If There Were a Water Crisis, How Would We Know?
The Perils of Official Statistics

James E. Nickum

for the XIII World Water Congress, Montpellier, France, 1-4 September 2008

Abstract *Chinese government statistics on water are often cited by the media and scholars to indicate the existence of a "water crisis" there. Yet in nearly every case, these statistics are "bureaucratically constructed" and often cited out of the context they were intended to serve. This would seem to give an exaggerated impression of crisis in many cases, but at the same time, it is not clear that the data pick up actual critical events. I will provide examples from statistics on irrigated area, water-short cities, and cessation of river flows (especially the Yellow River), and more if time allows. Although I focus on China, these kinds of problems with official data are likely to be of more universal significance.*

On my shelf is a book entitled *The Water Crisis* (Nikolaeff, 1967). It was given to me over 10 years ago by my late colleague Maynard Hufschmidt, who got it at a remainder sale. It is a collection of articles originally published in 1962-1966 about the dire situation of water in the United States. One item from the *Wall Street Journal* raised the specter of a "water war" in the US Southwest as the population expanded there from 13 million to an expected 30 million in the year 2000 (pp. 129-130). In actuality, California alone had 34 million water-starved souls in that year, Arizona another 5 million. I wonder how they managed…

One thing that has changed in the past 40 years is that the term "water crisis" has become even more imbedded in our discourse, official, academic and journalistic. It is true that we have come to recognize ever more disconnects between human activities and the hydrological cycle. We know there are many "manifestations" of "the" water crisis (to cite Wikipedia [2008], which, unsurprisingly, has an entry on "Water crisis"), and there are even more statistics that can be cited to demonstrate those manifestations. But what do these statistics actually tell us?

Effectively Irrigated Area: The Holy Roman Empire of Chinese Statistics

Here I would like to focus on two examples from China, mainly because that is what I know best, but also because that country seems to get more than its rather large share of international publicity about its various water "crises". I begin my story shortly after the above book was published, when I was doing my dissertation on China, very much at arm's length, trying to make sense in California of what data dribbled out during the Cultural Revolution. I devoted an entire chapter of my thesis to estimating how many people's communes there were! So Bruce Stone at IFPRI asked me to try to put together other bits and pieces of information I had come across to estimate China's irrigated area.

To make a long story short, it took me over a decade, but the trickle of data, including on irrigated area, became a flood, and I was finally able to pull together enough information to tell a coherent story. Part of that was a series of figures at a national level irrigated area over time. Actually, there were two (main) series, one published by the State Statistical Bureau and one by the Ministry of Water Resources. The former was based upon reports on farmers, whose taxes and procurement quotas depended upon the productivity of their land, with irrigation being a primary indicator of productivity. The latter was based upon the reports of the water facilities, where the rewards presumably came from having a large command area. Not surprisingly, the former was consistently below the latter. The surprise was how close they were, less than 10% apart.

The closeness is perhaps even more surprising given that irrigated area in Chinese statistics

usually refers to a category called “effectively irrigated area” (*youxiao guan’gai mianji*). Like the Holy Roman Empire, which my German teacher in college noted was not holy, not Roman, and not an empire, effectively irrigated area is not necessarily irrigated in any given year and, if irrigated, not necessarily effectively so. It is a command area measure, defined as land with operable (fixed) irrigation facilities. Those facilities may not actually operate – each year a few hundred thousand hectares are deducted for facilities, especially pump wells, that no longer work, and often never did. Land may be watered with mobile facilities (such as shoulder poles; in one case I witnessed a farmer with a teapot), in which case it is not counted as effectively irrigated. The amount of supplemental water applied to land registered as irrigated also varies widely. In 1985, dry Shanxi applied about 3,500 tons of water per hectare; water-rich Shanghai, 31,000 tons (Nickum, 2003).

Both series showed a rapid increase, about 50% over a decade, in the “effectively irrigated area” after 1965, coincidentally the period of the Cultural Revolution. The reason for this increase was not as much elevated political consciousness, however, as the spread of pump wells across the previously arid north China plain, roughly coincident with a similar development in the Punjab. In the late 1970s and early 1980s, there was a small decline in the total, leading a vice-minister of Water Resources to warn of “unimaginable” consequences if water conservancy were to continue to be neglected. It should be noted that this warning coincided roughly with a severe budget cut to the Ministry of Water Resources; after it was restored, reported irrigated area increased once more, but frequently in ecologically fragile zones (Nickum, 2003). Outside observers used the decline in overall irrigated area as one indicator that China was facing a water and (potentially global) food security crisis (e.g., Brown and Halweil, 1998). Ten years later we are having a global food price run-up, but number of hectares “effectively” irrigated in China probably play only a minor role in that drama.

A common argument justifying concern over irrigated area is that yields on irrigated land are higher than those on dry land. This of course focuses on only one factor in increasing yields, one that appears to have fallen considerably in significance over time.

China’s Rapidly Growing Water Short Cities

It is commonly reported that roughly two-thirds of China’s cities (e.g., over 400 of 660) lack water, and that water is seriously short in over 100 cities. China’s cities and industry were said to have a water deficit of 6 billion tons in 2003, “affecting” over 230 billion yuan of production. Figures such as these are often cited as evidence of a growing water crisis that threatens the sustainability of China’s rapid urbanization (Nickum and Lee, 2006).

