



China's Environmental Challenges

BY ANDREW M. MCGREEVY

A Chinese farmer carries buckets of water across a dried-up pond during a severe drought in Shangba Village in southwest China's Chongqing Municipality, March 2010. © 2005 Imaginechina.

The People's Republic of China (PRC) is a mighty engine of population growth, food production, and economic power. Since 1950, China's population has more than doubled to 1.3 billion people and life expectancy has greatly increased. Once known for famines, China is now the world leader in many categories of food production including wheat, fruit, and meat. The PRC is the world's second largest economy—behind only the United States. China is already number one in many industrial factors, such as energy consumption, coal burning, and steel production, and some Chinese leaders want to expand the economy by 400 percent in the next ten years.

This new wealth comes with a high price. Many government officials, scholars, and citizens are concerned about China's worsening environment. American experts are writing of "environmental refugees" and "environmental disaster" in describing one of the "world's worst environments."¹ Satellite images show massive air pollution over China, and if the situation does not improve, the legitimacy of the central government may be jeopardized. Population growth, an increase in food production, and industrial expansion come with astounding environmental challenges and surprising responses.

Historical context is useful to understand China's present environmental dilemma. Mark Elvin's *The Retreat of the Elephants: An Environmental History of China* is an important work that reminds readers that parts of eastern China have been farmed for more than 4,000 years. Elvin links environment to the development of China's first dynasty for which historical records exist, "The Zhou Dynasty . . . was a civilization based on deforestation."² Long ago the central government established land use and control patterns that, to a certain extent, still exist today. Historian Ken

Pomeranz focuses on water control, the pursuit of national wealth, and the development of governing techniques during portions of the imperial period that make the same point when he concludes that "the Chinese state has been involved in ecological management for many centuries."³

To reach national goals for economic growth, China is now committed to manufacturing more automobiles and building nuclear power plants as well as coal-burning hydroelectric power plants. There is such an intense building frenzy for more factories, power plants, dams, reservoirs, pipelines, highways, railroads and airports that a current widely circulated joke among Chinese is that the national bird of China is the crane. Gigantic projects are underway to move more water toward Beijing. Formerly remote areas are being connected to the historic heartland in East China. Old patterns persist, but new demands are deforming the environment as never before. What follows is intended as an introductory overview of China's most critical environmental problems and their impact on land, water, and air as well as the health of the population.

Land

Readers less familiar with China's physical geography might first review this useful contextual information when considering land use and environmental issues.⁴ China can be divided into six environmental regions, but the eastern area along the Pacific Coast where most of the population, food supply, and economy are located is especially important.

Northeast. This area is centered on Manchuria, a mineral rich, cold, mountainous region. The topography is varied with grasslands, plains, forests, and farmlands. The population is sparse. In size, the Northeast region is about twelve percent of China's landmass.

Map concept from *China's Geography*, 18.
Graphics by T. Walker and G. Faria (adapted by
Willia Davis).



North China Plain. Known as the historical heartland of China, this region includes Beijing. It has a temperate climate and is mostly flat and deforested. A history of intense farming, combined with very high population growth and heavy industrialization, places much stress upon the land. The Yellow River is important in the region and the Yangtze River flows along the southern edge. In size, the North China Plain is also about twelve percent of China's landmass.

Southeast. China's warm, subtropical borderland has many mountains, highlands, and agricultural valleys that are partially deforested. While the Southeast is heavily industrialized, the population density varies. The Yangtze River flows along its northern edge to Shanghai. The Pearl River and Hong Kong are also important for the Southeast region. This region, like the previous two, is about twelve percent of the country's physical area.

Southwest. This warm weather area includes the rugged lands of Yunnan Province and borders Việt Nam and Burma. It is partially deforested with rugged limestone formations. The Pearl River flows eastward from the highlands. The Southwest is sparsely populated and also comprises twelve percent of China's landmass.

