

Chapter Eleven

Water Pollution in the Three Gorges Reservoir

Jin Hui, November 1993

Pollution of the Yangtze River

The Yangtze River has become the biggest sewer system in China. According to the Chinese Academy of Sciences, in the Three Gorges reservoir area alone “there are over 3,000 industrial and mining enterprises which release more than one billion tons of wastewater annually, containing more than 50 different pollutants.”* By 1988, a total of 16.6 billion tons of wastewater had flowed into the Yangtze’s basin from major industrial areas.** Included in the wastewater are such poisonous elements as mercury, cadmium, chromium, arsenic, phenol, lead, and cyanide.

Industrial sources account for the majority of the pollution, but significant amounts also come from agricultural run-off, residential wastewater, urban sewers, and pollution from ships. Most studies do not even consider the substantial amounts of pollution released from township-level enterprises.† Presently, there is very little treatment of industrial wastewater flowing into the reservoir area, and no treatment of residential wastewater;

* Yangtze River Water Resources Protection Science Research Institute and Environmental Evaluation Department, Chinese Academy of Sciences, *Changjiang sanxia shuili shuniu huanjing baogaoshu* (Environmental Report on the Pivotal Three Gorges Hydro Project on the Yangtze River) (n.p., n.d.).

**State Environmental Protection Bureau, *Huanjing tongji nianbao* (Environmental Statistics Yearbook) (n.p., 1988).

† According to Smil, the mushrooming of small and mid-size factories outside large cities does not bode well for China’s water quality. “Industrial wastes released into the local lakes, rivers, and canals contaminate water that is used for drinking, animal care, and irrigation. No one knows with satisfactory accuracy how much unprocessed waste these rural enterprises release annually.” Vaclav Smil, *Environmental Problems in China: Estimates of Economic Cost* (Honolulu, HI: East–West Center Special Reports, No. 5, April 1996), p. 25.

everyone relies on the river’s capacity to flush pollutants out to sea to keep it clean. But following construction of the Three Gorges dam, the river’s flow through the reservoir will be greatly reduced and with it the flushing capacity of the river.*

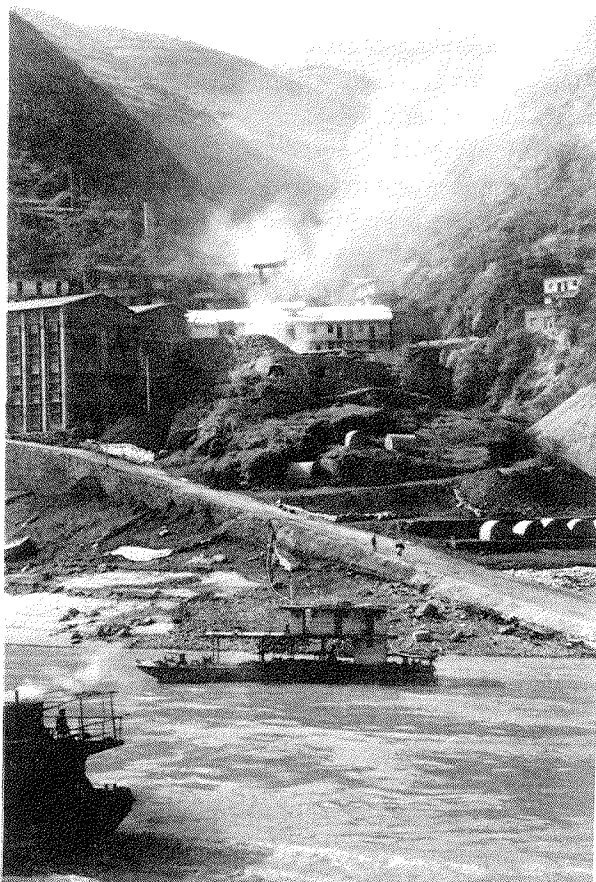
If we assume no net reduction or increase in wastewater release into the river, the COD level [chemical oxygen demand] in the water off the cities of Chongqing, Changshou, Fuling, and Wanxian will be greater by a factor of 2.08, 8.2, 10.36, and 3.5, respectively.** The overall water pollution index of the area contributing to the reservoir’s pollution is presently 2.31, a level indicating moderate pollution. This figure will rise to 3.45 after the dam’s construction, a level indicating a serious pollution problem. In Chongqing, for instance, the water pollution index will rise from 2.5 to 3.6 as a consequence of the dam’s construction. In addition, the dam will create bays off the main reservoir at various sites. The slow moving and stagnant water in these reservoir bays will have a lower dissipation capacity in comparison to the mainstream, something that will further increase pollution problems. Moreover, prior to the first rainstorm of the year, there is likely to be a dearth or lack of oxygen in the water.

