Ecological Housing Development for Rural Tanzania

Towards Green Housing Development in Tanzania

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Introduction

This aim of this proposal is to advocate change to the trend of shelter provision in rural Tanzania where by the use of available local materials is given great priority. The project proposal is also aimed at the establishment of ecological communities in Tanzania, by taking advantage of the great potential of renewable traditional materials and energy resources, recyclable waste products in the design and construction and eventually set a useful model of sustainable development actions in buildings for policy decision makers

1 Shelter Situation Analysis

1.1 Basic General Data

Geography and Administration

The united republic of Tanzania is located in the eastern part of Africa boardering the Indian Ocean on the eastern side, bordered by Kenya and Uganda in the north, Zambia and Mozambique to the South, Rwanda, Burundi and Democratic Repulic of Congo to the West. It is located between longitude 29^{o} and 41^{o} East, Latitude

1° and 12° South. Tanzania covers an area of 945,087 square likometers (364,900 square miles) including Zanzibar and Pemba Islands have a total area of 2,000 sq kms.

Figure 1: Tanzania Location: Source (CIA Fact Book)

The country's population is estimated to be 40.3 million people (2008 census) with about 130 ethnic groups. 99 percent of the population of mainland Tanzania is of native Africans, 95 percent of which belong to one of the 130 tribes that form part of the Bantu group of people. The remaining 1 percent consists of those of Asian, European, and Arab origin. The population of Zanzibar is slightly more diverse, with a higher percentage of Arab and mixed.

Tanzania experiences tropical climate. In the highlands, temperatures range between 10°C and 20°C during cold and hot seasons respectively. The rest of the country has temperatures never falling lower than 20°C. The hottest period spreads

between November and February (25°C - 31°C) while the coldest period occurs between May and August (15°C - 20°C).

Rainfall varies from 100 to 193 cm (40 to 76 in). There are two rainfall seasons that exist in the country. Short rains (December - April) and long rains (October - December and March - May). The former is experienced in southern, south-western, central and western parts of the country, and the later is found in the north and northern coast. Administratively, Tanzania has 26 regions (21 mainland and 5 Zanzibar), 130 districts (Zanzibar has 10 and Mainland has 120 administrative districts).

Demography and Health

Population density on average is 39 persons per km^2 at national level (2008 est. CIA facts Book). The average age structure for the population of 40.3 million people in Tanzania is as follows:

year	Total %	Male	Female
0 - 14	43%	8,853,529	8,805,810
15–64 years	54.1%	10,956,133	11,255,868
65 years and over	2.9%	513,959	663,233

Figure 2: Population and age structure: 2008 Census

The life expectance at birth in Tanzania is 50.45 years/ male and 52.88years/ female. The average household size is 4.9 (World Fact Book Tanzania, 2006), while more than 80 % of Tanzania's population resides in rural areas. Urbanisation is on increase with 70% of urban population living in unplanned settlement. The urban population is growing at a rate of 6% per annum about twice the national rate of population growth. Child mortality rate total of 96.48 deaths /1000 live births – while males accounts 105.65 deaths / 1000 live births and females account 87.05 death / 1000 live birth in (2006 estimated).

Economy

The economy of Tanzania depend much on the agricultural activities, which accounts for more than 25% of GDP, provides 85% of exports, and employs 80% of the work force. Tanzania's industrial sector is one of the smallest in Africa it accounts for only about 10% of GDP, It is ranked as one of the poorest countries where by 36% of the population live below the poverty line. Recent banking

reforms have helped increase private-sector growth and investment. Continued donor assistance and solid macroeconomic policies supported real GDP growth of nearly 7% in 2007. (CIA Fact Book) Per capita Gross Domestic Product (GDP) of Tanzania is USD 251, and that of Gross National Product (GNP) is estimated at USD 246.

