



USAID
FROM THE AMERICAN PEOPLE



FESS Issue Brief

January 2010

Key Points

Much of the environmental debate concerning the Three Gorges Dam has focused only on its immediate physical effects, while the public policy implications and the conflicting institutional interests that arose in relation to this massive project have received less attention.

Nearly one third of the National People's Congress deputies did not vote for the Three Gorges Project in 1992, reflecting the deep division and conflict of interests among various stakeholders in China's mainstream political elite.

China's so-called "environmental assessment storm" in 2005 demonstrated to all local governments and businesses that even the Three Gorges Project—the most "rich and famous" of all state-designated, high-priority projects—could not afford to ignore the Environmental Impact Assessment Law.

The Three Gorges Project significantly reduces China's greenhouse gas emissions, while its threats to biodiversity remain serious, if sometimes overstated.

The forced relocation of over a million residents from the Three Gorges area went relatively smoothly, without the kind of mass protests that accompanied other hydropower projects. However, the environmental impact of this massive relocation may be quite serious and remains understudied.

Recent changes in people's living standards in the area of the Three Gorges Reservoir Basin have brought about a gradual but clear shift in pollution from industrial to residential, and priorities in environmental protection need to be adjusted accordingly.

Environmental Security Concerns and the Three Gorges Reservoir Basin in China

Gang Guo

*Associate Professor of Political Science and International Studies,
Croft Institute for International Studies at the University of Mississippi*

Introduction

Figure 1 Satellite Images of the Three Gorges Dam Area in 1993 and 2009



Source: Information Management Center for Ecological and Environmental Monitoring of the Three Gorges Project 2009.

The Three Gorges Dam is the largest hydroelectric dam in the world, measuring 1.5 miles in length and 607 feet in height. In comparison, the Grand Coulee Dam, the largest in the United States, is less than 1 mile long and 550 feet high (U.S. Department of the Interior, Bureau of Reclamation 2009, 1). The electricity produced at the Three Gorges Dam is almost equivalent to the electricity consumption of Chad, the fifth largest country in Africa. The impact of this civil engineering project, one of the largest in human history, on environmental and human security has been a rather controversial subject among policymakers, scientists, civil society, and the private sector in China and abroad. However, much of the ongoing environmental debate concerning the Three Gorges Dam focuses only on the immediate physical effects, while the public policy implications and underlying conflicting interests of a project of such unprecedented scale obviously reach far beyond the surrounding area. For instance, the widely reported policy row in 2005 over the environmental legality of two accessory power plants of the Three Gorges Project became a turning point both in the enforcement of the Environmental Impact Assessment Law of China and in public participation in environmental impact assessments. Moreover, filling the Three Gorges Reservoir holds back 39.3 cubic kilometers (km³) of water from reaching the Pacific Ocean, in effect lowering global sea level by about 0.1 millimeters (mm). To put that in perspective, the average annual rise in global mean sea level attributed to increased melting of glaciers and ice caps worldwide between 1990–1991 and 2003–2004 was about 0.8 mm (Bates et al. 2008, 19). Of more immediate importance, the drainage basin of the Three Gorges Reservoir is one of the major urban, industrial, and

mining bases of China, with a population of over 30 million and reserves of 2 billion metric tons of coal and 121 km³ of natural gas (State Statistical Bureau 2008, 400). To link the environment with security, to assess the magnitude of the effects of the dam, and to develop policy recommendations requires a holistic approach that expands the analytic scope beyond just the physical aspects of the Three Gorges Dam.

This report on environmental security focuses on the Three Gorges Reservoir Basin, whose geographic boundaries coincide largely with the administrative borders of the municipality of Chongqing, one of only four provincial-level Directly Administered Municipalities in China. Indeed, the decision made by the National People's Congress in March 1997 to promote Chongqing from a prefecture-level city to a provincial-level municipality was directly based on the consideration of the construction of the Three Gorges Project (Zhu 2006, B1). The analytic framework used here employs a factor-based

probably originated decades earlier, it was not until during World War II that the first design of the project was drawn. In 1944, the National Resources Commission of China invited Dr. John Lucian Savage, then Chief Designing Engineer in charge of all designing for the U.S. Bureau of Reclamation, as a consulting engineer to study the Three Gorges area. Dr. Savage designed his "dream dam" in a report on the Yangtze River Gorge Project, which was published in November 1944 (Wolman and Lyles 1978, 232). Preparation for this ambitious project, however, was halted by the turmoil of the Chinese Civil War from 1946 to 1949. After the Chinese Communist Party came to power, the massive damage and casualties caused by flooding of the Yangtze River in 1954 convinced many people in China that the Three Gorges Dam was necessary to prevent such a disaster from happening again. However, for various political, economic, and technical reasons, the Three Gorges Project was debated among scientists and engineers but never reached the policy-making stage until the Great

A congressional vote result that deviated so much from the usual near universal support for government proposals was extremely rare in the history of the NPC, defying the usual image of the NPC as just an obedient rubber stamp of the authoritarian party state. This high-profile occurrence probably reflected the deep division and conflict of interests between various stakeholders even among China's mainstream political elite, who often appear monolithic and "harmonious" on the surface. The National People's Congress was certainly not designed to be an assembly of representatives who literally represent conflicting constituency interests in the first place but rather a legitimizing device for the communist party-state. The deputies to the National People's Congress are overwhelmingly composed of local government officials and communist party cadres. In regard to building the Three Gorges Project, most of the local government or party leaders in the Congress had little vested interest and thus were indifferent to the State Council's proposal. However, the

“The reasons why the State Administration of Environmental Protection decided to take on the Three Gorges Project Corporation, one of the most powerful state-owned enterprises in China, were the subject of quite a few media reports on this high-profile event, which was later dubbed ‘the environmental assessment storm.’”

approach, whereby critical environmental or environmentally related factors, such as human migration; industrial-, construction-, and mining-related pollution; land use; and deforestation are evaluated in the context of national, sub-national, and local capacities to manage stresses attributed to one or more of the factors. First, the report will discuss the historical development of the Three Gorges Project and examine the underlying conflicts of stakeholder interests during its construction.

