Environmental Case Study

The Three Gorges Dam

When finished in 2009, the Three Gorges Dam on the Chang Jiang (Yangtze River) will be the largest dam in the world. Spanning 2.0 km (1.2 mi) and standing 185 m (607 ft) above normal river level, the dam will create a reservoir more than 644 km (400 mi) long. The dam is designed to control floods, ease navigation, and generate 18,200 megawatts of electricity to support industrialization and modernization in China's heartland.

The dam is flooding the scenic Three Gorges, one of China's most picturesque and historically significant areas. It already has displaced more than a million people, and will flood 1,300 cities and villages and more than 8,000 archeological and cultural sites. Water stored in the reservoir will make possible a long-discussed plan to build aqueducts to carry water from southern China to the dry plains around Beijing (fig. 10.1). Planners expect the dam to reduce annual floods that for centuries have caused misery and death for the 300 million people who live in the Yangtze River Valley.

![Map of China showing the location of the Three Gorges Dam and surrounding regions]

**Figure 10.1** Flowing more than 4,800 km (3,000 mi) from the high Tibetan Plateau, across the southern Gobi Desert, to the Yellow Sea, the Huang He, or Yellow River, is the major water source for much of the arid North China Plain. Currently, agricultural, industrial, and domestic water withdrawals drain the river dry for several months each year.

Environmentalists criticize the dam because it will reduce fish stocks, eliminate important agricultural lands, and disrupt habitats and migration patterns of critically endangered species such as the Yangtze River dolphin and the Chinese sturgeon. Currently, about a trillion liters (roughly 260 billion gallons) of untreated sewage is dumped into the Yangtze and flushed out to sea every year. Critics claim the reservoir will become a stagnant cesspool, dangerous to both aquatic life and to the millions of people who depend on the river for their drinking water.

Tremendous volumes of sediment will accumulate as the silt-laden Yangtze River slows in the reservoir. To reduce sediment buildup, dam operators plan to let spring floods flow through silt doors at
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the bottom of the dam. They hope this flow will scour out the bottom of the reservoir. Critics doubt this will work.

Geologists worry about catastrophic dam failure because the dam is built over an active seismic fault. Engineers are confident the dam can withstand the maximum expected earthquake, but China has a poor record of dam safety. More than 3,200 Chinese dams have failed since 1949. Probably the worst series of dam failures in world history occurred in Henan Province in 1975, when heavy monsoon rains caused 62 large, modern dams to fall like a line of dominoes. Some 230,000 people died in the massive flooding that followed. Even if the dam is able to withstand earthquakes, giant waves spawned by upstream landslides could easily cause a calamitous dam failure. In 1986, a landslide just a few miles upstream from the dam site dumped 15,000 m$^3$ of rock and soil into the river, creating an 80-m-high (260-ft) wave. If a similar wave hits the dam when the reservoir is full, some engineers predict a flood "of biblical proportions" that could kill millions of people downstream. The Chinese government has banned timber cutting and farming on steep upstream hillsides in an effort to control both landslides and sediment loads in the river.

Critics of this project claim that a series of smaller dams on tributary streams might have been much cheaper and less disruptive than the current project. Original estimates were that the Three Gorges Dam would cost $11 billion. By 2002, the costs for construction, relocation, and landscape stabilization had risen to $75 billion, and the project is not yet finished.

This complex project illustrates the importance of water resources for modern societies. The United Nations warns that water supplies are likely to become one of the most pressing resource issues of the twenty-first century. By 2025, two-thirds of all humans could be living in countries where water supplies are inadequate. Our attempts to reengineer those shrinking resources are increasingly in conflict with natural systems.