1.2 Shelter Related Fact and Figures

Access to Shelter

Shelter is one of the main and basic requirements of every human being. However, several millions of people in Tanzania are not having access to an adequately shelter despite the right declared in the UN charter on Universal Human Rights (Kroes 1987: 32, Avramov 1998: 25-26). Studies conducted in 1995 under the Urban and Housing Indicators Programme indicated that in an urban area 75% percent of the population are poorly sheltered in unplanned and substandard settlement. 60 % of the urban housing stock is to be found in these settlements.

Housing Deficit

The gap between the supply and demand for housing has been widening with time. It is now estimated that the deficit in Tanzania urban centres is about 1,200,000 housing units. The growing housing shortage is confirmed by overcrowding levels that are found in urban areas. On the other hand the condition of most housing in the urban centres is not to the acceptable standard. Current studies indicate that about 32% of such dwellings could be classified as being in bad condition, 51% in fair condition and 17% to be in good condition.

Occupancy

The occupancy rate of more than 2 persons per room constitutes overcrowding; the percentage of families in overcrowded houses in urban centres in Tanzania is about 35% (Habitat. 1996:52). About 70.5% of the households have one to two bedrooms; approximately 17.2 percent have three bedrooms; around 7.7% have four bedrooms; and only 4.5% have five or more bedrooms. There is no significant difference between urban and rural areas as about 70.3 and 71.0 % of

private households in rural and urban areas respectively, live in houses with one and two bedrooms. (Kironde 2006)

Land Ownership

Land in Tanzania is state owned. Surveyed plots are acquired formally from the government on short and long-term leases (between 33–99 years). Surveyed plots are not necessarily serviced (with the exception of the sites and services projects, and the 20,000 plots project (which are partial serviced). The responsibilities of surveying and servicing plots for construction is the responsibility of municipalities; but due to lack of funds, the financial burden is shifted to the communities, and sometimes to donors in conjunction with the Government. When it comes to informal settlements, unauthorized individuals sell informal plots to other individuals. The pieces divided by the owner/seller consider few or none of the town planning ethics and codes of conduct.

Housing Standard and building materials

According to the National Population Census of 2002, it is indicated that there are improvements in the use of modern building materials for the main components of a house; even though the majority of houses in the rural areas are built with temporary materials. Houses in urban areas are characterised by metal roof, walls built with cement blocks and cement floor. There is significant variation in the use of modern building materials between urban and rural areas

Access to and cost of basic services/infrastructure

For the case of rural areas where 80% percent of the population in Tanzania lives (URT 2001: 1-3). There is no shortage of housing in rural areas, but the quality of these houses and infrastructure with regard to meeting the basic requirement of minimum standards housing unit remains highly debatable. Sixty percent of the households in rural areas depend on wells for their water supply while 13% have communal taps, 5.8% are connected to water pipes and 21.2% use other means including direct sourcing from rivers. Only 9.7% have connections to electricity. The houses in the rural area are characterized by the use of thatch roof, mud and pole walls and earth floors.

Access to and cost of Education

In terms of basic education in Tanzania, there is free primary education starting the age of 7 years old in government primary schools and cost sharing to secondary education. At the university level there is government loarn to study in a public and private university in the country.

1.3 Housing Policy

The first housing development policy was endorsed by the government in December 1981. The most important features of the policy statement were;

- The government recognised the importance of better housing for the people both in urban and rural areas.
- The government recognised that almost all housing in rural areas and more than 90% of those in urban areas have been constructed by the people with little or no public intervention. In this endeavour, the government stressed the importance of; Streamlining all the processes of surveying land in towns, land allocation process, record keeping, land transfer etc; Research and production of basic building materials should be given additional emphasis; Local authorities should produce definite programmes of surveying and servicing land for housing development and Financial institutions responsible for lending to housing development should be reviewed to make them more responsive particulary to the needs of the low income earners and, if need be new financial institutions should be created to increase lending opportunities for housing development.
- The government recognised the importance of the concept of community participation as being central to the success of the policy-action scenario on housing development.
- Realization of the housing stock already existing in squatter settlements (about 40% to 60% of all housing in towns in Tanzania), the government decided to invest on an upgrading approach.

