

Water diversions and dam threatening to fragment the Han River

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After five years of construction, the Danjiangkou dam on China's southern Han River, a tributary of the Yangtze, "has grown" from 162 meters to 176.6 meters above sea level—increasing the storage capacity of its reservoir from 17.45 billion cubic meters to 29.05 billion cubic meters. According to the new plan, the Danjiangkou reservoir is scheduled to supply water to the South-North Water Diversion (SNWD) project after the 2014 flood season. The reservoir will supply as much as 9.5 billion cubic meters in the first year—equal to nearly one sixth of the Yellow River's annual runoff (66.1 billion cubic meters) in northern China.

Based on figures from the Office of the South-North Water Diversion Project Construction Committee under the State Council, the total surface water flow of the Han River upstream of the Danjiangkou dam is 38.8 billion cubic meters—around 2.3 billion cubic meters of this volume is consumed, leaving some 36.5 billion cubic meters flowing into the reservoir each year. This means that the amount of water to be transferred from the Han River to the north will make up one-quarter of its total inflows into the Danjiangkou reservoir.

As the Environmental Impact Assessment (EIA) report for the central route of the water diversion project revealed, after the 9.5 billion cubic meters of water is transferred to the north, the flow of the Han River below the Danjiangkou dam will fall by 26%. With this significant drop in water flow, a number of downstream water facilities, including water plants for water supply and irrigation facilities, will become essentially useless, as both the quality of water and shipping conditions will worsen. A third of the river's fish are also likely to face extinction.

When interviewed by reporters from the *New Century Weekly*, experts in Hubei Province, where the Danjiangkou dam is located, warned that the situation may be much worse than they initially anticipated. As they point out, the official figures and the total surface water, in particular, come from hydrological data collected between 1956 and 1990. But since 1990, the total surface water has been in decline due to climate change and environmental destruction of the watershed. No accurate official statistics are currently available, with a number of experts estimating that the current total surface waterflow of the Han River may be 10% less than official figures.

In addition, both officials and experts in Hubei have also expressed concern about the possibility that an additional amount of water—as much as 1 billion cubic meters—must be transferred to the north via the central leg of the water diversion project on a yearly basis. Technically, this shouldn't be a problem as the main canal is designed to handle water flows of 350 cubic meters per second—meaning, as much as 11 billion cubic meters can be sent to the north through the water project annually.

Shaanxi to divert water from the Han, upstream of the Danjiangkou

However, both officials and experts in Hubei are nervous now that another water diversion project—in Shaanxi Province, upstream the Danjiangkou dam, where the Han-Wei diversion project, which will transfer water the Han River to feed the Wei River, a tributary of the Yellow—is being proposed. According to the proposal, as much as 1.5 billion cubic meters of water will be diverted from the Han River to the Wei River annually, providing water, predominantly, to four districts, 13 county seats and eight industrial zones along the Wei valley. A total of 1 billion cubic meters of water will be transferred in the first phase of the project—with that number eventually increasing to 1.5 billion.

A reporter from *New Century Weekly* learned that the plan, already approved by the Ministry of Water Resources, has been submitted to the National Development and Reform Commission for final approval.

In total, this means that at least 10.5 billion cubic meters of water would be diverted from the Han River each year—9.5 billion from SNWD and 1 billion from Shaanxi. The equivalent to one-fifth of the Han's annual runoff, the volume would have a significant impact on the river's middle and lower sections, below the Danjiangkou dam. A *New Century Weekly* reporter encountered a number of complaints from both officials and local citizens—many of whom described the situation as “snow plus frost”.

Hubei to transfer water from the Yangtze to feed its tributary, the Han

For Hubei Province, the central leg of the South-North Water Diversion project has been a “double-edged sword”, as the middle and lower Han valley in particular would suffer a dramatic loss of water, but would also benefit in the form of increased flood control.

For as long as records exist, Hubei has been plagued by flooding—both in the Yangtze valley and, in particular, its largest tributary, the Han River. During the 1950s, increased flood control capacity in the middle and lower Han River reduced the occurrence of floods to about once in every five years through the construction of flood diversion projects. By the 1970s, after building the Danjiangkou reservoir, officials had reduced flooding to once in every 20 years.

It is expected the raising of the Danjiangkou dam from 162 meters to 176.6 meters above sea level—in order to pump water to the north—will restrict the occurrence of floods in the middle and lower reaches of the Han to once in every 100 years. Because the South-

North Water Diversion project creates such a notable benefit, the debate concerning its advantages and disadvantages has been long and intensive.

Right up until the late 1990s, when the plan to build the central leg of the South-North Water Diversion was gaining traction, most experts believed it would do more good than harm, Shen Xiaoli, the former chief engineer of the Hubei Academy of Environmental Sciences who led the EIA report on the central leg of the SNWD project, told *New Century Weekly*. For this reason, officials in Hubei Province performed a series of feasibility studies, and called on the participation of a large number of experts from both inside and outside of the province. Almost all of them agreed the undertaking would have a negative impact on the environment, but would benefit flood control—additionally, short-term advantages would outweigh the disadvantages, but in the long term, the disadvantages would bring more harm than good.

