

TO BEIJING AND BACK: A MIDWESTERN'S VIEW OF CHINESE MINE RECLAMATION¹

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Abstract: Dr. Zhenqi Hu of the China University of Mining and Technology, Beijing, organized the 2010 "International Symposium on Low-Carbon Development and Land Reclamation Policy." The meeting was from November 20-21 in Beijing, and I was invited to present a paper at the symposium by Professor Hu. In addition, he invited me to give lectures on reclamation at his university. I also gave a lecture at Shandong Agricultural University at Tai'An, which is south of Beijing about 260 miles. I stayed in China long enough to visit mine sites near Jining and cultural venues in Beijing and near Jining, including Confucius' compound. This presentation recounts my experience visiting China and includes my observations on the similarities and differences in the American (Illinois) and Chinese approach, attitudes, and techniques in regard to mine reclamation. My presentations in China included a recap of the impact of longwall mine subsidence in Illinois. This is a still-controversial mining technique despite a near decade of research into its agricultural impacts. I also spoke on surface mine reclamation in Illinois, where many of the mines are on Prime Farmland and reclamation is held to a high crop productivity standard. The coal industry is very active in China, and their need for good reclamation is acute given their vast population and high density.

Additional Key Words: Longwall Mine Subsidence, Surface Mine Reclamation, Regulatory Agencies.

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Introduction

Dr. Zhenqi Hu of the China University of Mining and Technology, Beijing, the Richard and Lela Barnhisel Reclamation Researcher of the Year award winner in 2009 and a Life Member of ASMR, organized the 2010 “International Symposium on Low-Carbon Development and Land Reclamation Policy.” I was invited to present a paper and give a lecture at his university. I stayed long enough to visit mine sites and cultural venues. There are similarities and differences in the American (Illinois) and Chinese approach, attitudes, and techniques in regard to mine reclamation. Land ownership is conceptionaly much different in China than in the US, and this has an influence on attitudes and practices. Subsidence from longwall mining is much greater in the parts of China I visited as compared to Illinois, where I have worked. In Illinois, longwall mining is a still-controversial mining technique despite a near decade of research into its agricultural impacts. The coal industry is very active in China, and given their high population densities, their need for good reclamation is acute.

Coal Mining Facts, China

China is the most important coal mining and burning country in the world; it produces about 40% of the world's coal (Table 1). Coal is far and away the most important energy source for China and 96% is from underground mines (Hu and ChangHua, 2003). The coal industry employs about 5 million people in China, and is considered the most dangerous industry in the world (Wright, 2004). Recent official Chinese statistics show the death rate per million metric tons of coal produced is 2.63, a considerable improvement since 2002, when it reached a peak of 6.995, but still about 100 times the death rate in the US. In addition, the Chinese State Administration of Work Safety (SAWS) reports that about 600,000 miners suffer from pneumoconiosis, attributable to coal dust inhalation. In addition, the figure increases by 70,000 miners every year. In 2003, the average coal miner in China produced 321 tons of coal a year; which is only 2.2 percent of that in the United States (http://en.wikipedia.org/wiki/Coal_mining: http://www.chinadaily.com.cn/english/doc/2004-11/13/content_391242.htm). To increase safety and efficiency, the Chinese coal industry has moved very aggressively to longwall mining, which has the added environmental cost of subsidence. Longwall mining in Illinois typically causes about 1-2 m of subsidence; however in China subsidence of 6-12 m may be more typical due to thicker seams with thinner overburden covers.

There are not many English language publications readily available on mine subsidence mitigation in China despite the very impressive facts. Much of the published materials in English about mine reclamation and related activities are found in ASMR proceedings. Professor Hu, my host in China, has frequently presented at ASMR. His reported works include a GIS approach to reclamation (Wang and Hu, 2009), reclamation planning and evaluation papers from North-East China (Zhao et al., 2002) and from Western China (Hao et al., 2009), and fly ash utilization for reclaimed soil improvement (Hu et al., 2004). Published subsidence papers about China include subsidence from non-coal related processes (Yu-Qun et al., 2005), on aquifer impacts of mine subsidence (Zhang et al., 2004), and on filling vs. non-filling methods of subsidence reclamation (Hu and ChangHua, 2003). Some research has also been published on soil properties of reclaimed subsidence minesoils (ZhengFu and GuoLiang, 1999), and on peasants' opinions of reclaimed land (JingJing et al., 2010), and on (Fu et al., 2009).

Table 1. Three largest coaling nations.