What’s wrong with that? First of all, consider that the governmental body collecting these statistics is the Ministry of Construction. Then note that urban water shortage has three causes: lack of local water source, poor water quality, and a shortage of supply infrastructure. Not surprisingly, given the source, most Chinese cities are listed as water short because of the third reason. Additionally, these figures as cited do not indicate what the trend is at all. In fact, the percent of China’s cities that are counted as water-short by this measure has not increased, but may have fallen slightly, over the past decade. Water supply infrastructure actually appears to have kept pace with urban growth, a considerable feat given the rapid increase in urban population and sprawl the past decade.

What about that water shortage? The missing 6 billion tons constituted 4% of the total supply. If this were an unemployment statistic in most countries, it would be considered quite reasonable. It is probably does not change much from year to year. The amount of production “affected” was an even smaller 1.4% share of a total industrial output value that had increased by 27% over the previous year (Nickum and Lee, 2006). So with abundant water, and no need to shift to more water-efficient industrial practices, China’s industry could have grown by perhaps 30% instead of 27%. Is this a water crisis?

Focusing on a gap between water supply and demand, however defined, also assumes that

water is the limiting factor to growth. Is it? For example, Beijing, the site of this year's Olympics, is in a water short part of China that is prone to sequential years of drought, including 1998-2004. Total water use in the municipality fell by 15% between 2000 and 2006, from 4.05 BCM (cu.km.) to 3.43 BCM. During the same period, however, population increased by 14%, from 13.82 million to 15.81 million, and GDP grew by 214%. Perhaps water problems will cause Beijing to come to a screeching halt some day, but probably not.

So is everything ok with China's urban water supply? Not necessarily; enumerating "water short" cities does not tell us a lot about possible problems, in particular, the probable widening water footprint of China's cities and unsustainable drawdowns of sources that may come to haunt China's planners and city dwellers – or may not.

Other cases

It is well known that the Yellow River runs dry every year. Actually, that was the case in the 1990s, but since 2000, it has flowed to the sea without interruption, because of changes in allocation rules and their enforcement, governing institutions, and the completion of a regulating dam across the Yellow. So we cannot really say the Yellow River runs dry every year. Does that mean the problem is over? Not necessarily, for a number of reasons. One of them is that what now flows is highly polluted. Simply focusing on whether the river got to the sea was in a way a distraction from the quality of the water.

At an international level, but not official, the Falkenmark criterion (freshwater per capita generated within national borders) is commonly cited as a measure of water scarcity. The meaningfulness of this measure is often accepted as given, and rarely questioned. Yet in actuality, there is rarely a connection between this measure of water scarcity per capita and level of economic development (Chenoweth, 2008). The most water scarce countries in Asia, broadly defined, are Kuwait, Qatar and Bahrain. Excluding the Middle East, they are Singapore and South Korea. The most water-rich major countries are Bangladesh and Indonesia, followed distantly by Vietnam and the Philippines. Then comes Japan, which seems to be a rare example of a country that combines abundant water by the Falkenmark criterion with prosperity.

The world and its various parts no doubt face a number of water "crises," but it is not clear that they add up to a single global water crisis, as headlined in the UNDP's *Human Development Report 2006*. The indicators we use to indicate the existence of a crisis are often misleading, overstated, and sometimes even distracting from actual problems. We should not throw up our hands. We need to address problems. But we should always question authoritative statistics.

References

Brown, L. and B. Halweil. 1998. China's Water Shortages Could Shake World Food Security," *World Watch*, 11(4), pp. 10-18.

Chenoweth, J. 2008. "A Re-Assessment of Indicators of National Water Scarcity," *Water International*, 33(1), March, pp. 5-18.

Nickum, J. E. 2003. "Irrigated Area Figures as Bureaucratic Construction of Knowledge: The Case of China," *International Journal of Water Resources Development*, 19(2), June, pp.

249-262.

Nickum, J. E. 2004. “Water and Regional Development in the Yellow River Basin,” in Cecilia Tortajada, Olcay Unver and Asit K. Biswas, eds., *Water and Regional Development* (Oxford: Oxford University Press), pp. 114-136.

Nickum, J. E. 1998. “Water, Population, and the Environment in Asia,” Chapter 1 in *Water Crisis in the Twenty First Century: Prospect of Asian Population and Development*, No. 22 in the Population and Development series of The Asian Population and Development Association, Tokyo, March, pp. 17-37. Also published in Japanese.

Nickum, J. E. and and Y. F. Lee. 2006. “China’s Water-Short Cities: Some Number Games,” *China Environment Series*, Issue 8 (Washington DC: Woodrow Wilson International Center for Scholars), pp. 87-91.

Nikolaeff, G. A., ed. 1997. *The Water Crisis*. The Reference Shelf, Vol. 38, No. 6. New York: H. W. Wilson.

United Nations Development Programme. 2006. *Human Development Report 2006.* (Basingstoke and New York: Palgrave Macmillan)

Wikipedia. 2008. “Water crisis.” http://en.wikipedia.org/w/index.php?title=Water_crisis (viewed 13 April 2008).