Historical Development

Although the idea of building a hydroelectric dam at the Three Gorges

Cultural Revolution ended in 1976. Beginning in 1978, the former Ministry of Hydroelectricity conducted a feasibility study on the Three Gorges Project, which was approved in principle by the State Council in 1984 (Party Group 2009, 30). The environmental impact assessment (EIA) on the Three Gorges Project took another eight years before final approval by the State Council in 1992 (Stone 2008, 629). Despite that EIA, the project was still highly controversial, and when the proposal was brought to the National People's Congress (NPC) for a vote, almost a third of the delegates did not vote for it (Tanner and Chen 1998, 39).

deputies who had various connections to such sectors as hydropower, electrical grid, machinery, raw materials, and transportation were probably happy to support the proposal because of the tremendous financial bonanza that the multibillion-dollar project could potentially bring to those sectors.

Although the voting records of the National People's Congress deputies are not available, the sources of discontent for the nearly one third of deputies who refused to even superficially show support for the Three Gorges Project are actually not difficult to see. The Chinese system of the National People's Congress

“Just three years after the ‘environmental assessment storm,’ the enhanced status of the Administration was finally consolidated in a formal decision by the First Session of the 11th National People’s Congress to promote it to a new Ministry of Environmental Protection.”

ensures that the only possible conflicting interests that might be allowed to surface are those between different regions, since the deputies to the National People's Congress are by law elected by provincial people's congresses and organized by province during deliberations in session. For the provinces that were hundreds of miles away from the project, the short-term financial burden of the project that they would have to share probably outweighed the future benefits that they expected to gain from it. The electricity generated at the Three Gorges Dam probably would not reach them. In addition, the provinces that have a substantial local energy sector such as coal mines or natural gas and oil fields might have felt threatened by the added competition from the Three Gorges power plant. The stiffest opponents to the project at the National People's Congress probably came from the regions that would be most severely affected by the forced relocation of residents, namely the eastern part of Sichuan Province that later became Chongqing Municipality and the western part of Hubei Province. These regional governments clearly shouldered the most difficult task, while the benefits remained to be seen. The fact that only four years after the vote on the Three Gorges Project Chongqing was promoted to the rank of a province, which meant a sweeping political windfall to almost every party and government official in the region, suggests that there might have been a tacit bargain to bring Chongqing into agreement on the project in 1993.

In order to coordinate the various stakeholders involved in this huge project and to facilitate their cooperation, the State Council specifically established a cabinet-level Three Gorges Project Construction Commission (with the then-Prime Minister serving concurrently as its

director) and its Executive Office, in addition to the state-owned business entity of the China Yangtze River Three Gorges Project Development General Corporation (the “Three Gorges Project Corporation”) on January 3, 1993 (State Council 1993). After nearly 17 years of construction, the Three Gorges Project was finally completed, checked, and accepted on Thursday, August 27, 2009 (Jiang and Wu 2009, 18). A month later, the Three Gorges Project Development Corporation formally announced that its name had been changed to Three Gorges Corporation, which was approved by the State Council (Three Gorges Corporation 2009a).

During this period, probably the most dramatic demonstration of the underlying conflict of official interests over the environmental impact of the project happened in early 2005. The Environmental Impact Assessment Law of the People’s Republic of China took effect on September 1, 2003, but, like many other laws in China, was often not taken seriously by local governments and businesses. The large-scale state-owned enterprises, the Three Gorges Project Corporation included, were especially defiant with regard to implementation of and compliance with the Environmental Impact Assessment Law. The State Administration of Environmental Protection seemed helpless in the face of these well-connected violators of the Environmental Assessment Law, whose infamous approach was known as “getting on board before purchasing a ticket” (“*xian shangche hou maipiao*”), i.e., starting the project before its environmental assessment is approved or even completed.

However, a turning point in the bureaucratic balance of power came in November 2003, when the powerful State Development and Reform Commission and then the State Council became increasingly concerned by the looming overcapacity of electricity generation. At that time 280 gigawatts (GW) of power plants were already under construction, of which 150GW were to be started in 2004 alone. The problem of overcapacity seemed serious enough, but what was even more alarming to the State Council was the fact that 120GW of power plant projects under way had never completed any approval process at the central government level (State Council 2004). The State Council probably felt that it was losing important regulatory control over such a crucial area of economic activity, and the State Administration of Environmental Protection was certainly a ready ally in the State Council’s effort to regain regulatory authority over electricity generation. On January 18, 2005, the Deputy Director of the State Administration of Environmental Protection announced to the public a list of 30 construction projects that were illegally started. Unsurprisingly, the list consisted of mostly power plant projects, but three hydroelectric power plants, all being built by the Three Gorges Project Corporation, conspicuously occupied the top three items on the list. One was a hydroelectric plant with a capacity of 12.6GW on the Yangtze River that is hundreds of miles upstream from the Three Gorges Dam itself, but the other two were both on the site and integral components of the Three Gorges Project, namely the underground power plant and the source power plant, with generating capacities of 4.2GW and 0.1GW, respectively.

