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The Influence of Environmental Variables on Building Material Choice: The Role of Low-cost* Building Materials on Housing Improvement

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Summary

During the 1970s, many Third World countries became disillusioned by poor performance of capital and energy intensive industries. This was also true for the building material industry. Reliance on capital and energy intensive industries was not only costly, but also manpower resources were insufficient and incompetent. With this disillusionment, several countries now advocate and encourage the use of low-cost, both indigenous and improved, building materials. In spite of this change in the 'official' attitude, the paper argues that because of the mutual interaction that constantly takes place between people and various environmental variables, the success of low-cost building materials will only be modest.

The underlying rationale of this paper is that, in a given place and time, a large number of environmental variables are operating and exerting enormous pressure on individuals on their daily choices and this includes the choice of building materials. An attempt is made to evaluate the success or the failure of the Tanzanian *Operesheni Nyumba Bora,* or Operation Better House. It is argued that in order to introduce new building materials it is imperative to understand the complete context of society's culture in terms of interactions between its people and their environments over time and space.

Résumé

Pendant les années 1970 beaucoup de pays du Tiers Monde avaient été désillusionnés par les produits d'une industrie de construction très consommatrice de capital et d'énergie. Ce n'était d'ailleurs pas uniquement une question de coûts, mais aussi du manque et de l'incompétence de la main-d'oeuvre. A la suite de cette désillusion, plusieurs pays se sont faits les avocats de matériaux de construction indigènes bon marché et ont encouragé leur emploi. Malgré ce changement dans l'attitude "officielle", le succès de ces matériaux bon marché reste moeste, du fait de la complexité de l'interaction entre individus et leur environnement.

* The term 'low-cost' is used in this paper for lack of a better word. The term 'intermediary' is unsuitable and ambiguous.

L'article tente d'évaluer le succès ou l'échec de "l'Opération meilleures maisons" *(Opersheni Nyumba Bora)* en Tanzanie. Il indique comment, dans un lieu et un temps donné, un nombre important de variables de l'environnement agissent et exercent une énorme pression sur les individus dans leurs choix quotidiens, y compris le choix de matériaux de construction. Il montre que pour introduire de nouveaux matériaux de construction, il est impératif de comprendre le contexte complet de la culture d'une société en termes d'interactions entre sa population et son environnement au cours du temps et de l'espace.

1. Introduction

In almost all Third World countries, people and institutions have been forced to adapt to environmental changes such as those prompted by periods of colonization and decolonization. These changes have affected cultural, social and material aspirations of the people in their daily life, and Tanzania is no exception.

Changes that followed decolonization in Tanzania in 1961 will be used as a case study material. Soon after independence Tanzania embarked on a number of development programmes, among them, the establishment of a heavy building material industry. This industry was based on large-scale, capital and energy intensive production techniques of modern building materials such as cement, corrugated iron sheets and steel. This biased decision by the Government was mainly influenced by the inherent nature of such industries such as their forward and backward multiplying effects (Nyerere 1973, 308).[1]

Also, and most important, the establishment of a capital and energy intensive building material industry was seen as a helpful step in the right direction towards fulfilling earlier commitments made by local politicians prior to independence. In order to gain political support, almost all emerging local politicians made a number of promises, saying, among other things, that attaining independence would ensure not only better living conditions for every citizen, but also improved housing standards (see, for example, Tanzania 1981, 6).[2] It seems that for many of the politicians, the source of poor housing conditions lay in colonization; this was in itself a constant reminder of the whites' exploitation and injustice which had to be eradicated fast and forgotten altogether. It is therefore the intention of this paper to find out how these promises have been kept and achieved.

1.1. Previous Attempts

One of the earliest attempts by the Government to improve housing conditions started two years prior to independence, in 1961. This was known as the *Urban Roof Loan Scheme* (URLS) and was intended to assist those who wanted to replace thatch roofs with corrugated iron sheets. Despite its good intentions, this scheme proved totally inadequate, and was replaced, soon after independence, by the *Slum and Squatter Clearance Programme*. Through this new initiative, the Government still hoped to rid

[1] For detailed discussion about the contribution of the building material industry to the GDP and GFCF, see Wells (1984) and Tanzania (1987:38; 41)

[2] This period is remarkable in the sense that almost every where political participation made many people become aware of a number of social issues. It brought together both rural and urban people whose past involvement in politics was marginal or indifferent (See, for example, Gutkind 1975).

people living in urban areas of poor housing and settlement conditions. However, like its predecessor, this programme proved to be too prohibitive financially and socially disruptive.