By the mid-1980s, a 500-kilometer-belt of pollution stretched along the Yangtze from Dukou, in Sichuan, to Chongqing, Wuhan, Nanjing, and Shanghai. In Chongqing, the white foam released from a nearby paper mill is now referred to by locals as “white ducks.” The term was coined, oddly enough, by Prince Sihanouk of Cambodia. While on a tour of the Jialing River some twenty years ago, the then-Prince asked his guide what the white forms floating on the water in the distance were. His Chinese guide answered that they were flocks of white ducks! Twenty years later, the white ducks are still there, day and night.

I have traveled the entire length of the Three Gorges by ship, and have seen the sewer pipes located on the banks of the river. These pipes dump untreated waste into the river 24 hours a day, covering the water with pollution. The local boatmen hate these pipes with a passion and told me exactly how many there were and when each was installed. They told me

* Slow moving and stagnant polluted water in a reservoir creates the opportunity for massive algal blooms which deplete the oxygen from the deeper water. In some reservoirs, this oxygen-depleted water becomes acidic and toxic, killing all life in the river when released downstream.

**Chemical wastes discharged into a river can deplete oxygen levels, killing fish and other organisms. COD is a measure of this potential oxygen depletion.



River Pollution. (Photo by Richard Hayman)

how the number of pipes spilling pollution into the river has multiplied in recent years, how the mountains on both sides of the river have become increasingly barren, and how the water has become more and more polluted and the fish increasingly inedible. But they worry less about these problems than about the unknown diseases that have afflicted them and other workers on the river as a result, they feel, of drinking the river's water.*

*A study by the Chongqing Branch of the Yangtze River Transportation Bureau showed that more than 600 workers out of 2,200 suffered from various liver, stomach, and lung diseases.

According to the State Environmental Protection Bureau, in 1992, 58 percent of the Yangtze River and its tributaries had a water quality of Classes I and II—suitable for use as drinking water. Twenty-two percent was rated Class III—usable for drinking water after treatment. And 20 percent was at Classes IV and V—suitable only for industrial water supply, recreation, and irrigation.* In October 1993, the Yangtze River Water Environmental Monitoring Center issued its own report on the water quality of the Yangtze. It found that, “the water samples taken in September from around Fengjie, Wushan, Badong, Zigui, Sandouping, Nanjinguan, and Yichang were at Class III. The water quality in the area of the left bank of Yichang was at Class IV and that of some of the tributaries in the Three Gorges area were even worse—in some cases below Class V.” These findings came in spite of a higher than average rate of flow in the river (and a consequent increase in the river's ability to flush pollutants out to sea) during the sampling period.

The monitoring center's report is clearly a warning. The water quality of the Yangtze River is deteriorating rapidly. Although the Supreme Creator endowed the Chinese people with a great river containing rich water resources, and despite ancient adages such as “the endless waters of the Yangtze pour forth” and “the ageless river is eternal,” we must come to terms with the current reality: The river's natural capacity to purify itself is not infinite.

There are now more than 400 million people living in the Yangtze River Basin. An old song about the Yangtze proclaims: “You nurture the children of various nationalities with your sweet milk.” These words now ring hollow because the sweet milk has become poison.

Lessons from Gezhouba

During construction of the Gezhouba dam, from 1970 to 1989, virtually no consideration was given to the potential effects of the reservoir on the water quality of the river. At that time, people were less aware of the impacts of dams on river ecology and the environment and, perhaps

*No source for the water classification system was cited in the original Chinese text. The World Bank, however, also uses a five-class system to rank water quality in China. See, for example, World Bank, “Staff Appraisal Report, Hubei Urban Environmental Project” (Washington, D.C.: The World Bank, 1995) (Rept. 14879-CHA), p. 47.

more importantly, they felt that the dam's reservoir was quite small compared to the flow of the mighty Yangtze.* In 1981, as the dam neared completion, the likelihood of a serious pollution problem seemed remote. Instead, people were treated to the fantastic scenery of a smooth lake emerging among the high gorges. The view from the town of Yemingzhu, where the water was said to shine like a mirror, was particularly attractive. There was talk of building a multipurpose water park in the area, and the National Sports Committee even considered moving its water sports training facilities to the city of Yichang (near Gezhouba) since its current site at East Lake on the outskirts of Wuhan was seriously polluted.

