COMMENTARY

Risk Management: Lessons Learned From the Snow Crisis in China

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In January 2008, just before the Chinese Lunar New Year, 21 of China's 31 provinces were hit by an unexpected snowstorm. This large-scale snow was most intense in the usually warm southern China and the storm caused unprecedented havoc for millions of holiday travelers. While the direct economic damage was estimated to be $21 billion, the subsequent bill for infrastructure repairs, living allowances, and agricultural production restoration totaled nearly $35 billion. More than 100 million people throughout the country were directly impacted and more than 129 people died. This snow disaster tested the newly established Chinese emergency response system and exposed the weaknesses of the current risk management system.

China has long been a country plagued by natural disasters, but in today's more interconnected world, Chinese and international journalists, as well as Chinese bloggers are quick to disseminate information on earthquakes, floods, and landslides, as well as the growing number of serious pollution accidents, major disease outbreaks, and food safety incidents. Thus, the Chinese government has come under increasing pressure to show adequate responses to all types of major emergencies. The snow disaster offered Chinese officials many important lessons that were useful in responding to the subsequent earthquake in Sichuan Province in May of 2008.

CHINA RECEIVES A "VICIOUS SLAP FROM MOTHER NATURE"

As the Chinese New Year approached in January of 2008, many in China viewed the upcoming year as an exciting one with the summer Olympic Games opening in Beijing. Ironically, on January 10, just as many were speculating about excessively hot weather for the Games and with no warning from China's Meteorological Administration, the country was hit by a massive snowstorm. This snow marked China's coldest winter in 50 years and even in the past 100 years in some regions (Zheng, 2008). In total, 21 provinces in China were hit by snow and icy rain. (See Map 1). The icy rain and snow lingered for more than 30 days and even provinces that rarely receive excessive snow—such as Hunan and Hubei—were blanketed in heavy snow. The total number of consecutive days of icy rain broke the record in 56 counties of Guizhou Province ("Consecutive days," 2008). With more than half of a meter (18 inches), this storm shattered snow accumulation records from 1951 in parts of six provinces.

This snow disaster overwhelmed the Chinese transport and energy systems, wreaked havoc on food and agriculture, and tested China's fledgling risk management system. The snow halted all New Year's travel in the southern provinces, leaving five million travelers—from what is the world's largest annual migration—stranded. More than 2,850 trains were postponed, and over 3,000 flights cancelled and 5,550 delayed in the 15 days following the snowstorm. The travel woes hit hardest in Guangzhou, where more than one million migrant workers waited in the cold for nearly two weeks for trains to resume service—for most, trains did not start soon enough to return home ("Dynamic news," 2008).

Many more people in China experienced a cold and dark New Year's festival without electricity.

Some 8,000 freight trains were delayed, triggering the country's most serious power crisis as coal deliveries languished on stranded trains. A large number of power lines and towers collapsed

Map 1: Provinces and regions affected by the snowstorms and icy rains in China in January 2008

Source: Authors

under the heavy snow and ice. Parts of central and eastern China saw the worst power failures in the country's history. Nineteen provinces and regions suffered blackouts with some areas losing electricity for nearly two weeks, as was the case in Chenzhou, a city of 4.5 million people in Hunan Province ("Notice of the State Council," 2008). In Guangdong, emergency supplies of coal arrived on a fleet of 125 cargo ships.

Although most Chinese citizens blamed severe winter weather for the power crisis, policymakers are now being forced to admit their own role in the crisis by imposing low, state-set electricity fees that cause power generators to run in the red as coal prices leap. Recent crackdowns on small, unsafe coal mines also led to rising coal prices and shortages. With enormous efforts and investments, on February 6, 2008—almost a month after the storm began—power was restored at least partly to 164 of the 169 counties, including the most affected city of Chenzhou ("Electricity back," 2008). The energy problems following the snow crisis catalyzed more aggressive laws and standards to push for energy efficiency. A stronger amended *Energy Conservation Law* went into effect on April 1, 2008, and 46 national energy-saving standards were promulgated and implemented in the months following the snow disaster.

