

Environment

1.1
million
Water footprint
of average China
resident, liters/year

2.8
million
Water footprint
of average U.S.
resident, liters/year

Gas wells leakier than thought

Measurements show twice as much methane escaping

By Devin Powell

Wells that pump natural gas from the ground in Colorado have leaked about twice as much gas into the atmosphere as previously thought, a study published February 21 in the *Journal of Geophysical Research* finds.

That could tarnish gas's image as a clean source of energy. Natural gas, made mostly of methane, does give off less carbon dioxide than coal when burned. But methane itself strongly warms the atmosphere, which means


even relatively small releases can have a big impact on the climate.

For the new study, scientists monitored air quality near Denver using sensors mounted on a 300-meter tower perched on the southwestern edge of the Denver-Julesburg Basin, an area that feeds more than 20,000 natural gas wells.

When winds blew in from the basin, levels of methane detected by sensors on the tower spiked. Landfills, cattle feedlots and wastewater treatment plants probably belched some of the gas into the sky. But methane from the gas wells

was accompanied by other components that allowed it to be fingerprinted, report atmospheric scientist Gabrielle Pétron, of the National Oceanic and Atmospheric Administration, and her colleagues.

These measurements suggest that about 4 percent of the methane produced by the gas wells was leaking. Previous studies by the U.S. Environmental Protection Agency and by industry groups pegged this loss at between 1 and 2 percent. But the earlier estimates were done by measuring leakages from individual pieces of equipment.

"You tend to underestimate things when you do that kind of bottom-up approach," says Robert Howarth, a biogeochemist at Cornell University. 

Food exports can drain arid zones

Trade in agricultural products can increase water stress

By Susan Millus

About a fifth of the water that humankind now uses gets exported from one country to another — though rarely as anything that can splash into a glass.

Understanding the big blue picture of water resources means getting over the notion that water is wet. Ninety-two percent of water used planetwide goes into agricultural production, according to the latest accounting from Arjen Hoekstra and his water research group at the University of Twente in the Netherlands. So for 1996 through 2005, Hoekstra and colleagues tracked "virtual water," a combination of actual liquid and the shares of water used in industry and in growing wheat, beef and other products.

This accounting highlights the various degrees to which nations depend on foreign water. Some arid countries take a whopping portion of their virtual water from outside their borders

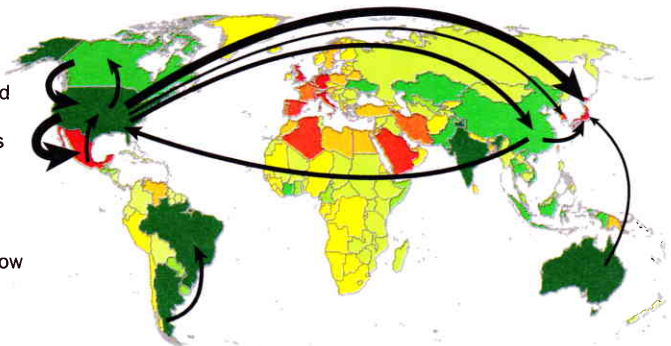
(Israel, 82 percent; Kuwait, 90 percent). But so do relatively watery places such as the United Kingdom (75 percent) and the Netherlands (95 percent), the researchers report online February 13 in the *Proceedings of the National Academy of Sciences*. The United States, which exports more virtual water than it imports, still reaches outside its borders for 20 percent of its consumption.

A worldwide trend toward eating more animal products and processed foods could increase demands for water. Producing a gram of protein in milk, eggs and chicken meat typically requires at least half again as much water as delivering a gram of legume protein, Hoekstra and Twente colleague Mesfin Mekonnen report online January 24 in *Ecosystems*.

Big flows

Countries in green exported more virtual water than they imported from 1996 to 2005. Yellow and red countries were net importers. Arrows show directions of largest virtual water flows. (Virtual water includes that used to grow crops or make goods.)

SOURCE: A.Y. HOEKSTRA AND M.M. MEKONNEN/PNAS 2012



GEOTLAS/GRAPHIOGRE, ADAPTED BY E. FELICIANO