But the environmental impacts of the dam's construction soon became apparent.

Yemingzhu Port

On October 23, 1993, I visited the renowned port of Yemingzhu, and to my great surprise I saw a river full of sewage, with garbage scattered everywhere. The surface of the water was covered with oil and drifting lotus plants. Moreover, the smell and color of the water were simply unbearable.

According to an official from the Environmental Protection Bureau (*Huanbaoju*) of Yichang, the pollution in the Gezhouba Reservoir stems mainly from the following sources: waste, including oil, released from ships lined up to pass through the dam's locks; seepage from phosphorous (*lin*) deposits extracted from a local mine that have been piled up on the riverbanks awaiting shipment; sewage released into the reservoir from nearby residential areas and hospitals; and, finally, industrial wastewater.

A major polluter, the Number 403 factory, which produces ship engines, releases waste oil into the reservoir via a network of small brooks. When the accumulation of oil on the surface of the reservoir is particularly heavy, nearby farmers skim off a few jars, pour it into their tractors, and drive off. Fires also frequently break out on the reservoir when matches

*One likely reason why so little attention was paid to the possibility of increased river pollution is that no detailed feasibility study of the project was ever conducted. See, Shiu-hung Luk and Joseph Whitney, eds., *Megaproject: A Case Study of the Three Gorges* (Armonk, N.Y.: M.E. Sharpe, Inc., 1993), p. 6.

are carelessly thrown into the water. As I was completing this study in November 1993, the water quality at Yemingzhu had deteriorated to Class IV, which is unsuitable for drinking. Nevertheless, 50,000 tons of drinking water is drawn daily into a local waterworks from the reservoir. Moreover, nitrate levels in the water have recently increased by 20 percent annually.*

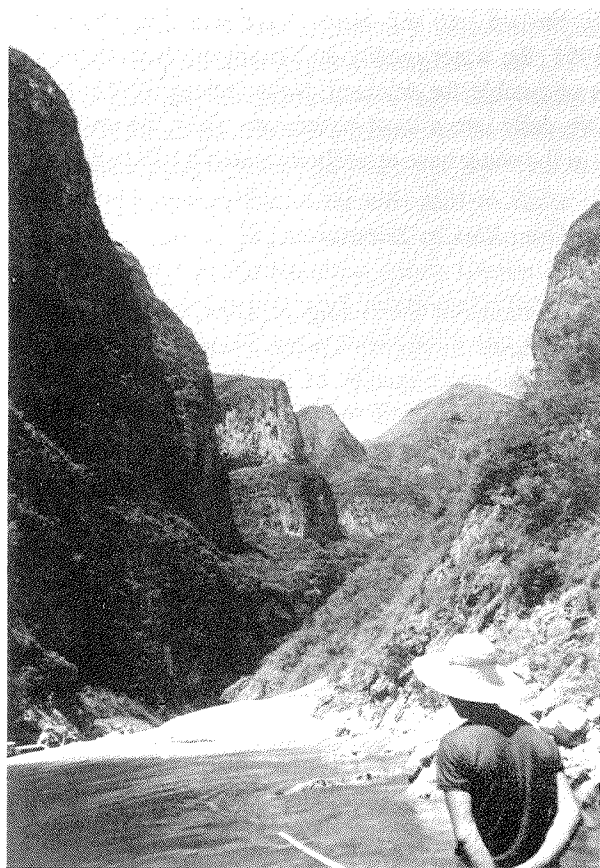
The Huangbai and Xiaoxita Tributaries

I also visited the banks of the Huangbai River, a primary tributary of the Yangtze, which flows through Yichang. Prior to the construction of the Gezhouba dam, the water quality of the Huangbai was very good. But when the dam was built and the reservoir backed water up into the Huangbai, it slowed down the flow of the river and consequently the ability of the Huangbai to flush out pollutants. Water quality in the river was recently lowered to Class III or IV, and an October 1993 study found that the water quality of the Xiaoxita tributary of the Huangbai River was rated at Class IV.** According to the local environmental protection officials with whom I spoke, the wawa fish, the Chinese Yangtze River sturgeon, and the rouge fish (*yanzhi*) have all disappeared from the area. Apparently, in 1991, entire truckloads of yellow phosphorous was dumped directly into the river, which caused the water to deteriorate dramatically and killed upward of 300,000 jin of fish. Fishermen who formerly raised fish in wooden cages submerged in the water were all driven away.