IMPROVING THE CHINESE RISK MANAGEMENT SYSTEM

Of course, it is easy to criticize China's energy and transportation sectors for poor infrastructure and design flaws that could not withstand the snowstorm. The political institutions also exacerbated the problems—most notable were the failures of the weather forecasting system to provide early warning of the snow and the subsequent slow responses of the central and local governments. However, it is more important to understand the fundamental institutional and management causes behind these problems. Learning from globally established models, a national risk management system should be based on the principles of prevention, preparedness, response, and recovery. The recent snowstorm tested the effectiveness of the country's nascent risk management system and indicated that many improvements are needed. Before reflecting on future changes, it is helpful to examine recent natural and pollution disasters that have shaped the Chinese government's actions in creating better emergency response and risk assessment systems.

Major Pollution Incidents and SARS Catalyze New Planning and Laws

China has been jolted by a series of pollution accidents and major disease outbreaks in recent years—such as the heavily reported Severe Acute

Respiratory Syndrome (SARS) outbreak in 2003, followed by the serious emergence of avian flu, the chemical spill into the Songhua River in 2005, and the toxic algae blooms on Lake Tai in 2007. The central government paid closer attention to emergency response capacity building after the SARS outbreak, which led to 685 deaths within China (including Mainland, Hong Kong, Macao and Taiwan) and 89 abroad. The Chinese government's initial cover-up and later mishandling of the outbreak led to considerable unwanted scrutiny, which prompted the formulation in 2003 of more than 100 emergency response plans at various levels in China. However, most of these were sector or subject-based (e.g., *Emergency Response Plan for Public Incidents of Beijing Municipality*, *National Emergency Response Plan for Environmental Incidents*) rather than integrated plans. Most problematic is the fact that these were quickly prepared campaign-style plans rather than true institution-building mechanisms. Furthermore, the current emergency management system focuses only on the responses to past disasters rather than anticipated or unseen crises.

On the heels of the November 2005 Songhua River chemical spill, China's State Council passed initial measures to establish a formal emergency management system, mainly dealing with natural disasters, catastrophic incidents, public health, and social security issues. On January 8, 2006, when the State Council officially issued the *National Emergency Response Plan*, all the provinces and municipalities had completed their plans, which provided guidelines for officials dealing with different emergencies. These guidelines boosted China's crisis management capacity. *The Emergency Response Law*, which came into effect on November 1, 2007, put into effect the principals of "protecting the security of public lives and property and rescuing humans after sudden incidents." About two months later, the new law was challenged by the snowstorm. Effective responses to this snow disaster demanded coordinated and integrated measures between transportation, power, and communication sectors and public health authorities. However, as the emergency response plans remained simply principles on paper, it is not surprising that miscommunication and inaction by some government authorities were observed during the snow disaster.

Struggles in Top-Down Coordination

Arguably, a formal institutional network for comprehensive emergency management was nonexistent in China before SARS, which was a major shortcoming that the central government tried to address by creating the National Emergency Response Office (NERO) to act as a liaison between the State Council and other governmental authorities in 2006 right after the Songhua spill. Although NERO is responsible for coordination among different organizations and mobilizing resources needed in cases of emergency, given its limited capacity and authority, it performed poorly during the snowstorm. For example, NERO did not issue the "Notice of Low Temperatures and Heavy Snow" until January 21.

The poor coordination during the snowstorm led the State Council to set up an ad hoc national Command Center on January 28 (nearly three weeks after the snow started) to coordinate relief work and direct operations in the coal, oil, and power sectors ("The State Council," 2008). Six offices were established under the Command Center during the first three days and dealt with the following areas: (1) transportation of coal, power, and oil; (2) road repairs; (3) power line repairs; (4) rescue and market safeguards; (5) post-disaster restoration; and (6) news media and public outreach. These offices marked an important model for better disaster preparedness, as was demonstrated during the earthquake in Sichuan in May 2008.

