



Three Gorges Dam nears completion  
Seth Rosenblatt © 2006

# Three Gorges Dam

## A MODEL OF THE PAST

The Three Gorges Dam on the Yangtze River is the world's largest and most controversial hydropower project. The 600 kilometer-long reservoir has displaced 1.3 million people and is wreaking havoc with the environment. The reservoir reached its final height in 2010, but many of its impacts are only now becoming apparent. China will deal with the project's legacy for generations to come.

Project supporters celebrate the Three Gorges Dam Project as a symbol of China's economic and technological progress. They point out that the power plant substitutes the burning of more than 30 million tons of coal every year and has greatly improved navigation on the Yangtze River. They also claim that the project has made devastating floods in the Yangtze Valley a thing of the past, while improving the quality of life of the resettled population. According to former President Jiang Zemin, the dam "embodies the great industrious spirit of the Chinese nation."

Since the project was first championed by Mao Zedong in the 1950s, however, leading scientists have warned about the project's environmental risks. These concerns were largely silenced after the crackdown on Tiananmen Square in 1989. In 1992, the National People's Congress approved project construction with a record number of abstentions. Since then, the environmental and social impacts have been profound and continue to this day. In 2011, China's highest government body for the first time officially acknowledged the "urgent problems" of the Three Gorges Project.

### RESETTLEMENT WITHOUT RIGHTS

The Three Gorges Project, situated in the densely populated Yangtze Valley, is the world's largest resettlement project. According to official figures, the dam has submerged 13 cities, 140 towns and 1,350 villages. When the project was launched, the authorities promised to provide replacement land to farmers and new jobs to the urban population. Yet arable land is scarce in China, and the government had to stop resettling farmers on steep hills to check erosion. In addition, when resettlement began, many state-owned enterprises were closing down rather than creating new jobs.

Farmers did not receive compensation for their lands because they did not officially own them, and the compensation they received for their houses was often not sufficient to pay for their new homes. Some cities overcame the shock of resettlement and restarted their economy. Others became dilapidated a few years after they were built. In Yunyang, only 45 of the city's 181 factories were moved to higher ground, and many of them have



closed in the meantime. An estimated 20,000 people have lost their jobs.

Corruption was rampant as local officials diverted compensation and resettlement funds into their own pockets throughout the project area. It has been estimated that 12% of the resettlement budget has been embezzled. “Our lives have been ruined by the dam while the big officials got their fruit and filled their wallet,” a displaced resident told the *Financial Times*. The government prosecuted hundreds of officials and found more than 300 of them guilty. Yet security forces cracked down harshly against people who held out for fairer treatment or protested against abuses.

### ECOSYSTEM UNDER STRESS

The Three Gorges Project has completely changed the ecosystem of the Yangtze River. It has interrupted fish migration and altered the river’s chemical balance, temperature and velocity. The mighty river has been turned into a stagnant pool with a limited ability to clean itself, and local boat owners are fishing garbage off the surface.

The dam has most likely driven the famous Chinese river dolphin to extinction. Populations of the Chinese sturgeon, river sturgeon and Chinese paddlefish have been decimated; all are now considered endangered. Commercial fisheries in the Yangtze and off the river’s mouth in the East China Sea declined sharply after the dam was closed.

In September 2007, government officials admitted that “if preventive measures are not taken, there could be an environmental collapse.” Pollution from industry, agriculture and households is causing frequent algae blooms in the reservoir. The government built dozens of garbage and sewage treatment plants, but most of them lie idle because local authorities cannot afford to operate them.

Since 1951, the run-off in the Yangtze Basin has decreased by more than one third. Droughts have prevented the Three Gorges hydropower plant from generating electricity at full capacity, and the impacts of climate change on water flow and availability puts a question mark behind the project’s benefits.

### WEIGHING THE RISKS

Periodic devastating floods have claimed the lives of millions of people in the fertile plains of the Yangtze Valley. The Three Gorges reservoir acts as a buffer that can mitigate flood risks. Yet because the river deposits its silt load in the reservoir, it now flows faster downstream of the dam and is eroding the levees in the Yangtze Valley. This has reversed some of the dam’s flood control benefits.



The town of Yunyang, already desperate and poor (Nick Austin)

Every year, the reservoir level at the Three Gorges fluctuates between 145 and 175 meters. This destabilizes the slopes of the Yangtze Valley and has created serious risks of erosion and landslides. According to the business magazine *Caijing*, more than 150 dangerous geological events were recorded within five months after the reservoir was first impounded.

Erosion affects more than half of the reservoir area, and 178 kilometers of riverbanks are at the risk of collapse. An additional 530,000 people will have to be relocated by 2020 in order to relieve pressure on the fragile reservoir slopes.

