Pros and Cons of Desal Detailed

Desalination may soon live up to its original hype and become a viable part of the nation’s water future, says a report from the National Research Council (NRC).

Because 97 percent of water on Earth is either seawater or brackish groundwater, desalination has the potential to greatly increase the amount of water usable for drinking and irrigation. However, the high energy costs of desalination—10 times the energy of traditional surface water treatment—and potential environmental impacts of the process have stymied the industry’s growth.

Recent technological improvements have lowered the costs of desalination, while other schemes to augment water supply have only become more expensive. This has made desalination economically viable, although the report cites the need for more research to further lower costs and energy use.

Meanwhile, environmental concerns related to the process are far from resolved. Desalination may be no more harmful than, say, diverting water from sensitive ecosystems, the report said, but this is a prime area for research. So are the impacts of salt concentrate disposal in rivers and seas; the extent to which fish get trapped in intakes; and ecological monitoring related to the desalination plants themselves.

Regarding environmental issues related to energy use and greenhouse gas emissions, the report suggests that desalination plants use alternative energy sources such as the sun, wind, and tides. Most current desalination technologies use reverse osmosis, which forces water through a membrane to separate out the salts. Improving the permeability of the membrane or pretreating the water might also reduce energy use, but reductions are not likely to be more than 15 percent.

Other research should be devoted to finding cheaper, environmentally friendly ways to dispose of the brine and further the development of thermal desalination—a technique using low-grade, leftover industrial heat that has potential to lower energy use even more.

Desalination currently generates 0.4 percent of the water used in the United States, representing 40 percent growth in the industry from 2000 to 2005. The NRC report recommends that the White House Office of Science and Technology Policy coordinate the research, with $25 million per year in funding plus additional contributions by the private sector, which has been funding the majority of the nation’s desalination research.

Despite the ambitious research plan and positive outlook, the report notes that water conservation and transfers are likely to remain cheaper water resource options.

“Desalination: A National Perspective” is available at www.nap.edu.
Organic Compounds: Widespread at Low Levels

Past research has shown that organic compounds including pharmaceuticals have been found near wastewater discharges and livestock facilities, and a March 2008 Associated Press report revealed pharmaceuticals had been detected in the drinking water of 24 major metropolitan areas.

Researchers subsequently reported in *Science of the Total Environment* that they had studied the presence of 100 organic wastewater contaminants, including 36 pharmaceuticals, in 25 groundwater and 49 surface water sources of untreated drinking water. In the Southwest, these included two surface water sources in New Mexico, one in Nevada, and a spring in Texas.

The study’s detection level capability was subparts per billion, and 63 of the chemicals were detected in at least one water sample, typically in the submicrograms-per-liter range. The maximum number detected at any site was 31, while only six sites had no detections. The median number of detections per site was four. The researchers wrote that this indicates that “the targeted chemicals generally occur in mixtures in the environment and likely originate from a variety of animal and human uses and waste sources.” Sixty percent of the 36 pharmaceuticals were not detected in any sample.

Except for tetrachloroethylene and a group of dyes, resins, and fuel additives, compounds were detected less frequently in groundwater than in surface water. The chemicals most frequently detected in surface water were cholesterol (natural sterol), metolachlor (herbicide), cotinine (nicotine metabolite), β-sitosterol (plant sterol), and 1,7-dimethylxanthine (caffeine metabolite). The top five chemicals in groundwater were tetrachloroethylene (solvent), carbamazepine (pharmaceutical), bisphenol-A

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(plasticizer), 1,7-dimethylxanthine, and tri(2-chloroethyl) phosphate (fire retardant).

The researchers noted that because drinking water standards do not exist for most of the compounds in this study, it is hard to put the results in a human health context. However, the data will help prioritize additional research on occurrence, fate and transport, and health effects of the compounds most likely to be found in drinking water sources.


Naturally Occurring Chromium in Groundwater

Chromium-6, a toxic chemical usually associated with industrial activities, occurs naturally in groundwater in California’s Mojave Desert, sometimes at levels that exceed California’s drinking-water standards, the U.S. Geological Survey reported in June.

Population growth in arid areas has raised concern about naturally occurring concentrations of chromium, leading USGS to examine the geologic abundance and isotopic composition of chromium in rock, alluvium, and groundwater from two areas in the western Mojave Desert. Chromium-6 occurs naturally in rocks and can enter deep aquifers; source rock in the San Gabriel Mountains near the study site contains high levels of chromium.

A USGS study team analyzed water samples from 157 public-supply, irrigation, and observation wells and found two drinking-water wells where chromium-6 exceeded the California Maximum Contaminant Level (MCL) of 50 micrograms per liter (μg/l) total chromium. Other wells in the study also contained chromium-6 but at levels below the MCL. Overall, concentrations ranged from less than the detection limit of 0.2 μg/l to 60 μg/l.

Prior to this study, chromium-6 concentrations in excess of 50 μg/l were assumed to be the result of human contamination. The best-known case occurred in the Mojave Desert town of Hinkley, where chromium-6 used by a public utility as an anti-corrosion agent contaminated local wells. The chemical is a suspected human carcinogen and can cause other health problems as well.

The USGS study also developed techniques to distinguish naturally occurring chromium from man-made sources. Study results were published in Applied Geochemistry.


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