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## Commentary

## The latent causal chain of industrial water pollution in China

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## ABSTRACT

The purpose of this paper is to discover the latent causal chain of industrial water pollution in China and find ways to cure the wanton discharge of toxic waste from industries. It draws evidences from the past pollution incidents in China. Through further digging the back interests and relations by analyzing representative cases, extended theory about loophole derivations and causal chain effect is drawn. This theoretical breakthrough reflects deeper causality. Institutional defect instead of human error is confirmed as the deeper reason of frequent outbreaks of water pollution incidents in China. Ways for collaborative environmental governance are proposed. This paper contributes to a better understanding about the deep inducements of industrial water pollution in China, and, is meaningful for ensuring future prevention and mitigation of environmental pollution. It illuminates multiple dimensions for collaborative environmental governance to cure the stubborn problem.

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## 1. Introduction

China is facing severe environmental challenges and the civil roar of environmental protests (Wang, 2010; Wang et al., 2012). A news report revealed “up to 40% of China's rivers are seriously polluted” and “20% were so polluted that the water is too toxic to touch” (Jian, 2012). China's polluting companies are critical contributors to the toxicity as is evident by the frequent outbreaks of pollution incidents caused by toxic substance discharged into rivers and lakes. According to information from the former State Environmental Protection Administration of China (a sub-ministry of the government, was upgraded to Ministry of Environmental Protection of China), water-related pollution incident occurred in average two or three days since 2005; while the Ministry of Supervision of China revealed that there were more than 1700 outbreaks of water pollution incidents each year in China (Xie, 2011). A survey reported by China Youth Daily showed that 71.8% of Chinese people are feeling under the threat of water pollution (China Youth Daily, 2013). 190 million people fall ill and 60,000 people die from diseases caused by water pollution every year in China (Qiu, 2011; Tao and Xin, 2014).

Driving force for companies to protect environment is mainly from governmental regulation with community participation and market demand as complementarities (Zhang et al., 2008). However, policy conflict and lacking of policy interactions make the pre-existing environmental regulations underperforming (Zhang et al., 2012, 2013a). This issue was attributed to laws (Cao and Prakash, 2012) and its solution was resorted to revising China's environmental laws (He et al., 2013). It had taken 25 years that China finally decided to pass the legislation on the revised Environmental Protection Law in late April 2014, but this just a good starting point and there is still a long way to go for success of saving China's environment. The revised law still has its limitations such as (1) only organizations registered above the city level will be able to launch lawsuits, so only around 300 non-governmental organizations (NGOs) qualify; (2) lawsuits are allowed only against polluters but the provisions for actions against enforcement authorities remain murky (Yang, 2014). Therefore, whether the revised law can achieve desired efficacy is still up in the air. What should China do besides the revised environmental law? What is needed to be further done to ensure effective implementation of the revised law? There are multiple dimensions that need to be considered.

China's water pollution has drawn extensive attention from diverse perspectives. Lan et al. (2011) identified that the incentives were incompatible and ill-aligned with environmental protection so that there was no strange for severe pollution in China. Dong et al. (2011) discovered in their research that environmental

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complaints from local citizen may contribute to efficient allocation of environmental inspection resources by regulators, and hence, they proposed to strengthen basic education and encourage environmental information disclosure to support more people to involve in environmental surveillance. Zhang et al. (2013b) highlighted the importance of designing water pollution trading policy to alleviate the severe river pollution in China. Wang and Yu (2014) gave a review on researches about protection of sources of drinking water in China, and they believed that water quality standards and high technology as well as legislation should be the focus of future search.

Literature shows that the causal chain effect originated in institution has not been paid special attention, while this causality has significant meaning for understanding the predicament and may give clue to find effective ways to cope with the predicament. This paper draws evidence from the past water pollution incidents in China to illustrate the causal chain effect and the deep root inducements for industrial water pollution in China. In the following, we use cases to develop theory about loophole derivations and causal chain effect, and propose ways for governance as complementarities of the revised environmental protection law.

## 2. Methodology

Frequent outbreaks of water pollution incidents in China result from accumulation of various risky factors that are not suitable to be explained by traditional technical perspective of risk management. The famous causal chain theory (Heinrich, 1959) and Swiss cheese model (Reason, 2000) about human errors are useful but need to be modified in exploring the deep roots of the incidents. Wu et al. (2009) and Tang et al. (2013) have analyzed a number of famous outbreaks of water pollution incidents from the perspective of human errors, and developed models and discussions about what behind human errors. However, certain deeper inducements and relations such as institution and governance have not been explored in their articles.

