

Exploring Vernacular East African Architecture: Lessons for the Modern World

The spaces one lives, works, and plays in are essential to one's overall sense of self, community, and well-being. In East Africa, there is little research to date on the role of the built environment in defining cultural values, largely because it is broadly perceived that great architecture and architectural innovation originates in the developed world.

However, these underdeveloped nations are particularly valuable places to observe the inseparable relationship between man and nature – or nature and the man-made – due to critical financial, environmental, and health challenges which make resources scarce. As architect and consultant Geoffrey Payne describes,

“Developing countries are better placed to face the future than middle income groups...because they ...are not dependent on the easy availability of resources and services on which the rich have come to depend.”¹

BACKGROUND

In recent years, globalization, the integration of people and markets across national and continental boundaries, and urbanization, the increase of the urban population, have challenged the vernacular building traditions and urban forms of East Africa. Capitals and other cities that were once filled with two or three story buildings are rapidly becoming international commercial centers, many dotted with Africa's newest building type: the skyscraper (Figure 1). Business from tourism, trade, and other emerging domestic markets are largely responsible for the creation of this new economy, and with it, the shift of people from rural communities into Western-style city centers. It is no surprise, then, that between 1950 and 1990 the urban population in Africa increased from 14.5% to 32%. By the year 2025, the United Nations projects that 54.1% of Africans will live in urban areas, making Africa second only to Asia for its projected rate of urbanization.²

The nation of Tanzania is representative of this trend with over a quarter of the population currently living in urban areas and the rate of urbanization increasing at 4.7 %, a number comparable to its neighbors, Kenya, at 4.36%, and Uganda, at 5.74% (second highest in the world). For reference,

Aimee Buccellato

University of Notre Dame

Megan Reineccius

University of Notre Dame



1

we can compare the rate of urban growth in Tanzania to that of the U.S.'s current rate of 1.2% annually and China's 2.85%.³ Services, like tourism, for example, or hotels and hospitality companies account for nearly half (48%) of Tanzania's Gross Domestic Product (GDP), higher than agriculture (27%) and industry (24%).³ This rapid influx of people into formerly rural urban city centers has had a profound impact on the landscape of Africa and Tanzania, specifically.

Predictably, rapid urbanization as a result of globalization has created a host of new development challenges for Africans, including pressures on the environment, existing infrastructure and urban building stock and a shortage of both time and adequate building materials to construct new housing and services. The result of this trend has been seen in other major African cities in the adaptive re-use of many existing structures, such as a former hotel in Douala, Cameroon that was adapted to serve many functions, including housing a butchery in the original swimming pool;⁴ and in the construction of shantytowns, such as the now infamous Kibera, in Kenya, whose uncertain nature as a temporary town contributed to the loss of some 1,500 lives during the explosive poll violence during the 2007 national elections.⁵

Another, perhaps more established trend in African development is the elevation of non-African architecture above vernacular tradition. Formal architectural expression in Africa has long been influenced by European architecture much in the same way Africans were compelled to adopt European languages, governing systems, and aspects of European culture during colonization. African cities existed and thrived before colonial rule, but not in the way that Europeans defined cities. Antonio Folkers explains this difference in his book, *Modern Architecture in Africa*, saying,

Figure 1: View of Kampala, Uganda. A typical East African city. (Reineccius 2011)

“erect(ing)...enduring monuments was unknown in most African cultures. Buildings were used at most for one generation...they were abandoned to nature or recycled.”⁶

The result Western ideas of urbanity and building typology are seen as superior to traditional African forms and building culture even when incompatible with the environmental and cultural context.

