

It takes more than a village to build a house

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Adequate housing is difficult to find in many parts of Africa even for the middle class and wealthy, but it is particularly difficult for the poor, according to an international team of housing specialists.

"Working in African countries we see the challenges posed, especially to the lowest economic levels, by inadequate housing," said Esther Obonyo, associate professor of engineering Design and architectural engineering who is currently a Jefferson Science Fellow in the U.S. Agency for International Development's Global Development Lab in Washington, D.C. "What are some of the cross-disciplinary factors that people in my profession need to consider to solve this problem?"

The housing deficit in Tanzania, which is mostly in the major cities of Dar es Salaam, Mwanza, Mbeya, Morogoro and Dodoma, is estimated to be 3 million, with an annual demand of 200,000 units. Of existing houses, only 15 percent have electricity, mostly in the cities. A three-bedroom, cement block home costs 70 million Tanzanian shillings or \$32,000, but lower income workers make at most 400,000 Tanzanian shillings, under \$200 a year.

One problem area is housing finance. Loans are expensive and incurring long-term debt is nearly impossible for much of the population.

"Interest rates on loans are prohibitive, even for those who can afford the loans," Obonyo told attendees at the annual meeting of the American Association for the Advancement of Science today (Feb. 12) in Washington, D.C. "The model of microfinance that has been

popularized for low-income groups works for consumer products, but inflates total costs for capital goods such as housing significantly."

In some areas, the concept of sweat equity—future owners contribute manual labor for a reduction in the cost of their home—has been tried, but, because labor is often the primary cause of delays in the building schedule, inexperienced or unskilled labor increases the final cost of housing.

Obonyo, who worked with Simion Kintingu, National Housing and Building Research Agency, Dar es Salaam, Tanzania, found that location also matters.

"We went to visit a project that was 'right on the edge' of town," said Obonyo. "Two and a half hours later we got there. The remote site was not the right location for [low-income families](#). How do they commute back to Dar es Salaam?"

Although the development is intended to provide housing for city workers, it is not commuter-friendly. City workers who move there need to rise at 3 a.m. to leave at 4 to 5 a.m. and don't return home until 11 p.m. This explains why a significant portion of the city workers who actually move there end up leaving.

This location is also an example of why some efforts to relocate people from the slums do not work as well as they are expected to. Generally speaking, the most accessible land for low-income housing is usually in remote locations with limited employment opportunities. Such locations also lack infrastructural services and social amenities such as shops, hospitals, schools and recreational facilities. Relocation efforts are further complicated by existing social ties that slum dwellers have to their previous place of residence.

Expanding the housing stock for low-income families within the city is difficult because land is not available. Solutions that have explored building beyond two or three stories high have not scaled up well. Even with well-made bricks, a four-story building needs a structural support system of columns and beams. These systems require steel reinforcement, an expensive commodity.

Even two-story buildings can be problematic because cement is expensive and unless bricks are built to standards, they will not hold up.

"We need to do research on an international level," said Obonyo. "Success and failure stories from different parts of the world provide valuable lessons that can be used to design sustainable housing for low-income families at scale." She notes that western countries have well-established building codes and for the most part, sustainable buildings can stand up to hurricanes, wind and snow storms.

"If we can show that a product can pass the building codes in the U.S., that would increase acceptance in Africa and other places," said Obonyo.

One material the researchers looked at were interlocking, locally manufactured bricks. These bricks are manufactured from soil and cement and are 40 percent less expensive than concrete blocks. The interlocking mechanism also eliminates the need for mortar. A house built of these bricks costs only 70 million Tanzania shillings, \$18,000 and takes half the time to build.

The NHBRA has a two-bedroom house that costs 4,700,000 million Tanzania shillings, about \$2,000, if the future owners train in the interlocking brick method and help with construction. Fully financed, this house takes two weeks to build.

"With examples like the interlocking bricks made of sustainable, locally

available materials by local people, some of the [housing](#) issues might be solved," said Obonyo. "But to make sustainable impact at the required scale, we need to look beyond borders and disciplines for this and other solutions."

The views and opinions expressed in this paper are those of the authors and not necessarily the views and opinions of the United States Agency for International Development.

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