Also, some major world and regional events that took place in the 1970s - such as drought, increased oil prices, inflation and lack of foreign exchange - adversely affected smooth performance of almost all industries in Tanzania (Tanzania 1981, 6-7). To illustrate this, figure 1 gives production capacities of cement building material industries in the country at the various periods for which data are available. The general picture that emerges is that almost all industries are operating in the range of 20-25 per cent, which is far too below the installed production capacity.

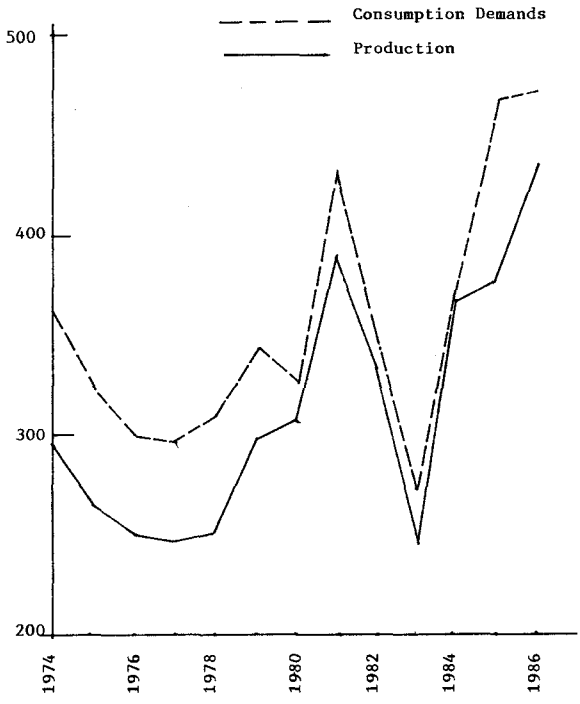

Fig. 1 Production and consumption demand for cement (Vanouayears, thousands of tons).
Production et demande en ciment (Vanouayears, milliers de tonnes).

One major implication of this industry is that it has, in turn, resulted in the general shortage of almost all building materials. The shortage in building materials for housing is further exacerbated by the fact that building materials are also required in other construction sectors such as the maintenance of civil engineering works (Wells, 1985). The demand for building materials for housing therefore competes with the demands made by other construction works, including commercial, industrial, administrative and institutional buildings. This has led to a great deal of building material rationing. Rationing has tended to favour special projects of national repute such as the extension of the Dar-Es-Salaam Harbour, the construction of the new capital in Dodoma as well as the construction of the International Airport in Dar-Es-Salaam (See Kaitilla, 1990). Thus, one of the most serious problems faced by individ-

ual efforts to improve housing in Tanzania lies in the inefficiency of the capital and energy intensive building material industry in meeting demands for all types of uses.

1.2. New Attempts

In the years which followed these major world events, the government, disenchanted with the performance of this industry, decided to adapt cheaper ways which encourage people to build houses, and progressively improve them by using low-cost building materials. To facilitate this new initiative the *Building Research Unit (BRU)* was established in 1972 to research into ways of improving the strength and durability of indigenous building materials. Other small-scale institutions, or building materials production centres (BMPCs), have also been established nation-wide to assist BRU in its endeavours.

By establishing these small-scale BMPCs near points of consumption, the government essentially hopes to minimize costs on the use of capital and energy intensive materials. The government has now realized that:

(i) low-cost building materials are cheaper and easy to use;

(ii) the production of low-cost building materials relies on less sophisticated technology that can easily be made on site by the individuals themselves.

However, one problem still remains: that of creating market demands for low-cost building materials. It seems that the government has opted for a *laissez-faire* attitude which is based on the concept of escalating costs. The concept of escalating costs makes the assumption that high prices resulting from the shortage of capital and energy intensive building materials will produce the required shift in peoples' choice behaviour. Although the concept is of a limited scope, the Government, nevertheless launched *Operesheni Nyumba Bora* in 1974 as a means to popularize low-cost building materials.