Plateau of Tibet. Parts of the Himalaya Range, with their legendary cold and dry climate, lay within the Plateau of Tibet. The area also includes considerable flat lands and is thinly populated. Deforestation has marred the region. The plateau is significant as the source of several major rivers. This vast region comprises twenty-five percent of the nation.

Xinjiang-Mongolia. Mountains, the Taklimakan and Gobi Deserts, extreme temperatures and fragile grasslands—all of these daunting features define the northwest frontier region. This sparsely populated area is the location of the Great Belt project and comprises twenty-five percent of China.

Thus, China is a large country with extremely diverse geography. Some of the land produces an extraordinary amount of food, but at least half of the country is infertile, unproductive, and barely habitable. Focusing on "Land" as a category for environmental challenges, we find that the following five concepts are crucial. Deforestation, desertification, erosion, arability, and pollution are the major environmental challenges to China's land use.

Deforestation

As noted earlier, deforestation has been identified as an important factor in China's history. The practice started in the North China Plain and spread west, south, and north. Some fifteen percent of China remains forested, compared to forty percent in pre-agricultural times. By the early part of this century, deforestation occurred at the rate of 39,000 square miles per year with 2,000 square miles per year of virgin forest eliminated.⁵ In this massive reduction, old growth natural forest with species such as pine, larch, birch, conifers, and a wide variety of deciduous trees have been lost. Tragically, a cancer-fighting chemical was lost when Yunnan yew trees were cut down. The bark of the trees contains taxol, a chemical that could have been used against cancer, including leukemia.

Recently much attention has focused on deforestation in Tibet, the Yangtze River Valley, southern China, and the northern reaches of the nation. In the last twenty years, even the northern and western areas lost fifty percent of their remaining forests. The situation became so bad that in 1998 logging was banned on the upper Yangtze region. Deforestation and illegal logging issues are part of governmental agendas worldwide. One reason for the perpetuation of deforestation in China is that timber can be made into furniture, and it is very difficult to trace the origin of the wood. The government of China has taken steps to fight deforestation, and millions of poplars, eucalyptus, larch, and birch trees have been planted, with large sums of money spent to reclaim ravaged lands.

Desertification

One-third of the PRC is desert and the problem is getting worse. China has many deserts, but the three of most concern are the Taklimakan in the far west, the Gobi to the west and north of Beijing, and the Ordos, with a mixture of clay and sand, that lies due west near Beijing. The vast Gobi, with 400,000 square miles in China, crosses the border of Mongolia.

The Chinese State Environmental Protection Agency (SEPA) confirmed that one million acres of land are lost annually to deserts. While desert growth is most acute in China, the effects of arable (farm) land loss spread across Asia to the US. Estimates are that between the 1950s and the present, as many as forty million Chinese may have been displaced through loss of grasslands, food supply, health, and prosperity.

Desertification can be a natural process, but in modern China, government policies are often to blame for the worsening situation. The ill-fated Great Leap Forward (1958–1960) created a manmade famine that reduced the population by an estimated thirty million people due to deaths and lower birth rates. During and after the Great Leap Forward, government policies caused the northern grasslands on the edges of the deserts to be converted to farmland and encouraged enlargement of livestock herds. Both of these practices degraded thin soil which has blown away.

The Three North Forest Protection Project, also known as the Green Belt or the Green Wall, is China's answer to the problem of desertification.⁶ The project involves planting a 3,000-mile strip of protective vegetation and eventually billions of trees to prevent the expansion of the northern deserts. Similar efforts have taken place in the US and Russia. This is an on-going experiment, and the battle between the trees and the deserts is not over.

Soil Erosion

The loss of soil through the action of wind and water is one of China's worst problems and is illustrated in the Loess Plateau. This area, to the west of Beijing, is the largest deposit of its kind in the world and contains most of the Loess (thick earthen dust) in China. The Plateau is covered by barren hills up to 250 feet high—the region is one of the poorest in China and has a peculiar feature in that millions of its residents live in homes dug into the hillsides. The Yellow River flows around the plateau, and the color of the river derives from the fact that some ninety percent of the sediment (1.6 billion metric tons per year) in the water is eroded soil.