A similar phenomenon is occurring with building materials, where “modern” materials, such as Concrete Masonry Units (CMUs), are considered by Tanzanians to be a sign of higher social rank and financial standing in comparison to traditional, local materials, mud and timber, despite the near impracticability of the material – CMU’s – in the tropical sub-Saharan climate and distance from manufacturers. The use of traditional materials and methods in contemporary construction is largely seen as a retreat to a “stone age” way of living, rather than as materials and methods both effective in their environment and reflective, of their physical and cultural surroundings. AbdouMaliq Simone, specialist in African urbanism, describes this fascination with modernity on an individual level, where there is a “reproduction of ‘customary’ ways of living large” and a “pursuit of such ‘modernity’” which results from urbanization.⁷ There is perceived pressure to establish cities and buildings that would be considered legitimate according to the “modern” standards of more advanced nations.

Of course, what stands to be sacrificed in the course of rapid urbanization and the attendant haphazard re-use/restoration of historic buildings, the advance of shantytowns, and the perpetuation of faux-colonial architecture is the significance of indigenous⁸ African architecture. What follows are two case studies conducted in Tanzania: one in Musa, a rural town in Northern Tanzania; and the other, in Stone Town, a historic city on the main island of Zanzibar. Each study analyzes current development trends and local construction practices, and how globalization and urbanization will influence the future of these cities.

METHODOLOGY

The methodology of the research includes a comparative quantitative analysis of building materials and methods, experiential observation through interviews and firsthand experience, as well as literature-based research sets to provide additional qualitative and quantitative data. Material analyses compare traditional vernacular methods common to each study site, specifically wattle and daub and mortared coralline rag stone, to common, non-native modern construction methods, including compressed earth brick and reinforced concrete masonry. Specific material properties, including site impact and costs associated with long-term maintenance, expand our understanding of these methods and the broader ecological and financial impacts of each. A series of interviews along with personal experience living in each of these settings will also describe how the Maasai and Zanzibaris interact with and perceive their unique built environments, in order to begin exploring the range of post-occupancy issues: building maintenance, socio-cultural factors, health impacts, and comfort.

CASE STUDY I. MUSA: A LOOK INTO THE BUILT ENVIRONMENT OF A MAASAI FARMING COMMUNITY

Landing at Kilimanjaro airport on the evening flight, one is immediately struck by two things—the darkness and the smell of garbage. In Tanzania,

the majority of land use is agricultural, so much of the country lacks basic infrastructure, such as trash removal, conventional plumbing and electricity, or road networks. As you drive down the single Chinese-funded highway west from the airport, you pass through a dozen or so small towns market by their series of shops, or *dukas*, that meet the roadway. Finally, you enter the city of Arusha which mirrors many East African cities in its multi-story buildings, chaos, crowds, and constant construction. About one half hour outside of the city, the homes become increasingly modest and the landscape changes to fields of corn, beans, sunflowers, tobacco, and an occasional coffee plantation. Another 30 minutes off the main highway, on a dirt road impassible during and directly after the rainy season, is Musa Ward.

Because of Musa's limited access to the City, the community relies heavily on the natural environment for its basic needs and livelihood, including building materials. Homes are still built in the traditional manner of wattle and daub (Figure 2). The people in Musa are called Maasai, a tribe historically known for its nomadic warriors. However, Colonialism and the advent of 'Ujamaa' (Julius Nyerere's socialist plan) brought about large-scale farming initiatives to this tribe and their lands, which have taken a significant toll on both the natural environment and the people who live there. Deforestation is one such result of increased agricultural activity and increased construction. This issue forces women to walk for hours to retrieve firewood for cooking or building materials. Also due to lack of deeply rooted vegetation, each rainy season digs deeper gorges into the farmland creating traps for valuable livestock.

Through a series of interviews conducted in the Musa Ward, Owners of homes made from wattle and daub and thatched roofs and Owners of homes made of concrete block responded nearly uniformly that their current built environment does not serve their needs. In the Ward, 90 percent of the families interviewed answered that the primary challenge they face is building maintenance, such as the need to reapply mud-plaster to their homes three or more times a year in order to prevent structural failure and to keep their houses clean. The next, most common answer was a need for electricity. Less (human) energy spent maintaining the home and electricity



Figure 2: Typical Wattle and Daub construction at a compound in Musa. Here also illustrates an example of both a thatch roof (left) and corrugated metal roof (right) (Reineccius 2012).

