

Solutions to Underutilization of Appropriate Building Materials and Construction Technologies (ABTs)



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Introduction

Appropriate Building Materials and Construction Technologies (ABTs) refers to building processes and tools that are acceptable to the climate, socio-economic conditions and natural resources of an area. They are affordable, safe, environmentally friendly, locally available and/or innovative conventional technologies that realize reduction in building costs invariably through use of innovativeness, appropriate designs, equipment, construction techniques, incremental construction, on-site local materials and use of semi-skilled or self labour.

This paper critically analyses the use of ABTs and more specifically the Stabilized Soil Blocks (SSBs) with a view to enhancing the sustainable development, adoption and use of ABTs to address the acute shelter problem in Kenya. Besides the SSBs, other ABTs include the Fibre Reinforced Concrete (FRC) tiles for roofing; cut quarry stones; bricks; concrete hollow block moulds; and pre-cast ceiling components amongst others.

The SSBs comprise 5-8% cement mixed in the ratio of one bag of cement against a range of twelve to eighteen wheelbarrows of sand (1:12-18). In some instances, sand is added to strengthen weaker blocks. The block dimensions are 230mm length,

220mm width and 115mm height. The required weight of a block is 10kgs and a unit cost is Kshs 15 (US\$ 0.21). The photographs on pages 11 and 12 shows how the SSBs look like.

General Basic Data

Figure 1: Map of Kenya

Kenya is almost bisected by the equator and has a total land area of about 582,650 km² of which 569,250 km² (97.8%) constitutes dry land while water surface takes the rest of about 13,400 km² (2.2%). Approximately 80% of the land area is arid or semi-arid and only 20% is arable. The population is estimated at 33.7 million people with about 11.5 and 22.2 million people living in urban and rural areas respectively. The overall population density is estimated to be 58.1 people per km². Life expectancy at birth for the total population is 56.64 years (*male*: 56.42 years, *female*: 56.87 years as per 2008 estimates).



Table 1.1: Life Expectancy at Birth

Year	Life Expectancy at Birth	Rank	Percent change	Date of Information
2003	45.22	204		2003 est.
2004	47.99	199	6.13 %	2004 est.
2005	47.99	203	0.00 %	2005 est.
2006	48.93	200	1.96 %	2006 est.
2007	55.31	182	13.04 %	2007 est.
2008	56.64	182	2.40 %	2008

Source: CIA World Factbook as at May 16, 2008

The country economy registered a real Gross Domestic Product (GDP) growth estimated to have expanded by 7.0 per cent compared to a revised growth of 6.4 per cent in 2006. The renewed expansion has mainly been on account of the economy resilience, improved business confidence, stable macro-economic environment and a rebound of the global economy. The overall inflation decreased from 14.5 per cent in 2006 to 9.8 per cent in 2007. The Gross National Income (GNI) recorded a decelerated growth of 11.5 per cent in 2007 compared to a growth of 14.6 per cent in

2006. The population in absolute poverty is estimated to have fallen down from 56% in the year 2002 (Central Bureau of Statistics, 2003a) to 46% in the year 2007.

Household characteristics

The average household size in Kenya is 4.4 and the minimum appropriate and decent size of housing for households is a two room dwelling.

Table 1.2: Household characteristics

	Household size	Female Headed Households in %	Median Age of Household Heads
Kenya	4.4	36.7	25-29 years
Kenya Rural	4.8	39.6	
Kenya Urban	3.4	26.3	

Source: Kenya 1999 Population and Housing Census Analytical Report Volume X.

Kenya Housing Production Policies

The first comprehensive Housing Policy for Kenya was developed in 1966/67 as Sessional Paper No. 5. At that time Kenya's population was just over 9 million people. The annual housing requirement then were 7,600 and 38,000 new units in urban and rural areas respectively. The policy directed the Government to provide the maximum number of people with adequate shelter and healthy environment at the lowest possible cost.