The reasons why the State Administration of Environmental Protection decided to take on the Three Gorges Project Corporation, one of the most powerful state-owned enterprises in China, were the subject of quite a few media reports on this high-profile event, which was later dubbed “the environmental assessment storm” (Xiong 2006, 26). Just a week after the list of illegal projects was publicized, the State Administration of Environmental Protection convened the 2005 National Conference on Environmental Protection Work. The

Director of the Administration reportedly told attendees of the conference, who were mostly provincial environmental protection bureau chiefs that “we used to investigate only small cases, and neither the mass public nor the leaders were satisfied. This time we caught 30 big projects, and the responses from society were very good.” He went on to say that the Prime Minister praised their actions (Zhang 2006, A08). In addition, on the day before the National Conference, 56 nongovernmental environmental organizations in China jointly issued an open letter in support of the action of the State Administration of Environmental Protection (Xiong 2006, 30). The Three Gorges Project Corporation faced unprecedented media scrutiny as well as public and government pressure and eventually decided to comply with the directives from the State Administration of Environmental Protection, ostensibly after the State Development and Reform Commission sided with the latter (Xia and Shi 2005, 1).

The consequences of this so-called “environmental assessment storm” were quite positive, even though it certainly remains debatable whether the parties involved, including the State Administration of Environmental Protection, the State Development and Reform Commission, and the Three Gorges Project Corporation, were genuinely more concerned about the environment than about their respective turfs of bureaucratic authority. The National Conference demonstrated to all local governments and businesses that even the Three Gorges Project, the most “rich and famous” of the state-designated key projects, could not afford to ignore the Environmental Impact Assessment Law. As a direct result, the year 2005 saw a dramatic increase in the number of EIAs on construction projects that were filed with the State Administration of Environmental Protection (Xiong 2006, 30). In addition, the amount of media attention and public enthusiasm was overwhelming and probably far exceeded what the State Administration of Environmental Protection had initially expected. Later, in November 2005, the Administration drafted an unprecedented official document on public participation in environmental impact assessment and sent it to all provincial environmental

protection bureaus and relevant central government ministries to solicit opinions (Office of the State Administration of Environmental Protection 2005). Finally, the triumph of the State Administration of Environmental Protection in this “storm” became a crucial catalyst in the rise of its official standing among central government agencies. Just three years after the “environmental assessment storm,” the enhanced status of the Administration was finally consolidated in a formal decision by the First Session of the 11th National People’s Congress to promote it to a new Ministry of Environmental Protection (State Council 2008, 5).

Critical Environmental Factors in the Three Gorges Reservoir Basin

Thus, the construction of the Three Gorges Project was inevitably contentious and complex, due to the extremely high stakes and high visibility associated with it. Accordingly, the critical factors in the environmental security of the Three Gorges Reservoir Basin should be considered in the wider subnational, national, and international contexts rather than being confined to the physical structure itself or its immediate surrounding areas.

