

Designing Water's Future



CASE STUDY:

China

REIGN OF SAND:
DESERT OVERTAKING CHINA'S
INNER

THE ASPEN
DESIGN CHALLENGE
TO STUDENTS



REIGN OF SAND:
DESERT OVERTAKING CHINA'S INNER MONGOLIA

The blowing sands of Inner Mongolia, where the desert is expanding faster than almost anywhere on Earth, has attracted advocates of all stripes in China. One of them is Chen Jiqun (pronounced *chun gee chun*), an artist who specializes in landscapes and portraits and whose work is in the prestigious permanent collection of the National Gallery. Chen is now one of the leading grasslands conservationists in China, an articulate advocate for herders and their nomadic grazing patterns, which he is convinced are key to saving the grasslands.

Chen was 20 years old in 1967 when he decided to go to East Ujumchin Banner, a section of eastern Inner Mongolia 600 hundred miles north of China's capital. Inner Mongolia during that period was a place of astonishing beauty and harshness. Though the air rarely was still and the ground was dry, great expanses of tall grass swept to the horizons, unfurling like a great waving sea beneath surpassingly huge skies. Summers were short and hot. Winters were ferocious, marked by blizzards and knife-edge cold.

Though the central government discouraged self-identity by almost every means imaginable, thousands of Inner Mongolians, a people distinguished by sturdiness and stamina, followed the nomadic ways of their heirs, freely herding livestock from one range to the next. Chen Jiqun stayed for 13 years, working different jobs on the land as he painted. He spent a few of those years as a semi-nomadic shepherd.

Even when he departed Inner Mongolia in 1980, Chen, now 60 years old and living in Beijing, did not really leave. He visited frequently to see friends and to paint. The grasslands of Chen Jiqun's student years live in his paintings. Vast landscapes filled with horses galloping between herds of sheep, goats, and cows grazing on foot-high grass on the banks of rippled rivers.

Those paintings, drawn from personal history and memory, could now just as easily fall into the category of artistic fantasy. The grasslands of Inner Mongolia and other



northern Chinese provinces are dying, turning into mini-deserts that grow and connect, forming oceans of sand. In some regions of the province, 70 percent of the grasslands have turned to desert. Inner Mongolia, according to conservative estimates, is losing 1,500 to 2,000 square miles annually to the desert, or an area every five years about the size of New Hampshire.

During the first decade of the 21st century, the conditions that scientists say produce the storms—drier climate, heavier winds, severe water shortages, over-grazing, population growth, and a clash between nomadic herders and the government over range and farmland management—worsened. Many of the same conditions that produced the American Dust Bowl in the 1930s, an environmental calamity and human tragedy that journalist Timothy Egan called the “worst hard time” in United States history, are being replicated in China with even graver consequences for the land and for people in and outside China who are directly affected by the sand storms.

The dimensions of the disaster, like the gravitational pull of a heavy magnet, attracted Chinese scientists, prompted a nascent national environmental movement to take note, and spurred calls for action from other nations—Japan, South Korea, the United States—that choke on China’s dust. And for good reason.

In 2001, dust from a violent storm closed airports in Korea and blew all the way across the Pacific, obscuring visibility in the Grand Canyon. A year later, on April 12, 2002, South Korea was engulfed by another dust storm from China that left people in Seoul literally gasping for breath. Koreans have come to dread the arrival of what they now call “the fifth season”—the dust storms of late winter and early spring. In March and April 2006, Beijing, the Chinese capital, was enveloped eight times by choking storms.

COSTS OF DESERTIFICATION

Most importantly, the dust and sandstorms, along with the growing expanses of extremely dry and eroding grasslands and desert from which they are born, threaten the livelihoods of 400 million Chinese. Sandstorms driven by 80 mile-per-hour winds that can last days are putting severe stress on China, causing roughly \$1 billion in damage annually, according to the Chinese government. An Asian Sahara of sand is moving closer every year to Beijing, blackening the sky and producing environmental refugees and social unrest in Inner Mongolia and throughout China.

“Desertification is not a natural function,” said John D. Liu, an American-born journalist, researcher, and director of the Environmental Education Media Project for China, a 10-year-old environmental organization based in Beijing. “Scientifically what’s happening is that the grasslands are losing natural infiltration and retention of water, which is altering respiration and evaporation rates. That affects relative humidity, and potentially precipitation in other regions.”



“Socially and politically what you are talking about are policy decisions made in earlier eras – from the 1950s to the 1990s – and now those mistakes are really biting them,” added Mr. Liu, who’s lived and worked in China since 1979, when he helped open the CBS television news bureau in Beijing. “They have to deal with the decisions made in those years.

And in Inner Mongolia those decisions have produced some horrific consequences. Large areas of the region have been massively devegetated.”