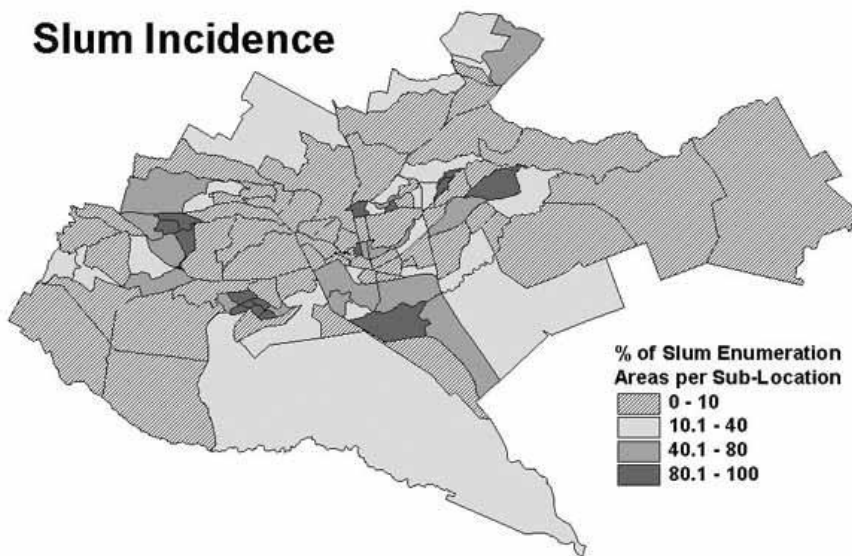
The policy advocated for slum clearance and encouraged mobilization of resources for housing development through aided self-help and cooperative efforts. Emphasis was placed on enhanced coordination to increase efficiency in the preparation of programmes and project. Other areas addressed in the policy paper included increased research in locally available building materials and construction techniques, and housing for civil servants through home ownership schemes in urban areas as well as institutional and pool housing schemes in remote areas.

From 1986, the Government ushered in the implementation of International Monetary Fund's (IMF) Structural Adjustment Programmes (SAPs). These required that the State withdraws from service provision and government subsidies and citizens to cost share services such as health, education, agriculture farm inputs among others.

In the mid '90s, the demand for housing continued to outstrip supply, particularly in urban areas. The comparable supply and demand figures for the 1997-2001 period were 112,000 and 560,000, respectively. Currently, the average annual urban housing demand is estimated at 150,000 units, but only an estimated annual average supply of 30,000-50,000 units is expected to be produced if the factors that constrain housing production are not addressed. In addition, an estimated 300,000 housing units require to be improved annually in the rural areas.

The above scenario has led to mushrooming of overcrowded slums and informal settlements lacking in physical and social amenities especially in the urban areas. A study on intra-city differentials in Nairobi city was carried recently using a 5% sample (102,000 people) of the 1999 Housing and Population Census from Kenya. One of the objectives of the study was to develop and illustrate a methodology for intra-city differentials study using census data, and the use of Geographical Information Service (GIS) as a tool to show the spatial variation of urban poverty and poor living conditions within a city.

The statistical analysis shows that many poverty related factors are spatially clustered and location does impact poverty. What is also significant is that land is unequally distributed as 60% of the population of Nairobi lives on 4490 Ha which equals to 8.7% of the land.



On the other hand, the housing shortage has led to substandard housing in the rural areas due to population growth, rural-urban migration, low income/poverty,

unfavourable land and housing finance markets, hitherto unresponsive housing policy, hitherto unrealistic planning and building standards, and high building cost.

To facilitate the production of decent and affordable housings for Kenyans, interventions by the government and stakeholders have to be guided by accurate and reliable data on housing and related facilities. Unfortunately, the housing sector has over the years suffered from serious data gaps.

It is evident from the available data that housing shortage is more acute in the urban areas than in rural areas. For instance, in 1999, the housing stock in Kenya stood at 6.4 million dwelling units¹ out of which only 19.5% catered for the urban areas leaving 81.5% of the stock in rural areas. While the housing stock is concentrated in the rural areas, the quality of housing especially the level of services is better in urban areas than in rural areas. For instance while only 12% of households in urban areas had mud/wood walls, over 50% of rural households had the same.