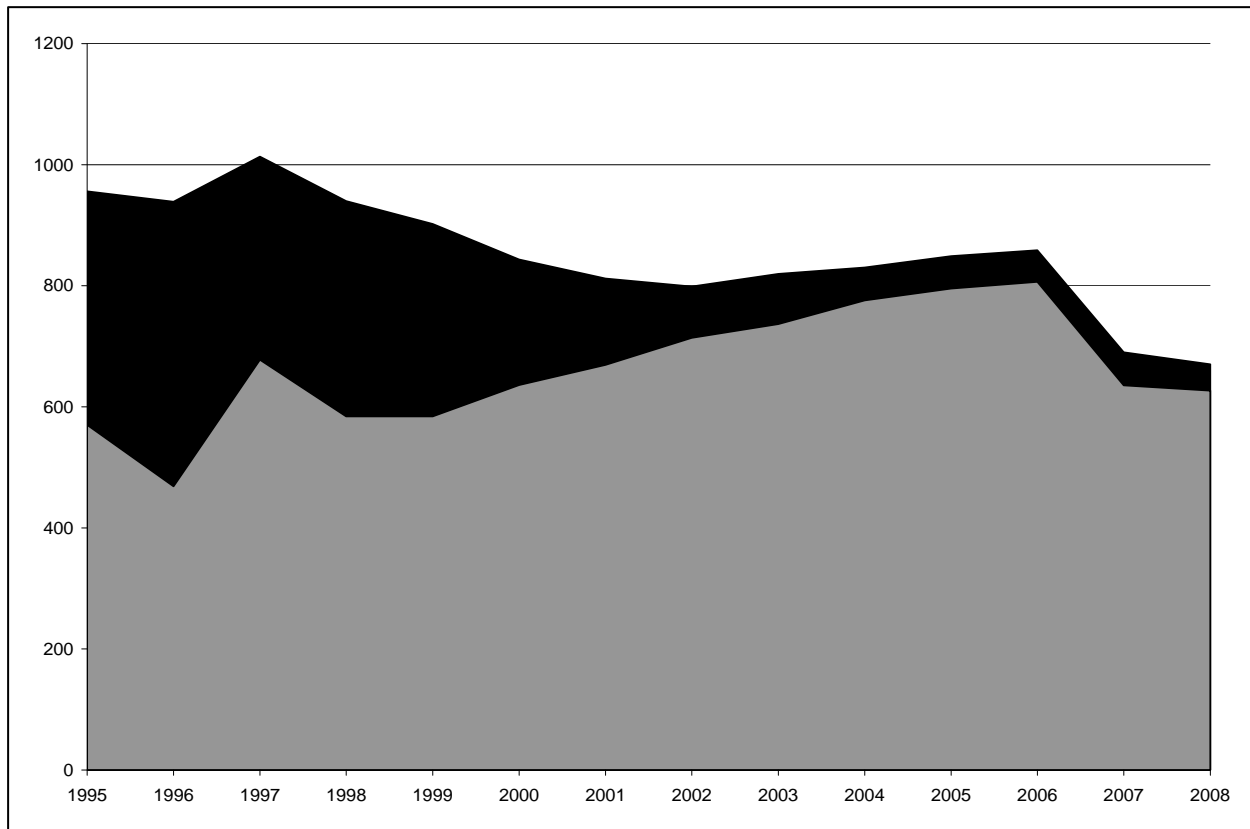
Carbon Emissions

As the largest hydroelectric power plant in the world, the Three Gorges Project reduces China’s emission level of gases such as carbon dioxide that contribute to the global greenhouse effect by replacing the need to burn coal or other fossil fuels. Indeed, *Scientific American* recently listed the Three Gorges Project as one of the 10 largest renewable energy projects in the world (Mims 2009). According to the Three Gorges Corporation, the annual electricity generating capacity of the project is 84.7 thousand gigawatt-hours. It would take 10 large-scale coal-based thermal power plants, each with a generating capacity of 1.8GW, to generate the same amount of electricity. Every year, these 10 thermal power plants would burn 50 million metric tons of coal and emit more than 100 million metric tons of carbon dioxide, more than 2 million metric tons of sulfur dioxide, more than 10 thousand metric tons of carbon monoxide, and 370 thousand metric tons of nitrogen oxides, not to

mention the massive amount of ashes and other toxic solid waste (Three Gorges Corporation 2009b). Some recent studies by Chinese scientists seem to confirm certain environmental benefits of the Three Gorges Project. For instance, Zhao et al. (2008) estimate that the Three Gorges Project reduces the ecological footprint through its prevention of floods, generation of electricity, and facilitation of navigation, although it also increases the ecological footprint by submerging vegetation, reducing fish, soil soaking, and secondary saline-alkalization. It should also be pointed out that the enormous amount of concrete, steel, and other materials as well as energy used during the 17 years of construction of the Three Gorges Project obviously caused significant carbon emissions. Moreover, the calculations by the Three Gorges Corporation on the replacement of thermal power plants were based on assumptions of ideal conditions and did not take into account such considerations as the substantial transmission losses during the transportation and distribution of electricity from generators to end users over long distances. However, it would be hard to deny that the overall net effect of the Three Gorges Project on reducing emissions, especially in the long term, is quite positive.

Relocation

The Three Gorges Project has involved a massive relocation program, even though the total number of migrants constitutes only a small fraction of the population of Chongqing municipality. According to the latest announcement by the Deputy Director of the State Council Three Gorges Project Construction Commission Office, 1.27 million residents were relocated in the reservoir basin area, and nearly 50 million square meters of housing were built for them. Altogether 1,632 factories and mines were closed or moved, and 12 cities or county seats and 114 towns were relocated (Xinhua News Agency 2009, 10). Needless to say, the socioeconomic problems created by this large-scale population flow are potentially enormous, such as unemployment, poverty, lack of education facilities, and psychological adaptation. There have been sporadic reports by some non-governmental human rights organizations and news

Figure 2 Discharge of Industrial Wastewater (in million tons) in Chongqing

Grey area represents the portion of discharge that met national or local environmental standards.

Source: Chongqing Municipal Bureau of Statistics 2009.

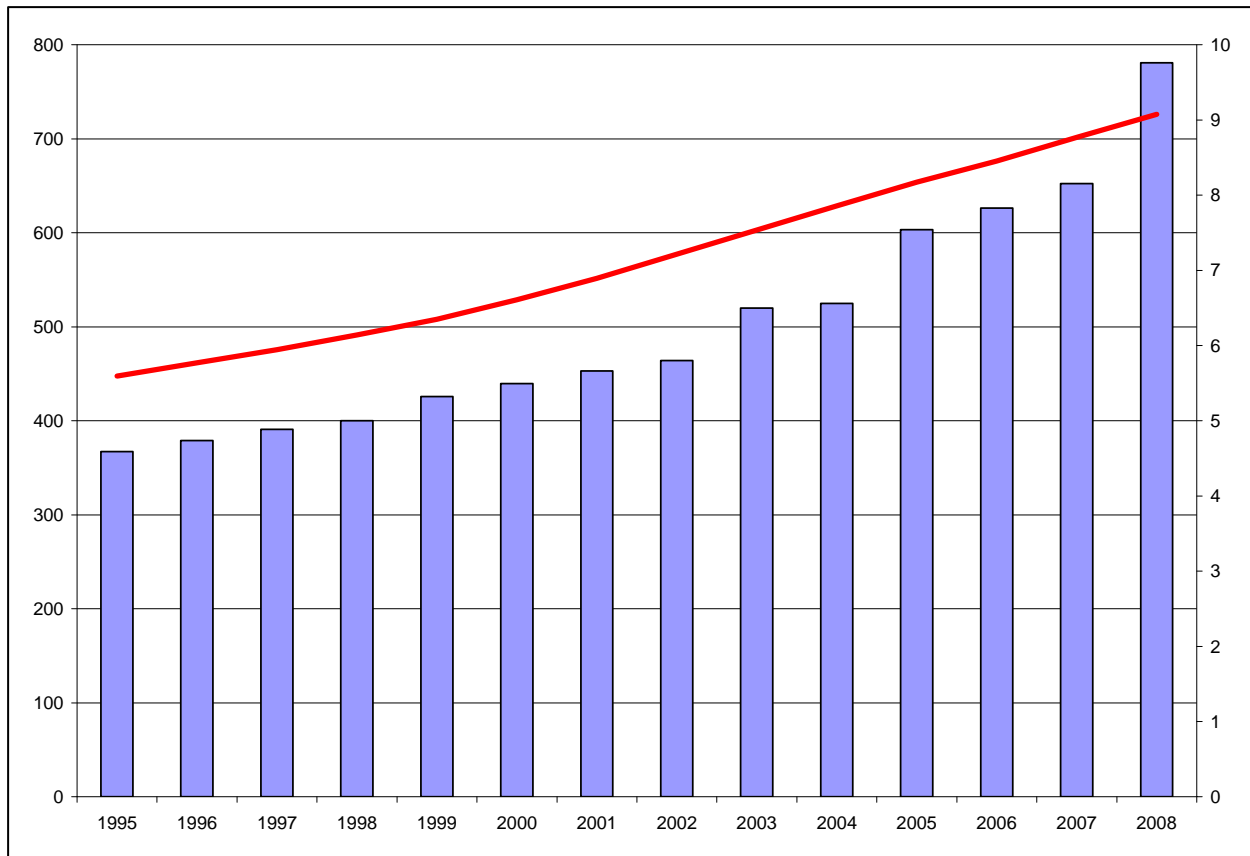
media based in the West about the open or tacit protests by the migrants who were forced out by the Three Gorges Project. Some migrants who were resettled to the provinces on the Pacific coast, for instance, decided to move back to the reservoir area because they were dissatisfied with the living conditions of their designated destination. However, considering the sheer number of people affected, the forced resettlement caused by the Three Gorges Project went relatively smoothly, without the kind of mass protests that accompanied some other hydropower projects in Sichuan and Yunnan Provinces (Mertha 2008). One of the main reasons for that interesting contrast is, as mentioned above, the extremely high stakes and high visibility associated with the Three Gorges Project, which meant that the central and local governments were willing to invest more fiscal and other resources in resettlement relative to the total cost of the project. The original investment budget for the project allocated 40 billion RMB yuan (in