2

Type	Building Materials	Labor	Cost (0-\$\$\$)	Time Of Construction	Distance To Transport Material
	Mud with ash or manure as binding agent	Local, Not hired	0	2 days	0
	Sisal poles	Local, not hired	0	5 days (to strip bark & trim)	Up to 15 km on foot
	Sisal split stalks for holding together walls	Local, not hired	0	5 days to prepare, 1 day to put in place	Up to 15 km on foot
	Corrugated metal with lumber wood trusses	Local, Hired	\$\$ (for labor and material)	1 week	45 km by vehicle
	Concrete block units	Not local, hired	\$\$\$ (for labor and material)	2 to 5 years (based on funding)	15 to 45 km by vehicle
	Poured concrete foundation	Not local, Hired	\$\$\$ (for labor and materials)	1 week but based on funding	15 to 45 km by vehicle
	Corrugated metal and lumber wood trusses	Local, Hired	\$\$ (for labor and material)	1-2 weeks (usually larger, complex structures)	45 km by vehicle
	Walls : -Soil (40% sand, 25% gravel, 25% clay, 10% silt and water) -Concrete & mortar -Rebar(not always)	Local, Hired	\$\$	Around 2 years (based on funding)	0 (soil) 15 to 45 km by vehicle (concrete)
	Poured concrete foundation	Not local, hired	\$\$\$	1 week (depending on funding and size)	15 to 45 km by vehicle
	Corrugated metal roof with wood trusses	Local, hired	\$\$\$	1-2 weeks (usually larger, complex structures)	45 km by vehicle

3

provides residents, especially women, who are responsible for the home, more productive hours in the day to focus on their trade or education.

Despite the harshness and remoteness of this area, when asked whether one would rather live here or move to a more convenient urban setting, all nine families interviewed strongly agreed they would rather live in Musa. Musa provides a valuable opportunity to study what a rural community has to teach us about resiliency, sustainability, and survivability, in building materials and local building traditions, and how both can be capitalized upon to address the growing needs of this community – and many communities like it--in the face of global change.

Taking into account the needs of the community and the challenges, environmental, social, and economic put upon it by increasing development pressure, it is essential to critically assess and evaluate the material types and methods of building that would most directly benefit the community in the immediate future and indeed over time. (Figure 3)

WATTLE AND DAUB

Wattle and daub construction uses mud set within a wood form and plastered in a mud and ash or mud and manure mixture. Homes in this manner are traditionally constructed with a thatch roof, but today many homes use corrugated metal and wood trusses for roofing. Variations on this type of construction are widely used across East Africa in traditional housing. The Maasai people have built their homes in this manner for as long as the oldest generation can remember. Because all of the building materials come from the immediate environment, this method is the most cost effective and convenient construction method. Only recently have deforestation and

Figure 3: Preliminary quantitative comparison of prevailing and emerging building materials and methods in Tanzania. Additional analysis underway to compare broader ecological impacts of these materials, including embodied energy, embodied water, and cultural/labor force impacts.

plantation farming made spare the few necessary materials to make wattle and daub walls and thatched roofs.

Homes made out of this material meet the needs of most families in Musa because much of their architecture must necessarily be dynamic; capable of growing and shrinking with the needs of the family. For example, families must build a new room in their compound that is separate from the rest of the buildings when a male in the family reaches the age of circumcision. A new wattle and daub structure can be constructed from start to finish within a week. The only labor from outside of the family is the construction of wood roof trusses to support a corrugated metal roof, often done by the local carpenter, or *fundi*.

CONCRETE MASONRY UNITS (CMU)

Concrete and Block houses can take years to build because the materials are comparably expensive, require greater quantities of water to construct, and are more labor-intensive in the construction process. However, concrete block buildings, once completed, require comparatively less maintenance than their wattle and daub counterparts. CMU's are widely believed to provide a healthier and safer living environment, especially when used to construct rooms for food preparation or sanitary uses, like Kitchens and Outhouses, or *Choos*. Tanzanians take great pride in keeping their homes clean and tidy; however, With CMU homes, the floors are also typically made of concrete, making it easier for families to use water to clean them versus simply sweeping mud floors. For example, *Choos* are typically hastily constructed with wooden poles enclosed by crop sacks and a floor of corrugated metal covering the larger pit, but with concrete, the structure will not weather as fast as mud-plastered structures and therefore are usually better maintained and can be safer structurally.

