EIR National Economy

Water usage decline shows U.S. economy is 'drying up'

by Marcia M. Baker, A.K. Wikrent, J. Hoefle

Water safety problems in Washington, D.C. made the headlines this summer, when warm temperatures brought a florescence of bacteria contamination in the city pipe distribution system, because of decades of undermaintenance. In July, Mayor Marion Barry held a press conference to be photographed drinking a glass of District water to show that it was safe, and he rightly blamed Congress for stinting for decades on maintenance funds; later in July, Sen. Robert Kerrey (D-Neb.) was televised in Senate chambers, refusing to touch a glass of local water.

In fact, the situation of risky drinking water in the nation's capital epitomizes the water problems existing all around the country. But bugs aren't the only danger. You could say that the U.S. economy is "drying up." There is less water available, and in use, per capita, in the U.S. economy now, than 15 years ago. The water crisis is a marker for the overall breakdown of the physical economy (see *EIR,* Jan. 1, 1996, "The 30-Year Collapse of the U.S. Economy.)"

We will report on the specifics of Washington, D.C., but, first, we will look at the economic overview, and how we are overdrawn on what hydrologists call the national "water budget."

In terms of the provision of necessary "market-basket" ratios (per capita, per household, per unit area, and per sector of production) of levels of needed physical consumption of infrastructure (water, power, transport, etc.) and goods and services, the U.S. economy has been allowed to decay over the past 30 or more years, to the point that gross volume of per-capita supplies and usage of water are in decline, even in fundamental economic sectors such as industry and irrigated farming.

Figure 1 shows the total level of water withdrawn for all uses in the U.S. economy, for nine points in time from 1950 to 1990, at five-year intervals (the depiction differentiates the shares of how water was withdrawn for five uses). Reading from the top to bottom of each bar, industrial, thermoelectric power, irrigation, rural domestic and livestock, and public supply uses are depicted.

First, you see that the total volume of water estimated in use daily (in billions of gallons) in the United States over 1950-90, went up from 1950 to 1980, then dropped dramatically down in 1985, and increased only slightly from then to 1990. The year 1990 is the last year for which complete statistical estimates are available for the United States, but the trend of diminished water use still holds up to the present.

(You can visualize a volume of 1 billion gallons of water as a column whose base is the size of a football field, and whose height is over four times that of the Washington monument.)

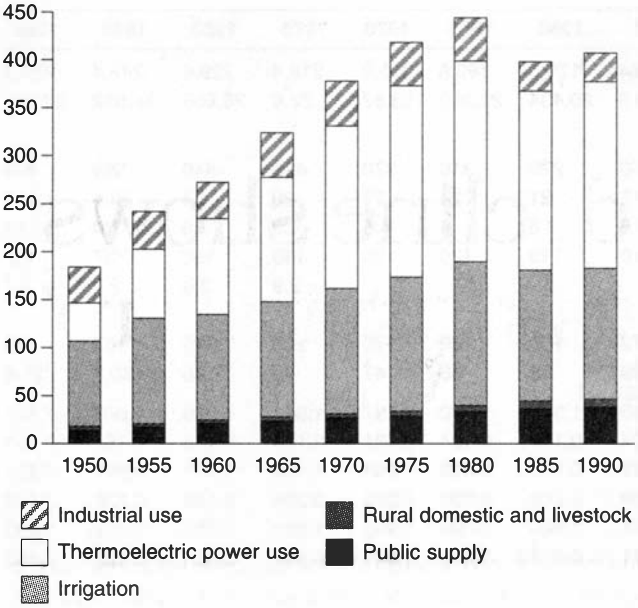
The term "withdrawals" is the hydrologist's term referring, in general, to water *used* up (that is, vaporized, or incorporated into something, and removed from stream run-off, or other flows and sources). Consistent with this, the data in Figure 1 all refer to what hydrologists call "offstream" withdrawals—that is, water removed, and not returned to its source (rivers, lakes, groundwater), in distinction to "instream" water uses, such as hydroelectric power generation (for which data are given in **Table 1**).