Currently, most households (66%) in urban areas who rent their dwelling live in single rooms while smaller proportion of households (24%) own their dwellings. The situation has been compounded by the current high rates of interest especially on mortgage. The rent charged varies based on different factors e.g. construction materials used, location and social facilities available amongst others. A poorly located house (10x10 foot) goes for a house rent of Kshs. 500 (US\$7) per month while some stone houses built in the upmarket area of Nairobi goes even beyond Kshs. 80,000 (US\$1142) per month.

Housing Policy review through Sesssional Paper No. 3 of 2004

The review of the Housing Policy is intended to provide a guide to addressing housing problems and challenges in Kenya along with other members of the international community, implement the Habitat Agenda and the National Plan of Action on Shelter and Human Settlements to the year 2020. This policy has adopted an enabling strategy, guided by the principles of partnership and participation by all partners in accordance with their comparative advantages.

¹ A place of abode or residence occupied by one or more households with a 'private entrance'. It is therefore a structure used by a household for sleeping, eating and entertaining guests.

Vision 2030 Program

The government has also recognized housing as a key element of development by incorporating it in the Vision 2030 Program. The 2030 vision for housing and urbanisation is “an adequately and decently-housed nation in a sustainable environment.” This will be achieved through implementation of the following flagship projects:

- Preparing a national land-use plan (as recommended under agriculture) in order to facilitate better urban planning.
- Installing physical and social infrastructure in slums in 20 urban areas to formalise slums, permitting construction of permanent houses and attracting private investment.
- Producing 200,000 housing units annually by 2012 through a mixture of initiatives in order to fill the huge housing gap in the country (e.g. build/enhance capacity in local authorities to provide serviced land; and / or to produce low-cost houses building materials and technologies.
- Establishing housing technology centres in each constituency to increase access to decent housing by promoting location-specific building materials and low-cost housing.
- Establishing a secondary mortgage finance corporation to increase access to housing finance.
- Enacting the Housing Bill, 2006 to legislate for a one-stop housing development approvals mechanism to fast-track approval of housing plans and reduce the time cost of construction.

Strategies for realizing Housing and Urbanisation Goals

To realize the housing and urbanization goals, the strategies that have to be put in place include:- better development of and access to affordable and adequate housing; enhanced access to adequate finance for developers and buyers; pursuit of targeted key reforms to unlock the potential of the housing sector; and initiation of a nationwide urban planning and development campaign, starting with major cities and towns.

Actors in Shelter Delivery and their Roles

In the process of shelter delivery, we have different actors who have strong links with the Ministry of Housing and plays different roles as follows:-

Table 1.3: Actors in shelter delivery and their roles

Ministries/Government agencies & other institutions	Key consideration
Finance	Financial Resources
Local Government	Urban planning and development
Local Authorities	Housing infrastructure and services
Directorate of Personnel Management	Professional and technical support
Attorney General	Legal advice
Roads and Public Works	Infrastructure planning and management
Transport	
Lands	Land resource Management and spatial planning framework
Universities	Research and resource development
Private sector organizations	Identify needs and provides for the housing demand as well as provides suggestions on the policy direction that will enhance Public Private Partnership.
Development Partners and International Organizations	Supplements funding of Government programmes; enhances the implementation of the programmes; and provides expertise and new ideas on house service delivery.
Parliament	Approves policies and legislative issues.
NGOs, CBOs & FBOs	NGOs and CBOs informs and mobilizes communities among whom they work with to improve their housing and living environment- encourage community savings for housing construction and promoting small-scale building materials industries. The FBOs develops a secondary mortgage market; encourage investment in low cost housing, provide mortgage finance for housing development and house purchase, and, establishes mechanisms for the creation of seed capital to assist developers involved in housing delivery.

Organization and Mandate of the Ministry of Housing

Vision

To have excellent, affordable, adequate and quality housing for all Kenyans.

Mission

To facilitate access to adequate housing in sustainable human settlements for all Kenyans.

Mandate

This include coordination of the implementation of Housing Policy, monitoring housing delivery processes and improvement of living conditions of urban poor, use of low cost housing technologies, facilitating access to housing development finance; promotion of efficient and effective management of government housing and leases; and rent restriction and dispute resolutions services for low income groups.