During the Sichuan earthquake (Wenchuan earthquake) the government coordinated a national first-class response to the disaster. The State Council's Earthquake Relief Headquarters, headed by Premier Wen Jiabao, was established several *hours* after the earthquake. Eight working groups dealing with rescue, forecast and monitoring, medicine and sanitation, infrastructure, production recovery, living resettlement, security, and publicity were organized rapidly. Although NERO played an active part in collecting and releasing information (e.g., number of deaths), it did not act as a leading organ or coordinating backbone in the disaster relief. Although the ad hoc response center did function well, ideally the Chinese government should have empowered NERO—potentially drawing on the experiences of American and European systems—to become a more effective management system covering prevention, preparedness, response, and recovery, and the formulation of strategic guidelines for risk management. NERO and its provincial counterparts also need specific training to enhance the management skills and understanding of risk management.

Using the principles of prevention, preparedness, response, and recovery, Table 1 outlines some of the weaknesses of China's emergency management system in response to two pollution incidents (the Songhua River chemical spill and the Lake Taialgae bloom) and two major natural disasters (the snowstorm in southern China and the Wenchuan earthquake). All four cases took place within the past four years and each demonstrated insufficient prevention and inadequate preparation.

Uneven News Reporting

Apart from the important role of the government, a quick response from the news media is crucial for decision-making and communication with the public when a disaster occurs. A review of the news records by Chinese Central Television (CCTV) shows that 68 'snow' news items were released from January 11 to 31, of which only 8 articles were published during the first 10 days. Strikingly, no news was reported between January 14 and 16. These gaps in reporting may be linked to the restrictions placed on journalists after the Songhua River incident, during which the Chinese news media responded quickly and carried out fairly critical investigative reporting into failings by local governments in preventing and reporting the accident. Following the Songhua incident journalists were required to get permission from editors before reporting on environmental accidents and natural disasters. China's news outlets are often ordered not to report on such crises. In contrast to the news media during the Songhua River spill, none of the news content during the snow disaster was critical about the performances of the local governments in the crisis. Moreover, some news stories were even misleading. For instance, the news reports on January 23 declared that the train system was back in order, causing thousands of passengers to push back into the Guangzhou railway station even though the trains were not yet running normally. During the snowstorm the public's right-to-know was not fully protected. The passage of the 2008 Open Information Measures did lift some of the restrictions on journalists. If the news media in China can play its proper role in disaster communication, the Chinese people would benefit from better decision-making.

However, the situation is changing, as can be seen in the Wenchuan earthquake just 12 days after the *Decree of Government Information Openness* was put into effect on May 1, 2008. Notably the new open environmental information measures passed on the same day made misleading and restricted reporting illegal, allowing for much freer reporting during the earthquake. As Table 1 noted, the response time and access to information linked to the Wenchuan earthquake was significantly better than what occurred in previous disasters. Ultimately, timely and sufficient information played a crucial role in decision-making for rescuing people and mitigating losses following the earthquake ("Three breakthroughs," 2008).

CONSIDERING THE ENVIRONMENTAL AND HEALTH IMPACTS OF THE SNOW CRISIS

This crisis also raised questions about environmental and ecological protection in China. Scientists say the snowstorms in China were not directly linked to climate change, but simply an extreme event caused by very cold winter temperatures and a La Niña weather pattern. However, the devastating snowstorms show that China and rest of the world must prepare for possibly increasing and new types of disasters. The storm underlined the need for greater global cooperation on global weather forecasting. Following the lead of many countries that set up key bodies on climate change, China should identify and support science to provide reliable forecasting.

The snowstorms also indicated a need for energy efficiency, which could have helped maintain power to affected areas, and green technology to help in disaster relief. Regarding the latter point, during the snowstorm an average of 60,000-100,000 tons of chemical snow-thawing agents were used in each of the affected provinces. Some researchers have pointed out that the use of these chemical snow-thawing agents has polluted drinking water, damaged or even destroyed plants and animals, and increased saline in soils in Guangdong, Anhui, Jiangsu and Hubei provinces (Peng & Lai, 2008; Wang, 2008).

