A little **technology** can go a long way

The new showhome, sporting a sloping roof and large eaves to evacuate rainwater, as well as a chimney

As the concept of innovation is often associated with high technology, it tends to be regarded by many African communities as an esoteric cult beyond the reach of the poor. The research coming out of universities circulates in specialized journals and scientific conferences but rarely finds its way into the rural communities living just down the road. Without concrete examples demonstrating how science, technology and innovation can solve everyday problems, politicians with little background in the sciences have trouble picturing the benefit of research. As a result, life remains difficult for many African women and children, even though affordable solutions exist.

Over the past year, UNESCO's Dar es Salaam office has been working with the advocacy group Tanzanian Women in Science and the NGO Tanzanian Women Architects for Humanity to design a series of improvements to the dwellings of Maasai women in the rural village of Ololoskwan in the district of Loliondo. The project is funded by the UN Development Assistance Plan for 2011–2015,[9] within a wider drive to increase the role of women in applying science, technology and innovation to national development. The idea for healthier, more comfortable dwellings sprang from the Maasai women themselves. Now that they have finished building their new 'showhomes,' the women plan to start their own small construction business.

The district of Loliondo is home to a community of about 7000 Maasai, whose traditional homes are made of adobe. Adobe buildings are made of a mixture of sand, clay, cow dung and water that is sun-dried. They abound in Africa, Asia and Latin America, with some historic cities being almost entirely made of this natural building material, including Bam in Iran, Sana'a in Yemen and Timbuktu in Mali, all world heritage sites.

Dark, smoke-filled homes

Among the Maasai, it falls to the womenfolk to build the family's dwelling, or *boma*. As adobe materials can be found locally and the work is done by hand, the construction of the *boma* comes at little or no cost, produces no pollution or waste and barely consumes any energy. The Oiti tree poles used for the

The interior of traditional Maasai huts is dark and smoke-filled.

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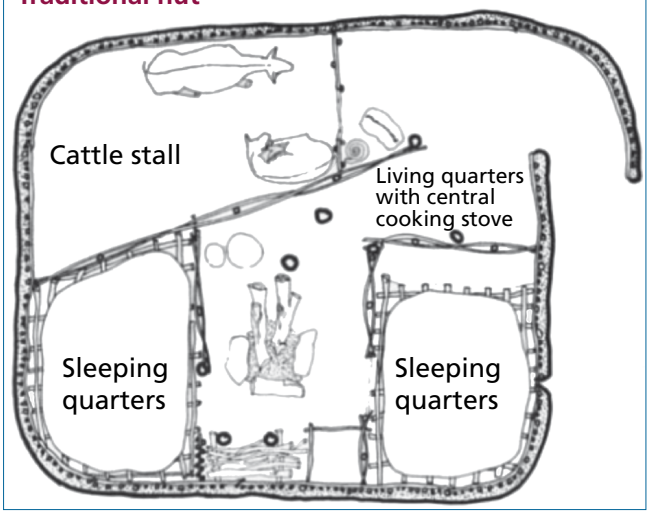
Traditional hut



Source: Kaj Blegvad Anderson (1977) *African Traditional Architecture*

skeleton are readily available in nearby forests and have the virtue of being durable and highly resistant to infiltration by termites or moisture. The mud keeps the homes cool and acts as insulation; it can also be recycled once a building is demolished.

But the *bomas* also have severe drawbacks. The mud absorbs a lot of water, causing the structure to swell when the rains come and to shrink in sunny weather. This causes cracks to appear which allow not only water but also insects to infiltrate the house, including termites. To prevent cracks appearing, the walls have to be replastered with cow dung every two years. In addition, the low ceilings force the occupants to stoop and the use of an open fire creates a smokey interior that is a health hazard. The tiny windows compound the problem by preventing adequate ventilation. Years of living in poorly lit, smoke-filled huts has taken its toll. 'Elderly women develop bloodshot eyes,' one woman explained. 'Women with red eyes were once considered witches and even killed at times,' she said. Fortunately, this superstition has died out but the women's smoke-polluted environment persists.

Staff at UNESCO's Dar es Salaam office decided to tackle the problem in October 2011, after visiting the new community multimedia centre set up by UNESCO in the village of Ololoskwan. During the visit, the UNESCO staff sat down with women and elders from the community. At first, the conversation focused on how the multimedia centre could help the women generate income and access health services and education. However, the Maasai women brought up another priority, that of obtaining better prices for the milk they sold through a cooperative.

This problem was solved by a training workshop. With the support of UNESCO and the Tanzanian National Commission for UNESCO, a well-known NGO in the Tanzanian milk industry, the Dutch Orkonorei Group, trained a total of 25 men and women in milk-handling and production from 24 to 27 June 2012. The villagers learned an easy method for eliminating pathogens from milk, for instance. The Dutch Orokonorei Group also showed them how to start and run their own microbusiness. Within days, the village men and women had mustered cows, goats and sheep worth 33,000,000 Shillings (US$20,625) to finance their own dairy enterprise. The community also set aside a portion of land for the construction of a minifactory to transform milk into yoghurts, cheese, cream and other dairy products.

A second critical issue for the women was to make their homes healthier places to live for their children and themselves. They urged UNESCO to support their idea of designing and building prototype *bomas* which they could then replicate in their own community and neighbouring villages for a fee.