Second, notice in which subsectors of the economy the lowered water use over the 1980s and 1990s occurred. There was less water in use in industry in the United States in 1985, and in 1990, than in any previous point in time shown. Water in use for thermoelectric production grew steadily until 1980, then fell. Likewise, water for irrigation grew up through 1980, then fell. Lastly, down at the bottom of the bars, you see that water for rural uses (the narrow strip), including suburban

FIGURE 1

U.S. water withdrawals, total and by sector

(billions of gallons per day)



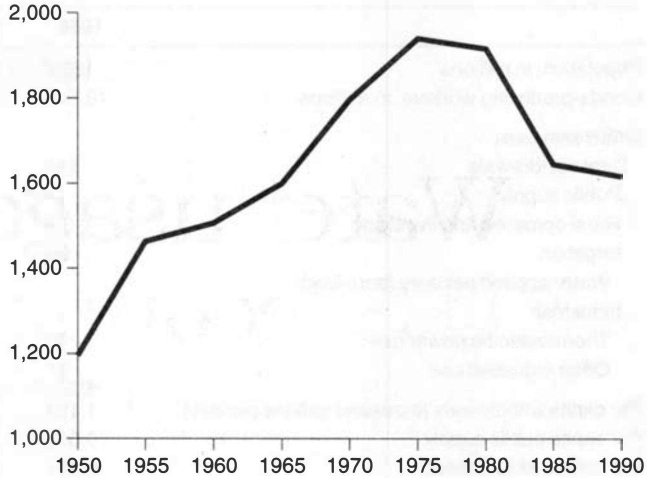
Note: These figures show water withdrawn for use "offstream" (that is, removed from lakes, streams, and groundwater). Not included here are figures for "instream" water used for hydroelectric power.

Source: U.S. Geologic Survey Circular 1081 (1993).

FIGURE 2

U.S. per-capita water withdrawals, 1950-90

(gallons per day)



Note: Refers to water for all uses withdrawn from "offstream" sources.

Source: U.S. Geologic Survey Circular 1081 (1993).

residential, domestic, livestock, and all other non-urban uses, grew steadily over 1950-90. Likewise, the bottom, darkest segment shows that water for "public supply" (the hydrologist's term for water withdrawn and provided centrally for a variety of uses including residential, commercial, civic amenities) grew steadily, though at slackened rates beginning in 1980, over the past 40 years.

The data from which these diagrams are prepared were collated by the U.S. Geological Survey, in the Interior Department. For reference purposes, we present data from this source in Table 1, along with other relevant economic data from the *EIR* database, to cover the period of water use trends 1950-90.

For a quick benchmark, look across the row in Table 1 called "total withdrawals," under "offstream use." It shows the data represented in Figure 1, for volume of water in use, in billions of gallons per day, rising from 1950 to 1980, going from 180 billions of gallons per day in 1950, up to 440 billions of gallons per day (bgd) in 1980. Then the water in use fell down to 399 bgd in 1985; in 1990, the withdrawals were 408 bgd, only somewhat higher. Now look at what this means in more specificity.

Figure 2 shows total water withdrawals, divided by the population for the various 1950-90 time points, to give per-capita water withdrawals. Even with the relatively slow growth of U.S. population beginning in the 1970s, the use of water declined so much that, in per-capita terms, it dropped, beginning in 1975. This means that less water is being made use of (for all kinds of purposes) in the U.S. economy now, than in the past. Look at this now, by subsector.

First, **Figure 3** shows the one hydrological subsector where withdrawal levels have continued to go up per capita—"public supply." All this means, is that the water withdrawn and provided by central distributors (supplying 25 users or more) for a variety of public uses, including residential domestic, office buildings, colleges, schools, prisons, commercial, and such, rose, but only slightly. Apart from the slight rise in this category of use, and also in "rural use" (see Table 1), other uses are falling drastically per capita.

Industrial water use declines since 1960s

Figures 4 and **5** show water used for industrial purposes (but not for cooling of power plants, noted in Table 1 as thermoelectric power use), on a per-capita basis throughout the economy; then, on a per-capita basis of goods producing workers. There are dramatic drops in these ratios beginning in the early 1970s.

In 1965, there were 237 gallons a day in use per capita in the economy in the industrial sector, which, at that time, meant that there were 2,097 gallons of water per industrial worker.

In 1990, there were only 118 gallons per capita in average daily use in the U.S. industrial sector; and per industrial worker, only 1,200 gallons of water used daily.