The direct and indirect ecological impacts of the snowstorm also should not be ignored, especially on forest ecosystems. One-tenth of China's total forested area was destroyed in the snowstorm, which resulted in habitat loss and starvation of many kinds of wildlife (Pan, 2008). The potential, cumulative, and long-term effects of the storm on natural ecosystems will need further research to understand the full extent of the damage.

Table 1: Weaknesses of the Risk Management System in Major Accidents in China

INCIDENT	TIMELINE	WEAKNESSES
Songhua River Chemical Spill (2005)	13 November Explosion at a petrochemical plant in Jilin City, Jilin Province; officials do not notify downstream Harbin city in Heilongjiang Province until eight days later. 21 November Harbin officials cut off water to the city, initially explaining it was for routine maintenance, but public outcry leads to admission about the spill, catalyzes massive news media coverage. 22 November State media says water could have been contaminated after the blast; PLA sent in to bring water to Harbin. 23 November Authorities admit very high levels of benzene have been found in the water. 25 December The polluted water flows into Russia.	Insufficient prevention: Poor governance of chemical enterprises; unsound industrial arrangements; no alternative drinking water sources. Lack of preparation: Petrochemical plant, provinces, and cities lack emergency plans, skills, and technologies to deal with pollution emergencies; no plans for industrial accidents or public information systems. Bad response: Tight control of information in Jilin and Harbin; slow handling of the case; insufficient communication with the public; uncoordinated government agencies at all levels; inappropriate mitigation measures; insufficient emergency response equipment; uncooperative actions by some officials. Difficult recovery: Studies of short-, medium-, and long-term impacts on human health should be conducted; survey of risk assessment at a random sample of Chinese chemical factories needed; aquatic toxicity research should be promoted; cooperation and coordination between China and Russia over the incident should be improved; lessons learned from the incident should be incorporated into legislation and policy enforcement.
Algae Bloom of Lake Tai Lake (2007)	7 April Blue-green algae fans out across Lake Tai. 25 April The algae bloom reaches Meiliang Bay in Lake Tai. 28 May A severe algae outbreak causes water quality to deteriorate, tap water becomes undrinkable for 2.3 million residents in Wuxi City, Jiangsu Province. 29 May Algae bloom threatens water for millions; local residents flock to buy bottled water and bread; local governments take emergency response measures. 1 June The water quality improves; crisis is relieved for the short term. 4 June Water supplies are fixed.	Insufficient prevention: Too much industrial waste discharge; poor governance of industry and agriculture; no alternative drinking water sources. Inadequate preparation: Shortage of pure water; undeveloped emergency response plans and technologies. Imperfect response: Timely yet ineffective (or short-term) solutions; completely inaccurate labeling of the algae bloom as a "natural disaster;" lack of collaboration at all levels of government. Long-term recovery: Uncoordinated government agencies for Lake Tai pollution control; aggressive long-term recovery strategy.

Table 1 (continued)

