

to take about 1 million cu km of water a year, about 10% of the Irytsh's flow.

The economic growth of Uzbekistan and Kazakstan, the two most populous Central Asian nations, is already being curbed due to lack of water. Uzbekistan has 27 million people (its population grew by 17 million in the past 20 years); Kazakstan has 15 million. Several years of extreme drought, starting in 2000, have exacerbated the problem. There have been crop and food shortages in Tajikistan, Iran, Uzbekistan, and in Afghanistan, and insurgency by radical groups, which set off civil war in Tajikistan. The deployment of U.S. troops in the region, especially in Uzbekistan, as part of the unsuccessful "war on terrorism" in Afghanistan and Iraq, is also generating regional tensions.

After the collapse of the Soviet Union, the five Central Asian republics put together accords to maintain existing region-wide water- and energy-distribution policies. In 1992, the five nations formed the Interstate Commission for Water

Coordination (ICWC), to manage water in the entire Aral Sea basin system; the International Fund for the Aral Sea (IFAS), was begun in 1993; and the 1994 Interstate Council of the Republics of Kazakstan, Kyrgyzstan, Tajikistan, and Uzbekistan (ICKKTU), to enhance economic and trade cooperation. Turmenistan stands "outside" the later two agreements, but the Syr Darya countries—Kazakstan, Kyrgyzstan, Tajikistan and Uzbekistan—are showing a continuous interest in cooperating within common legal frameworks. (Daniel Linotte)

The newly independent countries all wrote "Water Codes" emphasizing national sovereignty over water resources; they define water as "exclusive property of the state" and "national wealth." In early 2001, Uzbekistan called for declaring all Central Asian water resources "common wealth." In 1997, a draft Agreement "On the Use of Water and Energy Resources in the Syr Darya Basin" was made part of the Action Program on Formation of a Single Economic Zone of the Syr Darya nations. This set up a Working

Desalination's Huge Potential

The greatest potential for solving the whole world's water problems, is through creation of much more fresh water by desalinating seawater. The failure of Soviet water management in Central Asia, was not so much due to its grand scale, but rather to the failure to bring sufficient water into the most arid region on Earth, both to save the Aral Sea and to turn the steppes and deserts green.

Bringing river water from Siberia would be one great help; another, is desalinating brackish water in Central Asia, including its abundant groundwater reserves.

Hal B.H. Cooper, a civil engineer and consultant on many infrastructure projects in North America, says, "I believe that there are many saline aquifers which exist throughout the world which could be utilized if it were possible to implement the LaRouche water and energy desalination policy, with nuclear power plants and desalination together. . . . We should be making extensive use of the desalination of brackish and impure waters, so they can be used for municipal, industrial, and agricultural purposes."

Professor Micklin reported in 1988 that in Central Asia, "ground water could make a larger contribution to regional water supplies. Subsurface storage is huge, but little used. However, much of the reserve lies at great depth or is heavily mineralized. Up to 17 cu km per year of

ground water could be consumed in the Aral Sea basin without adversely affecting river flow." Kyrgyzstan alone has aquifers which carry 13 cu km of water a year.

Only small-scale desalination projects exist, such as one set up by the United Nations Children's Fund (UNICEF) to produce drinking water on the Amu Darya River in Dashoguz province, Turkmenistan.

Both China and India, with huge populations and urgent water management problems, are working on combined nuclear power and desalination projects. Some 11 seawater desalination plants using nuclear energy are already in operation internationally. The nations of Southwest Asia produce about 60% of current desalinated seawater, but they use abundant petroleum supplies as the heat source for the process. This would be far too expensive for petroleum-importing nations. In Central Asia, Kazakstan has petroleum resources, which could be put to use for desalination projects on the Aral Sea and in the lower reaches of the Syr Darya.

But this, while useful in the short term, will not meet the needs of the future. Regions of such broad expanses as Central Asia, and nations of such high population as China and India, must develop nuclear energy as the only clean, safe, and "non-geopolitical" energy resource. Petroleum must be transported, often over long distances, and is currently hostage to geopolitical economic and political operations. Nuclear plants are local, under a nation's sovereign control, and uniquely produce enough energy for *large-scale* desalination.

