



Three Gorges Dam: The Cost of Power

Worker over-looking construction of the Three Gorges shiplock in 2001
(© Chris De Bode / Panos Pictures)

The Three Gorges Dam is the world's most notorious dam. The massive project sets records for number of people displaced (at least 1.3 million), number of cities and towns flooded (13 cities, 140 towns, 1,350 villages), and length of reservoir (more than 600 kilometers). Yet this once glittering monument to China's might is fast becoming a symbol of government folly. The project has been beset by corruption, human rights violations and spiraling costs, and the environmental impacts are rapidly escalating.

Chinese citizens and top government officials are awakening to the negative impacts of big dams like Three Gorges. However, this has failed to curb the government's domestic and global dam building activities. This paper examines the impacts of the Three Gorges Dam, other problematic dams in China, and solutions to meeting the country's energy needs.

A POOR RESETTLEMENT RECORD

To date, more than 1.3 million people have been moved to make way for the Three Gorges Dam. The government promised land to farmers, jobs for city dwellers, and cash compensation for all dam oustees. However, China doesn't have spare land, and in the face of increasing privatization, the government no longer creates jobs. Hundreds of thousands of people have received tiny, barren plots of land or been sent to urban slums with limited cash compensation and housing.

In a rare survey published in 2000, Chinese Academy of Sciences researchers tracked a small number of rural migrants living in Wanxian city who had been relocated by Three Gorges. They found that most were worse off than they had been before. Almost all households suffered an increase in unemployment and a sharp decline in income. Existing residents had only half as much land as before resettlement. As one such oustee notes, "When I had land I could grow my own food and was free to work when I wanted, I was happy then." To make matters worse, residents relocated by Three Gorges have no grievance mechanisms to address unresolved compensation issues. Their protests have been met with repression, including imprisonment and beatings.

Corrupt local officials have stolen millions of dollars intended for oustees. It is estimated that about 12 percent of the project's



resettlement budget has been embezzled. At least 349 people have been found guilty of embezzlement.

The experiences of the Three Gorges Dam are emblematic of problems with resettlement from hydropower projects all over China. According to Prime Minister Wen Jiabao, some 23 million people have been displaced by dams, most of them built since 1949. Most of these people have been left worse off as a result.

SAFETY CONCERNS

Those resettled in towns around the edge of the Three Gorges reservoir are facing a host of geologic hazards. Geologists warn that the reservoir could trigger massive earthquakes as a result of reservoir-induced seismicity (or earthquakes caused by changes in water pressure when reservoir levels are rapidly raised or lowered). The Sichuan earthquake of May 2008, which claimed the lives of over 80,000 civilians, also damaged roughly 400 dams, including the 156-meter-high Zipingpu Dam, according to the central government. The Three Gorges Dam sits on two major fault lines, the Jiuwanxi and the Zigui-Badong. In the seven months after the September 2006 water level increase at Three Gorges, scientists recorded 822 tremors around the reservoir.

Another major safety concern is landslides. The shore of the Three Gorges reservoir has already collapsed in at least 91 places. A month after the dam was completed in 2006, a landslide occurred on a Yangtze tributary, with 20 million cubic meters of rock sliding into the Qinggan River. Twenty-meter waves killed 14 people on the water. In May 2007, villagers in the town of Miaohe, 17 kilometers upstream of the Yangtze, had to evacuate their homes when wide cracks developed in their houses and on their lands after the reservoir water had been lowered. In November 2007, 3,050 cubic meters of rock fell onto a highway, killing 30 people. To deal with these disasters, officials have spent an additional \$1.6 billion on fortifying landslide-prone areas, adding to the escalating costs of the project.

WATER QUALITY AND FISHERIES DECLINE

The Three Gorges reservoir has had severe and far-reaching impacts on water quality in the Yangtze River. The reservoir has submerged hundreds of factories, mines and waste dumps. In addition, pesticides and other urban runoff flow into the slow-moving reservoir. Additional urban growth along the reservoir caused wastewater discharge to double between 2000 and 2005. This has led to algal blooms in the reservoir and tributaries, affecting drinking water supplies.

At a meeting in Chongqing in 2007, officials admitted that Three Gorges has caused a vast array of ecological problems, and that it could lead to an environmental “catastrophe.” Local governments are spending an estimated \$3.2 billion of resettlement funds on water treatment facilities to clean up the reservoir in the next three years.



Worker sitting on a demolished building in Gaoyang

The increase in water pollution is adding urgency to China’s growing water shortages, which are most critical in northern cities like Beijing. More than half of China’s major waterways are already so polluted that the water is unsafe for drinking and irrigation.