However, despite the relative stability and cleanliness of CMU, this method of construction is still very expensive for most members in the community, as the average Musa resident makes a little less than a dollar per day. It is also not generative to the local economy because the materials are not produced locally.

COMPRESSED EARTH BRICKS (CEB)

New materials technologies, such as compressed earth brick (CEB) construction, are an emerging alternative to CMU and wattle and daub construction. CEB combines a ratio of local earth, sand, and water as well as a very small amount of mortar. CEB construction uses more local materials than CMU construction, is more durable than wattle and daub, and is also accepted as a more refined construction method than wattle and daub. A home constructed in CEB takes longer than a similar home of using wattle and daub because of the time required to form and air dry the blocks before construction. The labor required is low-skill and materials are mostly local which, in turn, means that most of the construction process is locally generative - a positive for the economic and environmental well-being of the community. There are critics of this material, especially those studying the life-cycle impacts of CEBs. Because the cement and small amount of mortar in the composition comes from outside sources, there are attendant transportation impacts and costs. CEB construction would be a good alternative to test in Musa due to its structural and social integrity similar to CMU while only being slightly less sustainable than wattle and daub.

Design that incorporates residents' priorities and preferences is extremely important in the Maasai community in order for architecture to progress and meanwhile remain an integral part of a self-sustaining community. Maasai are a very traditional people, from their ceremonies, to food, even to their buildings; they can be very cautious of new ideas. Methods of construction that capitalize on embodied community knowledge, skills, and local building materials are more likely to be accepted by and accessible to residents. Introducing new materials, such as CEBs, could be a sustainable alternative to imported CMUs and less maintenance intensive alternative wattle and daub, especially in community structures, such as schools or health clinics.

CASE STUDY II. STONE TOWN: A GLOBALIZED HISTORIC CITY

Stone Town and the greater archipelago of Zanzibar have an interesting history: the Swahili language and culture originated there and the islands were the epicenter of slave trade to the West. Set 70 kilometers off the coast of Dar es Salaam, Tanzania, Stone Town has long been a center of both trade and architectural innovation in East Africa and the Middle-Eastern world. It is home to the first building with electricity and running water in Africa and to some of the oldest mosques in the region. Stone Town's architectural, historical, environmental, social, and economic domains are closely interrelated and, in many ways, interdependent; where these relationships overlap, unique opportunities for progress amidst tremendous development pressures exist.

The language and the architecture of Stone Town are living records of the cultural history of Zanzibar as experienced through five defined waves of influence.⁹ First, Stone Town under the rule of a Swahili sultan was marked by Swahili-style wattle and daub homes. The Portuguese traders arrived next in the late 15th century contributing a fort and Christian church to the city, as well as economic downturn and the start of the slave trade. The third wave was the most transformative, both culturally and physically; with the Omani Sultans' rule from the late 17th century through the 19th century and introduction of tightly-clustered, multi-story, flat-roofed structures made with coral rag stone, a local limestone composed of ancient coral reef material and mortar. The fourth wave saw an influx of Indian traders in the 18th century, as well as a new, mixed-use building type and the introduction of airy verandas and intricate detailing. Lastly, Stone Town came under British rule in 1890, when Zanzibar became a British protectorate and a small amount of colonial architecture filtered into the already crowded city. In 1964, the Omani Sultan was overthrown in a coup put on by local African revolutionaries driving out the Indian and Arabic populations and leaving much of the urban core – and hundreds of its finest houses and shops – vacant.