The following uses representative cases to extend theory and develop insights. Case based theory development has been used as a kind of methodology to develop logically self-evident analysis and draw insights (Miao et al., 2013). The logic of this paper is as follows: using multiple cases to provide facts and analyses about industrial pollution to water bodies in China; extending theory to identify and explain the latent causality and deeper inducements; providing case-based countermeasures, insights and theory to enlighten practice.

This paper extends the works of Wu et al. (2009) and Tang et al. (2013) through further digging behind interests and relations by analyzing representative cases, and proposes countermeasures to the root causes.

## 3. Materials and analyses

### 3.1. Analysis of representative cases

Below, using content analysis, we selected total 9 representative cases in a span of 9 years with each case in each year from 2005. Each case is one of the most known and influential water pollution incidents in that year. The facts come from official news reports with partial information from reliable journal articles. Therefore, the cases are typical and representative.

Case 1: The Songhua River contamination. On November 13, 2005, more than 100 tons of nitrobenzene and related compounds were discharged into the Songhua River because of the world-shaking explosion of an aniline production factory of the Jilin Petrochemical Company (Li et al., 2008), which, however, claimed

in the subsequent days that the explosion produced only carbon dioxide and water that will not cause pollution. Nine days past after the explosion, the residents in Harbin just learned the truth (Tang et al., 2005) due to the lying of the company and the concealment of the local government. In fact, just a few days before the explosion, the aniline production factory had experienced a “thorough maintenance check”, which did not really take effective measures and went through as a mere formality, and eventually led to the disaster. The contamination along the Songhua River from Jinlin to Harbin had been an unsolved long-term issue. Liu Yuzhu, a principal of Harbin municipal water supply company, stated that “countless times we contact with Jilin in dealing with the contamination from upstream, but each time the Jilin aspect presents a report to show that there is no harmful substance in the river, and hence, numerous contacts resulted in numerous conflicts; usually, the upstream uses the treatment plant when the investigation team come and shut it off when the team leaves” (Tang et al., 2005). The explosion incident reflects that the upriver company and the local government are indifferent to environmental externalities (Zhao et al., 2014), and lack ethics and responsibility. Self-serving attempt of the company and the local government make the prevention and control of contamination become empty talk. The central government cannot effectively supervise local governments, betraying loopholes in institution and governance. The Jilin Petrochemical Company was fined 1 million renminbi due to the Songhua River contamination (China Environment Net, 2007), while the Chinese government has to launch a plan costing 26.6 billion renminbi to cope with the contamination of Songhua River (China News Net, 2006). That is to say, the central government finally paid the bill for the contamination incident but the money actually came from the tax payers – the Chinese people.

Case 2: Arsenic contamination in Yueyang at Hunan Province. In September 2006, due to consecutive discharge of industrial wastewater from three chemical plants, high concentrations of arsenic in wastewater ran into the Xinqiang river, resulting in over 10 times of arsenic than permitted concentration in the local drinking water sources, threatening the living of 100,000 residents. Pan Yue, the deputy director of the Environmental Protection Administration of China, stated that “it seems that enterprises should take the responsibility but the real root is in the local government; local protectionism and nonfeasance are the real root cause of the incident (China Economy Net, 2006).

Case 3: Cyanobacterial bloom in Taihu Lake. In May 2007, due to the decomposition of a massive cyanobacterial bloom that was triggered by illegal industrial discharges, an odorous tap water crisis affected two million residents for several days occurred in Wuxi (Zhang et al., 2010). Local governments’ loose supervision on local polluting companies is a major inducement of this crisis.

Case 4: Arsenic contamination in Yangzonghai at Yunnan Province. In June 2008, arsenic concentrations far above the permitted standard were detected in the highland lake Yangzonghai. 20,000 residents had to stop drawing drinking water from the lake. The arsenic contamination came from a local star company, which had been required to “rectification” for many times due to environmental problems, but it always can continue to operation. It had been fined 15 times with the maximum fine for a single time as 0.1 million renminbi and the accumulative total fine was 0.7139 million renminbi; however, from 2005 to June 2008, its income from sale is 615 million renminbi (Xinhua Net, 2008). It is definitely a shining local “industry nova” and contributed significantly to local Gross Domestic Product (GDP) increase and local fiscal levy, and accordingly, the penalty on it is negligible. The local supervision is a mere formality and is actually longtime in absence (Xinhua Net, 2008).

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