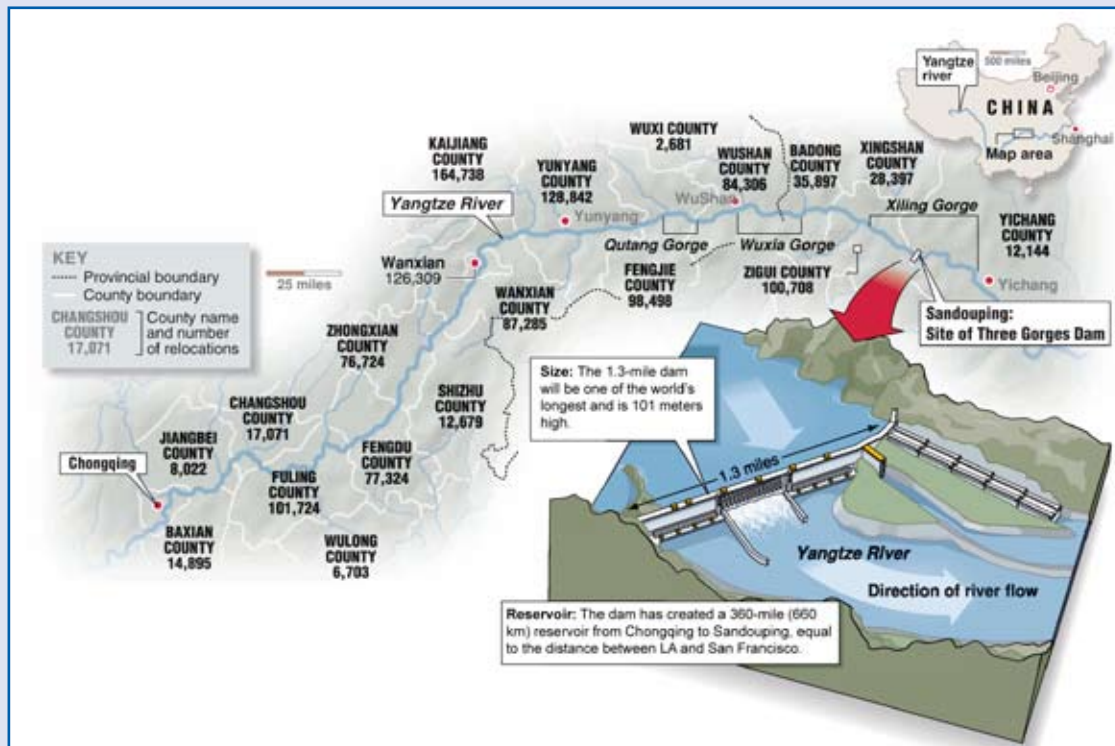
Government statistics show that more than 300 million people, or one-quarter of the population, lack access to clean drinking water.

Despite concerns about declining water quality on the Yangtze, China is moving forward with a controversial \$62 billion scheme to transfer water from the Yangtze to the Yellow River in northern China. Many worry that the scheme will compound water quality problems on the Yangtze as less water is available to dilute its polluted waters.

Another major concern for water quality and quantity is rapid downstream erosion. As the river is lightened of its muddy load, water flows faster downstream, eroding riverbanks and levees, and increasing the threat of downstream floods. In May 2006, sections of the Yangtze River burst its banks in Hunan Province after the river had eroded the levees, making Three Gorges’ ability to control floods questionable. In January 2008, as a result of Three Gorges, the Yangtze’s river flow reached its lowest level in 142 years, stranding dozens of ships in Shanghai.

The vast changes in water quality and quantity will likely lead to the extinction of many plants and fish, causing major long-term biodiversity declines. The Three Gorges region is home to the endangered Chinese sturgeon and paddlefish. It was once home to the baiji river dolphin, until the government recently declared it functionally extinct due to development on the Yangtze.

The Three Gorges Dam also threatens one of world’s largest fisheries in the East China Sea. It is estimated that annual catches may be reduced by one million tonnes. One cause of this dramatic decrease is the drop in phytoplankton, which forms the base of fishery food chains. Two months after the reservoir was filled in 2003, scientists detected a massive decline in phytoplankton as a result of chemical changes to the water downstream.



WHO FUNDED THREE GORGES?

China Construction Bank, China Development Bank, and Minsheng Bank. Export credit agencies from Brazil, Canada, France, Germany, Japan, Sweden, and Switzerland also provided funds for the project.

WHO BUILT THREE GORGES?

China Three Gorges Project Development Corporation (CTGPC) is a state-owned company set up to oversee the construction of the dam. Sinohydro, China's largest dam builder, is constructing the dam, the State Grid Corporation is responsible for transmission works, and the Yangtze Power Company is responsible for operation.

