

# Seeking safe water solutions in the slums of Sub-Saharan Africa

Water is easily available in the UK, and many of us take this for granted. For certain communities in the world, it is not always so readily available, or safe to use. This is the case in the slums of Sub-Saharan Africa, whose inhabitants commonly obtain water from the ground by themselves. Unfortunately, these waters are often unsafe, and contain contaminants. **Dr Jan Willem Foppen** and his team address this issue, as part of the T-GroUP project, to improve water management in these areas. Their approach combines social intervention with hydrological assessment.

**D**eprived communities built in unplanned urban areas of Sub-Saharan Africa often depend on groundwater for their daily water needs. Unfortunately, safe quality water is a scarce commodity in these areas. Without political or economic resources to meet these needs, the communities commonly self-supply from the water that runs beneath the ground (groundwater). Much of this water may contain contaminants and pathogens that can lead to disease. The availability of safe water in these locations is a neglected concern for government authorities, even though this need will increase as population rapidly grows, particularly in slums where the majority of the expansion will occur.

Dr Jan Willem Foppen at the IHE Delft Institute for Water Education, The Netherlands, is facing this issue, in the multi-national project 'T-GroUP – Experimenting with practical transition groundwater

management strategies for the urban poor in Sub-Saharan Africa'. To tackle it, the group assesses the availability of groundwater, evaluates its safety, conducts hydrogeological assessments, and organises 'social learning alliances', and 'shared strategic planning' sessions to enable the communities to problem solve together.

## T-GROUP – THE PROJECT AND MISSION

While Dr Foppen is part of a team based at IHE Delft Institute for Water Education in The Netherlands, T-GroUP is made up of an alliance of multiple research organisations across The Netherlands, Sweden, Ghana, Tanzania and Uganda. Together, their aim is to improve the availability of safe water in the unplanned residences of the urban-poor, across Sub-Saharan Africa.

In these settings, which often comprise slums, Dr Foppen describes their water resources as 'patchwork', made up of the occasional hand pump, piped network or

**The idea is that small successful experiments can spark changes... this process is the essence of transition management**



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Children fetching water at one of the groundwater fed springs in Bwaise slum in Kampala.





Left: Mostly women carry water.

Washing her baby along the road between the motorcycles.



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The meter (white standpipe) provides drinking water. The spill is scooped for toilet use.



borehole. Since there is little consistency, there are differing water tariff structures in place, and it is actually the poorest who pay the most for their water. Little is done to address the issue, as institutions such as councils, assemblies and ministries are rarely consulted about groundwater issues in their regions, and city development plans do not take it into account. This is part of the social challenge that further complicates the situation. As Dr Foppen comments: "There are different types of inequalities and political or social power dynamics when it comes to access to water". He also reports that the groundwater is usually contaminated with various chemicals that seep in from the ground surface, as a result of human activity. An abundance of viruses have been identified, some of which are pathogenic.

An ethos of the project is to avoid telling communities or authorities what to do. Instead, the team learns about the complexities of the regions, and gathers

## There are different types of inequalities and political or social power dynamics when it comes to access to water

the right people together to discuss the problem. T-GroUP designs small-scale experiments, in the hope that whichever ones are successful in increasing sustainability, these solutions will spread out to other communities, benefiting them too. This approach is named 'transition management theory'. Dr Foppen explains: "The idea is that small successful experiments can spark changes. This process is the essence of transition management".

The T-GroUP team investigates the political and economic situations of each area

studied, what the governance arrangements are, and the power dynamics at play. This will allow them to develop a model for improving groundwater sustainability, which they hope could be applied further afield from the sites of study, to other urban areas of Sub-Saharan Africa.

### ASSESSING THE SITUATION

As part of the project, the team consider the environmental and hydrogeological perspective, to understand the groundwater flow systems at work. In a previous study, Dr Foppen teamed up with George Lutterodt

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(Central University College) and Obed Minkah (Hydrological Services Department) based at Accra, to gain an overview of the groundwater flow system at Dodowa, Ghana. Here, they drilled 12 holes, chemically analysed groundwater samples, and considered the geological make-up of the area. The aquifer system was found to contain high nitrate concentrations in the groundwater, due to the infiltration of waste. A similar situation was observed in his study of Arusha, Tanzania, where high nitrate levels were also found in the groundwater. As many households around these sites depend on this groundwater, this is a prevailing health concern.

