



KIGOMA **TANZANIA**

ENABEL STONE ARCH BRIDGES

Connecting communities using local stone

KEY CONCEPTS

STONE ARCH BRIDGES, **VERNACULAR TECHNOLOGY,** LABOUR-INTENSIVE CONSTRUCTION, **URBAN-RURAL LINKAGES**

Built infrastructure plays an important role in sustainability, with carbon emissions from construction processes and building materials accounting for a significant amount of East Africa's carbon footprint. Dating back to 62 BCE, stone arch bridges—with their relatively low construction cost and time, lower embodied carbon as compared to steel and concrete bridges, and incorporation of locally available materials—represent an ancient yet durable form of appropriate technology. Supporting the construction of stone arch bridges in Uganda and Tanzania, the Belgian development agency Enabel is contributing to a resurgence of this ancient form of appropriate technology, facilitating rural-urban connections, creating jobs, and promoting more sustainable and climate-friendly modes of building.



COMMUNITIES Kigoma, Tanzania



2,1 million

POPULATION



DENSITY

57 inhabitants per km²



INFRASTRUCTURE DEFICITS

Poor road infrastructure, lack of bridges to cross rivers and valleys, rural-urban inaccessibility



CLIMATE Tropical climate, average temperature of 25.5°

RISKS



Areas not accessible for trade and essential services

Introduction

Buildings and built infrastructures have significant environmental, social and economic impacts throughout their lifespans. The choice of construction materials is important as it impacts on the areas where the materials are extracted from, and certain materials generate significantly more emissions than others during extraction, processing and transportation to site. Cement production, for example, requires significant amounts of energy, and is a major source of greenhouse gas emissions. Local materials like stone require shorter travel distances, and can help to support local businesses. Construction methods are also important, as they determine the extent to which local workers can be employed in the construction, maintenance and decommissioning phases. While green buildings are receiving increasing attention across Africa, other forms of infrastructure like bridges also have potential to be constructed in ways that incorporate local materials and skills, and can cost less than infrastructure built by overseas contractors.

Approach

WRITTEN BY:

Since 2018, Enabel has been facilitating the building of stone arch bridges in the region of Kigoma, Tanzania. Originally working to improve agricultural markets, the project found that improving infrastructure would facilitate access to markets for rural farmers. Having constructed 30 stone arch bridges in the district of Kasese in Western Uganda, Enabel has trained numerous masons in the technique, and developed a publically accessible manual actively in use.

Key criterion for site selection include proximity of stone

materials to the proposed bridge location (not more than five kilometres, as the community needs to bring the stones to the site), and strategic placement of bridges to enable connection to major roads and highways. Selected communities provide labour, including collecting materials (such as murram soil and stone), clearing vegetation, backfilling, digging trenches, and structure maintenance, while Enabel provides the required cement and tools. Facilitating rural-urban connections, the bridges improve access to jobs and markets, create jobs, and also contribute to urban food security, due to the greater access they provide to food from rural markets.

Governance and Finance

The project works as a partnership between local communities, Enabel, and the local roads authority. The community buy-in ensures local ownership of the process. In areas where the district requires a bridge, the district is responsible for sourcing the labour. Enabel trains and pays the stonemasons, who hire semiskilled labourers to assist them. A labour-intensive endeavour, building stone arch bridges also creates jobs.

The Impact

IMPACT	SOCIAL	ENVIRONMENTAL	ECONOMIC
Local job creation for masons and their staff	X		X
Low-cost infrastructure	X		X
Durable infrastructure	X	X	X
Use of local materials reduces embodied emissions		X	
Community ownership	X		
Community connection to markets	X		X
Safer river crossing	X		X

Looking Ahead

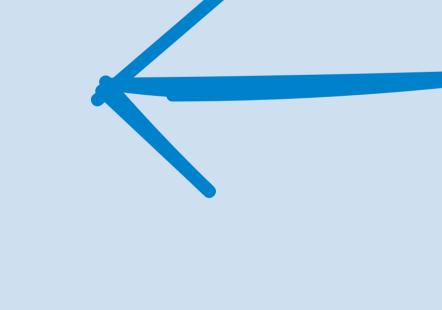
Recently approved by the national road authority in Tanzania for scaling and implementation, the project has already built 100 bridges. With another ten targeted for construction by May 2023, the project hopes to see stone arch bridges implemented across the country and throughout the region. In neighbouring Uganda, the Mount Elgon Labour Based Training Centre (MELTC) has used Enabel's manual as the basis of a training for masons, resulting in six bridges built in Eastern Uganda, the longest of which is 12 metres.

