

Impacts of the Simiyu Climate Resilience Project in Tanzania

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Evaluation designs and initial learnings

Confronting climate change

Simiyu, one of Tanzania's poorest regions, experiences severe water shortages during the dry season and extreme water events in the rainy season. Both challenges are exacerbated by climate change. Especially in rural areas, the lack of clean water threatens agricultural livelihoods and poses serious health risks to the population, leading to illness and increased child mortality. Moreover, many women and children spend hours walking long distances to collect often low-quality water, sacrificing time for work, school, and leisure, while enduring physical burdens.

The *Simiyu Climate Resilience Project* (SCRP), which is jointly funded by the Government of Tanzania, the German Federal Ministry for Economic Cooperation and Development through KfW, and the Green Climate Fund, aims to counter the adverse effects of climate change in the region. Its largest component is the construction of a 100-kilometer-long water pipeline inland from Lake Victoria, complete with water treatment plants, secondary distribution lines, and other investments. The pipeline will be a reliable source of clean water for nearly half a million people.

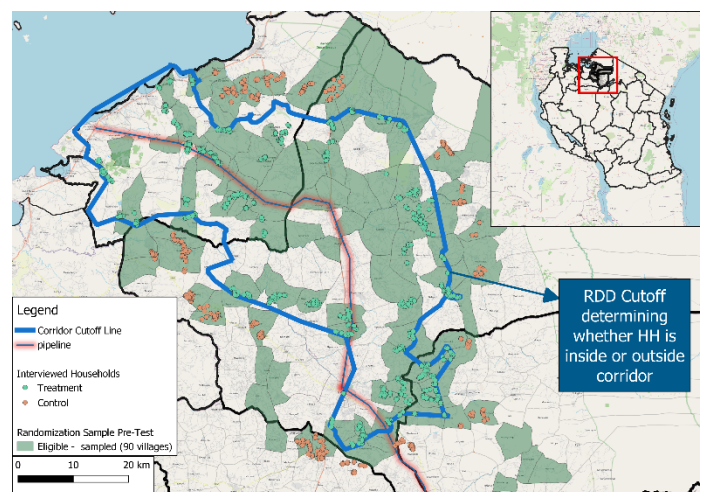
Pilot study

Since the project's inception, KfW's Development Impact Lab (DIL) accompanies the SCRCP with a rigorous impact evaluation (IE). The objective is two-fold: first, the study will quantify short- and medium-term causal impacts of the project on people's health, education, and economic opportunities. Second, it will provide project management with actionable information during implementation and draw lessons for future climate resilience projects.

Prior to the start of construction, in 2024, a pilot study was conducted in collaboration with the Tanzania-based company *Ideas in Action* (iAct). The pilot helped us get a better idea of future beneficiaries and to inform the final evaluation design. Ninety randomly selected villages across the region were surveyed, including interviews with village leaders and a representative

sample of—primarily female—household members from 1 809 households (Figure 1). The survey focused on water consumption patterns and willingness to pay for clean water.¹ Additionally, water analysts collected samples from 272 water sources used by villagers, using portable laboratories to evaluate the chemical and physical quality of the water sources currently used by the villages. The pilot study also informed the study's evaluation design and the future sampling of households.

Figure 1: Simiyu project region and evaluation design



Note: The map shows the Simiyu project region, the planned pipeline (red) and the cutoff line (blue) for the Regression Discontinuity Design (RDD), which is determined by distance of households from the beneficiary water kiosks. The cutoff line determines whether a household is considered as treatment or control group.

Evaluation designs

To arrive at a plausible estimate of the causal impact of the pipeline requires a plausible counterfactual: in the future, we want to know what would have happened had there been no pipeline. What is needed, in effect, is a control group. In this case, one idea seems particularly promising.

The idea is based on the notion that some households will be just within the area that can be supplied by the pipeline while

¹ We report on households' willingness to pay for clean water in a separate brief.

others will be outside (and sufficiently far from one of the newly constructed water kiosks). The only systematic difference between these two groups will be that they live on opposite sides of a ridge, which renders household on the side that is further away from the pipeline a suitable control group. This design, which is known as a *spatial regression discontinuity design* (RDD), is illustrated in Figure 1, where green dots mark households that are part of the treatment group and red dots mark households that can be used as a control group. Overall, rural households will be surveyed once before the pipeline becomes operational and twice after construction begins and water starts flowing.