Country	Coal Mined (Mt, 2009)	Electricity from Coal (%)	Proven Reserves (% of world's)	Years Until Domestic Coal Gone
China	2,971 (40% of world)	69	13	38
USA	919	49	23	245
India	526	50	7	105

Source: Wikipedia: (http://en.wikipedia.org/wiki/Coal_mining)

International Symposium on Low-Carbon Development and Land Reclamation Policy

The Chinese government realizes it has to address the impacts of mining and the coal industry on its rapidly industrializing economy. Awareness of the environment and concepts of environmental protection are growing in China, and consequently the China Center for Land and Resources along with the China Mining Association organized the “International Symposium on Low-Carbon Development and Land Reclamation Policy.” It was held in Beijing from November 20-21, 2010 (Fig. 1). I was invited to present a paper at the symposium by Professor Zhenqi Hu (Fig. 2) of the China University of Mining and Technology. I was one of the invited foreign speakers and presented a talk on the US and Illinois approach to surface mine reclamation and subsidence mitigation (Fig. 3). The written program was essentially all Chinese with some abstracts in English. The presenters were predominately speaking in Chinese with the exception being the foreigners, who spoke in English. The presentations were simultaneously

translated into either English or Chinese, an impressive feat. One of the speakers was from a Chinese petroleum company. If I followed the presentation properly, my understanding was that he argued that if his company spent a lot of money on reclaiming an area after they had impacted it in their mineral extraction activities, the company should own it after they were finished. In addition, I heard the translator say that the speaker commented on the problem the company faced with peasants trying to occupy the company's reclaimed land. I thought these were two statements that would unlikely be heard in an American reclamation conference.



Figure 1. Attendees at the 2010 International Symposium on Low-Carbon Development and Land Reclamation Policy, November 20-21, Beijing China.

The day before the symposium, I gave a lecture at Dr. Hu's university, the China University of Mining and Technology (CUMT) in Beijing (Fig. 4). This is a leading mining-related university in China, and is considered a Key National University. As such, it is under the direct administration of China's Ministry of Education. CUMT has two campuses, at Xuzhou and Beijing. The Beijing campus is nearby the symposium site in Beijing (Table 2). I spoke about the approaches in the US and Illinois towards surface mine reclamation and subsidence mitigation. The students were attentive and interested.



Figure 2. Professor Zhenqi Hu presiding over the November 20-21, 2010 International Symposium on Low-Carbon Development and Land Reclamation Policy.



Figure 3. Foreign speakers and Chinese hosts at the Beijing symposium.



Figure 4. Stele at the Beijing campus of the Chinese University of Mining Technology (CUMT); Professor Hu's colleagues and graduate student.

Table 2. Universities visited in November, 2010.

University	Founded	Location	Enrollment		Area	Colleges	Faculty/Staff
			Undergraduate	Graduate			
CUMT	1909 / 1978	Xuzhou / Beijing	25,000 / 3,900	5,000, 2,400	297 ha, 21 ha	19; 9 schools	3,000/665
Shandong Agricultural	1906	Tai'An	30,000	2,000	5,145 mu ¹	19	860 Fac.

1. A mu is a traditional Chinese measure of area, 1 mu = 0.07 ha or 0.16 ac.

Tour of Mine Subsidence Areas near Jining, China

After the conference, we flew to Jining, an area of active mine subsidence from longwall mining. Jining is about 340 miles south of Beijing and it also is an important agricultural area (Table 3). We met with mining officials and they presented a video showing their subsidence mitigation activities (Fig 5). The presentation was in Chinese, but from what I gathered, they either turn subsidence troughs into fish ponds or backfill them to permit conventional agriculture. Materials they use for filling the subsided areas include Yellow River sediment, which is hydraulically transported to the sites, and fly ash plus other mine wastes.

Table 3. Cities visited in November 2010.

City	Area (mi ²)	Population (x10 ⁶)	Density (#/mi ²)	Lat. N	Lon. E	MAAT (C°)	MAP (mm)	Elevation (m)
Beijing	6,487	22.0	3,391	39° 55'	116° 24'	12.5	572	44
Jining	4,126	8.0	1,945	35 24	116 34	-	-	40
Qufu	-	0.6	-	35 36	117 02	15	680	74
Tai'an	3,000	5.5	1,835	36° 10'	117° 07'	12.9	697	163

Source: Wikipedia.



Figure 5. Meeting with mining officials in Jinan, a major mining area.