2. *Operesheni Nyumba Bora*

The *Operesheni Nyumba Bora (ONB),* Operation Better Houses, was a nation-wide attempt to improve individual housing conditions where centralized efforts had failed (Tanzania 1981, 6). The main objective of the operation was to encourage especially villagers to improve housing conditions. According to specific criteria, as stated in the operation, a *nyumba bora*[3] must be:

(a) built of permanent building materials that do not get easily destroyed by rain and sun;

(b) built in such a way that insects will not easily enter into the house; and

(c) able to provide a healthy environment as well as allow sufficient light and air to enter; it must have a toilet, kitchen and a clean compound.

In order to see that this operation succeed, the government set out a number of strategies. The first was to establish *Rural Construction Units (RCUs).* These were

[3] See, a speech by the Minister of Lands, Housing and Urban Development, during the financial year 1974/75. A similar remark was also made more recently in a Tanzania local paper, Daily News (1987), by a top politician that having a better house must be a pre-requisite for electricity connection .

intended to offer technical assistance to villagers on how best to make use of low-cost building materials. The second was to offer financial assistance, just as at the time of URLS, i.e., loans of up to Tshs 5,000 were made available to those wanting to buy low-cost building materials to improve their houses. The third strategy was to increase people's awareness about the importance and benefits of *nyumba bora*. This was done, in part, through the adult education campaign which, at this time, was at its peak.[4] The fourth strategy, which was introduced a bit late in the programme, was to broaden the - initially limited objectives - of the operation by including urban areas. In 1982 the government was obliged to revise its national housing policy to allow the use of low-cost building materials in urban areas.

In spite of all the good intentions behind these strategies, it is argued that for many people a better house, that is, one that meets the above criteria, is one that is invariably built of modern, or *western,* building materials such as cement, and cement related components, and that has a corrugated iron roof (cf., Tanzania 1981, 13, 15; Caplan 1981, 106). Many Tanzanians have shown a strong desire to acquire these building materials, although they are capital and energy intensive in their production and utilization.

The desire for these materials became more and more obvious as many people were postponing their housing intentions for as long as *Udongo ulaya lit,* or European soil for cement, and *bati,* or corrugated iron sheets, were in short supply. This attitude, or 'mental paralysis', to use Nyerere's terminology (1977, 31) has been widely condemned, due to the inability of the people to visualize other building material alternatives. However, Nyerere, and others may be forgiven for being naive. They simply failed to realize the role of a number of environmental variables with which people interact.

As Saini and Brealey (1971) argue the choice of building materials is limited by a country's state of the building material industry; it is also true that other, very critical, variables such as cultural context, the quality of the built environment, legal and political institutions as well as the level of urbanization, influence the choice of building materials. A large number of these variables are operating and exerting enormous pressure on individuals in their choice of building materials in a given locality and time (See, also Koloko 1979, 588).

Everywhere, daily experiences are characterized by mutual interaction of people with their environments. Along with these interactions come specific behaviour and activity patterns, norms, values and systems of relations.

[4] For instance, when launching 1970 as the year for adult education Nyerere (1973, 137), then the President of Tanzania, emphasised that one of the advantages of mass adult education is to make people reject bad houses. Similar education campaigns were conducted to promote local sanitation and hygiene (Yeager 1989, 105)..

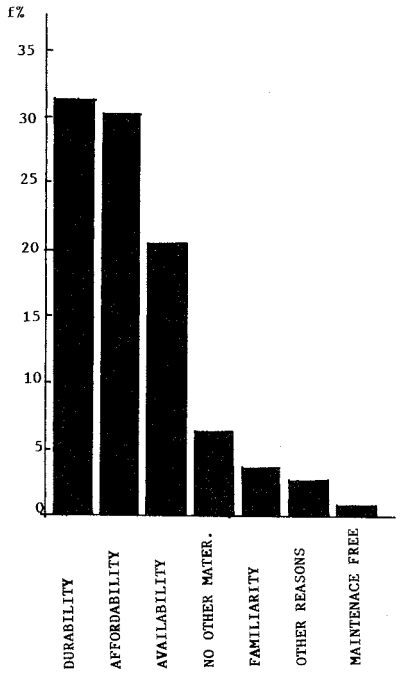

Fig. 2 Reasons for choosing building materials.
Raisons influençant le choix des matériaux de construction.