The Chinese are now in a huge debate over what to do about water. In the meantime, the rivers are drying up and polluted water threatens the nation's health.

Arable Land

China feeds somewhat less than twenty-five percent of the world's population on approximately seven percent of the world's arable land.⁷ Compared to the world average, the PRC has less than fifty percent of usable farmland per person, and only twelve percent of the US average. "Arable Land" is the first heading on the *2002 Report on the State of the Environment in China*.⁸ Authors of Chinese government documents, linked to the *2002 Report*, were blunt in describing worsening conditions in the heavily populated and highly industrialized area along the Pacific Coast. The report linked misuse of pesticides and various chemicals to the deteriorating quality of the land.

To feed 1.3 billion people, China needs to maintain some three hundred million acres of land, but despite governmental remedies, the nation keeps losing good land. The population increases by some ten million people per year, and the industrial economy demands more land. When the Communists took over in 1949, the population was about five hundred million; however, life expectancy almost doubled by the 1980s when the "One Child Policy" (one child for each married couple) was started to limit the population to about 1.2 billion. China is now somewhat lax on family limitations, but that only puts more pressure on the land for more food.

Nutritional issues are behind the rise of China to world leadership in several scientific disciplines related to agriculture, bioengineering, and biotechnology. The PRC is also the global leader in many categories of food production. Genetically Modified (GM) food, although feared by many, is promoted in China, where government-funded research sees GM foods as a solution to land and food problems. Even rice is becoming a GM food.

The Chinese government is also experimenting with a foreign policy concept, the Go-Out-Policy, that has a connection with the arable land challenge.⁹ A central part of this policy includes buying and leasing farmland in several African nations. Chinese farmers are exporting food and working to model advanced agricultural methods for African landowners. Additionally, Chinese bureaucrats are in Africa with foreign aid construction projects and other Chinese are seen working in commerce and retail businesses. At least one million Chinese are reported to be employed in Africa.

Soil Pollution

Government officials have announced that over ten percent of China's arable land is polluted. Zhang Lijian, Vice-President of the Chinese Academy of Agricultural Sciences, reports

*Pollution that threatens agricultural production comes mainly from long-term unreasonable use of such chemical compounds as fertilizer, pesticide, herbicide and growth modifiers, from improper disposal of animal excrement and from waste from farm land. Other pollutants sources include irrigation with industrial and domestic sewage, discharge of extra solid, liquid and gas-form wastes and acid rain.*¹⁰

A toxic combination of pollutants decreases food production by some forty billion kilograms per year—a huge economic loss. Mercury is of special concern because of its dangers to human health. Soil pollution caught the Chinese government unaware of this terrible threat. As of 2007, there were no laws protecting farmland, but a national Soil Survey was commissioned. The results are due during the twelfth Five Year Plan (2011–2015).

Water

The PRC is ranked fourth in the world for volume of fresh water resources, and it contains some fifty thousand rivers, lakes, and streams. China is best known for three major rivers: the Yellow, the Yangtze, and the Pearl. Waterways such as the Irrawaddy, Salween, Mekong and Brahmaputra, originate in China. These rivers support over two billion people—one-third of the world's population. Yet in the PRC, nearly five hundred million people lack safe drinking water.¹¹ Some rivers in northern China are disappearing—drying up and going underground. A 2006 UN study reported that China ranked seventeenth out of thirty countries in average water use per person, per day. China ranked lower than India, which is a poorer nation. Chinese consumed almost twenty-three gallons per day compared to Indians' nearly thirty-six gallons. In the number-one ranked US, the average person consumed 152 gallons daily, more than six times that of the average Chinese.¹² Ironically, China starts with a large amount of water and ends up with shortages.

The Three Gorges Dam is one of China's most ambitious, largest, and most controversial water control projects.¹³ Located on the Yangtze River in Hubei Province, the mile-wide structure cost almost US \$25 billion. The world's largest construction project, the Three Gorges Dam was completed in 2009, and both Chinese and international environmental groups have denounced it as an environmental disaster. Increased water pollution, soil erosion, and landslides are attributed to the project, notorious for displacing over one million people.

