USE OF GEOGRAPHIC INFORMATION SYSTEM (GIS) IN STUDYING GROUNDWATER CONTAMINATION: AN APPLICATION TO ARSENIC PROBLEM IN BANGLADESH

By

IBRAHIM TAIWO ABDULKADIR
(ID#: 230341)

For

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Course Instructor:
Dr. Baqer Al-Ramadan

INTRODUCTION

- First reported case of arsenic-contaminated groundwater __ 1978 in West Bengal.
- First case of arsenic poisoning __ diagnosed in 1983.
- Same contamination report in the west of Bangladesh in late 1993.
INTRODUCTION (II)

- Analyzing large amounts of groundwater—an overwhelming task.
- ArcView’s ability.
- The wells are predominantly in the shallow aquifer—usually in the range 15-70 m depth.
- Study limitation/constraints.
SOURCE OF ARSENIC

- Arsenic—an ubiquitous element in the atmosphere, soils and rocks, natural waters and organisms.

- Mining activity, combustion of fossil fuels and through the use of arsenic in pesticides, herbicides, crop desiccants and as an additive to animal feed.
PROBLEM STATEMENT

- Displayed of useful hydrogeological analysis on maps.
OBJECTIVES

- Maps showing the regional distribution of arsenic and other elements in the groundwater.

- Estimates of the percentage of wells exceeding various limits for arsenic and other elements on maps.
DATA SOURCE

- Source of data:
  [http://www.bgs.ac.uk/arsenic/bangladesh/data download.htm](http://www.bgs.ac.uk/arsenic/bangladesh/data download.htm).

- The raw data are in a Microsoft Excel spreadsheet format.
## DATA IN EXCEL FORMAT

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TOOLS OF STUDY

- ArcView was used to query and analyze data and finally making different maps.

- Presentation of data on maps.
DISTRIBUTION OF SAMPLED WELLS

Figure 1: Distribution of well sites and year sampled.
DISTRIBUTION OF SAMPLED WELLS (II)

Figure 2: Distribution of wells based on the year of construction.
Figure 3: The depth distribution of wells sampled.
GEOGRAPHICAL DISTRIBUTION OF ARSENIC

Figure 4: Concentrations of groundwater arsenic.
Figure 5: Average concentration of arsenic in wells from each of the six administrative divisions.
Figure 6: Concentration of arsenic plotted against well depth for all sampled wells.
ARSENIC VERSUS GEOLOGY

Figure 7: Classification of sampled sites by lithological units.
HYDROGEOCHEMISTRY OF THREE SPECIAL STUDY AREAS

Figure 8: Sketch map of Bangladesh showing the locations of the three Special Study Areas.
Figure 9: Spatial Variation of Sodium.
CONCLUSIONS AND RECOMMENDATIONS

- Arsenic contamination threatens water resources.

- The generated maps show an effective way to help investigate and remedy arsenic contamination in Bangladesh.

- Also help environmental professionals prioritize their limited budgets for groundwater cleanup, develop field investigation strategies and design remedial systems.
CONCLUSIONS AND RECOMMENDATIONS (II)

- The ability to use GIS created data along with data queried from a Excel spreadsheet is beneficial for contamination analysis.

- A larger size of well random samples should be needed if physical and economic constraints are not significant.
CONCLUSIONS AND RECOMMENDATIONS (III)

- Human errors and laboratory uncertainties are also possible factors for prediction errors. These should be considered in the assessment of arsenic contamination.

- Need to license drilling of boreholes by the government and for details of the borehole logs to be logged in a systematic way.