GRASSLANDS OLYMPICS

As Beijing prepares for the 29th Olympic Games in August 2008, the dust storms and deteriorating condition of Inner Mongolia’s grasslands have also become a priority of Chinese environmental scientists and agronomists.

During the first of week of July, China will host the International Grassland and Rangeland Congress in Hohhot, the capital of Inner Mongolia, a high plains city of 2.3 million people. Hong Fuzeng, head of the preparatory committee of the 2008 Congress and a grasslands scientist, said the conference will focus the attention of 3,000 rangeland experts from around the world on the environmental, demographic, and industrial trends that are turning Inner Mongolia’s grasslands to desert.

The blowing sand, in short, is more evidence of the consequences of the irrational duel China fights daily as it promotes rapid industrial development while exposing land, water, communities, and people to levels of pollution, waste, and resource diminishment never before seen on the planet.

China is the most polluted country on Earth. Its air and water consistently rank among the dirtiest anywhere. The World Health Organization estimates that pollution causes an estimated 750,000 premature deaths annually in China, the majority among the elderly and children.

There are economic costs as well. Earlier this year, the World Bank conservatively estimated that the cost of China’s environmental degradation is 3.5 percent to 8 percent of the gross domestic product annually. The cost of desertification caused by water scarcity alone, said the bank, is roughly \$31 billion a year. While many finance theorists predict that China may become the preeminent industrialized nation this century, environmental economists say China is outrunning the capacity of its natural resources to sustain such rapid development, and could instead experience a frightening ecological collapse.



FUN AND NOT-SO-FUN FACTS:

- The province's thin soil, 15 inches of rainfall annually, and nomadic herders once supported one of the planet's most robust wild ranges, a grass ecosystem nearly twice as large as France.
- Since 1980 desert has claimed 2 million acres of cropland, nearly 6 million acres of rangeland, and 16 million acres of forests in northern China.
- The steady desertification of northern China has put the world's fastest growing economy and 500 million people at risk of sandstorms, health effects caused by blowing sand, and food shortages prompted by severe drought and water mismanagement.
- China planted a 74-million acre "Great Green Wall" of trees, 2,800 miles long stretching from the northeast, through Inner Mongolia to Xinjiang in the far west. The desert is killing the trees.

REPORTING: *W. Chad Futrell and the Woodrow Wilson International Center for Scholars China Environment Forum*
PHOTOGRAPHY: *Palani Mohan, Getty Images for Circle of Blue*



Mongolian herder, Qumege, pumps water outside her home in a village just north of Xilinhot. Eight to 10 families regularly use her well to provide water for washing dishes and clothes, bathing, and drinking.



A lone herder rides his horse through a dry lake bed west of Mandubaolage. Local people have watched Arxiot Lake be transformed from a 500-hectare lake deep enough to swim in to a 1000-ha desert in less than a decade as mines drain the groundwater and a recently constructed road blocks one of its feeder streams. The owners of the mines did not meet with any of the herders before fencing off the grasslands around the mines. The sandstorms that kicked up on this day are smaller than usual because of recent rain. The lake first went dry in 2003, and the resulting desert has doubled in size over the last 4 years.



A nomadic Mongolian herding family walks to find water, which will be transported on their bullock cart in the north of Inner Mongolia. Much of the once-green pastures of Inner Mongolia have turned into dust bowls because of drought and climate change, as well as overgrazing.



Badamsileng, a Mongolian nomadic herder, runs sand from a dry lake bed through his hands west of Mandubaoilage. Local people have watched Arxiot Lake be transformed from a 500-hectare lake deep enough to swim in to a 1000-ha desert in less than a decade as mines drain the groundwater and a recently constructed road blocks one of its feeder streams. The owners of the mines did not meet with any of the herders before fencing off the grasslands around the mines. The sandstorms that kicked up on this day are smaller than usual because of recent rain. The lake first went dry in 2003, and the resulting desert has doubled in size over the last 4 years.



A lone herder tries to protect himself from a sandstorm as his horse protests west of Mandubaolage. Local people have watched Arxiot Lake be transformed from a 500-hectare lake deep enough to swim in to a 1000-ha desert in less than a decade as mines drain the groundwater and a recently constructed road blocks one of its feeder streams. The owners of the mines did not meet with any of the herders before fencing off the grasslands around the mines. The sandstorms that kicked up on this day are smaller than usual because of recent rain. The lake first went dry in 2003, and the resulting desert has doubled in size over the last 4 years.



A Mongolian herdsman leaps over the remaining puddles of water on the diminished Arxiot Lake. Local people have watched Arxiot Lake be transformed from a 500-hectare lake deep enough to swim in to a 1000-ha desert in less than a decade as mines drain the groundwater and a recently constructed road blocks one of its feeder streams. The owners of the mines did not meet with any of the herders before fencing off the grasslands around the mines.