The Yangtze carries more than 500 million tons of silt into the reservoir each year. Some of it is flushed through the sluice-gates at the bottom of the dam, but most of the sediment is deposited in the reservoir. This silt is now being withheld from downstream areas. After the dam was completed, the sediment load near the river’s mouth dropped to one third of previous levels. As a consequence, up to four square kilometers of coastal wetlands are being eroded every year. Seawater is intruding up the Yangtze, destroying arable land and threatening drinking water supplies.

The Three Gorges Project has also created serious seismic and safety risks. The reservoir sits on two major fault lines, and hundreds of small tremors have been recorded since the reservoir began filling in 2006. Reservoirs have triggered scores of earthquakes around the world, and there is evidence that the devastating Chinese earthquake of May 2008 may have been triggered by Zipingpu Dam. While most dams are built to withstand strong earthquakes, the houses, schools and office buildings of millions of people in their vicinity are not.



Landslide at the Three Gorges Reservoir

### STAGGERING COST

When the Three Gorges Project was approved in 1992, its cost was estimated at 57 billion Renminbi (or US\$9 billion at the current exchange rate). In the meantime, the official figure has risen more than fourfold to \$37.2 billion. There is evidence that some costs have not been included in this figure to avoid the impression of even bigger cost overruns. Dai Qing, a prominent project critic, estimates that the full cost of the project may be as high as \$88 billion.



## Exporting the Three Gorges Experience

China had to rely on Western technology to build the Three Gorges Project. The companies which supplied the power equipment – including ABB, Alstom, General Electric and Siemens – had to manufacture half of all turbines and generators in China in cooperation with local partners.

As in other sectors, the Chinese

students soon adapted the Western technology and overtook their teachers. The Chinese companies involved in the Three Gorges project started exporting large turbines and generators for hydropower dams around 2003. With approximately 300 projects in 66 countries (in January 2012), they already dominate the global hydropower market.

While environmental concerns are growing within China, the Three Gorges Project is still being used as a showcase to demonstrate the capabilities of the country's dam builders. In recent years, government delegations from Congo, Nepal, Pakistan, South Africa and many other countries were invited to visit the project on the Yangtze River.

their interests. In 2005, more than 100,000 people protested the construction of the Pubugou Dam in Sichuan Province. As a result of domestic pressure and the newly inscribed Three Parallel Rivers World Heritage Site, Prime Minister Wen Jiabao suspended the construction of several dams on the Nu River in 2004 and again in 2009. Neither President Hu Jintao nor the Prime Minister attended the inauguration of the Three Gorges Project. In May 2011, China's highest state body warned that the project has "caused some urgent problems in terms of environmental protection, the prevention of geological hazards and the welfare of the relocated communities."

Despite the experience with the Three Gorges Project, China has resolved to increase its hydropower capacity by as much as 120 GW – the equivalent of seven Three Gorges Dams – by 2015 in order to meet its climate change targets. This could prove disastrous for China's major rivers, including the Upper Yangtze, Lancang (Mekong), and the Nu (Salween).

### THE WAY FORWARD

China is still using energy relatively inefficiently. The efficiency of Chinese electrical motors for example, which consume more than half of the country's power, is 10-30% lower than international standards. Successive governments have made great strides to improve energy efficiency, and energy demand has grown more slowly than the economy throughout the 1980s and 90s.

Pressure to maximize economic growth reversed this positive trend between 2001 and 2005. Improving energy efficiency during this period could have obliterated the need for the Three Gorges Project – and at a lower cost. "It would have been cheaper, cleaner and more productive for China to have invested in energy efficiency [than in new power plants]," comments Douglas Ogden of the Energy Foundation's China Sustainable Energy Program.

In recent years, China has renewed its efforts to improve energy efficiency. The country plans to reduce its energy intensity by 16% and carbon intensity by 17% under the Twelfth Five-Year Plan (2011-2015). Its Renewable Energy Law has also set the world's most aggressive, legally binding target. By 2020, 15% of all energy – or 137,000 MW – is to come from wind, biomass, solar and small hydropower projects.

China is investing hundreds of billions of dollars in renewable energy, and has become a global leader in wind and solar energy. The country's wind power capacity is expected to exceed 100,000 MW by 2020. A Harvard University research team estimated that over the next 20 years, wind farms with a capacity of 640,000 MW could be installed to generate affordable electricity.

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– Douglas Ogden, Energy Foundation

The Chinese government should continue its efforts to promote renewable energy, and prioritize the development of economic sectors that are less energy-intensive. The loopholes in China's environmental protection laws should be addressed. In 2006, the Chinese government began to make retroactive payments to millions of people who were displaced by reservoirs. Those who were resettled for the Three Gorges Project should benefit generously from this program. Now that the Three Gorges Project has been completed, its impacts should be comprehensively evaluated and addressed before more mega-dams are built.

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