The subsided areas appear as dark irregularly shaped areas on aerial photos (Fig. 6). Population density is high throughout China and preservation of agricultural land is a priority. Traditional land use patterns near Jining include very dense villages surrounded by agricultural fields (Fig. 6). Where subsidence underlies a small village, I was told the entire village is moved. Where practicable, subsidence troughs are converted to fish ponds (Fig. 7). At the time of my visit, the upland sites were in wheat cultivation (Fig. 8), and the fields of wheat I saw looked good. Sites that were reclaimed as fishponds were large rectangular water bodies where I was told the water was 8 m deep (Fig. 9).



Figure 6. Image from Google Earth showing subsidence impacts near Jining, China.

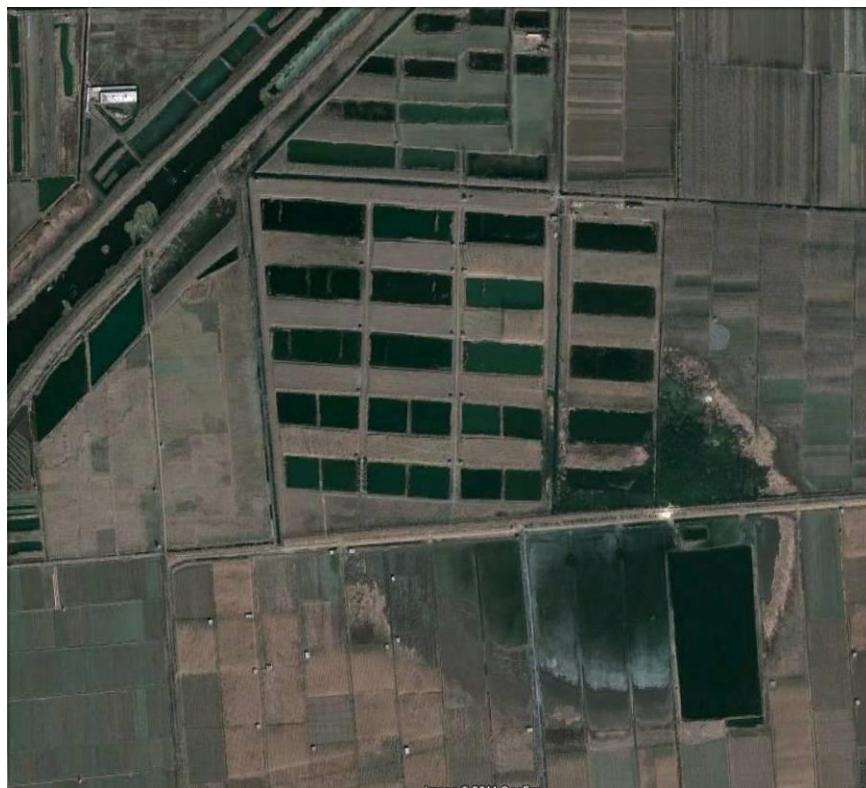


Figure 7. Image from Google Earth showing fish ponds made in longwall mine subsidence troughs near Jining, China.



Figure 8. Mining officials at a reclaimed subsidence area, now in wheat production.



Figure 9. Tour of longwall subsidence ponds near Jining, China.

The mining officials, who conducted the tour, were obviously very proud of their reclamation success (Fig. 10). They invited the local press and, I gave an impromptu presentation of my impressions of the reclamation area on camera for a TV reporter. Where and when that interview was shown, I have no idea.



Figure 10. Proud mining officials posing at successful subsidence reclamation site.

Later on in the week, I also lectured at the Shandong Agricultural University in Tai'An (Tables 2, 3; Fig. 11). I gave a similar lecture to the one I gave at CUMT. The students there were also very attentive, yet hesitant to try out their English language skills with a foreign native English speaker. But with some encouragement from a visiting Chinese Professor, whose skills with English were noteworthy, I got a few questions from the students.



Figure 11. Gate to Shandong Agricultural College, Tai’An, China.

Tourist Activities

After the Jining mine subsidence activities and before the lectures at Shandong Agricultural University, we traveled to Qufu, the ancestral home of Confucius. We visited his home, temple, and cemetery, where 100,000 of his closest relatives are buried. After Qufu, we ascended Mount Tai, a holy mountain and popular spot for tourists to watch the sunrise. It was on Mount Tai that Mao is said to have exclaimed that “The East is red.” After the lecture at Shandong, we traveled north from Tai’An back to Beijing. Rounding out my visit, we toured the Forbidden City and climbed the Great Wall at Badaling (Fig. 12).



Figure 12. Coal stored at the base of the Great Wall near Badaling., China.

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