TABLE 1

Trends of estimated water use in the United States, 1950–1990

Billion gallons per day (except per capita calculations)

	1950	1955	1960	1965	1970	1975	1980	1985	1990
Population, in millions	150.7	164	179.3	193.8	205.9	216.4	229.6	242.4	252.3
Goods-producing workers, in millions	18.506	20.513	20.434	21.926	23.578	22.6	25.658	24.842	24.905
Offstream use:									
Total withdrawals	180	240	270	310	370	420	440	399	408
Public supply	14	17	21	24	27	29	34	36.5	38.5
Rural domestic and livestock	3.6	3.6	3.6	4	4.5	4.9	5.6	7.79	7.89
Irrigation	89	110	110	120	130	140	150	137	137
Water applied per acre (acre feet)						2.9	2.9	2.7	2.7
Industrial:									
Thermoelectric power use	40	72	100	130	170	200	210	187	195
Other industrial use	37	39	38	46	47	45	45	30.5	29.9
Per capita withdrawals (thousand gallons per day)	1.194	1.463	1.506	1.600	1.797	1.941	1.916	1.646	1.617
Per capita public supply	0.093	0.104	0.117	0.124	0.131	0.134	0.148	0.151	0.153
Per capita, all industrial	0.511	0.677	0.770	0.908	1.054	1.132	1.111	0.897	0.891
Per capita industrial, excluding thermoelectric	0.246	0.238	0.212	0.237	0.228	0.208	0.196	0.126	0.119
Industrial per goods producing worker	1.999	1.901	1.860	2.098	1.993	1.991	1.753	1.228	1.201
U.S. per capita irrigation water use	0.591	0.671	0.613	0.619	0.631	0.647	0.653	0.565	0.543
Sources of Water:									
Ground:									
Fresh	34	47	50	60	68	82	83	73.2	79.4
Saline	no data	0.6	0.4	0.5	1	1	0.9	0.652	1.22
Surface:									
Fresh	140	180	190	210	250	260	290	265	259
Saline	10	18	31	43	53	69	71	59.6	68.2
Reclaimed wastewater	no data	0.2	0.6	0.7	0.5	0.5	0.5	0.579	0.75
Consumptive use	no data	no data	61	77	87	96	100	92.3	94
Instream use:									
Hydroelectric power	1100	1500	2000	2300	2800	3300	3300	3050	3290

Notes: 1950 and 1955 are for 48 states and District of Columbia.
1960 and 1965 are for 50 states and District of Columbia.
1970 is for 50 states, District of Columbia, and Puerto Rico.
1975, 1980, 1985, and 1990 are for 50 states, District of Columbia, Puerto Rico and Virgin Islands.

Source: *Estimated Use of Water in the United States in 1990*, U.S. Geological Survey Circular 1081, by Wayne B. Solley, Robert R. Pierce, and Howard A. Perlman, USGPO, 1993, page 65. http://www.h2o,usgs.gov water use program

This dramatic fall over the 1970s to 1990s, reflects the decay of the "post-industrial" decades, when U.S. manufacturing activity declined, and "free trade" and "outsourcing" policies shifted the supply sources to foreign countries for many U.S. "market-basket" items of household and producer consumption.

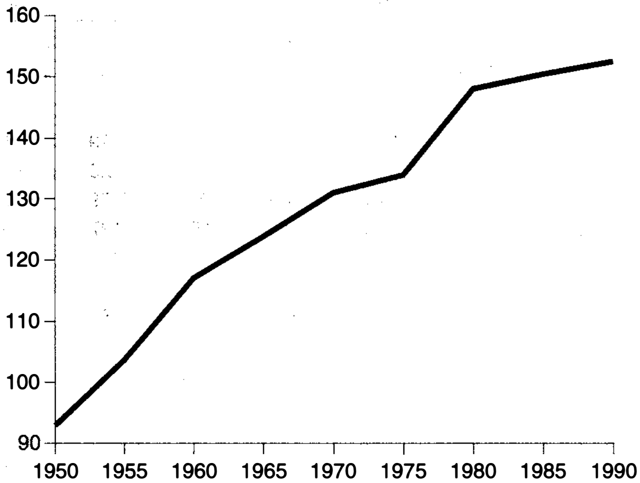
It should be noted that, while there have been some striking gains in efficiencies from certain technological advances that require less water to be used per certain finished products made, or per worker involved in that line of product, that desirable trend is not what you are looking at here.

Take a simple example such as shoes. It takes, on average, 116 gallons of water to tan a square meter of hide for leather shoes. In the mid-1960s, most footwear consumed in the United States was produced in the United States, and water use statistics reflected this accordingly. Today, over 50% of U.S. footwear comes from abroad, mostly China. So, Chinese water is being used to supply the United States with footwear. There are dozens of similar examples.

The problem shows up the other way around. For example, take computer chips. The processing of a single silicon wafer requires about 2,000 gallons of water. (A typical wafer is 8 inches in diameter, and holds up to 250 chips.)

