

# The Environment: Challenges For The Chemical Sciences In The 21st Century

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## Challenges in Environmental Chemical Science

Chemical scientists and engineers have a particularly strong stake in the future of the environment. Many of the most important environmental threats are caused—or at least perceived to be caused—by release of undesirable chemicals into the air, water, or soil. In some cases, the source of such chemicals is natural, as in the highly publicized case of arsenic-contaminated groundwater in Bangladesh<sup>1</sup> and also in some parts of the United States.<sup>2</sup> Chronic exposure to small amounts of arsenic in drinking water increases a person's risk of cancer and other diseases.<sup>3</sup> High concentrations of arsenic found in the aquifers in Bangladesh and West Bengal pose serious threats to public health; estimates of population at risk run from 30,000,000 to a high of 80,000,000.<sup>4</sup> In other instances, human activity has been the origin of the chemical release. Some of the most important cases are also the most ironic—because the harmful effects on the environment were a direct consequence of a technological innovation that was intended to enhance environmental quality. Two compelling examples are provided by DDT (Box 3-1) and chlorofluorocarbons (CFCs, Box 3-2).

<sup>1</sup>Arsenic Contamination of Groundwater in Bangladesh; Kinniburgh, D. G.; Smedley, P. L., Eds.; Volume 1: Summary, BGS and DPHE, British Geological Survey Technical Report WC00/19, British Geological Survey: Keyworth, UK, 2001.

<sup>2</sup>Focazio, M. J.; Welch, A. H.; Watkins, S. A.; Helsel, D. R.; Horn, M. A., A Retrospective Analysis on the Occurrence of Arsenic in Ground-Water Resources of the United States and Limitations in Drinking-Water-Supply Characterizations: U.S. Geological Survey Water-Resources Investigation Report 99-4279, 1999; <http://on.water.usgs.gov/rwcc/pubs/wri-99-4279/>.

<sup>3</sup>Arsenic in Drinking Water: 2001 Update, National Research Council, National Academy Press, Washington, D.C., 2001.

<sup>4</sup>Smith, A. H.; Lingas, E. O.; Rahman, M. *Bulletin of the World Health Organization* 2000, 78(9), 1093-1103.

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