The renowned "Yangtze River China Sturgeon Research Institute," located on an island in the middle of the Xiaoxita tributary of the Huangbai River, can no longer draw water from the Huangbai for use in its sturgeon breeding efforts. The water is too polluted. Instead, researchers have to fetch water from the mainstream of the Yangtze miles upriver. Funding to

* Pollution of water with nitrates from high levels of nitrogen-based fertilizers is a growing problem in China. The well-documented health effects of high nitrate loadings include potentially life-threatening methemoglobinemia (also known as blue baby syndrome), which is characterized by a reduced ability of the blood to carry oxygen, and increased risks of stomach cancer. High nitrate loadings also contribute to eutrophication, the excessive algal blooms whose subsequent decay deprives affected waters of most of their oxygen supply and kills fish and other vertebrates. See, Smil, *Environmental Problems*, p. 25.

** *Changjiang sanxia shui huanjing tongbao* (General Report on Water Quality in the Three Gorges Area of the Yangtze River) (n.p., n.d.).



Entrance to Small Three Gorges, Daning River (Photo by Audrey Topping)

transport large volumes of clean water is due to run out in 1994, leaving the future of the sturgeon uncertain. As for the poor residents of Yichang, they have no choice but to use the polluted waters for drinking and other domestic needs.

New studies are underway to evaluate the overall water quality of those portions of the Huangbai River affected by the Gezhouba dam. Hopefully, these studies will not only help save what's left of the Huangbai, but will also serve as an example of what may happen to the Yangtze River, as well as the Jialing and Wu rivers, and the Daning River's Small Three Gorges. People have only just begun to appreciate the immense beauty of



Small Three Gorges. (Photo by Audrey Topping)

the Small Three Gorges, but they too will soon be submerged by the Three Gorges dam. Right now, the pure waters of the Small Three Gorges are just about the only place left that leads one to appreciate the old adage about how "the waters of the Shu River [the name given to the Yangtze in Sichuan Province] are clear enough to reflect the Shu mountains" (*shushan shuibi shujiangqing*).

Who Pays for the Pollution?

At noon on October 22, 1993, some colleagues and I landed on Zhongbao Island, one of the construction sites of the Three Gorges dam. The island

is actually no longer an island because the 813-metre-long coffer dam (built to sever and divert the river so that the main dam can be built) has connected it with the northern bank of the river. The officials in charge of the project from Hubei Province told me that construction began last year [December 1992], and that there are now over 5,000 workers and 800 pieces of heavy machinery working at the site day and night. He told us that China Central Television would carry a report on the first phase of construction work on the dam that very evening. However, because the National People's Congress (NPC) had not yet approved the final construction schedule for the dam [and would not do so until March 1994], dated pictures of the site would be used in the television report in order to create the impression that work on the dam had only just begun. The official explained that they did not want to be accused of looking down on or swindling the NPC, and asked that I not leak any information on the early start of the dam. It would only make it more difficult to maintain the NPC's support, he claimed.

So far in 1993 the state has invested ¥2 billion in the project, and in 1994 the figure will rise to ¥4.5 billion. As the rate of investment gathers steam, the completion date for the project has also been moved up. As a result, pollution control in the Three Gorges area is an even more urgent issue than I had imagined. The environmental impact statement for the dam states that "as much as ¥2.8 billion will be needed to clean up wastewater flowing into the river; a figure that is currently beyond the economic capacity of the region." It continued: "The volume of pollutants being dumped into the river must be reduced after the construction of the dam to compensate for the reduction in the rate of pollution clearance [flushing] from the reservoir. Input of pollutants to the reservoir should be reduced by an average of 43 percent of the current influx. Given the current volume of pollutants being discharged, 650,000 fewer tons of wastewater must be released each day." However, for every 650,000-ton reduction, ¥650 million of capital investment will be required, a figure not included in the original budget for the project.

The official cost estimate for the Three Gorges dam has surpassed ¥100 billion. How can we afford to invest billions of yuan to build this megaproject, when we cannot afford the ¥2.8 billion to treat wastewater in the reservoir area or the ¥650 million to mitigate pollution made worse by the dam. If we can afford to "buy the horse but not the saddle" we will embarrass ourselves in this unprecedented project.

And the cost of pollution abatement is by no means the only problem.