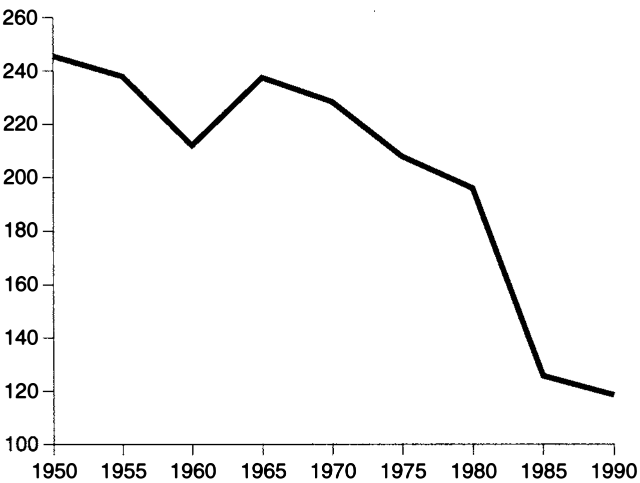
At present, three semiconductor manufacturing plants which are under construction in the state of Virginia, are facing water supply problems. In the northern Virginia area (the Potomac River watershed), IBM and Toshiba have a joint venture project in Manassas. In the James River watershed in

FIGURE 3
U.S. per-capita water withdrawals for 'public supply,' 1950-90
(gallons per day)



Note: Refers to water for all uses withdrawn from "offstream" sources.
Source: U.S. Geologic Survey Circular 1081 (1993).

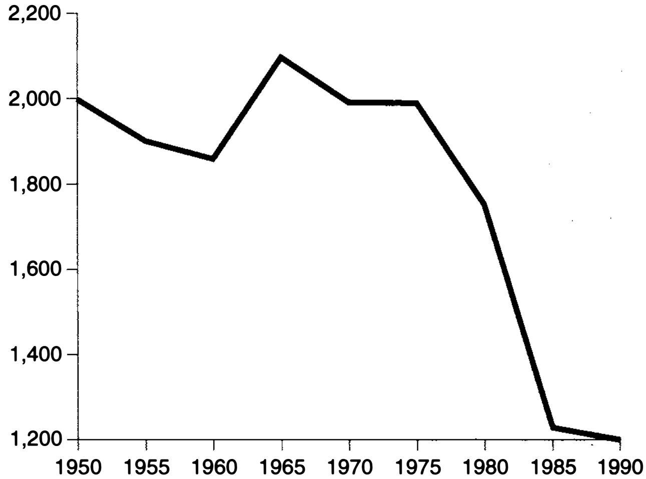
FIGURE 4
U.S. per-capita water withdrawals for industrial use, 1950-90
(gallons per day)



Note: Refers to water for all uses withdrawn from "offstream" sources.
Source: U.S. Geologic Survey Circular 1081 (1993).

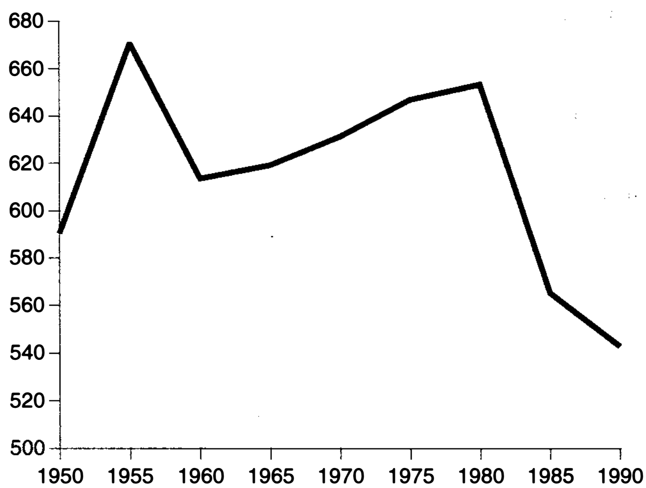
the Richmond area, Motorola and Siemens have a joint venture in Goochland County. And Motorola has a facility planned for Henrico County. However, the U.S. water resource base has declined so much, that despite declining per-

FIGURE 5
U.S. industrial water use per goods-producing worker, 1950-90
(gallons per day)



Source: U.S. Geologic Survey Circular 1081 (1993).

FIGURE 6
U.S. per-capita irrigation water use, 1950-90
(gallons per day)



Source: U.S. Geologic Survey Circular 1081 (1993).

capita use, there is not enough water for new manufacturing start-up.

Irrigation water use declines since 1980

Figure 6 shows that water in use for irrigation in the United States has dropped dramatically per capita since 1980, going from over 650 gallons daily in 1980, down to

568 gallons in 1985, and down to 545 gallons in 1990.

