Tales of the Mzungu
Episode II: Cloudburst
The water boy for AECOM

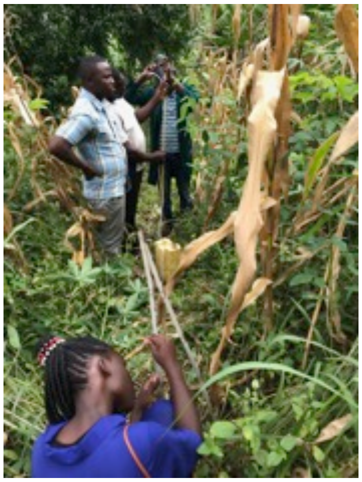
"Akuba ja!" "Better hurry, it looks like rain." Quickly packing the samples, we headed down the hill through the jungle. Cloudburst! In a moment, everything in front of me vanished in the rain. "Just keep on the path going downhill," he shouted, "and you'll end up at the house!" And off we ran down the hill before the path became impassible. Minutes later, I burst out of the brush... onto a deserted dirt road. Soaked to the skin, I peered left, then right. No one in sight. No sound but the pounding of the rain. "Well, you've done it up right this time, haven't you!," I said to myself...

Sometimes the problem isn't water supply, it's location. We'd worked the last several years with the village of Nyanzi trying to assist in their water problems. Most often, they gathered their water from muddy pools, located in the valley. But these were seasonal. Well drilling was problematic, because the geology was primarily hard rock, and the water supply seepage water. But our host told us of permanent pools of clear water, way up at the top of a steep hill. "They are hardly used," he said, "who wants to climb uphill through thick underbrush up a steep slope for 20 liters of water?"

But what if we could simply pipe the water into the valley? It shouldn't be *that* hard. While pondering the problematic, I received a call from an old friend at the University of Trier. "I received a request from at Masters student at the University of Salerno looking for an interesting Masters topic. She's a hydrogeologist. Any ideas?" With that call, we decided to add the project to this year's Blueprint Program.

While seemingly simple, the project did present challenges. How would the removal of water affect the stability of the slope? Would it affect the agriculture in the area? We had the good fortune of having Professor Guida of the University of Salerno joining the team. There was indeed evidence of prior slides in the area. We decided not to empty the pools, leaving some water to minimize the effects.

Next question was choice of pipes. Because of the rapid changes in slope, we chose HDPE (PE100) pipe because of its flexibility and uv-resistance. A simple rain barrel in the valley on a concrete pedestal with emergency overflow should be sufficient. There was some concern about velocity, because 90 meters of elevation change is a *bunch* of pressure.



But how to measure the slope? For obvious reasons, we hadn't brought proper survey equipment along and a hand level would be too inaccurate. We settled on the old water tube level method. Water in a tube will always be level at both ends, so 3 meters of tubing should be enough to measure the slope. Picking two points on the slope, one up and one down, and measuring the height of water in the tube enabled us to measure the difference in height. Using the measured distance between the points as the hypotenuse, we were able to calculate the slope using trigonometry. The velocity in the pipe wouldn't be too extreme. We'd need to either brace the tank in the valley or keep it full.

As always, we dealt with the unexpected. Initially rolling out the pipe was easy, but, as the day wore on, the pipe became more and more flexible. What we didn't expect was the effect of heat. Around 2 in the afternoon, the pipe walls collapsed at the sharp slope bends, just like a garden hose. We were forced to buy rigid fittings at the bends to restore the diameter.

The concept was a simple one. Set the pipe an inch or so below the water surface of the pond. Initially, the flow would be great, because of the water pressure and the elevation difference. But eventually the flow would reach equilibrium as the water level would drop to the level of the pipe and the flow out of the pond would equal the re-fill rate of the pond. Great was the joy when the water geyser-ed out of the pipe. But the joy was short-lived. After about a half hour, the flow stopped. It couldn't be collapsed pipe; we'd fixed those. Clogged pipe? We'd screened the inlet to avoid leaves.

There was nothing for it but to go back up the slope. To my surprise, the pond was empty. How was that possible? As it was coming on evening, we headed back to our lodging to ponder the mystery. Then I knew it! The very flexibility that was the advantage had an odd side effect. The pipe didn't stay in place; it moved with the water surface. The elevation difference caused a powerful syphon, which dragged the pipe slowly to the bottom of the pond until the pond was empty. We needed to build a brace for the pipe.

Out of time, we explained what was needed to the villagers. Two weeks later, we received the pictures of the villagers lining up to fill their jerry cans with their new water source!

And the jungle adventure? *The cell phone, that wonder of technology, surely that'd do the trick! But the very technology that makes things so easy was the root of defeat. A touch screen won't work when it's too wet... (And besides, there was no cell net.) ☹ Any other great ideas? Faced with a lack of alternatives, in typical engineering fashion, I walked 100 m down the road, then 100 m up the road, then 200. By the 300 mark, I came back out at the house, to the great relief of the team.*

The University of Salerno is planning a joint project with cooperative agreements with WeDev Water and AECOM to develop the water resources in the Nyanzi Basin through grant funding.

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