What have we learned thus far?

Understanding households' needs is essential for designing appropriate activities. The pilot study confirms and quantifies the urgent need for improved water infrastructure among future project beneficiaries by highlighting the significant challenges and varied costs households currently incur in accessing water.

 The future beneficiaries of the SCRP live in households with on average nine household members. More than half of the respondents report that primary school is their highest educational qualification and 90% of households live from agriculture and livestock husbandry. Overwhelmingly, future beneficiaries are poor, which has important implications for their ability to pay for clean water.

 Households collect water from between one to five different sources to meet their needs for drinking, washing, and cooking. The most used sources are tube wells and boreholes; however, during the rainy season, approximately 40% of households also successfully harvest rainwater (Figure 2). Therefore, the project's potential impact is greatest during the dry season.

Figure 2: Exemplary water sources



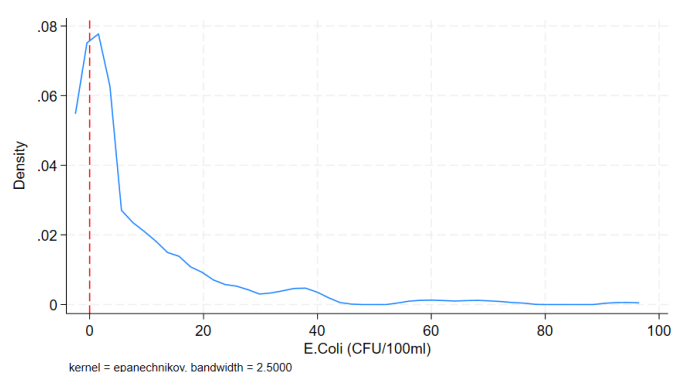
Note: The figure shows examples of water sources currently used by households. From left to right: protected dug well, rainwater collection, surface water, protected tubewell/borehole.

 Many households travel long distances to reach the nearest water source. During the rainy season, when water is more plentiful, they spend an average of 49 to 78 minutes per day collecting water, depending on whether they have a water source at home. In the dry season, this average increases to up to 200 minutes—over three hours per day—representing substantial time costs.

 The project's impact on education and employment will largely depend on effective time savings, which in turn will depend on the distance between households and the nearest water kiosks. Water collection is predominantly undertaken by women and children, often at the expense of education: one in four families reported that at least one child misses school or arrives late up to three times a week due to fetching water.

 Using portable laboratories, the survey team collected water samples from 272 water sources currently used by the villages. The analyses revealed that more than half of the water samples were contaminated with *E. coli* bacteria, an indicator of faecal contamination. Figure 3 shows that most water sources have contamination levels just above zero, as indicated by the peak of the blue curve. Yet, the standard of the *World Health Organization* states that safe water should not contain any *E. coli* bacteria (dotted red line). The figure also shows that some water sources have very high contamination levels, ranging up to 94 colony forming units (CFU) per 100ml. Since only 20% of households effectively treat their water—for example, by boiling or chemical disinfection—this level of contamination presents a significant health risk, particularly for children and the elderly. Consistent with this, 16% of respondents reported that at least one household member had suffered from diarrhoea in the two weeks preceding the survey.

Figure 3: E. Coli contamination at current water sources



Note: The figure shows a kernel density function illustrating the distribution of water sources and the quantity of *E. coli* found in a 100 ml sample. The vertical line at the 0 indicates the WHO standards demonstrating that safe water should not contain any *E. coli* bacteria.

Outlook and implications

 For the project implementers, the pilot study provides two more key insights: first, there is strong willingness to pay for improved water services, with nine out of ten households expressing willingness to pay, and higher average amounts reported during the dry season (see separate policy brief). Second, actual water consumption is approximately one third lower than previously estimated in the project design phase, at 30 litres per capita per day. This has important implications for the expected future demand for water from the SCRP infrastructure.

Water infrastructure is a key means to adapt to the adverse consequences of climate change – not only in Tanzania. While insights from the first steps towards an impact evaluation of the SCRP can already inform effective project planning and implementation, lessons from further rounds of data collection and analysis will also be available to inform future projects. The next data collection will take place shortly before the infrastructure is put into operation.