Yet the housing sector in Tanzania is faced by a lot of challenges which need to be addressed by all actors in shelter delivery. Same of the challenges being: high rate of urbanization, absence of housing finance, lack of institution legal

framework, public private rural housing,Tax regime, implementation of building regulations and standards, planning standards and plot sizes and building materials

1.4 Actors in Shelter Delivery and their Roles

In Tanzania there are a number of actors in the shelter delivery including the Government through its Ministry of Lands and Human Settlement, the community, UN-Habitat, World Bank, Private Sectors, Non-Governmental Organisations, Social Security Funds.

- Governments through its Ministry of Lands and Settlement Planning handle all land related matters; it surveys and allocates land to developers.
- Social Security Funds as government agencies invest money on the building sector
- UN-Habitat, this is a United Nations Organisation dealing with housing issues world wide. It funds many housing projects in Tanzania including squatter upgrading.
- World Bank also gives grants to housing improvement and shelter delivery system at large.
- Non-Governmental Organisations, these play a big role in squatter upgrading in Tanzania. For example, Tanzania Gatsby Trust works with UN-Habitat in squatter upgrading in some areas in Dar es Salaam.
- Private Sectors, These play a very important role in shelter delivery system in Tanzania by construct buildings for renting and selling.
- International organisations like Swedish International Development Ageny (SIDA and DANIDA also plays a big role in capacity building and fund construction research and projects

1.5 Shelter Design

Physical Planning

Physical planning for shelter delivery is governed and regulated by the towns and country planning ordinance of 1956 which was revised in 1961 and then 1993. The growth of the urban areas is governed by the master plans which are

descriptive in nature and by the strategic urban development plans which are performance oriented.

Land use

The land use planning in Tanzania is detailed out in terms of plot uses such as areas for residential, public playground, health service, market, open spaces, commercial and the plot are categorized in three density levels; High density 400 – 600sqm, medium 601 – 1200 sqm, and low density 1201 – 1500sqm. *(MLHHSD – 20,000 plots project)*

2 Organisation

Ardhi University is the only university in Tanzania that teaches research and offer consultancy services in architecture and architecture related subjects. It was established in 1956 as a Surveying Training School offering land surveying technician certificate courses. In 1972, the school became an institute called Ardhi Institute. The Institute offered two-year diploma programmes in the fields of Land Surveying and Land Management and Valuation. In the same year a three-year Diploma program in Urban and Rural Planning was introduced.

By the Act of the Parliament No. 35 of 1974, Ardhi Institute was made a parastatal organisation and consequently the duration of two-years was extended to three years. Later in 1975, all the three-year diploma programes were upgraded to Advanced Diploma level. The Building Design and Building Economics courses started in 1976 and 1978 respectively. In the 1979, the Centre for Housing Studies was established as a joint project between the Government of Tanzania and the Netherlands. The centre has now grown into the Institute of Human Settlement Studies (IHSS). In early 1980s, the Public Health Engineering (later named Environmental Engineering) course was introduced.

In 1996 the Ardhi Institute was affiliated to the University of Dar es Salaam and became a constituent college of the University. It then became known as the University College of Lands and Architectural Studies (UCLAS). Within ten (10) years of its existence (i.e. 1996-2006) UCLAS increased the number of academic programmes from six (6) to thirty nine (39). At last, Ardhi University came into being in March 2007 after becoming a full fledged university.

Ardhi University like any other university is guided with the following objectives:

"To be recognised as a center of excellence in seeking knowledge and disceminating it to a wide spectrum of beneficiaries at national, regional and global levels".

Mission is:

To provide intergrated teaching, research and public services that is geared towards achieving sustainable social-economic development of Tanzania and the World at large.