May 1993 prices) to the relocation and rebuilding for the areas to be submerged by the reservoir. In comparison, 50 billion RMB yuan (in May 1993 prices) was originally allocated to building the physical structure of the project itself. In 2009 prices, the actual total amount spent on relocation to date has been 69.3 billion RMB yuan (Zhang 2009). Other hydropower projects probably rarely devoted such a high proportion of total investment on resettlement, often leaving the forced migrants inadequately compensated for their sacrifices. Additionally, nongovernmental environmental organizations and mass media have not played a significant role in investigating and exposing the grievances of the migrants forced out of the Three Gorges Reservoir area, which contrasts with the cases where public protest did occur.

However, the main environmental concerns over the massive relocation of

migrants are probably no less serious. For instance, the submerged cities, towns, factories, and mines may still contain trace amounts of toxic or radioactive materials, despite local government efforts to clean them up before the water level rose. In addition, many of the rebuilt houses for migrants are located in formerly uninhabited areas in higher altitudes where human activities and farming may disrupt the fragile natural equilibrium of the ecological systems. For the new settlers, their interests are framed by the conflict between the immediate developmental needs of poverty alleviation and the long-term environmental needs of ecosystem preservation and, except in the case of air and water pollution, most probably incline toward the former. So far, however, most of these concerns are still speculative and have yet to be substantiated by scientific studies. This is an area where civil society can still remain active in mitigating threats to

Figure 3 Urban Population (in millions) and Discharge of Residential Wastewater (in million tons) in Chongqing Municipality



The red line represents urban population in millions, with the scale on the right. Blue columns represent discharge of residential wastewater in millions of tons, with the scale on the left.

Source: Chongqing Municipal Bureau of Statistics 2009.

environmental security even though the Three Gorges Project is already a fait accompli. The vocal opponents to the Three Gorges Project before 1993 have either been silenced by the government or have decided to move on to other environmental projects where they feel they can have more of an impact. However, the environmental NGOs, media, individual activists, and scholars from the scientific community who oppose the project can make invaluable contributions now, since they understand the environmental risks probably better than most people, and they are in a good position to analyze the environmental concerns of and impacts on the resettlement communities.