By 2000, the population of Stone Town's historic center grew from its 1968 population of 17,000 to 195,000, a number that is expected to double by the year 2018¹⁰ (Figure 4). What is driving this population boom off the coast of Africa? International tourism. Hotels, tour companies, Western-style restaurants, and souvenir shops have overtaken much of the best real estate in town. The first foreign-run hotel in Stone Town, the American-owned Emerson and Green, opened in the 1990's. Over the past 20 years, this number has spiked such that a hotel or hostel exists on every street. With the influx of hotels also come conveniences modern tourists expect, such as indoor plumbing, and air-conditioning-- amenities not historically present



4

Figure 4: Main market in Stone Town called Darajani Market seen in a photo from the late 1940's (Zanzibar Trade and Tourist Traffic Bureau 1949) compared to the more chaotic tourist and automobile-ridden version of today. (Reineccius 2013)

in Stone Town. With them, tourists bring an increase in automobile and ferry traffic in a city built for primarily pedestrian traffic and only one small port.

With such a sudden increase in population and visitors, the city was at high risk of literally falling to pieces. A survey by the Aga Khan Network in 1992 revealed that 85 percent of the 1,700 structures in Stone Town's historic district were deteriorating or in poor condition, and 85 of these buildings had already collapsed.¹⁰ In 1994, the Stone Town Conservation Authority (STCA) was created to oversee building permits and provide careful guidance on building restoration and construction projects. In 2000, the city successfully achieved UNESCO World Heritage Site status attracting outside funding and support for restoration projects and also a set of laws for preservation, including a requirement that all renovations and new construction within 50 meters of the historic center be carried out using only traditional materials such as coralline rag and lime plaster. The STCA, in conjunction with the Aga Khan Trust for Culture and the Stone Town Conservation Society, recently created training programs and literature to help locals find instruction on restoring their own homes.

One notable program of the conservation efforts capitalizes on existing structures to solve a pressing social issue: social housing. Despite the city's recognition as a World Heritage site, the majority of its residents still subsist on less than a dollar a day. Historical, single family residences, which make up 60 percent of Stone Town's structures,¹⁰ are now being converted into hotels and multifamily residences. This trend started after the 1964 revolution, when many of the grand, single family residences of the Indian merchants and Arabics were abandoned and subsequently overtaken by squatters. These historic homes are pushed beyond capacity, some of them occupied by up to 70 people at one time. Hallways turn into kitchens and makeshift toilets easily overflow as monsoon rains hit the city for much of the year. Residents paying a rent of \$1.50 to \$5.00 per month,¹⁰ have limited ability and motivation to properly restore let alone maintain these buildings. The social housing project uses outside funding to move residents to a halfway house while restoring and upgrading their current residence. Their restored homes effectively accommodate multiple families, including designated cooking and cleaning areas and private rooms for each family.



Figure 5: Unlike lime plaster, the Portland cement is not compatible with the masonry substrate, leading to water damage to the structural walls. (Aga Khan Trust for Culture 1993).

5

One of the most critical issues facing the reconstruction efforts in Stone Town is the use of proper materials. The natural environment is a driving force behind its historic position as a trade and now tourist destination as well as the main influence in much of the design and material choices of the buildings that line the city. Traditional Swahili homes are constructed out of coralline rag stone, mud, mangrove poles, and palm leaves. The Omani Arabics used coral for masonry, as well, and to make lime mortar through a process of heating coral to high temperatures until it becomes lime powder. Indians and Europeans introduced architectural forms to contend with the tropical climate, including rooftop terraces and sloped, corrugated metal roofs which perform better during the dual-monsoon seasons than the Arabic flat roofs. Restorations conducted with incompatible, oftentimes “modern” materials, can have disastrous affect. For example, in the restoration of Stone Town’s Old Dispensary, conducted by the Aga Khan Network, they found that much of the rot and water damage to the building had occurred due to the Portland cement-based plaster used in a previous restoration (Figure 5).¹¹

Preservation and restoration is in the best interest of the city economically, culturally, and socially, but how the city is preserved is debated. Adapting buildings to improve quality of life for current residents is as important as providing an environment for international visitors to appreciate the city’s history and bring revenue into the local economy. The Stone Town Conservation Authority’s regulations may seem extreme and tedious, but their interest, as a non-governmental entity, is solely in preservation of the architectural character and structural soundness of the city. Through their educational programs they are rejuvenating near-forgotten crafts and inculcating a culture of preservation keeping the city alive and advancing, as one of the few East African historic cities.