ARU Values:

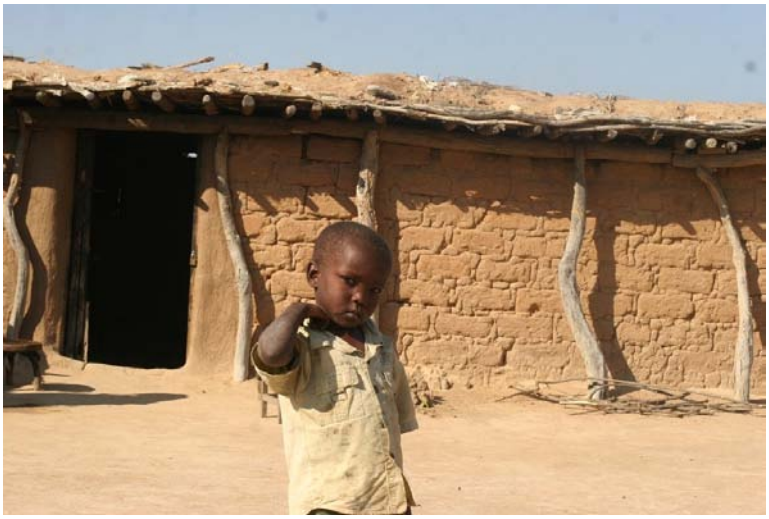
- To produce knowledgeable people in the area of housing and related field
- To lead on research related to housing and related issues
- To offer consultancy in archietures and other related fields

3 Shelter Problem

The new trend of construction in rural areas in Tanzania dwells much on the use of conventional materials (Bay 2006); materials that undergo industrial processing before being used in building construction. These materials include cement blocks, concrete blocks, corrugated iron sheets, glass, plastic and roofing tiles. (Everett, 1994) These conversional materials have proven incompatible with the environment, culture and economy of the people in the rural communities. These materials not only adds considerable cost to the cost of construction because of the cost of materials, transportation and construction process using skilled labour, but also roofing material like corrugated does not play well with the climate in terms of creating comfortable interiors in the tropical climate. Hence, the use of conventional building materials in rural areas contributes greatly in inefficient use of energy if one has to calculate their embodied energy that goes in it and the efforts to cool or warm the interiors. (Bay, 2006)

On the other hand traditional building materials have proven to be very effective for providing comfortable conditions in extreme climatic conditions unlike conventional building materials. Lauber (2005) has highlighted that despite the advantageous climatic behaviour of traditional building materials in the

tropics, people tend to build using conventional building materials in order to cope with the dominant perceived notion of “development”. However, this type of construction does not contribute to ecologically sustainable adaptations to the climate, culture and use of available resources in the tropics. (Lauber, 2005). Based on the studies on the decline use of traditional building materials in many developing countries by Lauber, 2005, Bay 2006 and Mosha 2005 , this study seeks to develop innovative uses of the readily available traditional materials.



Typical rural house using traditional building materials, such as, mudblocks and pole

Typical rural house using traditional building materials, such as, mud, poles, and thatch.

Conventional materials used in rural areas

Tanzania has abundant natural resources: sun, water and natural building materials like bamboo, stones, wood and earth. However, housing development in the rural area does not utilize these resources as was the case with our ancestors Instead, you will find the thoughtless duplication of the conventional building practices like using corrugated iron sheets and cement blocks found in most urban areas in Tanzania. Conventional building materials are widely used in the rural areas in Tanzania today because of different reasons, one of it being that they are considered to be symbols of progress and wealth (bay 2006, Lauber 2005), and the advantages it can offer which include more durability and less maintenance as compared to traditional materials. However, the use of these building materials in the rural area adds cost of construction and does not blend in well with tropical climate. Traditional building materials, however, have proven to be very effective for providing comfortable conditions in extreme climatic conditions, although they will require regular maintenance and care to attain its acceptable durability and strength. (Lauber, 2005).

