



**Scenario**  
DOCTORAL TRAINING PARTNERSHIP

**NERC**  
SCIENCE OF THE  
ENVIRONMENT

## **Impact of risk assessments for small water supplies in low income countries in the Southern Hemisphere**

**Lead Supervisor: Dr Katherine Pond, University of Surrey, Department of Civil and Environmental Engineering**

Email: K.Pond@surrey.ac.uk

**Co-supervisors: Dr Dan Lapworth, British Geological Survey; Dr Sue Hughes, University of Surrey**

Small water supplies are frequently associated with outbreaks of waterborne disease and pose a risk to the health of users in both developed and developing countries. They are often poorly managed leading to breakdown and contamination, and poorly financed and maintained in part due to fragile local governance. Investing in small water supplies may reduce waterborne disease outbreaks and overall costs in terms of the prevention of illness, death and associated health-care costs (WHO, 2012).



**A shallow well with several potential hazards**



**A borehole with fewer potential hazards**

The World Health Organization advocate the use of low cost risk assessments to identify hazards that may contaminate these supplies (WHO, 2012). Sanitary risk assessments were designed to be very simple, identifying visual hazards such as the presence of a protective fence around the water source but in some situations they could also be adapted to combine information across different disciplines for example, geology, biology and human behavior. Current research at the University of Surrey is identifying the best combination of questions to make sure that a simple risk assessment is as robust as possible. The current project will be related to this research but will go further by exploring the use of interaction-matrix-type techniques (based on a system analysis approach) to help develop tools for assessing water safety within a risk assessment platform. By determining the key factors affecting water safety such as soil properties, depth to groundwater, geology, distance from or density of latrines, contamination sources, pathways, contaminants and others, the matrix can be used to determine weightings for each parameter, which can then be applied to different datasets. This will allow the impacts that the different parameters have on each other to be determined.

In the first instance quantitative data held by BGS (and their partner organization) from Malawi and Zambia will be used to assess the robustness and suitability of the current methodologies being used in those countries. The results will be interpreted with the aim of integrating the findings into the risk assessments to better align them with in-situ conditions and develop new interactive tools based on a system analysis approach. In addition, there will be an opportunity to collect primary qualitative and quantitative data from users of risk assessments and small supplies – NGOs, government departments and owners of small supplies. This could be used to identify the level of use; the extent to which risk assessments are being implemented and the overall impact they may have on small supplies. This research is relevant for improved monitoring, protection and management of small drinking water supplies with potential applications in both developed and developing economies.

**Training opportunities:**

Overseas fieldwork will be an important component in this PhD. The successful candidate will have the opportunity to attend relevant modules from the University of Surrey's MSc in Water and Environmental Engineering such as hydraulic modelling, regulation and management, GIS and remote sensing, lab and field microbiological techniques. In addition, there are a number of other relevant technical and non-technical training opportunities offered at the University of Surrey relevant to the project, including using statistical methods and scientific writing. The candidate will have the opportunity be placed at BGS for a period of time during the project and will be able to draw on the expertise of staff at the WHO for advice.

**Student profile:**

This project would be suitable for students with a good degree (First or 2:1) in public health, microbiology, geology, geography or a closely related environmental or physical science. It would be advantageous to have a strong background in mathematics.

**Funding particulars:**

This project has collaborative BUFI funding from BGS for fieldwork support.

**References: (optional)**

WHO (2012). Water safety planning for small community water supplies: step-by-step risk management guidance for drinking-water supplies in small communities. World Health Organization, Geneva.

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