Table 1 gives the absolute volume of water withdrawn for irrigation water use, showing that in 1980, some 150 billion gallons a day went for irrigation; in 1985, this fell to an estimated 137 bgd, which remains the best estimate for 1990.

"Irrigation water use" figures include all water artificially applied to farm and horticultural crops, as well as water used to irrigate private and public golf courses. The use of irrigation, especially in technologically advanced forms of "protected agriculture," meaning greenhouses, hydroponics, and similar modifications, results in far higher productivities of biomass per acre of production. In these advanced modes, there is much more biomass output per gallon of water, e.g., with drip irrigation, instead of furrow irrigation.

For example, you can expect to triple crop output by using advanced drip irrigation, instead of furrow irrigation, for such crops as cotton. One acre-inch of water will produce 20 pounds of cotton with furrow irrigation; and with drip irrigation, 59 pounds. The difference for sorghum is 4,600 pounds per acre with furrow irrigation, and 8,500 pounds per acre with drip irrigation. For watermelons, the ratio of yield goes up from 20-25 tons per acre, to 25-35 tons per acre.

However, the decline in total volume of irrigation water in the United States does not represent a sweeping shift over into advanced irrigation modes, with higher output ratios per water volume applied. In fact, less water is being used for irrigation overall. Table 1 shows that the average volume of water applied per acre in the United States dropped from 2.9 acre-feet in 1985, down to 2.7 acre-feet in 1990. Only in a few locations are advanced hydroponics in use, and many of the largest are operations run by Cargill, Chiquita, and other international commodities cartel giants that dominate key links in the food chain for private profiteering, not public benefit.

Therefore, the decline in use of irrigation is a marker of a declining U.S. agriculture sector. This shift is acknowledged in a backhanded way in a new study by the National Research Council of the National Academy of Sciences, entitled "A New Era for Irrigation," due out in October. The NRC notes a decline in the total U.S. land area irrigated, from a peak of 52 million acres in 1994.

The impact to the consumer of the downgrading of the U.S. agriculture sector, specifically irrigated production, is masked temporarily by the huge increase, over the 1980s-1990s, of imported fruits, vegetables, and juices. Since 1985, the United States has been a net importer even of onions (that is, tonnage of imports exceeds exports). As of the late 1980s, Mexico supplied 35% of the U.S. consumption of the six fresh winter vegetables (October through June)—tomatoes, bell peppers, cucumbers, eggplant, snap beans, and squash. This flow has increased over the 1990s, representing a de facto use of Mexican water for provision of the U.S. consumer market basket. Huge quantities of fruit juice base are now coming into the United States from Europe, Turkey, and even South Africa.

Declining water usage is not conservation

Does declining per-capita water usage in the U.S. economy mean that future water supplies will be adequate? Is this a form of "saving water for the future," as the radical environmentalists (at *National Geographic,* Turner Broadcasting, the World Wide Fund for Nature, et al.) claim?

Just the opposite is true. The U.S. Geological Survey statistics showing the "drying out" of the economy, correspond to a decline in maintenance, replacement, and expansion of U.S. water supply infrastructure, that is now showing up in the form of regional water crises in many locations around the country. It is the lack of infrastructure and technology that is causing ecological decay and degradation of the U.S. water resource base.

In the following sections, we give a brief survey of the nation's regional water problems, then look at what should be done to remedy these situations, and, finally, we identify the forces preventing sensible water infrastructure and ecology development.

Major problem areas in U.S. water supply

by Marcia Merry Baker

The water problems present in various regions in the United States range from trouble at the source, through to the end-user stage. At the source, there are regions with severe water supply shortages, or others, with flooding and uncontrolled "oversupply"; at the treatment phase, there are thousands of locations where filtration, purification, sewage and discharge treatment, and other essential processes are inadequate; and finally, thousands of miles of distribution pipes, and thousands of storage reservoirs, pumps, and other parts of urban water systems need to be refurbished. We begin here, with a national overview of the geography of freshwater supply problems.

Figure 7 shows the boundaries of the 18 hydrologic regions in the coterminous 48 states of the United States, and indicates two general zones of water problem areas. The hydrologic regions are delineated with heavy boundary lines, and named and numbered according to the standard system used since the 1960s by the U.S. Geologic Survey. An hydrologic region refers to a natural drainage basin that contains either the drainage area of a major river (e.g., the Lower Mississippi, region No. 8), or the combined drainage area of two or more rivers (e.g., South Atlantic-Gulf, region No. 3, which has numerous rivers draining out to sea, including the James, the Potomac, and the Tombigbee).