc.org/en/p/how-is-pvc-used>
- ²[https://www.vinnolit.com/vinnolit.nsf/id/E134EE0F20C529E1C125792E00528B0A/\\$file/Vinnolit_Trend%20Report%20PVC_PE110883_PE10_11_e.pdf](https://www.vinnolit.com/vinnolit.nsf/id/E134EE0F20C529E1C125792E00528B0A/$file/Vinnolit_Trend%20Report%20PVC_PE110883_PE10_11_e.pdf)
- ³<http://www.plastemart.com/upload/Literature/China-to-drive-global-growth-of-%20PVC-polyvinyl-chloride.asp>
- ⁴<https://books.google.com/books?id=Af2O3p1JmVEC&pg=PA269&lpg=PA269&dq=%22China+Chemical+Group%22&source=bl&ots=PmnSqDrhrx&sig=54-td0DTtMWQpAGK5wCsaUXCU18&hl=en&sa=X&ei=ow21VOGzLNiyyATqwIK4CA&ved=0CCwQ6AEwBw>
- ⁵http://www.chemchina.com.cn/en/gywm/A6016web_1.htm
- ⁶http://www.chemchina.com.cn/en/cyqy/mc/A602301web_1.htm
- ⁷http://www.chemchina.com.cn/en/gywm/zjlzy/A601602web_1.htm
- ⁸http://www.hhhlj.chemchina.com/hljhhen/gywm/gsjj/A670101web_1.htm
- ⁹http://www.hhhlj.chemchina.com/hljhhen/cpyfw/ppysb/jlyxsz/A67030204web_1.htm
- ¹⁰http://www.epa.gov/teach/chem_summ/VC_summary.pdf
- ¹¹<http://www.epa.gov/iris/subst/0409.htm>
- ¹²<http://www.scientificamerican.com/article/chlorine-accidents-take-big-human-toll/>
- ¹³<http://www.scientificamerican.com/article/chlorine-accidents-take-big-human-toll/>
- ¹⁴Studies show 40-60 ppm produces lung injury; 430 ppm usually causes death in 30 minutes, and 1,000 ppm is fatal within a few minutes. Under federal standards, workers are never supposed to be exposed to concentrations exceeding 1 ppm; see reference above
- ¹⁵ Tremblay JF (2010) China's venerable vinyl process, 88:18-19
- ¹⁶ Tremblay JF (2010) China's venerable vinyl process, 88:18-19
- ¹⁷<http://www.ipen.org/documents/ngo-introduction-mercury-pollution-and-minamata-convention-mercury>
- ¹⁸<http://www.ipen.org/documents/ngo-introduction-mercury-pollution-and-minamata-convention-mercury>
- ¹⁹<http://www.ipen.org/documents/ngo-introduction-mercury-pollution-and-minamata-convention-mercury>
- ²⁰<http://news.sina.com.cn/o/2008-10-22/074914611528s.shtml>
- ²¹<http://www.cqnaqb.gov.cn/upfiles/201207/20120711155027827.pdf>
- ²²<http://www.nbd.com.cn/articles/2013-08-05/763650.html>
- ²³<http://china.caixin.com/2014-06-30/100697374.html>
- ²⁴<http://www.ceweekly.cn/2014/0714/86965.shtml>
- ²⁵<http://www.chemchina.com.cn/en/xwymt/jtxw/webinfo/2014/07/1404866597839404.htm>
- ²⁶http://www.chemchina.com.cn/en/gywm/zjlzy/A601602web_1.htm
- ²⁷ Rio Principle 13
- ²⁸ Eleventh special session of the Governing Council/Global Ministerial Environment Forum Bali, Indonesia, 24–26 February 2010 UNEP/GCSS.XI/11
- ²⁹<http://www.ipen.org/documents/ngo-introduction-mercury-pollution-and-minamata-convention-mercury>
- ³⁰<http://www.healthybuilding.net/uploads/files/environmental-impacts-of-polyvinyl-chloride-building-materials.pdf>
- ³¹<http://www.trwnews.net/Documents/Dioxin/dioxelimination%20imperitive%20greenpeace.pdf>
- ³²<http://www.trwnews.net/Documents/Dioxin/dioxelimination%20imperitive%20greenpeace.pdf>
- ³³<http://chm.pops.int/Implementation/BATBEP/BATBEPGuidelinesArticle5/tabid/187/Default.aspx>
- ³⁴<http://www.healthybuilding.net/uploads/files/environmental-impacts-of-polyvinyl-chloride-building-materials.pdf>
- ³⁵<http://www.plasticsnews.com/article/20130906/NEWS/13090958/chinas-pvc-pipe-makers-under-pressure-to-give-up-lead-stabilizers>
- ³⁶<http://chej.org/campaigns/pvc/resources/reports-on-the-hazards-of-pvc/>
- ³⁷https://noharm-uscanada.org/sites/default/files/documents-files/104/Grn_Bldg_PVC_Alternatives.pdf
- ³⁸http://www.chej.org/pvcfactsheets/PVC_Policies_Around_The_World.html
- ³⁹<http://www.greenbiz.com/news/2005/12/08/microsoft-other-major-companies-complete-phase-out-pvc-plastic>
- ⁴⁰<http://www.healthybuilding.net/uploads/files/environmental-impacts-of-polyvinyl-chloride-building-materials.pdf>