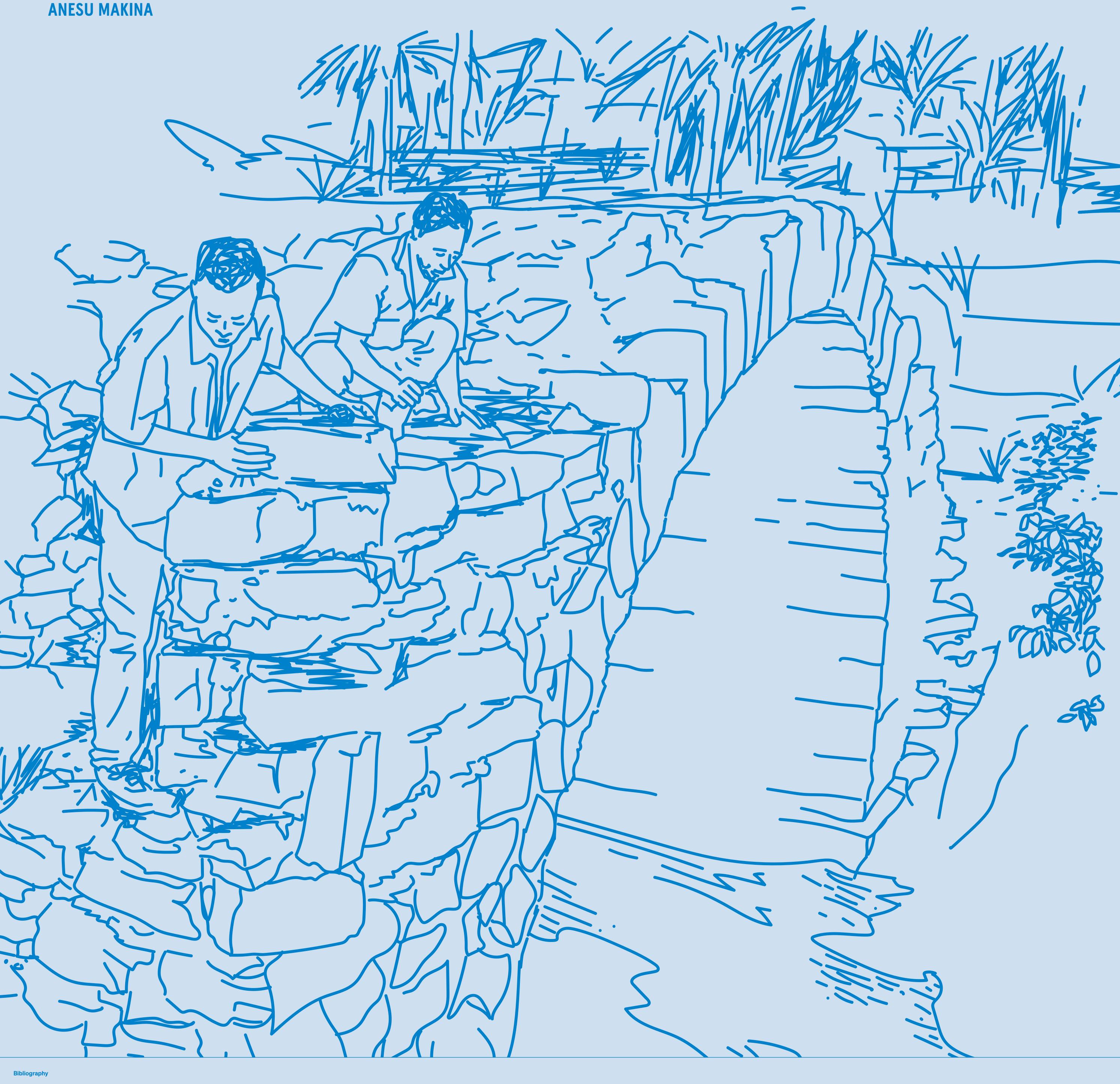
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