

Stone age revolution gets Tanzania moving

February 24 2022, by Hayley Jarvis



Credit: Adrienn Tomor

Getting to hospital, or going to school, work or the market for most people in rural Tanzania depends on crossing a river safely.

About 40 million people live in remote parts of the East African country, one of the world's poorest economies.

High costs of steel and reinforced concrete and a fast-growing population mean the national government struggles to build much-needed roads and bridges.

But a fresh approach that revives the ancient art of [stone](#) arch bridge-building could safely and sustainably get millions of rural Tanzanians where they need to go.

Belgian charity Enabel and the Tanzania Rural and Urban Roads Agency have, in the past four years, built 70 stone arch bridges for villages in Kigoma, North Western Tanzania.

"Stone bridges offer an ultra-low-emission alternative to concrete and steel with minimal maintenance costs," said structural adviser Dr. Adrienne Tomor.

Standard steel and concrete bridges call for expensive, carbon-greedy industrial materials and machinery. Kigoma's new stone bridges are built with locally sourced stone, sand and wood, and importantly, labor—which are all cheap and in good supply.



Credit: Adrienn Tomor

"The stone arrives on bike or large pieces cut out of a river bed and the local community dig the foundations," said Dr. Tomor, who teaches civil and [environmental engineering](#) at Brunel University London. "They are surfaced with the reddish local soil, murrum, which compacts easily and withstands the monsoon, which is no small ask. No machinery is used, so I have great respect for the builders, who—sometimes working in monsoon floods—create these bridges through ingenuity, skill and muscle power."

Shunning steel, cement and conventional [construction techniques](#) for local labor and materials cuts costs by 80 to 85% and lowers carbon emission 50 to 80%. And money spent building them can be poured back into the community, rather than spent on hiring expensive

equipment and paying big companies big salaries. Besides cost and environmental benefits, having had a hand in their building, local people are invested in the bridges and want to maintain them.

The bridges cost about £35,000 each to build and are 80% funded by Enabel, which has translated a construction manual into Swahili for the roads agency to use. Putting the project out to tender, the agency can afford to build one concrete [bridge](#) a year. Involving local people in construction, that same budget can fund 10 stone bridges. It also means local governments don't have to ask central government for financial backing and can upgrade more rural roads without their budget ballooning.

"Both the design and execution rely on simple rules of thumb that have been tried and tested through time," said Dr. Tomor, who checked quality and structural performance. "Masonry bridges last much longer than concrete or steel, probably minimum twice the life span. There is a compelling case for reviving this incredibly long-lasting material."

Tanzania's government is weighing up a plan to roll the project out nationally. "There is much the developed world can learn from this," said Dr. Tomor. "It certainly raises some questions about why masonry arch bridges aren't really considered as an option in the West... especially with our drive for more sustainable construction and reduction in carbon."

Provided by Brunel University

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