Finding Mutual Interests in Nature

by Vaclav Smil

DURING THE 1950S, Stalinist planners (whose modest slogan was "We order the wind when to blow, the rain when to fall!") wanted to flip the direction of several voluminous north-flowing rivers of Western Siberia (Irtysh, Ob, Yenisei) and use them to change the Soviet Central Asia into an irrigated communist paradise. Fortunately, Stalin died and Khrushchev had other problems, but before 1960, the megaproject propensities of the Soviet experts working in Mao's China left a deep imprint on China's water engineers. Soviet experts helped plan a number of audacious water projects but only one, the first dam across the Huanghe, or Yellow River, at Sanmenxia, was completed before their withdrawal. The dam turned out to be a major disaster, and the rapid silting of the reservoir was solved years later only by creating large outlets at the dam's bottom and drastically reducing its electricity-generating capacity.

Large hydro projects completed or begun during Mao's life were relatively small, and the dams at Liujiaxia (1,160 MW on the upper Huanghe in Gansu province) and Danjiangkou on the Han River in Hubei province (900 MW) have worked more or less as planned. Gezhouba, the first dam across the Yangzi, was started in 1970 and finally completed in 1988. As Deng Xiaoping's reforms began to make China more prosperous, water megaprojects made a strong return under a policy guided by Li Peng, a hydro engineer educated during Stalin's last years at Moscow University who also served as China's premier in 1987-88. His successors not only continued but increased the pace and scope of the effort; without any doubt, China by now has done more than any country to change the flow of its rivers and to dam so many of its major streams, and no other country has so many plans to keep on building them.

The Three Gorges Dam (Sanxia), the world's largest hydrostation, was completed in 2006, and the aggregate generating capacity of its turbines will be about 60%

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larger than that of the runner-up, Itaipu on the Paraná River between Brazil and Paraguay. And concurrently with its dam megaprojects, China began to build the world's largest water-transfer schemes. The idea of south-north water-transfer project was first proposed under the Soviet guidance during the 1950s, but actual work on the eastern diversion—the least difficult 1,130-kilometer long route that follows the ancient Grand Canal—began only in December 2002. In November 2001, preparatory work on the much more difficult central route commenced. This conduit, about 1,250 km long, would bring water from the enlarged Danjiangkou reservoir on the Han River in northern Hubei and from Sanxia via a large canal snaking along the edges of Funiu and Taihang Mountains all the way to Beijing's Yuyuantan Lake.

The work on the central diversion was accelerated in the summer of 2009 so that both canals would be supplying water to the north by 2014. The eventual annual capacity of the two routes should be close to 30 billion cubic meters. Comparatively, the diversion of the lower Colorado River to California, Arizona and New Mexico has annual capacity of 9.3 billion cubic meters. Indeed, China has technical knowledge and the capital necessary to undertake these megaprojects, and the leadership will ignore foreign concerns as well as some surprisingly bold criticism by concerned experts within China.

Not surprisingly, the projects have also engendered major concerns by China's neighbors. As the megaprojects moved further southwest into Sichuan province, concerns about damming the Mekong River came first. Originating in China's Qinghai province, the 4,350 km river with an annual discharge of 475 cubic kilometres drains a basin extending to six countries: China, Myanmar, Thailand, Laos, Cambodia and Vietnam. The last four countries belong to the Mekong River Commission which China had refused to join during the late 1980s. In the early 1990s all of them expressed their concerns about planned Chinese dams on the Mekong's upper course.

China went ahead and completed first the 1,500 MW Manwan project in 1996 and then the Dachaoshan (1,350 MW) and Gongguoqiao (750 MW) dams in, respectively, 2003 and 2008; Jinghong (1,750 MW) should come online in 2010. The giant Xiaowan (4,200 MW) and even larger Nuozhadu (5,850 MW) should be completed in 2013 and 2017. Filling of the first two dams caused exceptionally low downstream water levels and the filling of Xiaowan reservoir, with the world's tallest dam (292 meters) would be even more demanding: although the Chinese watersheds make-up only about 20% of Mekong annual water flow, their contribution rises to 50% to 70% during the dry months. In the long run, after the entire series of Chinese dams is finished, there are justifiable worries about the water flows downstream, particularly in the watershed of Cambodia's Tonle Sap, the country's largest source of fish.

It would not be exaggeration or nationalistic paranoia for India to think that the next westward step in China's megaprojects, after damming and diverting the Yangzi and damming the Mekong, is to move into Tibet and start building dams on another of the world's mightiest rivers, the Brahmaputra. From its sources in western Tibet, it flows some 1,800 km eastward at about 4.5 km above the sea level until it makes a 180 degree hairpin bend around the 7,782-meter Namchagbarwa, the tallest mountain of the eastern Tibet, and breaks in a series of enormous gorges through the easternmost spur of the main Himalayan chain before it enters Arunachal Pradesh in India; then it turns south on the borders of Assam and Bangla-

desh and end its more than 2,000-km journey by emptying into the Bay of Bengal.