The Ministry is structured into Seven Departments. The Department are:- General Administration and Planning; Housing; Government Estates; Rent Restriction Tribunal, Kenya Slum Upgrading Programme (KENSUP); Civil Servants Housing Scheme (CSHS); and Housing Infrastructure Development Programme (HIDP). The National Housing Corporation (NHC) operates as a Commercial State Corporation.

Duties and Responsibilities in the Ministry of Housing

My duties and responsibilities in the Ministry is to review and give advice on Environmental Impact Assessment Reports on Housing developments projects to National Environment Management Authority (NEMA); co-ordinate and participates in the national observance of World Habitat Day (WHD) and identify, document and disseminate Best Practices related to human settlements. Further I do promote and protect the Kenyan Statehood and Nationhood through coordination and participation in all activities of UN-HABITAT and development of Country Report in United Nations Organs such as the Governing Council of the UN-HABITAT, the relevant sessions of the UN General Assembly; the World Urban Forum and the African Ministerial Conference on Housing and Urban Development (AMCHUD); and promote the use of low cost housing building materials and appropriate construction

technologies through training workshops in schools, community groups and construction of demonstration units in these areas.

Shelter Problem

In spite of putting in place an ABTs programme by the Ministry, utilization of ABTs has been low. This paper critically analyses the solutions to underutilization of ABTs with more emphasis being laid on the use of SSBs. ABTs has been necessitated by high building costs of materials that accounts for approximately 70% of the total buildings costs. Compared to mainstream conventional building materials, utilization of some ABTs e.g. the SSBs amongst others can reduce costs by about 30-50%.

Since ABTs are classified as permanent materials, they can be utilized in the urban informal, urban formal and rural settlements. Additionally, the growth in the Housing sub-sector depends highly on technological innovations. This is a driving force towards new market oriented and socially acceptable houses. The technological innovations must focus on development of both alternative low-cost building materials and new technologies that will create added value, improved products and cut construction costs.

Objectives of ABTS

The objectives of the ABTs is to:-

- Enhance affordability in housing through reduction in the cost of building materials and technologies;
- Facilitate the improvement of sub-standard housing in both urban and rural areas;
- Facilitate sustainable research in both local and conventional building materials and technologies that are appropriate and affordable;
- Broaden the number of ABTs available in the market;
- Facilitate the development of sustainable, environmentally-friendly and replicable ABTs in partnership with both local and foreign organizations and institutions;
- Create awareness on the range and nature of ABTs available for use in housing construction and improvement;

- Establish ABT Centers and use other avenues to provide quality research, training and dissemination;
- Demonstrate the efficacy of ABTs through construction of model/demonstration houses;
- Empower consumers and entrepreneurs by facilitating their acquisition of new skills, technology transfer and ownership of ABTs; and
- Contribute to the national goals of job creation, income generation and poverty reduction

Use of Stabilized Soil Blocks in the building process



Source: Author



Source: Author



Source: Author

Who is affected by the shelter problem and why

Most of the Kenyans in the low and middle income groups living in the urban and rural areas are the most affected by the shelter quandary. Survey shows that this shelter quandary can be influenced by Ministry of Housing, Local Authorities, communities, universities/research institutions, manufacturers of ABT materials & equipment, Micro-finance institutions, NGOs, CBOs, Development partners and international organizations.

Conversely, this shelter problem occurs due to existence of a number of factors that include inappropriate standards and By-laws which has greatly reduced the range of approved materials and building technologies; non extensive research on alternative locally available building materials by our research institutions combined with minimal dissemination and use has of these materials. There has also been lack of ABTs demonstration centers, disincentives among professionals to recommend ABTs as this would lower their fees, failure to establish a Board to deal with ABTs, failure of Local Authorities to adopt the revised building and planning standards (Code '95) for use in designated areas of their jurisdiction. Nevertheless, the Government has not boldly demonstrated the efficacy of using ABTs and SSBs in particular in its projects.