The trend of using conventional materials in housing design and development in rural Tanzania shows little or no concern for the available local resources, the climate of the area and the people who are going to use the product. According to (Bay 2006) conventional building materials used in the tropics have proven to be incompatible with environment, culture and economy of the people

in the rural communities. He also noted that the use of local available materials is declining and undervalued in many rural communities and the local people are losing the ability construct their own houses because of the need for skilled labour which in the end it threatens the existence of traditional architecture and knowledge in the rural communities. This trend of using conventional materials in rural communities in Tanzania is also contributed by the fact that failure, weaknesses and frequent need of maintenance of traditional buildings which is due to properties of natural materials used. As part of this study, material properties will be a major component of study so that to device ways to improve material properties as used in building construction

In 1997 the government created the National Environmental Policy with the overall objectives of conserving and enhancing the unique ecosystem of Tanzania and to promote individual and community participation in environmental conservation (National Environmental Policy, 1997). This policy was established because the government of Tanzania recognised the serious nature of environmental problems caused by the inefficient use of energy and other natural resources that lead to soil erosion, air and water pollution. Following the wakeup call from the government's National Policy and the fact that 1/3 of the energy consumption is used by buildings while 80% of the country's population live in rural areas without electricity. The emerging shelter development in rural areas and based on the population of 80% it would be logical as well to put the inefficient energy and resources use problems into considerations. However, the awareness in Tanzania is very low and government policies are yet to be implemented.

The main purpose of this study is to advocate the establishment of ecological communities in Tanzania so that integration of innovative sustainable design and construction systems with available local resources becomes a key concern for the design and construction of housing in the rural Tanzania. Taking advantage of the great potential of renewable traditional materials and energy resources, recyclable waste products in the design and construction will be a major focus of this study

and eventually set a useful model of sustainable development actions in buildings for policy decision makers.

In summary the following are shelter problems in the rural areas of Tanzania:

- The new trend of construction in the rural area; the use of conventional material which have proven incompatible with environment, culture and economy of the people in the rural communities.
- The use of local available materials is declining and under valuated
- The local people are loosing the ability for self help construction of their own houses as it has been the case before the new trend of construction.
- Access to adequate shelter is limited because of the high cost of convetional building materials and cost of labour in the rural communities.
- Traditional building materials, proven to be very effective for providing comfortable conditions in extreme climatic conditions unlike conventional building materials yet they are ignored and abandoned because of the need to show progress and wealth in the society

4 Proposal for Change and Improvement

The major Goal for this proposal for change is:

- To improve people's quality of living by integrating sustainable design and construction technologies with local materials
- Take advantages of the great potential of renewable materials and energy resources in the design and construction - set useful model of sustainable development actions in buildings for policy decision makers

The aim is to eventually contribute to generate a multiple effects in other rural communities in the country, with the objective to improve and preserve natural environment and improve quality of living and to contribute in promoting people to settle in their local rural communities, which is essential factor to prevent rural urban immigration and create a balance between rural and urban areas.

The proposal for change will be achieved through three stages; research, shelter design and construction project of a model shelter that incorporate innovative

sustainable strategies in the rural area. The research part will address shelter design and construction problems in rural Tanzania, the focus will be on the behaviour and properties of traditional building materials and how best they can be utilized in order to create a durable and sustainable shelter. In order to elaborate the essence of integrating sustainable design and construction strategies in rural housing, the study will focus on how to recycle and use waste products from farming or local industries within the chosen community in building construction, use of renewal sources of energy in the design and if possible reduce the use of conventional building materials in the rural area.

The proposed shelter design part will be based on the application of research results in the following aspects: Integration of bioclimatic design, Integration of sustainable technology systems like alternative uses of solar energy, material recycling and reuse and knowledge transfer through community participation in the design and preparation of building materials.

Focus on waste treatment and water conservation through rain water harvesting, grey water recycling to mention a few.

The construction of model houses will be through Community participation by supervised self construction in order to build capacity to implement and operate productive projects based on the traditional skills of the local people and eventually promote the use of local available materials in a sustainable manner with the aim of showing that rural communities can have sustainable and durable buildings with modern look that are thoughtfully matched with the local environment, culture, climate and economy of the rural area.

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