Biodiversity

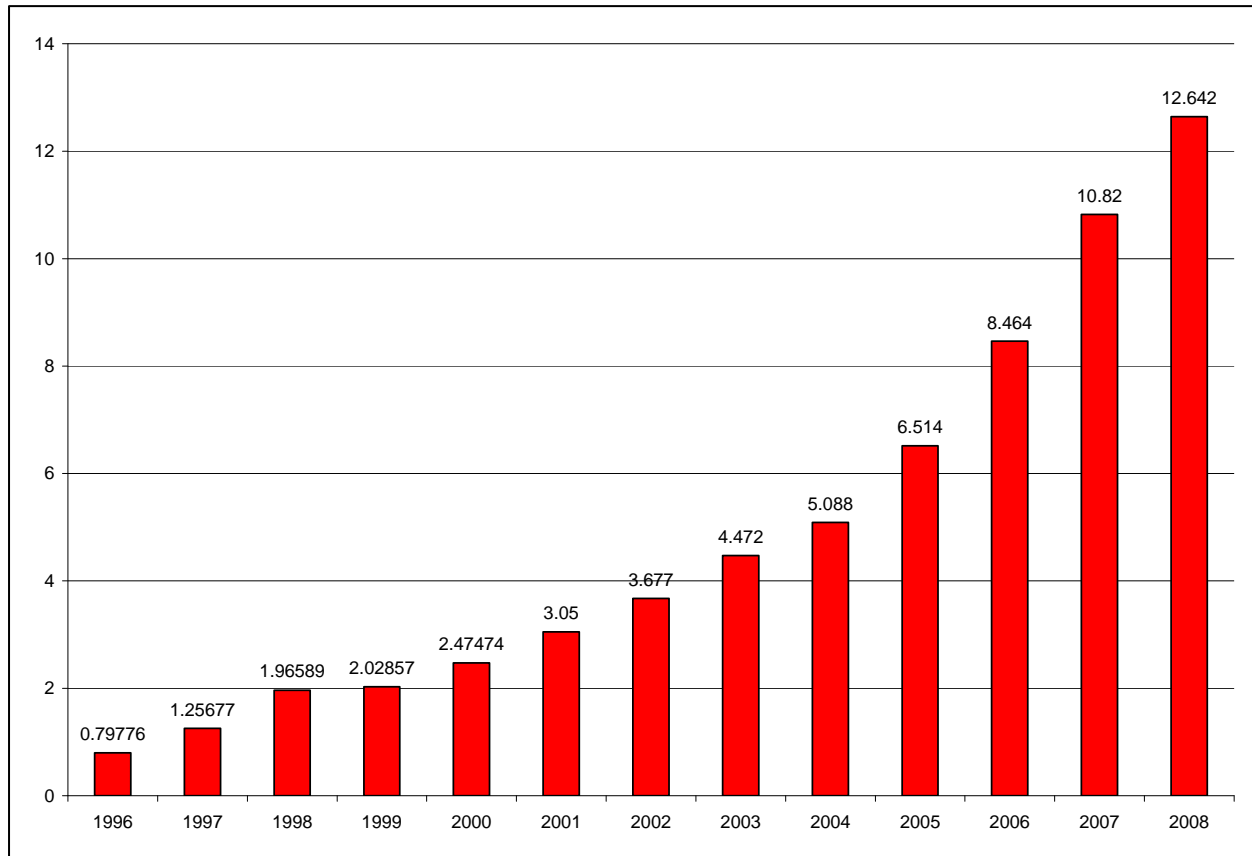
By cutting off migratory paths in the Yangtze River and by submerging large areas of land that used to be covered by

live vegetation, the Three Gorges Project has become a major threat to the survival of some animal and plant species in its reservoir basin. Moreover, the project may also affect life in the Yangtze River in subtle ways far beyond its immediate surrounding area. For instance, Xie and Chen (2008) found that the Three Gorges Project greatly altered the growth pattern of wetland vegetation in Dongting Lake, which is connected to the Yangtze River nearly 400 kilometers (km) downstream from the Three Gorges Dam. According to another study, the Three Gorges Dam has smoothed out seasonal flows of the Yangtze River, which disrupts the regular spawning runs of adult carp. As a result, the number of carp eggs and larvae were severely reduced from 1997 to 2005 (Stone 2008, 631).

Despite these observed effects, it is probably still hard to rule out the possibility that with the dramatically

increased human activities along the Yangtze River in recent decades, wildlife in the area would be severely threatened in any event, even without the construction of the Three Gorges Project. For instance, forest coverage in the surrounding area of the reservoir had already dropped from 32 percent to 22 percent because of previous logging (Huang 2001, 474), and fish population in the Yangtze River had already plummeted due to pollution and over-fishing, even before the Three Gorges Dam started regulate water flows (Huang 2001, 477; Stone 2008, 631).

Needless to say, efforts to mitigate the impact of the Three Gorges Project on biodiversity are a Herculean task and require careful coordination and effective implementation often across multiple administrative boundaries and sometimes at the national level. For example, while

Figure 4 Investment in Environmental Protection (in billion RMB yuan) in Chongqing Municipality

Source: Chongqing Municipal Bureau of Statistics 2009.

the Three Gorges Dam was still under construction in the late 1990s, the central government decided to ban all logging of natural forest in the Yangtze River Basin upstream of the dam and to require that all hillside farmland with a slope of more than 25 degrees be restored to forest. The central government also has designated sections of the Yangtze River scattered across several provinces as nature reserves (Huang 2001, 480). Future preservation measures will also inevitably have to involve public or private sector efforts far beyond the surrounding areas of the Three Gorges Dam to be effective.

Pollution

The Three Gorges Dam slows down water flow in the Yangtze River upstream of the dam in the reservoir, and thus it now takes much longer for waterborne pollutants to detoxify and to dissipate. To make matters worse, the city of Chongqing, located at the upstream end of the Three Gorges Reservoir about 600 km from the dam, was an old industrial

base and one of the most polluted cities in China. The primary cause of pollution for the Three Gorges Reservoir is likely the discharge of wastewater, from both industrial and residential sources in the Directly Administered Municipality of Chongqing, which includes 19 urban districts and 21 rural counties.

Figure 2 shows the trend in the emission of industrial wastewater and the efforts to bring the discharges up to environmental standards in Chongqing Municipality from 1995 through 2008, a period that corresponds roughly to the years when the Three Gorges Project was under construction. Generally speaking, total industrial discharge has decreased while the proportion that met environmental standards has increased in Chongqing Municipality during this period. From 1995 through 2008, the municipality's gross domestic industrial product increased nearly sixfold, from 36 billion RMB yuan to 204 billion RMB yuan (Chongqing Municipal Bureau of

Statistics 2009, 4–5), and so the downward trend in total discharge took place in the context of a growing industrial sector. The upward trend in the proportion of emissions that met environmental standards can probably be attributed to increased investment in equipment and better enforcement of standards. However, there still remains a lot to be done, as the percentage of discharge that met environmental standards in Chongqing Municipality was 93.5 percent, only slightly higher than the national level of 92.4 percent in 2008 (General Department, State Statistical Bureau 2009). Given Chongqing's strategically crucial location in relation to the Yangtze River and the Three Gorges Reservoir, it is imperative that it be subject to a higher and stricter standard than the national average.