Proposal For Change and Improvement

Strengths

- Use of locally available raw materials thus reduce high transportation cost from other areas and also import cost.
- Creation of temporary employment with labor being easily sourced from the local communities.
- Improvement of the living standards to the local community as a result of the employment generated.
- ABT materials and the SSBs included have so far been tested by the Kenya Building Standards and found to be favorable for use in the country.
- Utilization through Code 95 in the use of ABTs in the building industry.
- Reasonably priced ABTS equipment has been developed and manufactured for the market.
- Formulation of the National Strategy for shelter to the year 2000 where by the Government facilitates other actors to invest in shelter.
- Formulation of Sessional Paper No. 3 of 2004 on National Housing Policy for Kenya that intend to arrest the deteriorating housing conditions countrywide and to bridge the shortfall in housing stock arising from demand that far surpasses supply, particularly in urban areas.
- Preparation of comprehensive guidelines to facilitate the utilization of ABTs and documentation of affordable technologies available in the country by the Ministry of Housing.
- Ministry of Housing has embarked on establishment of one National/Regional ABT center in Nairobi and seven provincial centers
- Procurement of 22 hydraform machines, 36 interlocking manual block presses and 18 Tevi tile making equipment which have been distributed to the provinces for training and use by people.
- Establishing housing technology centres in each constituency to increase access to decent housing by promoting location-specific building materials and low-cost housing.

Weaknesses

- The implementation of ABTs has not been done in an orderly and sustainable manner consistent with the core functions of the Ministry. Various agencies have been active in the field of intermediate technology ranging from research and development agencies, donor agencies, finance institutions, NGOs, CBOs, government ministries and departments. They undertake independent programmes and projects and hardly collaborate with each other in their implementation strategies.
- There is no central agency overseeing and co-ordinating the various activities of various agencies as a result of which there are duplication of efforts and adhoc approaches.
- ABTs have not been fully accepted in the market
- Lack of funding for research
- High transportation cost of suitable materials.
- High training cost
- High cost of machines for example the Hydraform machine which limits affordability.
- Dissemination of ABTs has not been conducted adequately in the country. A survey in Central Province covering the local authorities, the provincial administration and public works' officers revealed that there is minimal awareness of ABTs among both consumers and professionals.
- The capacity of Housing and Building Research Institute (HABRI) to continue with research and dissemination of ABTs has been compromised compelling the Ministry of Housing to take up the task of dissemination while research has been left in abeyance.
- The Provincial Housing Offices have not been adequately empowered and supervised to promote ABTs countrywide.
- Poor coordination among stakeholders have resulted to ABTs not fully penetrate the market.
- The range of existing ABTs materials available in the country is limited and no extensive research on alternative locally available building materials by our research institutions has been done.

- Stringent planning regulations and high infrastructural standards have been an impediment in the housing delivery system.
- Acute shortage in the number of habitable dwellings, inadequate infrastructure, community facilities and services, overcrowding and extensive slums and squatter settlements in the urban areas.
- Poor quality of shelter fabric and limited access to safe drinking water in the rural areas.
- Inability of trained groups to construct or improve their housing due to lack of affordable and friendly housing financing mechanism
- The existence of inappropriate standards and By-laws has greatly reduced the range of approved materials and building technologies.

Opportunities

- Training,
- Giving out of technical assistance,
- Promotion of ABT materials and technologies,
- Partnership between the Ministry, Civil Society Organizations and other stakeholders
- Research on local building materials and its dissemination
- Production of innovative/cost effective building designs
- Tax reductions on ABTs
- Production of more houses.
- The Ministry is also evaluating a number of new technologies i.e stone cutting machines, innovative use of machine cut stones, cellular lightweight concrete, mortars and hollow concrete blocks, steel walling and roofing technology, among others with a view to facilitate their use in the country if proven viable.

Threats

- High cost of machines
- High incidences of poverty
- Inadequate infrastructure to support technological change

Conclusion

Shelter is everyone's basic needs beside food and clothing. Therefore the use of stabilized soil blocks in the building process which is cheaper in production will lead to promotion of provision of improved, affordable, quality and decent housing in both urban and rural areas, enhancement of rural-urban balance in shelter delivery; serve as a vehicle for curbing mushrooming of slums, and in upgrading existing ones. In addition it will act as a poverty reduction tool due to its labour intensive nature and lowered cost of material production; lead to transfer of knowledge on available technologies and materials; promotion of sustainable human settlements and environmental conservation and protection; and promotion of wider use and adoption of innovative building technologies.

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