Shen Xiaoli recalls pounding the table in anger at a key meeting of the feasibility studies over the decision to pursue the project. He says, "Ultimately, the senior official (from the State Council) in charge of the water project accepted the conclusion of 'more harm than good'."

Perhaps as a response to the reaction from Hubei Province, the project authority—acting under the State Council, or even the State Council itself—lowered the water volume slated to be sent north. In 2002, when construction officially began on the project, officials announced the total amount of water to be transferred would equal 9.5 billion cubic meters, down from an initial figure as high as 14.5 billion cubic meters. Later, the schedule for water transfers moved forward from 2010 to 2014.

Of course, the biggest benefit for Hubei is the diversion of water from the Yangtze River to its tributary, the Han River. The State Council officially approved the program, initiated by Hubei Province, in 2009. With an additional 40 billion yuan RMB slated for the project by the State Council, more than 8 billion yuan will be used for this project. In fact, the project to divert water to the Han River is already under construction.

The so-called "water diversion from the Yangtze to the Han" aims to move more water into the Han, and from here, a large percentage would then be pumped north, in four years' time. According to the plan, water will divert from the Yangtze near Jingzhou City, then flow via a canal into the Han near Qianjiang City. The total volume of water to be transferred is estimated at 3-billion cubic meters annually—it is expected to meet the water needs of a 270 km-area in the lower reaches of the Han River.

Additionally, Hubei Province also submitted a proposal to transfer water from the Shennongxi in the Three Gorges reservoir area to the Han River via the river Du, in an attempt to make up for volume lost from the diversion of water from the Han to the Wei in Shaanxi Province, upstream of the Danjiangkou dam. Estimated to be as much as 6 billion cubic meters, the transfer is expected to feed the Danjiangkou reservoir.

Fragmenting the Han River

Along with the two water diversion projects—one already under way and another in the planning stages—Hubei Province is also planning to build a cascade of dams in the Han's middle and lower stretches in an effort to compensate for the loss of diverted water. As many as eight dams, the Danjiangkou included, are slated for construction—not only to store water for local use, but also for electricity generation.

To date, except for the Danjiangkou dam, three hydropower stations—Wangfuzhou, Cuijiaying and Xinglong, all downstream of Danjiangkou dam—have already been completed. The Gushan dam, the only project upstream of Danjiangkou, began construction in 2006, and another three proposed dams, the Xinji, Yakou and Nianpan, are still under planning.

Not surprisingly, Shaanxi Province—upstream of the Danjiangkou dam—is pursuing the same policy. As early as February 1997, the government of Shaanxi proposed building a cascade of hydro dams on the main channel of the Han River's upper reaches, which would include the Huangjinxia, Shiquan, Xihe, Ankang, Xunyang, Shuhe, Baihe dams. Currently, all of these dam projects, except for Huangjinxia, have been built or are under way.

When they are completed—from Huangjinxia dam upstream to Xinglong project downstream—the 1000-km section of the main channel of the Han River will be fragmented by as many as 15 dams. In the 150-kilometre long river section of Xiangfan City, below the Danjiangkou, four dams will be built. Ultimately, there will be a dam less than every 50 kilometre.

Experts interviewed by *New Century Weekly* aired their concerns over the Han River's increased fragmentation. They say transforming sections of the main channel into man-made lakes will drastically slow the river's flow and diminish water quality.

With more than 900 small hydropower stations, the splicing of the Han's tributaries is even worse and will increase the ecological problems plaguing the river.

Xiangfan: a closer look at the effects of water diversion

Xiangfan—sitting below the Danjiangkou dam and the second largest city in Hubei Province—will be significantly affected by water diversions. Based on an assessment report by the Wuhan-based Huazhong University of Science and Technology in 2002, the diversions from the Danjiangkou reservoir will result in the reduction of average water levels by 0.31 to 0.51 metres, while the quality of water in the Xiangfan section of the Han River will drop by a whole grade. The groundwater table will also diminish from 0.25 to 0.41 metres.

Ultimately, 21 water plants, 39 pumping stations and 1,680 motor-pumped wells will become, either useless, or will struggle to obtain the necessary water.

In response, the government of Xiangfan City has proposed four dams for its section of the Han, hoping to store water for local use and maintain shipping routes. The Cuijiaying dam is one of these four projects—located only 17 kilometres south of downtown Xiangfan.

With a budget of 2.06 billion yuan RMB, the Cuijiaying dam began filling its reservoir in May 2010 and commenced power generation in July.