PROJECT DETAILS

- Project components: a five-tier shiplock, 26 electrical generators
- Cost: roughly \$25 billion
- Energy production: 18,200 megawatts, enough to power 18.2 million homes

PROJECT STATUS

The reservoir was filled to 135 meters above sea level in June 2003, a year ahead of schedule, as the first of three stages in achieving the final level of 175 meters. The dam was completed in October 2006, and the reservoir water will reach its final level of 175 meters in 2009, four years ahead of schedule.

A CHANGE IN THE WIND?

The Three Gorges Dam has been a source of controversy within China long before it was built.

Over the past decade, a growing number of Chinese organizations, academics and individuals have spoken out against the impacts of large dams. They argue that China's headlong rush to build dams is inconsistent with sustainable development. In 2004, they helped suspend a 13-dam cascade on the Nu River which would have impacted a UNESCO World Heritage Site. A rare public outcry by villagers, local and international NGOs led the provincial government to publicly shelve the highly controversial Tiger Leaping Gorge Dam project in December 2007, though its status is still uncertain.

Concern about large dams in China has reached the highest levels of government. President Hu Jintao and Prime Minister Wen Jiabao are much less enthusiastic about large dams than their predecessors. Mr. Wen has even demanded environmental reviews for proposed sites. Yet with intensive energy growth due to China's booming economy, and many incentives built into the system for dam-builders, China continues to build many large and destructive dams.

A FUTURE IN ALTERNATIVE ENERGY

China has a number of promising solutions to meet its rising energy needs, including energy conservation and energy efficiency. China currently uses energy very inefficiently.

China's Big Dams Continue – at Home and Abroad

Despite the difficult experiences with Three Gorges, China is pressing ahead with plans to build scores of new dams by 2020. China is currently constructing two dams, the Xiluodu and Xiangjiaba, on the Jinsha (Upper Yangtze) River to offset the rising sedimentation levels behind Three Gorges. These dams are part of a cascade of twelve dams being constructed on the Jinsha River. As many as 360,000 people could be relocated as a result of the entire project.

China also plans to build a 13-dam cascade on the Nu River and an eight-dam cascade on the Lancang (Upper Mekong) River. The Mekong is a major source of fish and nutrients for millions living downstream in Cambodia, Laos, Thailand, and Vietnam.

After the devastating Sichuan earthquake, 62 Chinese scientists and conservationists wrote an open letter to the government asking them to

re-examine plans to build additional dams in seismically active Southwest China.

In addition, China is an increasingly prominent player in international dam-building. The China Export-Import Bank is currently the largest global funder of dam projects. Sinohydro and China Southern Power Grid are building large dams in Burma, Laos, Cambodia, and many parts of Africa.

Investment in energy efficiency is cheaper and faster to come online than costly large dams. In April 2004, China's National Development and Reform Commission (NDRC) reported that China could reduce its energy use by 100 gigawatts by 2020 through demand-side management policies and efficiency measures. This is five times the installed capacity of the Three Gorges Dam. New technology in wind, solar, and biomass offers promising solutions that are cost-effective and long-lasting. A 2007 Worldwatch report states that total power capacity from renewables (excluding large hydropower) could reach 150 gigawatts by 2020.

Wind energy potential is massive in China. The China Academy of Meteorological Sciences estimates that the country possesses 235 gigawatts of practical onshore wind power potential and a massive 750 gigawatts offshore. In theory, China could meet its entire projected electricity demand for 2020 from wind alone. Wind power is the fastest-growing power generation technology in China, with more than 50 domestic manufacturers of wind turbines. New policies are encouraging competitive pricing and mandating wind investment by power companies.

Solar power is in its infancy, yet it is growing in off-grid applications, particularly in rural areas. China is already a global manufacturer of PV panels, making it likely that it will have a large market for grid-tied solar in the near future. China is also the world's largest market for solar hot water, with nearly two-thirds of the global capacity. Forty million solar hot water systems currently supply heated water to 10 percent of Chinese households, with enormous potential for



Wind turbines

further growth. There is also significant potential for biomass energy from agricultural waste, straw and municipal waste.

The Chinese government passed a landmark renewable energy law in 2005 mandating that the country get 15 percent of its electricity from renewable sources by 2020. Yet large hydropower continues to play a major role in the government's plans. While China invested \$10.8 billion in renewable energy in 2007, it also annually invests \$6-10 billion in large hydropower. With the right policies and government incentives, however, China could become the leader of a global energy revolution that could transform our economies, protect rivers and rights, and reduce the intensity of global warming.

FOR MORE INFORMATION, VISIT THE FOLLOWING WEBSITES:

International Rivers: internationalrivers.org

Probe International: threegorgesprobe.org