INCIDENT	TIMELINE	WEAKNESSES
Snowstorm in Southern China (2008)	10 January Epic snowstorms start to slam central and southern China. 22 January The National Emergency Response Office (NERO) releases an urgent notice for preparation and relief of the snow disaster. 25 January Snow disasters exacerbate; trains and aircraft in southern China are almost completely paralyzed. 26 January Coal shortage; 19 provinces and regions suffer blackouts. 27 January More than 100,000 passengers stranded at Guangzhou Railway Station; the China Meteorological Administration issues a red alert warning of more snowstorms and blizzards in central and eastern China. 28 January The snowstorm spreads to 14 provinces and cities in China, affecting nearly 100 million people. 29 January The China Meteorological Administration issues its second red alert warning. 1 February The disaster relief and emergency command center under the State Council is established. 5 February The snow stops. 6 February Snow-plagued residents in central Chinese cities bid farewell to darkness. 9 February China's snowstorm-hit areas begin to recover gradually.	Insufficient prevention: Incomplete road systems; unsuitable power transmission lines; antiquated and inefficient power grid; vulnerable infrastructure; inadequate energy supply; inadequate emergency consciousness and knowledge among officials and citizens. Lack of preparation: Overburdened railways; uncoordinated government response from the top down; separate and narrow emergency response plans; uneven news reporting; unsatisfactory weather forecast system. Slow response: Ineffective response measures; uncoordinated actions; poor communication with the public; ineffective alarm system; uncoordinated mechanism for sudden incidents; nontransparent information. Difficult recovery: Slow recovery of power lines and grids on a large-scale; damage to agricultural and industrial production.
Wenchuan Earthquake (2008)	14:28 Beijing time, 12 May A massive earthquake measuring 8.0 on the Richter scale strikes Wenchuan County, Sichuan Province. 15:40 Beijing time, 12 May National Emergency Response Plan started up. 21:00 Beijing time, 12 May The Command Center for Disaster-Relief of the State Council is established; Premier Wen Jiabao is the commander; eight working groups are organized. 12-15 May A 72-hour period of relief; troops arrive in the affected areas. 4-8 June "Regulations on Post-Wenchuan Earthquake Rehabilitation and Reconstruction" adopted at the 11th executive meeting of the State Council on June 4 and come into effect on June 8.	Insufficient prevention: Poorly constructed buildings; inadequate relief materials; unsuitable urban planning. Inadequate preparation: Unsatisfactory earthquake prediction system; impractical emergency response plans. Timely response and open information: Effective anti-crisis strategy: Command, Control and Communication; uncoordinated and highly helpful spontaneous citizen assistance and donations. Hard recovery: Integrated post-earthquake evaluation needed; extensive reconstruction of infrastructure; human health and psychological therapy required; catastrophe models research needed.

Stranded passengers in Guangzhou railway station.
Photo Credit: Authors

In the background of natural and anthropocentric environmental changes, sufficient public awareness and general knowledge about risks can help reduce damage during disasters. The public should learn about different weather events, their causes and effects, and the regions most likely to experience them. Surveying and researching public health is necessary for building disaster response and prevention capacity within public medicine and sanitation organizations ("The retrospective survey,"2008).

FUTURE CONCERNS

In order to ensure people's health and safety in snow affected areas, the governments had to take precautious measures to prevent the outbreak of infectious diseases. Geological disasters resulting from melting snow should be closely monitored because there are many mountains in southern China where landslide accidents often take place. Between January and March 2008 more than 2,000 instances of snow-melt-induced landslides occurred across Hunan, Hubei, Anhui, Guangxi, Guizhou, and Jiangxi provinces. One major landslide took place in Sichuan two months after the snowstorm (March 22), which caused seven deaths (CIGEM, 2008).

The snow also called into question whether the Chinese government can successfully control inflation. The low temperatures and snow destroyed many vegetable, tea, grain, and fruit crops in China's usually temperate south, leading to food scarcity and higher prices. Clearly China's risk management system needs to include solutions on how to recover agricultural production following a severe weather disaster.

The disaster took a short-term toll on China's economy. However, the snow has also exposed deeper structural problems in the economy. Massive transportation bottlenecks and power shortages are a reminder that, despite years of intense growth, China still has a tremendous need for investment in roads and other infrastructure. Those issues will not melt away with the snow and dealing with these weaknesses is a crucial part of a truly comprehensive risk management system.

Like the SARS outbreak, the snowstorm and earthquake incidents temporarily slowed the economy and caused short-term pain. In the past, the Chinese government has used ad hoc measures to adequately respond to the immediate impacts of disasters, but more needs to be done to coordinate agencies, improve follow through after initial crises, and take measures to better anticipate disasters.

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