In early June, reporters from *New Century Weekly* travelled to Xiangfan and noted that the Han had widened and its water level had risen significantly higher by comparison to the same time period in previous years. A local taxi driver confirmed that, after the construction of the Cuijiaying dam, the water level had grown by a few meters. Reporters also noted that the river appeared to be muddier and a darker green than the Danjiangkou reservoir, only 100 kilometres upstream.

As one local environmentalist told reporters, the newly built Cuijiaying dam not only stored more water, but also more pollutants from both the Tang and Bai rivers, which join the Han River at Xiangfan. The two rivers are seriously polluted due to the number of paper mills, breweries and chemical plants that operate along the river valleys in Henan Province. In the past, the polluted water graded 5 and below flowing into the main channel of the Han was diluted or washed away, but now, vast amounts of wastewater have been blocked by the dam, causing a major pollution problem for residents in the area.

What worries local residents in Xiangfan the most, is the quality of drinking water, as the city's water intake is located in Cuijiaying dam's reservoir. If the reservoir becomes highly polluted, the entire drinking supply for the town is in danger. Local officials became anxious after residents voiced their concerns online. Several of the city's experts warn that the quality of water in the river around Xiangfan is getting worse and would most likely be downgraded.

In response, officials in Xiangfa have responded with a plan to divert water from the Danjiangkou reservoir, about 100 km upstream, for local use. But as reporters from *New Century Weekly* learned, that plan has yet to be implemented due to a shortage of funds—as much as several hundreds of millions of yuan RMB.

Fish will be the victims of the water projects

Several experts in Hubei Province have also warned that the number of fish species will decline by one-third and the population of fish will decrease by as much as two-thirds in the middle and lower of the Han, below the Danjiangkou dam, as a result of the water diversion projects. Reasons for the decline are varied, including a decrease in water temperatures, smaller breeding habitats and so on.

In interviews, [Professor Cao Wenxuan](#), a member of the Chinese Academy of Sciences and senior researcher at the Academy's Wuhan-based Institute of Hydrobiology, says

these numbers may not be correct or accurate, as no specific studies have been performed in recent years. He has called on the government to implement a systematic study on the impacts of the water diversions and hydroelectric projects on fish and aquatic life, as he believes the effect will be great.

For example, Professor Cao has pointed out that the water transfer project will alter the river's water temperature, and this will affect spawning. Most of the fish in the Han River typically require a water temperature above 18 degrees Celsius for spawning—with May the month fish favour for laying their eggs.

But existing studies have revealed that the average water temperature has dropped by 4 to 6 degrees Celsius in the middle and lower reaches of the Han since the Danjiangkou reservoir was raised to 157 metres. This is because the water discharged from the reservoir is the middle layer of the river, which is colder due to the lack of direct sunlight. The colder water is forcing fish to lay eggs more than 20 days later than usual.

With the Danjiangkou dam increasing by 13 meters, the average water temperature in the middle and lower Han may drop another 3 degrees Celsius. As a result, fish living below the dam would have to postpone the spawning period even further, with some of species of fish unable to produce eggs at all.

Like its main channel, the Yangtze River, the Han River is rich with fish. Four species dominate: variegated carp, silver carp, black carp and grass carp. These species require an uninterrupted migration channel to ensure their eggs can survive in a flow velocity no less than 0.2 m/s. When the Danjiangkou dam's extension is completed, the Han will transform into a slower moving or even lake-like reservoir. This means the many species of fish that prefer a turbulent river, in particular the Big Four, will be dramatically affected. This change will lead to a sudden and rapid decline in both fish populations and diversity in the reservoir area.

Moreover, fish living in the upper reaches will find it difficult to survive if they try to navigate through the cascade of dams on the Han. Currently, many of the workers attached to the project say special fish channels will be provided, but Professor Cao says they're of no practical use.

The builder of the Xinglong dam, downstream of the Danjiangkou, for example, says it has already built a fish channel for migrating herring and eels.

But Professor Cao said the claims are misleading. In reality, herring has yet to appear on the Hubei section of the Yangtze for some time. And eels don't need the fish channel at all, since they typically use locks for migrating.

He also believes further research is needed, not only on the ecological impacts of the water project and hydroelectric dams, but more specifically on what will happen to the fish stocks in the wake of their construction. For the fish studies alone, either on the

availability of food for fish, or on the species and stocks, current research continues to rely primarily on data obtained in the 1970s and 1980s.

Speaking to reporters from *New Century Weekly*, Professsor Cao Wenxuan anxiously said: "Currently there are how many species of fish in the Han River? We don't know. And how many species and how many of such species will be affected and may even be on the brink of extinction? We also have no idea. Forging ahead with projects, one by one, without any understanding of their effects would bring much more destruction to the fish and their habitat."

Translated by Probe International.

<http://www.probeinternational.org/beijing-water/water-diversions-and-dam-threatening-fragment-han-river>