Ma Jun's *China's Water Crisis* tells the story of a developing disaster, river by river, county by county, evolving over thousands of years.¹⁴ Still, after 1949, PRC development projects made the situation much worse. The newest of China's large water control efforts is the South to North Water Diversion Project, projected to cost some US \$60 billion and to be completed by 2050. The concept is to move twelve trillion gallons of water per year from the Plateau of Tibet, the Yellow River, and Yangtze River to North China.¹⁵ The work involves daring feats of engineering, such as going through mountains and passing the Yangtze River under the Yellow River.

Ma Jun elaborates upon why the Yellow River is actually drying up, how the Yangtze River is threatened by pollution, and how industry is poisoning food supplies around the Yellow River. It is not easy to read parts of the book, as the author describes rats taking over ruined lands and mud falling on the capital city of Beijing. But Ma Jun is Chinese, he loves his country, and the Yangtze River looks as he described it:

*The river is an even more shocking sight. Not only does the murkiness offend the eye, but the vast sea of garbage and sewage is singularly striking . . . Bit by bit, all the Styrofoam lunch boxes and vegetable scraps, toilet waste, cooking oil machine oil and industrial muck, and just about every other piece of garbage the river people get their hands on is casually jettisoned over the sides of this mobile fleet of what appears on closer examination to be garbage scows.*¹⁶

The thesis of *China's Water Crisis* is that a critical point has been reached. Ma Jun wrote of "eco-catastrophes," water that corroded steel and cement, a man who cut down 36,500 trees, and high cancer rates linked to water. The Chinese are now in a huge debate over what to do about water. In the meantime, the rivers are drying up and polluted water threatens the nation's health.

Elizabeth C. Economy's, *The River Runs Black: The Environmental Challenge to China's Future* focuses on the Huai River, China's third most polluted waterway.¹⁷ This book is an excellent account of a painful subject—the death of one river. The Huai River is in eastern China, the heartland of the nation, which is densely populated and highly industrialized. The Huai is notorious for pollution, flooding, and the collapse of two dams in 1975 that resulted in 230,000 deaths. The consequences for the people in the countryside around the Huai are spontaneous abortions, birth defects, waterborne diseases, air pollution, and “Cancer Villages.” Young men in the area are not healthy enough for military service.

Water from the high mountains of China ends up flowing into the Pacific Ocean, and coastal waters are becoming more polluted as the inland situation worsens. A 2002 report by China's State Oceanic Administration (SOA) indicates that heavily polluted ocean areas have increased by more than 1,500 square miles—mainly in waters close to major cities and industrialized areas in parts of the East China Sea and the Yellow Sea. The report states that almost 68,000 square miles of seas near the PRC no longer support marine life.¹⁸

Air Quality

As China's economic growth accelerates, air quality is becoming a major domestic and international issue for the PRC.¹⁹ Air quality is connected to other environmental problems and China is now the world's largest emitter of air pollutants, first in energy and coal consumption, and first in carbon dioxide and sulfur dioxide emissions. The US is the second largest polluter, followed by Russia and India. Air pollution puts China in the middle of controversies about global climate change that have implications for the US.

The controversy over environmental degradation, global warming, and climate change is tied to the Kyoto Protocol of 1997 that focused on green house gases (GHG), carbon dioxide, sulfur dioxide, coal, and world standards for national economies. China endorsed the Kyoto Protocol. However, the Chinese position is that they should be allowed to produce record amounts of pollution because they are still a developing nation.

Air pollution from China already reaches the US.²⁰ Prevailing winds from Asia blow across the Pacific Ocean and above North America. The US Environmental Protection Agency monitors air pollution as it reaches the West Coast. Research findings are alarming—at times almost one-third of the pollution above California is attributed to China. Traces of mercury, which can have lethal effects upon humans, are included in the toxic mix. It is believed that as much as forty percent of mercury in the air is distributed globally from the PRC.²¹

Dust from Asia is found above the US year round. NASA 2008 satellite research shows a fog-like cloud of pollution stretching from the coast of China, along the edge of Alaska, and down the West Coast to California.²² Prevailing winds travel around the world over all continents. While the problem now is traces of pollution from China, the future bodes ill if China expands its coal-based economy. Traces may become quantities that are more lethal.