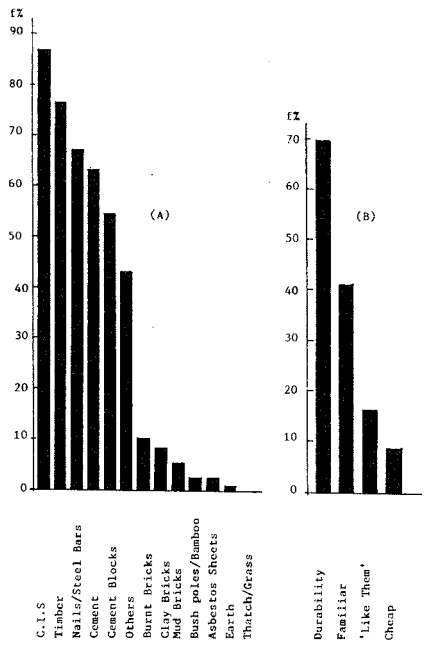

Fig. 3 Factors influencing the choice of building materials, hypothetical situation.
Facteurs influençant le choix de matériaux de construction, situation hypothétique.

This paper will highlight the degree of acceptability or unacceptability of low-cost building materials for housing construction, in general, and housing improvement in particular.[5]

3. Study Method

Data for this paper were collected in 1987, from a sample[6] of 112 owner-occupier household heads in two upgraded squatter settlements of Manzese and Mwanjelwa. Area stratification sampling procedure was adopted, in which each squatter settlement was divided into several small and manageable segments. A total of five such segments were randomly selected for the survey interview.

All houses within each segment were allocated a number from which the sample population was randomly selected. An obvious shortcoming of the sample is the bias towards male informants, mainly because of reasons already explained elsewhere (Kaitilla, 1989). Data were collected on different aspects related to preferences, values and attitudes towards building material choices. Data were also collected about building skills, and knowledge of indigenous materials.

4. Study Results

The research interview in the two squatter settlements had two aims. First, to find out which factors influence users' choice of building materials. Second, to establish what qualities users seek when choosing building materials.

4.1. Criteria for the choice of building materials

In the first instance, informants were asked to state which factors influence the choice of building materials used in their houses. As figure 2 indicates, strength and durability (31.3 per cent), affordability (30.4 per cent) and availability (20.5 per cent) ranked high as the most influential factors in the choice of materials.

In order to find out which materials would be chosen, if the constraint of availability of building materials was removed, it was necessary to introduce simulated games. All informants were asked to participate in a game in which all basic building materials were made available (see figure 3).

The results from this game suggest that the most, and highly, preferred building materials (Figure 3A) were: (i) corrugated iron sheets (86.6 per cent), (ii) timber (75.9 per cent), (iii) nails/steel bars (67.0 per cent), (iv) cement (63.4 per cent) and (v) cement blocks (54.5 per cent). Unfortunately, however, these materials are the most scarce. Almost everywhere they are in intermittent supply, and are frequently prohibitive in terms of cost.

[5] It does not deal with experiments and tests about the strength and durability of the various low-cost building materials, of which literature is large and increasing.

[6] Some may argue that this sample size is insufficient to assert any degree of representativeness of the population under investigation (see, for example, Schweizer and Lang, 1989). However, it should be reminded that large samples are a characteristic of those studies that focus on parameter estimation, which was not the main objective of this particular study. This study measured, among other things, values and preferences of informants to building materials selection.

The least preferred building materials (see also Figure 3A) were: (i) thatch (0.0 per cent), (ii) earth (0.9 per cent), (iii) asbestos and bush poles (2.7 per cent each), (iv) mud bricks (5.4 per cent), (v) clay tiles (8.0 per cent) and (vi) burnt bricks (9.8 per cent). Paradoxically, these materials constitute the bulk of the low-cost building materials being advocated and encouraged by the Government.

When asked what are the reasons behind such preferences, an overwhelming majority (70 per cent) of the informants said that their choices were influenced by the strength and durability of the materials so selected (Figure 3B). However, a high proportion (40 per cent) also based their choices on familiarity, while 16 per cent said they 'like' the materials chosen. Only a little less than ten per cent based their choices on affordability criteria. This latter result suggests that for almost 90 per cent of the informants affordability of the materials is not a very serious concern.

To find out more about the implications of these results, in-depth analyses were conducted on the social image, or meanings, that specific building materials communicate about the owners. Of all informants, more than one-half (51.8 per cent) consider low-cost building materials as bad, while a little less than one-third (33.0 per cent) consider them as only average. Only 11.0 per cent consider low-cost building materials to be excellent for housing.