In 1956, the Austrian physicist Hans Thirring suggested that by building a dam just above the gorges and then tunneling about 16 km under the Doshong Pass, the river's water could be diverted into a valley above Yortong where a series of dams could add to the total capacity of at least 27 GW. In 1996, Richard Cathcart, the American geographer, argued against a massive permanent dam in favor of a low nylon-reinforced anchored rubber bladder that would create a shallow reservoir; afterwards, virtually the entire river's flow could be diverted to a 42-km tunnel with a fall of more than 2.1 km where a series of turbines could generate 240 TWh of electricity a year, nearly 2.5 times as much as Sanxia. But building the world's largest hydroproject in the Yarlung Canyon is easier said than done given the remoteness of the regions, the extreme seismic nature of the bend area (it lies where the giant tectonic plates collide), as well as all the inevitable consequences for the downstream water flow to India.

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By 1995, another plan was consider by some in China: using nuclear explosives to excavate a 20-km canal cutting through the mountain range north of the river in order to bring massive volumes of irrigation water north to the arid Gobi Desert. And during the 1990s yet another diversion project began to attract attention, the plan for the westernmost route of the south-north water transfer tapping into the four largest rivers in the westernmost Tibet—Yarlung, Nu Jiang (Salween), Lancang Jiang and Jinsha Jiang—as well into Yalong Jiang and Dadu He in Sichuan and channeling as much as 200 billion cubic meters of water every year north into the Huanghe. This plan was promoted in the 1980s, the first official route survey was done in 1999. Over time this truly gargantuan scheme received support from the army and from many deputies of the National People's Congress, and publicity was especially bolstered in 2005 with the publication of a book entitled Save China through Water from Tibet.

But the scheme has not received any formal official blessing. In November 2006, Wang Shucheng, Minister of Water Resources, criticized all proposals to divert the Yarlung waters northward in order to feed the third, westernmost route of the massive south-north water transfer, called such schemes "unnecessary, infeasible and unscientific" and said that the Chinese government has no plans to build a dam on the Yarlung to divert water northward. In May 2009, Mr. Wang, who by that time had retired from the Ministry of Water Resources, repeated the assurances to an international water seminar in Beijing and, meanwhile, the government set up a new national reservation in the Yarlung's grand canyon.

India remains hesitant, and the latest news from Tibet will do nothing to ease its concerns. In March 2009 Beijing decided to invest 15 billion yuan (almost $2 billion) for environmental protection in Tibet as part of a grand ecological plan that will run until 2030, and the chairman of the Tibetan regional government repeated that no water will be diverted to other parts of China—but at the same time he announced plans to build several big hydropower electricity stations on the Yarlung, Nu, Lancang and Jinsha rivers. And, without any delay, the construction

of the first dam to cut the Yarlung in central Tibet (at Lhokha in Shannan prefecture, about 150 km southeast of Lhasa) should start in 2009. At 510 MW, it will be a relatively small project but it will most likely be followed by bigger dams downstream closer to the great bend. After the decisions to go ahead with such highly controversial and much criticized projects as Sanxia and the south-north diversions it would be most imprudent to assert that the world's greatest canyon will never become a site of a Chinese megaproject.

Indians have no doubt that that is exactly what will happen and, naturally, they are worried more about the oft-denied massive water diversion than about a new hydrostation. In the Aug. 4, 2009 issue of the Daily Times, Brahma Chellaney of New Delhi's Center for Policy Research wrote that "the issue now is not whether China will reroute the Brahmaputra, but when. Once authorities complete the feasibility studies and the diversion scheme begins, the project will be presented as a fait accompli." This is a case that combines a deep-seated mutual distrust (albeit repeatedly papered-over during all those official photo-ops of the two premiers), unsettled strategic matters and genuine worries about the adequacy of water supply in two of continental Asia's largest economies that may have been recent paragons of rapid economic growth but that are also both relying on increasingly precarious water supplies.

The principal strategic complication is the unsettled state of Sino-Indian borders. Though the Chinese army withdrew shortly after it took over most of the Arunachal Pradesh during the brief 1962 Sino-Indian War, China still refuses to recognize the old British McMahon line, created in 1914 and unilaterally declared by India as its border in 1947, as the southernmost limit of its territory and it has not formally abandoned its claim to most of the Arunachal Pradesh, claims that extend almost to the northern bank of the west-flowing Brahmaputra and all the way to the eastern border with Bhutan. But the most important factor that will affect water supplies and water policies of the two states—the pace and the eventual severity of global warming—is beyond their control, and still beyond anybody's confident understanding.

There is no doubt that the Himalayan glaciers have been receding, some losing well over 10% of their volume during the last three decades (at the same time, there is good evidence that precipitation in parts of the Himalayas has been increasing). If an accelerated glacier loss were to be combined with greater variability of precipitation then, even if the annual precipitation total remained the same, seasonal water shortages would worsen. If both the glacier and precipitation volumes were in a prolonged retreat, then both countries would have to resort to extraordinary measures to secure their essential water requirements.

Despite those often catastrophic projections of future wars over water, water problems have actually been catalysts for cooperation rather than promoters of violence. Given the commonly inefficient use of water in both China and India through frequent subsidies and ridiculously low prices paid by farmers, who by far are the largest users of water, there is a great deal of room for easing the strains. Still, the greatest uncertainty remains beyond our ken; we need to wait and see to what extent and how rapidly the future warmer climate will undermine or strengthen the human propensity for cooperation—or for confrontation—between Asia's most populous and deeply distrustful, neighbors.