After multiple investigations, Dr Foppen summarises that interventions need to be invested in, in order to reduce waste infiltration of the groundwater. For slums that are located in the lower part of the valley where groundwater discharge occurs, interventions to minimise pollution should be implemented by targeting the source of the issue, upstream, where the contamination of the water takes place. His colleague, Jenny Grönwall (Stockholm International Water Institute, Sweden) conducted interviews in the town of Dodowa, with residents and those within the public water industry. Her study showed that little had improved in the town, which faces an unreliable supply of water from the authorities, leaving people to rely on themselves, and self-supply. With little alternative choice, the communities continue to depend on the potentially harmful groundwater.

#### LOOKING TO THE FUTURE

The research team are halfway through the T-GroUP project, and have identified some complex factors that impact the availability of safe water in the slums of Sub-Saharan Africa. By combining hydrogeological investigations with social interventions, they have been laying the groundwork to find possible solutions for sustainable water management in these areas. As a result, the magnitude of the problem is ever more emphasised, as is the importance of raising awareness. Dr Foppen admits that there is no one quick fix, and tackling this challenge will be a lengthy process. Though, it is hoped that through the T-GroUP project, the smallest beneficial change to one community could progressively spread out and benefit others. Time will tell whether this 'transition management' approach will be an effective way of managing groundwater in Sub-Saharan Africa.



Dr Robinah Kulabako interviewing one of the residents of the area.

**With little alternative choice, the communities continue to depend on the potentially harmful groundwater**



Research in action: 2D electrical resistivity tomography measurements in the field.

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## Q&A

### **What led you from your research focus on the physical sciences to public health issues such as this?**

Many problems in the developing world are associated with safety issues. In the developed world, we have more or less overcome those safety issues, although calamities do occur every now and then. One way of keeping safety issues on the agenda of ministries and public entities is to do research about the topic and to publish about it. I have to add here that I am not into public health as such; but examining the safety of groundwater environments and ways to ensure that people can keep on using groundwater. This is not public health. It's a combination of physical and social sciences, really.

### **How long do you think it could take to start seeing positive changes from this project?**

That varies depending on the experiment we're about to carry out. Some are quite successful right from the start, while other experiments seem to be failing completely because we overlooked something. With a bit of tweaking from our side, we can perhaps turn the failures into successes.

### **Has the main challenge been social, in the communities; or physical, regarding the hydrology?**

Institutional I would say. The most important challenge is not the physical side of the project, nor to connect with the local communities, but to get the employees from the various stakeholders to move away from their institutional mandate. Usually, they hide behind the mandate of their institution.

We haven't reached that stage yet, but I am sure we'll get there in due course.

### **How do you think decision-making authorities in the region can be encouraged to provide adequate water resources to the urban-poor slum communities?**

Decision-making authorities don't provide water. This is usually done by public drinking water supply companies. Mostly, these are privately run businesses with ministerial representation on their boards or similar body. Decision-making authorities can assist with developing pro-poor policies or legalising households or plots in squatter areas, or by supporting communities to identify solutions for better water provision.

### **Can your identification of chemicals and viruses in the groundwaters potentially benefit other forms of research?**

Yes, absolutely. In a way, the slum areas can be seen as virus playgrounds in groundwater. Nowhere in the world is there as much waste water leakage into groundwater as in slum areas. What we find here is a kind of worst case scenario. Actually, we do find viruses that have never been found before in any groundwater environment anywhere in the world. These findings contribute to the science dealing with the transport of pathogens in groundwater. Some 70% of what we find has not been found before. It is not in any online DNA database. Perhaps this holds unknown virus species. Only the future can tell how valuable that information really is.

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## Detail

### RESEARCH OBJECTIVES

Dr Jan Willem Foppen's research interests include transport of the faecal indicator organism *Escherichia coli* in saturated porous media, and investigating water and sanitation in slums. He also explores DNA as a marker to study hydrologic processes.

### FUNDING

Natural Environment Research Council (NERC)

### BIO

After earning his MSc in Hydrogeology, Dr Jan Willem Foppen joined IHE Delft where he led a capacity building project at Sana'a University in Yemen.

There, he helped establish the Water and Environment Center. Inspired by poor groundwater health conditions in Sana'a, this became the focus of his PhD studies. He is currently Associate Professor of Hydrology at IHE Delft.



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