Figure 3 shows the trend in the emission of residential wastewater, which has seen a continuous increase in the past 14 years and has now surpassed the amount of

discharge of industrial wastewater in Chongqing Municipality. Residential sewage will probably continue to be the main source of wastewater in the Three Gorges Reservoir. Figure 3 also suggests a nearly perfect correlation between the increases in urban population and in the emission of residential wastewater. The period from 1995 to 2008 was one of fast urbanization in Chongqing Municipality, during which the rural population decreased by almost one million while urban population grew by 62 percent. This trend will probably continue in the future, resulting in even higher levels of residential wastewater emission. Therefore, greater emphasis should be placed on processing residential wastewater in Chongqing Municipality in the coming years, considering the new changes in the amount and composition of water pollution in the area.

Conclusion

By reviewing the historical conflicts of interest among institutional stakeholders, this report demonstrates that the unprecedented scale of the Three Gorges Project mandates a closer look at the wider regional and national context of the Three Gorges Dam. Critical environmental factors in the Three Gorges Reservoir Basin have often been closely linked to other provinces in a variety of ways. If past developments are good indicators of future trends, containing and mitigating the major threats to the environmental security of the Three Gorges Reservoir Basin will be an extremely challenging task, although certainly feasible. There already have been some encouraging signs of greater government efforts in that direction in recent years. For instance, Figure 4 shows that the amount of investment in environmental protection in Chongqing Municipality has multiplied manyfold throughout the construction period of the Three Gorges Project. To make the investment more effective, however, the priorities of environmental protection will have to be more carefully studied, and participation by the general public and civil society also will have to be further encouraged.

Preliminary Recommendations

To the Government of the People's Republic of China:

1) Transform the functions of the State Council Three Gorges Project Construction Commission so that the Commission becomes the primary governmental mechanism for coordinating environmental protection efforts of the areas that affect or are affected by the Three Gorges Project.

To the Government of the Chongqing Municipality:

1) Develop a strategic plan for sustainable development in cooperation and coordination with regional governments both upstream and downstream of the Yangtze River.

2) Commission a comprehensive study of the discharge of wastewater into the Three Gorges Reservoir and use the results to inform future decisions on building wastewater processing plants.

3) Gradually introduce competitive bidding in environmental protection initiatives to encourage participation by the private sector, civil society, and the general public.

To the private sector:

1) Apply principles of sustainable development and environmental protection to daily business operations.

2) Make donations to assist environmental education programs along the Yangtze River to promote environmental consciousness and sustainable development among the general public.

To civil society:

1) Nongovernmental environmental organizations, concerned scientists, university professors, and mass media should conduct field research in areas where migrants from the Three Gorges Reservoir Basin are resettled to study both the environmental impact and

socioeconomic needs of these new communities.

2) Provide training opportunities for local youth leaders to become more knowledgeable promoters of environmental security and sustainability.

To international donors:

1) Work with local governments in the Three Gorges Reservoir Basin to strengthen community-based environmental efforts.

2) Provide funding for research projects on environmental security and sustainable development in the Three Gorges Reservoir Basin in institutions of higher education in Chongqing Municipality.

References

- Bates, Bryson C., Zbigniew W. Kundzewicz, Shaohong Wu, and Jean P. Palutikof, eds. 2008. *Climate change and water*. Technical Paper of the Intergovernmental Panel on Climate Change. Geneva: IPCC Secretariat.
- Chongqing Municipal Bureau of Statistics. 2009. *Chongqing Tongji Nianjian* [Chongqing Statistical Yearbook]. Beijing, China: China Statistics Press.
- General Department, State Statistical Bureau, People's Republic of China. 2009. *Huanjing baohu chengjiu feiran* [Clear achievements in environmental protection]. http://www.stats.gov.cn/tjfx/ztx/qzxxgcl60zn/t20090928_402590846.htm.
- Huang, Zhenli. 2001. *Sanxia Gongcheng zhong de shengwu duoyangxing baohu* [Biodiversity conservation for the Three Gorges Project]. *Shengwu Duoyangxing* [Biodiversity] 9 (4): 472–481.
- Information Management Center for Ecological and Environmental Monitoring of the Three Gorges Project. 2009. <http://www.tgenviron.org/imagesofRS/daba.html>; Google Maps. <http://maps.google.com/?ie=UTF8&ll=30.851248,111.007404&spn=0.138824,0.175953&t=h&z=13>.
- Jiang, Shiqiang and Zhi Wu. 2009. *Sanxia Gongcheng kaishi zhengchang xushui, dui 175 mi shuiwei jinxing yanshou* [Three Gorges Project started regular filling-up, checked and accepted at the water level of 175 meters]. *Zhongguo Nengyuan Bao* [China Energy Daily], August 31.
- Mertha, Andrew C. 2008. *China's Water Warriors: Citizen Action and Policy Change*. Ithaca, NY: Cornell University Press.
- Mims, Christopher. 2009. Slide show: The world's 10 largest renewable energy projects. <http://www.scientificamerican.com/slideshow.cfm?id=10-largest-renewable-energy-projects>.
- Office of the State Administration of Environmental Protection. 2005. *Guanyu zhengqiu gongzhong canyu huanjing yingxiang pingjia banfa (zhengqiu yijian gao) yijian de han* [Letter on soliciting opinions on the methods of public participation in environmental impact assessment]. Office of the State Administration of Environmental Protection Letter Number (2005) 688.
- Party Group of the Office of the Three Gorges Project Construction Commission, State Council of the People's Republic of China. 2009. *Sanxia Gongcheng de gaige kaifang zhilu* [The path of reform and opening up of the Three Gorges Project]. *Qiushi* [Seeking Truth]. Issue 3.
- State Council, People's Republic of China. 1993. *Guowuyuan guanyu chengli guowuyuan Sanxia Gongcheng jianshe weiyuanhui de tongzhi* [State Council notice on establishing the State Council Three Gorges Project Construction Commission]. State Council Document Issue Number <1993>1.
- . 2004. *Guowuyuan pizhuan fazhan gaigewei guanyu jianjue zhizhi dianzhan xiangmu wuxu jianshe yijian de jinji tongzhi* [State Council urgent notice on the approval and forwarding of the State Development and Reform Commission's opinion on firmly stopping the disorderly construction of power plant projects]. State Council Document Issue Number <2004>32.
- . 2008. *Guowuyuan jigou gaige fang'an* [Plan of the organizational reform of the State Council]. *Renmin Ribao* [People's Daily], March 16.
- State Statistical Bureau, People's Republic of China. 2008. *Zhongguo tongji Nianjian* [China Statistical Yearbook]. Beijing, China: China Statistics Press.
- Stone, Richard. 2008. Three Gorges Dam: Into the unknown. *Science* 321:628–632.
- Tanner, Murray Scott and Ke Chen. 1998. Breaking the vicious cycles: The emergence of China's National People's Congress. *Problems of Post-Communism* 45:29–47.
- Three Gorges Corporation. 2009a. *Gengming gonggao* [Announcement on change of name]. September 27th. <http://www.ctgpc.com.cn/gmzg.php>.