LESSONS FOR THE MODERN WORLD

These two subtropical cities are literally architectural products of their environments. However, a nearly constant stream of new people and new materials is creating unprecedented (for East Africa) pressure on traditional and vernacular architectural forms and materials. Looking forward for both of these communities, it is important to compare the range of building materials and methods available to each community, including emerging “modern” building techniques.

From the most traditional building forms of the Masaai, we understand the capacity of completely locally-sourced materials that have been used over several generations and can ask ourselves: is a wholesale change of methodology the answer -- or will a variation on a material suffice? We also learn from Musa that as the City continues to encroach on precious farmland, the architecture of the community may need to be reexamined to keep pace with wider access to electricity, increased traffic, and social development needs. Studying emerging, mostly locally-sourced building methods, such as compressed earth bricks, which can be generated from within the community is important consideration when endeavoring to achieve truly sustainable – both culturally and environmentally – structures.

From Zanzibar we look at a City whose architecture is visibly at the center of life and interest of the community, with its name generated from its main material of construction. Despite its more sophisticated architecture, Stone Town is facing similar pressures of local poverty and the advance of the modern world. Stone Town, because of its status as a historic landmark, its strong local conservation leadership, and its ideal location in a tropical climate, has

great opportunity to thoughtfully shape the future of its built environment. It is meanwhile embracing its history as a center for craft-learning and local materials, particularly the adaptive reuse of historic structures for social good, and methods to promote economic stimulation within the constraints of a World Heritage Site.

Each of these cities have survived in one of the globe's harshest climate regions without the luxury of modern technologies, and in each city, we must learn from – and respect – the challenges, limitations, and opportunities these communities faced when constructing their built environment. As the World becomes more modernized, so must these communities prepare for the increasing pressure on the built and natural environment due to population growth and globalization. Our on-going research seeks to further understand whether variations on the localized, existing traditions rather than non-local, globalized solutions may be the more sustainable pathway forward for East Africa.

ENDNOTES

1. Payne, Geoffrey, *Are architects and planners part of the solution or the problem?* (Universitetsservice US AB: Stockholm, 2008), 13-20.
2. UN Department of Economic and Social Affairs, World Urbanization Prospects, the 2011 Revision. UN, 2012. Web. 10 December 2012
3. CIA The World Factbook, Field listing: Urbanization. CIA, 2013. Web. 2013.
4. Simone, AbdouMaliq, *Pirate Towns: Reworking Social and Symbolic Infrastructures in Johannesburg and Douala*, "Urban Studies," February 2006. 363.
5. BBC News Africa. Kenya Profile. BBC, 2013. Web. 2013.
6. Folkers, Antoni, *Modern Architecture in Africa* (Sun: New York, 2010), 26.
7. Simone, AbdouMaliq. "Pirate Towns: Reworking Social and Symbolic Infrastructures in Johannesburg and Douala." *Urban Studies*, February 2006. 360.
8. Definition of indigenous: 'belonging to a place,' originating in and naturally living, growing, or occurring in a region or country.
9. UNESCO World Heritage Center. Stone Town of Zanzibar. United Nations, 2013. Web. 2013.
10. Battle S., T. Melin, A. Forsman, *Fighting Poverty in Historic Cities: An Example from Africa*, "Fighting Poverty in an Urban World" (Aga Khan Trust for Culture and Sida: Geneva / Stockholm, 2006).
11. Battle, Stephen. *The Conservation Works in the Former Old Dispensary*, "Historic Cities Programme: Zanzibar Stone Town Projects" (The Aga Khan Trust for Culture: Geneva, 1997). 22-33.