According to officials from various organizations in the Wanxian municipal government, the agricultural land surrounding Wanxian will only support 10 or 15 percent of the current population after the dam's construction. The other 85 percent of Wanxian residents will have to be resettled elsewhere. The officials also said that their research indicates widespread opposition to resettlement if the move does not lead to an improvement in living standards. If relocation causes a decline in living standards, the locals will categorically refuse to move.

The essence of the resettlement policy for the rural or agricultural population is to move people back from the river and resettle them in nearby mountainous areas. But the slope of the land in the mountains is much too steep for agricultural production, and many consider the plan unworkable. Those forced to move up into the mountains will suffer lowered standards of living, and the environmental impacts of the policy will be devastating. The Three Gorges area is one of the most fragile areas in the entire Yangtze River basin. Even if the project was implemented perfectly, resettlement up into the mountains would still cause increased soil erosion and pollution. Officials are correct in emphasizing that resettlement could be disastrous if not handled properly.

The pollution caused by township-level enterprises is also a serious problem. Not long ago, the Chongqing municipal government approved a new policy which requires the number of township enterprises to double annually and be developed "in an unconventional and Great Leap Forward fashion." In the eyes of the dam's planners, these enterprises are cash cows that will play a key role in employing relocatees, alleviating poverty, and paying off various local officials who might otherwise oppose the project. But these enterprises are now developing at a pace beyond anyone's control. In areas of Sichuan Province, obsolete facilities for making coke, sulphur, and arsenic still exist. The enterprises are protected by local officials and are totally beyond the control of the environmental agencies. As I noted earlier, the pollution they cause is not even included in national statistics. Sadly, large numbers of resettlers are slated for employment in industrial and township enterprises. This will undoubtedly lead to the further destruction of the Yangtze River Valley's already fragile environment.

Environmental problems with the dam are cause for concern at the Three Gorges Environmental Protection Bureau, which was established in 1976. To date, there has not been any proper environmental planning for the project, and the environmental budget is being administered by the Yangtze River Planning Commission (*Changwei*), an organization

that because of its commitment to large-scale projects along the river has generally shown little concern for pollution alleviation. The new district of Wuqiao in Wanxian is a good example. No environmental plan for the district exists, and only those facilities which can afford to move have been relocated. Then there is the case of the Eastern Sichuan Chemical Company, which has received ¥2 billion from the government for construction of a new plant that will employ 20,000 relocatees. But the plant will produce 60,000 tons of caustic soda, 100,000 tons of formaldehyde, and 100,000 tons of polyvinyl chloride annually. Clearly, the construction of this plant will only add to the pollution problem in the reservoir, not solve it.

Conclusion

The Three Gorges dam will exacerbate an already serious pollution problem in the Yangtze River. By severing the mighty river and slowing the flow of its water, the dam will cause pollution from industrial, residential, and township-level sources to concentrate in the river rather than be flushed out to sea. The result, for the 400 million Chinese who live in the Yangtze River Basin, will be a poisoned river.

Chapter Twelve

Military Perspectives on the Three Gorges Project

Da Bing

There have always been strong links between key economic projects and national defense. This is the case with the Three Gorges dam. Dam supporters argue that the project will increase the supply of electricity and promote economic development, thereby strengthening the country's defenses. But because the dam will be built in central China, it will assume immense strategic importance. If it were destroyed by military attack, the consequences for the military, and for the entire nation, would be disastrous.

Although the world is becoming a more peaceful place, the threat of an attack on the Three Gorges dam cannot be dismissed.* Large cities, nuclear power plants, and hydro projects are routinely considered prime military targets. Examples abound: The British bombed Germany's Mohne and Eder dams during World War II, the United States bombed North Korean dams during the Korean War and Vietnamese dams and dikes during the Vietnam War, and in 1938 Chiang Kai-shek ordered his troops to blow up the Yellow River dikes to stem the Japanese Army's advance.

Based on available materials, it appears that the Leading Group for the Assessment of the Three Gorges Project (which issued its report in 1987) did consider how to protect the dam itself; however, if the dam were to come under attack it would most likely be part of broader multitarget assault. The enemy would not only target the Three Gorges dam but would also seek to destroy all the surrounding facilities, including the Gezhouba dam and the Zhi River Railway bridge. Therefore, any assessment of the

*China's perspectives on current international relations are examined in Robert Ross, ed., *East Asia in Transition: Toward a New Regional Order* (Armonk, N.Y.: M.E. Sharpe, Inc. 1995).