In December 2003, India's President Abdul Kalam, a noted scientist, told an Indian Nuclear Society conference

Group of water and energy ministry managers and specialists, from Kazakstan, Kyrgyzstan, Tajikistan, and Uzbekistan. U.S. and other international experts contributed to the draft, which drew on models including the Columbia basin of the United States and Canada, and the Rio Grande basin of the the United States and Mexico. In March 1998, Kazakstan, Kyrgyzstan, and Uzbekistan signed an Interstate Agreement “On the Use of Water and Energy Resources of the Syr Darya River Basin.”

In June 1990, wrote Bakhtior A. Islamov, the leaders of Uzbekistan, Kazakstan, Kyrgyzstan, Tajikistan, and Turkmenistan had signed a joint declaration on the devastation of the Aral Sea basin, and appealed to Moscow for assistance. This came to nothing. By December 1991, the Soviet Union was dead, and the “promised radical measures for the restoration of the destruction of the region’s ecological balance and the preservation of the Aral Sea were never fulfilled.” Amidst the economic disasters following the end of the U.S.S.R.,

including radical falls in production, and hyperinflation, the Central Asian nations sought to create new regional cooperation on economic, scientific, technical, cultural, and environmental issues, among “equal and sovereign republics.”

There is a commitment to avoid armed conflict, but disputes have arisen over water and energy. A 1996 interstate agreement among Kyrgyzstan, Uzbekistan, and Kazakstan was to compensate Kyrgyzstan for lowering water-use—and therefore generation of hydropower electricity—during the Winter, and increasing water releases during Summer.

Both Kyrgyzstan and Tajikistan have enormous hydropower resources: Tajikistan’s are the eighth-largest in the world, at 300 billion kilowatt-hours of potential. The Soviet system was designed to serve the cotton monoculture in the Aral Sea basin. In Winter, water was stored, for release in the Summer months when need for irrigation, not electricity, is greatest. Now, Kyrgyzstan wants to generate cheap electric power, rather than depending upon energy supplies of natural

at the Indira Gandhi Centre for Atomic Research at Kalpakkam, that desalination of seawater is the best solution to the world water crisis. Using the “multistage flash” desalination process requires enormous quantities of energy, and only nuclear power can supply that. “It is essential to set up desalination plants next to nuclear plants to reuse the waste energy effectively,” Kalam said.

China’s Programs

China also is developing nuclear desalination. The China Society of Nuclear Science, and the Beijing Institute of Nuclear Engineers directed by Prof. Li Zhaoheng, are developing projects which could produce an annual output of 300 million-1 billion tons of water. Only nuclear power is cheap and efficient enough for this scale of desalination. China has also developed new, more efficient distillation techniques. “Three decades worth of effort has ranked China among the world’s few countries capable of seawater desalination,” Prof. Hui Shaotang, director of the Tianjin Institute of Seawater Desalination and Comprehensive Utilization told a 2002 conference. “Water diversion can only alter the geological layout of water resources. It’s not able to enhance the total amount available.” Desalinated water from large-scale, nuclear-powered projects would cost about 25%—eventually even more—below what diverted water—at 20 yuan a ton—will cost.

China is now “first” in the world, with a nuclear technology which could be of enormous benefit in Central Asia for desalination. This is the modular high temperature gas-cooled nuclear reactor (MHTGR, or HTR for short). A



Seven nations already have operating desalination units powered by nuclear energy, needed for any large-scale production of fresh water, especially from brackish inland and groundwater. This nuclear desalination plant is at Kalpakkam in India.

prototype of the reactor has already been built at China’s leading science and technology institution, the Institute of Nuclear Energy Technology (INET) of Qinghua University, northwest of Beijing. This reactor is more efficient than conventional nuclear technology; is relatively simple and inherently safe; and can be built in small units, which are perfect for flexible application—for heating, industrial use, electricity generation. Because they could be produced on standardized “assembly-lines,” HTR production costs can be kept low. Germany first developed the technology, but China is the only nation to have built one.—*Mary Burdman*