- . 2009b. *Redian wenti* [Hot Issues]. <http://www.ctgpc.com.cn/sxslsn/index.php?mClassId=003010>.
- U.S. Department of the Interior, Bureau of Reclamation. 2009. Grand Coulee Dam statistics and facts. <http://www.usbr.gov/pn/grandcoulee/pubs/factsheet.pdf>.
- Wolman, Abel and W. H. Lyles. 1978. *John Lucian Savage 1879–1967*. Washington, DC: National Academy of Sciences.
- Xia, Mingqun and Baohua Shi. 2005. *Huanbao weifa xiangmu quanbu tinggong huanbao fengbao huo fagaiwei zhichi* [The projects that violated environmental protection laws all stopped; “Environmental protection storm” received support from State Development and Reform Commission]. *Jinghua Shibao* [Beijing Times Newspaper], February 3.
- Xie, Yonghong and Xinsheng Chen. 2008. *Sanxia Gongcheng dui dongtinghu shidi zhibei yanti de yingxiang* [The impact of the Three Gorges Project on the change and replacement of wetland vegetable in Dongting Lake]. *Nongye Xiandaihua Yanjiu* [Agricultural Modernization Study] 6:46–49.
- Xinhua News Agency. 2009. *Sanxia yimin banqian anzhi jiben wancheng* [Three Gorges Project migration and resettlement basically complete]. *Jinghua Shibao* [Beijing Times Newspaper], September 13.
- Xiong, Zhihong. 2006. *Huanping fengbao juguo zhendong* [Storm of environmental impact assessment shook the whole nation]. In *2005 Nian: Zhongguo de huanjing weiju yu tuwei* [Year 2005: China’s environmental crisis and breakthrough], ed. Congjie Liang, 26–33. Beijing, China: *Shehui Kexue Wenxian Chubanshe* [Social Science Literature Press].
- Zhang, Guilin. 2009. *Guowuyuan Sanxia ban: Gongcheng zijin shiyong anquan youxiao* [State Council Three Gorges Office: Use of project funds safe and effective]. Xinhua News Agency Chongqing Channel, September 13. http://news.ifeng.com/mainland/200909/0913_17_1346738.shtml.
- Zhang, Ke. 2006. *Pan Yue: Huanjing wenti tiaozhan zhongguo weilai* (Pan Yue: Environmental problems challenge China’s future). *Diyi Caijing Ribao* [First Finance and Economic Daily], January 10.
- Zhao, Jianmin, Jing Li, Liang Huang, and Zhigang Wang. 2008. *Sanxia Gongcheng dui changjiang liuyu shengtai chengzaili yingxiang de Chubu Fenxi* [Preliminary analysis of the Three Gorges Project’s impact on the ecological carrying capacity of the Yangtze River Basin]. *Shuili Fadian Xuebao* [Hydroelectricity Journal] 5:132–154.
- Zhu, Jun. 2006. *Chongqing weihe sheng zhixia* (Why was Chongqing promoted to be directly administered). *Dazhong Keji Bao* [Popular Science and Technology Daily], May 9.



An online edition of this *Issue Brief* can be found at our website (www.fess-global.org).

The **Foundation for Environmental Security and Sustainability (FESS)** is a public policy foundation established to advance knowledge and provide practical solutions for key environmental security concerns around the world. FESS combines empirical analysis with in-country research to construct policy-relevant analyses and program recommendations to address environmental conditions that pose risks to national, regional, and global security and stability.

Foundation For Environmental Security and Sustainability

8110 Gatehouse Rd, Suite 625W
Falls Church, VA 22042
Tel: +1-703.560.8290
Fax: +1-703.560.1645

www.fess-global.org

Ray Simmons, President

Darci Glass-Royal, Executive Director

Jeffrey Stark, Director of Research and Studies

The views expressed in this *Issue Brief* are those of the author, not the Foundation for Environmental Security and Sustainability, which is a nonpartisan public policy and research institution.

This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Foundation for Environmental Security and Sustainability and do not necessarily reflect the views of USAID or the United States Government.