The men pitch in

UNESCO duly organized a 20-day training course for 27 Maasai women from Ololosokwan, with UNDAP funding. Tanzanian Women Architects for Humanity agreed to run the course, which was programmed for July 2012. The participation of each Maasai woman was predicated on her being a member of a local association or cooperative, in order to guarantee her the necessary support. Eight young men from the village agreed to join the women on the course. This was quite an achievement, since the Maasai traditionally consider home-building as being women's work.

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The Minister of Communication, Science and Technology, Hon. Makame Mbarawa, emerging from a traditional Maasai hut during his visit to the project site on 16 November 2012

The men went a step further in their show of 'gender solidarity.' In the Maasai culture, it is the men who take the cattle out to graze each morning and bring them back at night but the bulk of chores fall to women. When she wakes up in the morning, the first thing a woman does is to milk the cows, bathe the children and prepare them for school. She then takes the milk to the cooperative before returning to farm work. Later, she cooks the midday meal and awaits the children's return from school. In the evening, she milks the cows once more before serving the evening meal. This busy timetable would have left the women just four hours a day to work on the project. Thanks to the support of the men, who volunteered to pitch in by fetching building materials, mixing sand and clay with cow dung or fabricating clay bricks for the chimney, the women were able to devote twice as much time to building the model homes.

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A journalist from the Tanzania Broadcasting Corporation interviews the Minister as he emerges from the model home on 16 November 2012.

Building better

On the course, the women architects taught the Maasai a number of techniques to improve the comfort and durability of their homes. In order to raise the ceiling and strengthen the structure, the architects replaced the existing poles with sturdier, longer ones.

To prevent water leakage, they designed roofs with eaves and overhangs. A polythene sheet was spread across the roof to form a second layer of protection over the cow dung. Sloping aprons were also introduced at the foot of the walls to protect them from splashing rain. 'The new *bomas* don't leak when it rains,' enthused Kootu Tome, one of the Maasai women. 'With the old *bomas*, the roof leaked so much that it was like staying outside in the rain. I have already constructed my new *boma* and I am enjoying it.' One of the models proposes an additional feature: troughs made of ferro-cement that are fitted round the roof overhangs to catch rainwater and channel it into drums at the base of the structure.

To ensure the mud plaster would not erode over time, the Maasai women were shown how to add bitumen and kerosene oil to the adobe mixture of clay and sand. The adobe was then blended with cow dung to produce a hard cement. Once the walls had been plastered, they were polished with trowels to give a smooth finish. According to the architects, it should be another 5–10 years before the structures need any maintenance. This will also mean that wood has to be collected less frequently.

The interior was made more functional by installing a smoke-free cooking stove that burned less firewood. In traditional *bomas*, the stove tends to be placed in the centre of the room.

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Solar water bulb made from a plastic bottle, which disperses about 55 Watts of light. The bottle is filled with water that has been treated with ammonia to eliminate fungal growth. It is then sealed. The top half of the bottle protrudes through the roof, catching sunlight which the water then scatters around the room.

In the new model, the stove was relocated in a corner and surrounded on two sides by a clay brick wall 70–80 cm high (*see sketch*), in order to help direct smoke upward. A hood or chimney to channel smoke outside completed the picture.

The windows were also enlarged to let in more light and improve ventilation. Lastly, a simple indoor lighting system based on solar water bulbs was installed (*see photo*). As the solar water bulbs work only during the day, solar panels will also be introduced to provide lighting at night for those who can afford them. One option is the Nokero N-200 solar bulb (short for No Kerosene), worth about US$20. It can be hung outside in the sun to charge and can provide up to six hours of lighting.

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In August last year, Maasai men and women pose proudly in front of one of the newly completed showhomes.

A second option is the SunLite Solar Kit (US$50). This consists of a solar panel, control box with charger and battery, and a very bright LED light. The kit comes with a long cable and wiring that can be connected to most mobile phones. The advantage of this model is that owners can not only charge their own mobile phones but also earn extra income from providing a service to others.

UNESCO has estimated the average cost of building a single *boma* at US$770, excluding labour charges. Since the women are taking this on as a commercial venture, the cost of labour will need to be incorporated. Ten women were assigned to the task of building each *boma*, in return for payment of about US$7 per day for 20 days, bringing the total cost of each *boma* to US$2,170.

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Maasai women learning how to build the chimney

Getting down to business

The two showhomes were completed in August last year. While they were being built, nearby villages sent emissaries to see what was going on. They were so impressed that many offered to pay the women to build model homes for them. Moreover, Airtel Tanzania, a mobile telephone company active in the region, has expressed interest in funding the replication of some of the model homes within the community. This would give the women the seed money they need to set up a small business.

It should not be difficult for the women to organize themselves, as they already produce handicrafts, raise chicken and sell milk within cooperatives. They can of course count on another valuable asset, the incredible solidarity within the community.

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9 *UNESCO's Dar es Salaam office has been leading the reform of STI in Tanzania within UNDAP (formerly the One UN Programme) since 2008. As part of this programme, UNESCO commissioned a survey (2011) of the participation of women in industries based on science, engineering and technology, as part of its support for the Tanzanian Women in Science group: http://tinyurl.com/acvse8c*

10 *Programme Specialist in UNESCO's Dar es Salaam office*