The first finding remained valid in spite of the fact that at least 60 per cent of the informants knew special indigenous species that are sufficiently strong and durable, and had originally been used successfully in the construction of traditional houses. Yet, almost 80 per cent of all informants would not accept these building materials for housing construction in urban areas. In this respect, 73 per cent of all informants were further asked to state why houses of indigenous building materials should not be built in urban areas. The majority (63.0 per cent) of those to whom this question was applicable stated that demands of modern progress do not permit such building materials to be used in urban areas. Others gave a wide range of reasons such as:

(i) disallowed by urban building by-laws (12.3 per cent);

(ii) individual financial constraints (12.3 per cent);

(iii) the *temporariness* or poor quality of many indigenous building materials (12.3 per cent).

However, three major implications can be deduced from the above analyses. First, a house built of modern building materials portrays a progressive and a positive social image of its owner to outsiders (Rapoport 1979, 34). Second, at the opposite, low-cost building materials portray a negative social image; an image that is associated with squalor and poverty, inertia to changes, backwardness and so on. Third, beyond the symbolic and psychological meanings associated with building materials, there are man-made variables which also prohibit or discourage the use of, particularly, low-cost building materials in urban areas.

These three implications have a direct bearing on housing improvement in that they strongly influence the choice of building materials and their qualities. As will be demonstrated below, the influence of environmental variables on housing is more negative than positive since these variables tend to prohibit the use of certain building

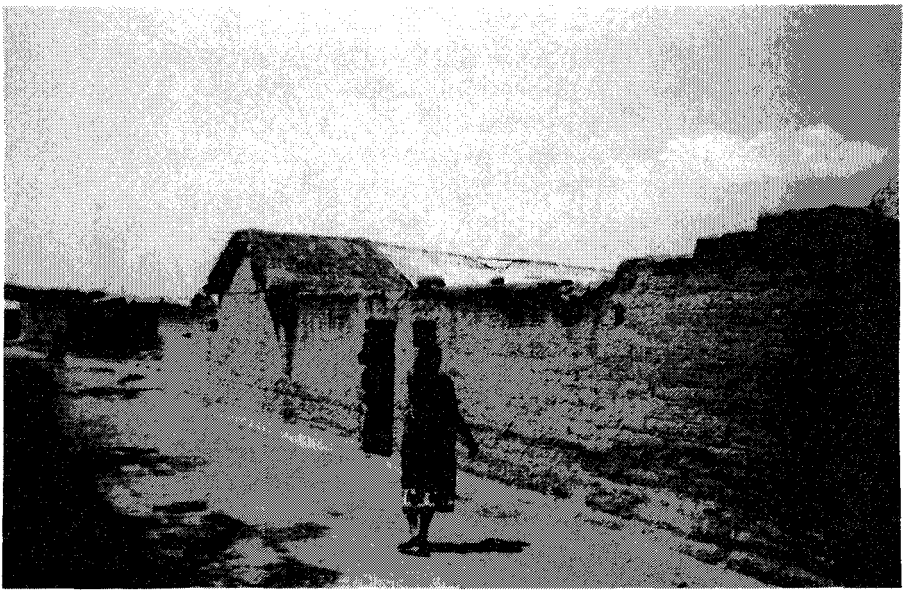

Fig. 4 Replacement of traditional building materials is a progressive process. Here, in Tanzania, thatch roofs are being replaced as corrugated iron sheets become available.

Les matériaux de construction traditionnels sont remplacés au cours d'un processus progressif. Ici, en Tanzanie, les toits de chaume font place aux toits de tôle ondulée, dès qu'on peut les obtenir.

Fig. 5a Improvement known as *humo kwa humo*, resulting in the reduction of the size of the house.

Une amélioration appelée *humo kwa humo*, qui fait que le volume du bâtiment diminue.

Fig. 5b House improvement and extension.
Amélioration et extension de la maison.

materials in specific areas. For instance, although almost one-half (46 per cent) of all informants have undertaken some kind of housing improvements on their house, one-third have been unable to undertake any housing improvements. Even then, dramatic improvements have only been accomplished in the 1980s, as figure 4 shows. This period coincided with the relative availability of cement and corrugated iron sheets.

4.2. Building Skills

The quality and the extent of building skills possessed by informants were also examined. From the survey results, it is evident that an overwhelming majority (80.4 per cent) of the informants have built their own house as opposed to only 9.8 and 9.8 per cent of those who have inherited and bought them respectively.