Health

Some observers make the case that the Chinese government does not want its citizens to know the truth about their health. A 2007 *New York Times* article on China's environment and economy included a grim description of the situation:

*The toll this pollution has taken on human health remains a delicate topic in China. The leadership has banned publication of data on the subject for fear of inciting public unrest, said scholars involved in the research. But the results of available research provides alarming evidence that the environment has become one of the biggest causes of death.*²³

Joseph Kahn and Jim Yardley, the authors of the article, include the following national data in their account:²⁴

700,000 deaths per year from air pollution
60,000 deaths per year from water pollution
One million deaths from cigarette smoking

Seventy-five percent of chronic diseases are due to industrial pollution and “personal activity,” i.e., smoking.

Despite the case for government suppression of environmental evidence, some Chinese officials are outspoken on health issues. Jin Yinlong, Director General of the Institute for Environmental Health and Related Product Safety in Beijing, asserts in the *Times* report that

*China's pollution is worse, the density of its population is greater and people do not protect themselves as well. So the studies are not definitive. My assumption is that they will turn out to be conservative.*²⁵

Notwithstanding some signs of official concern, thousands of public demonstrations on health issues have been reported. In 2005, some 35,000 residents of Zhejiang Province rioted over environmental issues, attacked chemical plants, and destroyed governmental properties. Police cars were destroyed before ten thousand members of the People's Armed Police restored order. The leadership knows that when the Chinese people start to attack government officials and burn police cars, trouble that is more serious is coming.²⁶ On a larger scale, the same type of public violence precipitated the Tiananmen Square Massacre in 1989.

Cleaner and Greener?

There may be a silver lining within the dark clouds of pollution. The government of China, ambitious entrepreneurs, and the public are showing signs of a “green movement.” China is guided by Five Year Plans that outline governmental policies. The Twelfth Five Year Plan (2011–2015) is expected to be very important for environmental and health issues. Xiong Yan, Chairman of the Beijing Environmental Exchange, was recently quoted as speaking of a forthcoming “low carbon revolution.”²⁷

Recent national economic stimulus funding in the PRC has included sums equal to billions of US dollars for environmental improvement, especially renewable energy. China is gaining a reputation as a world leader in clean energy technology for solar and wind power, and Chinese news media are carrying more stories on environmental issues. It is fascinating to find Internet sources such as “Cleaner Greener China: Clean Technology, Green Products, New Ideas, Clean China.”²⁸ This site includes information on an English company that demonstrated a “carbon zero” building in China and “Green Building” technology with solar, wind, geothermal, and recycled water usage. This recent enthusiasm must be balanced against the fact that China still relies on coal.

Conclusions

China's deforestation, desertification, land and water problems, air pollution, and many health-related issues collectively constitute a demanding agenda for reform. Typically, as nations attain higher income levels, social incentives are created to respond to environmental problems. The Green Belt, South to North Water Diversion Project, Go-Out Policy, bio-engineering, many laws, international agreements, public protests, green technology, the Kyoto Protocol, and even the One-Child Policy, are all examples of China's official responses to environmental challenges. Still, Yale University's Environmental Performance Index rated China as 121 out of 163 nations.²⁹ In the same index, Iceland was ranked number one, the US ranked sixty-one, the UK was fourteenth, and Germany was seventeenth.

We should not assume that China will always be as it is now. Remember that the Communist government turned to capitalism after 1976.

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Currently, China is simultaneously condemned as a menace while being praised for its green movement. China's economy has always taken precedence over the environment, but the land, water, air, and health issues add up to enormous costs that could cause environmental concerns to increasingly become critical government priorities, especially in an era when environmental issues clearly have global impact. ■

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