

Arsenic Polluted Groundwater and Its Countermeasures in the Middle Basin of the Ganges, Uttar Pradesh State, India

PDF (Size: 1078KB) PP. 856-862 DOI: 10.4236/jep.2012.328100

Author(s)

Yasunori Yano, Kenichi Ito, Akihiko Kodama, Koichiro Shiomori, Shigeki Tomomatsu, Mitsuhiro Sezaki, Hiroshi Yokota

ABSTRACT

The arsenic contamination of groundwater in Uttar Pradesh State was first recognized in 2003 and is now seen at 20 Districts out of 70 Districts. University of Miyazaki has performed the arsenic mitigation project in Bahraich District, severest arsenic-affected one in the 20 Districts, from June 2008 until now, with JICA (Japan International Cooperation Agency). The integrated mitigation, such as the raising awareness of villager, installing of alternative water supply units and healthcare of arsenocosis patients, have been executed at the 2 villages. The symptom of the arsenocosis patients was not so severe, which will be, therefore, improved by drinking arsenic-safe water supplied through arsenic removal units, installed by this project. In this paper, following results is discussed for the situation and mechanism of arsenic contamination of groundwater, objected in connection with the installation of arsenic removal units: 1) Groundwater is almost contaminated with arsenic in deep tubewell (depth: about 30 m), but scarcely in shallow tubewell (depth: about 10 m); 2) Arsenic contaminated groundwater is under the reduced condition with the oxidized condition for no-arsenic contaminated groundwater; 3) Arsenic concentration shows almost linear correlation with concentrations of Fe²⁺ and -N; 4) Ground is composed of sand with high arsenic content at around 25 m depth; 5) Arsenic exists mainly in the phase of reducible fraction or weak acid soluble fraction but no oxidizable fraction in the ground.

KEYWORDS

Arsenic; Contamination; Ganges; Groundwater; Soil; Mechanism; Removal

Cite this paper

Y. Yano, K. Ito, A. Kodama, K. Shiomori, S. Tomomatsu, M. Sezaki and H. Yokota, "Arsenic Polluted Groundwater and Its Countermeasures in the Middle Basin of the Ganges, Uttar Pradesh State, India," *Journal of Environmental Protection*, Vol. 3 No. 8A, 2012, pp. 856-862. doi: 10.4236/jep.2012.328100.

References

- [1] H. Yokota, "Arsenic Pollutions of Groundwater in the World and Arsenic Removal Unit Installed in Bangladesh," Keynote Lecture, Vietnam-Japan Joint Seminar on Geotechnics and Geoenvironment Engineering, Hanoi, November 2004, pp. 226-242.
- [2] R. B. Sah, "Studies for Possible Natural Sources of Arsenic Poisoning of Groundwater in Terai Plain of Nepal," Arsenic Research Committee, Department of Geology, Tribhuvan University, 2002.
- [3] D. Chakraborty, G. Samanta, et al., "Arsenic in Ground Water in Six districts of West Bengal, India: biggest arsenic calamity in the world," *Environmental Geochemistry and Health*, Vol. 18, 1996, pp. 5-15.
- [4] M. Feroze Ahmed and C. M. Ahmed, "Arsenic Mitigation in Bangladesh," An Outcome of the International Workshop, Local Government Division, Ministry of LGRD & Co-Operatives, September 2002.
- [5] D. Chakraborti, M. K. Sengupta, M. M. Rahman, S. Ahamed, U. K. Chowdhury, M. A. Hossain, et al., "Groundwater Arsenic Contamination and Its Health Effects in the Ganga-Meghna-Brahmaputra Plain," *Journal of Environmental Monitoring*, Vol. 6, 2004, pp. 75N-83N.

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[JEP Subscription](#)[Most popular papers in JEP](#)[About JEP News](#)[Frequently Asked Questions](#)[Recommend to Peers](#)[Recommend to Library](#)[Contact Us](#)

Downloads: 301,506

Visits: 673,441

[Sponsors, Associates, and Links >>](#)

- [The International Conference on Pollution and Treatment Technology \(PTT 2013\)](#)

- [6] Ministry of Local Government (Bangladesh) and JICA, " Sustainable Arsenic Mitigation under Integrated Local Government System in Jessore," Final Report, 2008.
- [7] K.-W. Kim, P. Chanpiwat, H. T. Hanh, K. Phan and S. Sthiannopkao, " Arsenic Geochemistry of Groundwater in Southeast Asia," *Frontiers of Medicine*, Vol. 5, No. 4, 2011, pp. 420-433.
- [8] K. H. Cho, S. Sthiannopkao, Y. A. Pachepsky, K.-W. Kim and J. H. Kim, " Prediction of Contamination Potential of Groundwater Arsenic in Cambodia, Laos, and Thailand Using Artificial Neural Network," *Water Research*, Vol. 45, No. 17, 2011, pp. 5535-5544. doi:10.1016/j.watres.2011.08.010
- [9] H. Yokota, et al., " Collaboration between NGO and University of Miyazaki and Asian Arsenic Network for the Mitigation of Arsenic Contamination in Ganges Basin," *Proceedings of 1st International Symposium on Health Hazards of Arsenic Contamination of Groundwater and its Countermeasures, Keynote Lecture*, 2006, pp. 47-58.
- [10] S. Ahamed, M. Kumar Sengupta, B. Das, B. Nayak, A. Pal, A. Mukherjee, M. Amir Hossain and D. Chakraborti, " Arsenic Groundwater Contamination and Its Health Effects in the State of Uttar Pradesh (UP) in Upper and Middle Ganga Plain, India: A Severe Danger," *Science of the Total Environment*, Vol. 370, No. 2-3, 2006, pp. 310- 322. doi:10.1016/j.scitotenv.2006.06.015
- [11] A. K. Srivastava and R. M. Tripathi, " Arsenic in Ground Water in Uttar Pradesh: Testing and Mitigation Activities," *Proceedings of 1st International Symposium on Health Hazards of Arsenic Contamination of Groundwater and its Countermeasures*, 2006, pp. 77-82.
- [12] Y. Yano, A. Kodama, K. Shiomori, M. Sezaki, K. Tanabe, R. Jaiswal, P. Jaiswal, Tripathi and H. Yokota, " Arsenic Contamination of Groundwater at Uttar Pradesh State in India," *International Symposium on Geo-disaster Prevention and Geo-environment in Asia, JS-Fukuoka, The Japanese Geotechnical Society*, 2009, pp. 193-198.
- [13] M. Pueyo, J. Sastre, E. Hernandez, M. Vidal, J. F. Lopez- Sanchez and G. Rauret, " Prediction of Trace Element Mobility in Contaminated Soils by Sequential Extraction," *Journal of Environmental Quality*, Vol. 32, No. 6, 2003, pp. 2054-2066. doi:10.2134/jeq2003.2054