Mongolian herder Damubulinzhabu poses for a portrait on August 22, 2007, in Dongwu Banner. After pollution from the Dianhua Pulp Board Mill killed 50 of his sheep in 2000, Damubulinzhabu decided to take action. After numerous appeals to government officials failed to bring action, Damubulinzhabu and two others brought a legal suit against the mill, winning in December 2004. Though the headaches and nausea from drinking polluted water and breathing the noxious odors is subsiding, they are still moving as their grasslands remain polluted.



Mongolian herder Damubulinzhabu stands next to a heavily polluted lake adjoining his grasslands on August 22, 2007, in Dongwu Banner. After pollution from the Dianhua Pulp Board Mill killed 50 of his sheep in 2000, Damubulinzhabu decided to take action. After numerous appeals to government officials failed to bring action, Damubulinzhabu and two others brought a legal suit against the mill, winning in December 2004. Though the headaches and nausea from drinking polluted water and breathing the noxious odors is subsiding, they are still moving as their grasslands remain polluted.



PHOTOGRAPHY BY PALANI MOHAN / GETTY IMAGES

Mongolian herder Damubulinzhabu dips his hand in a heavily polluted lake adjoining his grasslands on August 22, 2007, in Dongwu Banner. After pollution from the Dianhua Pulp Board Mill killed 50 of his sheep in 2000, Damubulinzhabu decided to take action. After numerous appeals to government officials failed to bring action, Damubulinzhabu and two others brought a legal suit against the mill, winning in December 2004. Though the headaches and nausea from drinking polluted water and breathing the noxious odors is subsiding, they are still moving as their grasslands remain polluted.



PHOTOGRAPHY BY PALANI MOHAN / GETTY IMAGES

Mongolian herders in traditional dress look at the remnants of Arxiot Lake west of Mandubaolage. Local people have watched Arxiot Lake be transformed from a 500-hectare lake deep enough to swim in to a 1000-ha desert in less than a decade as mines drain the groundwater and a recently constructed road blocks one of its feeder streams. The owners of the mines did not meet with any of the herders before fencing off the grasslands around the mines. The sandstorms that kicked up on this day are smaller than usual because of recent rain. The lake first went dry in 2003, and the resulting desert has doubled in size over the last 4 years.



PHOTOGRAPHY BY PALANI MOHAN / GETTY IMAGES

Mongolian women dress for the day, wrapping lengths of material around them on the windy plains. Much of the once-green pastures of Inner Mongolia have turned into dust bowls because of drought and climate change, as well as overgrazing.



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Badamusileng, a Mongolian nomadic herder, poses for a photograph in his tent, or yurt, west of Mandubaolage. Much of the once-green pastures of Inner Mongolia have turned into dust bowls because of drought and climate change, as well as overgrazing.



PHOTOGRAPHY BY PALANI MOHAN / GETTY IMAGES

Herders watch over thousands of sheep in the beautiful landscape of Inner Mongolia. Much of the once-green pastures of Inner Mongolia have turned into dust bowls because of drought and climate change, as well as overgrazing.



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An unidentified Mongolian herder in traditional dress stands near a dried-up lake west of Mandubaolage. Local people have watched Arxiot Lake be transformed from a 500-hectare lake deep enough to swim in to a 1000-ha desert in less than a decade as mines drain the groundwater and a recently constructed road blocks one of its feeder streams. The owners of the mines did not meet with any of the herders before fencing off the grasslands around the mines. The sandstorms that kicked up on this day are smaller than usual because of recent rain. The lake first went dry in 2003, and the resulting desert has doubled in size over the last 4 years.



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A nomadic Mongolian herding family walks to find water, which will be transported on their bullock cart, on August 22, 2007, in the north of Inner Mongolia. Much of the once-green pastures of Inner Mongolia have turned into dust bowls because of drought and climate change, as well as overgrazing.



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Mongolian herders in traditional dress look at the remnants of Arxiot Lake west of Mandubaolage. Local people have watched Arxiot Lake be transformed from a 500-hectare lake deep enough to swim in to a 1000-ha desert in less than a decade as mines drain the groundwater and a recently constructed road blocks one of its feeder streams. The owners of the mines did not meet with any of the herders before fencing off the grasslands around the mines. The sandstorms that kicked up on this day are smaller than usual because of recent rain. The lake first went dry in 2003, and the resulting desert has doubled in size over the last 4 years.



PHOTOGRAPHY BY PALANI MOHAN / GETTY IMAGES

A paper mill looms over a lake on August 22, 2007, in Dongwu Banner. After pollution from the Dianhua Pulp Board Mill killed 50 of his sheep in 2000, Mongolian herder Damubulinzhabu decided to take action. After numerous appeals to government officials failed to bring action, Damubulinzhabu and two others brought a legal suit against the mill, winning in December 2004. Though the headaches and nausea from drinking polluted water and breathing the noxious odors is subsiding, they are still moving as their grasslands remain polluted.