In relation to this high proportion, informants were then asked to state the type and quality of building skills they possess. Almost 80 per cent of all informants did not possess any approved building skills such as carpentry and bricklaying.[7]

Those with building skills in carpentry and bricklaying account for 4.5 and 8.9 per cent respectively. A very small proportion (3.6 per cent) of informants possess building skills in both carpentry and bricklaying. Also, another small proportion, (3.6 per cent) have building skills in other building trades such as electrical and plumbing.

However, in-depth statistical analyses of those informants who have built their own dwelling units give more useful insights. It is clear from these analyses that well over one half (60.7 per cent) of all informants who have built their own house,

7 Carpentry and bricklaying are the only categories that were used in the interview. This limitation was necessitated by the simple fact that a carpenter, *fundi mbao* or *seremala,* may also be a rooflayer, while a bricklayer, *fundi mwashi,* may work as a mason, plasterer, or even as a painter.

employed someone else, usually a local artisan, or a *fundi* (pl. *mafundi).* A little less than ten per cent used self-help labour from friends and family members. Those who both hired *mafundi* and used self-help labour from friends account for a little less than eleven per cent.

These findings are consistent with those recorded by Rodell (1983, 31) in an earlier study in Tanzania. Out of the 56 houses he surveyed in one squatter settlement, only nine (or 16 per cent) were entirely built by the owners. In other words, an overwhelming majority (84 per cent) of the houses were built using hired artisans.

The high proportion of informants who have hired labour of *mafundi* [8] for the construction of their house has three critical implications. First, it points out to a specialization that is already taking place in the housing industry as an inevitable consequence of rapid urbanization and industrialization processes.[9] Consequently, since these processes influence the quality of houses to be built in urban areas they, in turn, directly determine the quality of building skills, and hence the type of houses to be built.

Second, and drawing from the above, unlike in the construction of traditional rural dwellings, this also implies that very few informants have the necessary building skills needed to construct houses in urban areas according to the standards demanded by urban authorities. [See also Rakodi, 1988, 312 in the case of Zambia.] This points to the failure of traditional building techniques in coping with advances in building technology.

Third, it has been suggested that most low-income houses, and squatter houses in particular, are built on the basis of sweat-equity (Alexander, 1985). The findings of our study refute this allegation. The need to hire *mafundi,* therefore, poses a very serious question on the tenability of the self-help, or sweat-equity, principle of the residents in squatter settlements since the majority of the low-income families work too long hours, seven days a week, to have the time for self-help activities.

The choice of building materials is also influenced by the quality and the extent of building skills. The building materials requiring a building technique that is unfamiliar, or a bit complex, will not be selected despite the fact that those materials may offer durable, safer, and stable dwelling structures. This is currently the case with clay roofing tiles and burnt bricks. Although these building materials have proved to be sufficiently safe, strong and durable, it was observed, as we have noted above, that they were selected less frequently by informants. Some informants, for instance, argue that the use of these materials has declined with the departure of European missionaries. Others refuse to use them because they entail higher costs. For instance, the use of burnt clay roofing tiles requires large sections of timber trusses.

[8] Evidence exist to suggest that social prestige makes some individuals hire labour for specific types of jobs, particularly manual ones (Oliver 1987, 70; Hino, 1971). Such traits arise from one social group considering itself progressive, more civilised and hence modern to the extent that it relegates such jobs to another social class it considers of lower social standing. The Indian caste system about the untouchables is an excellent example.

[9] Schwerdtfeger (1982) and Prussin (1974) also note that the art of housing construction in some West African countries is an inherited trade for specific families or tribes.

4.3. The Quality of Building Materials

As the above results suggest, the acceptability of low-cost building materials is also affected by their generally poor quality. There have been many cases of defective low-cost building materials such as soil/cement or even sand/cement bricks (Kulaba, 1986). This is also the case with burnt clay bricks and roofing tiles. Although most of these building materials are inherently of inferior quality, the aspect of quality is further exacerbated by a lack of know-how related to poor mode of production. In order to improve the quality aspects, these materials need perhaps to be produced in controlled environments rather then in field kilns.

Yet, burnt clay roofing tiles from the Zuzu plant in Dodoma, for example, have been found to be defective despite the fact that they were produced in a controlled environment. Many roofing tiles produced at this factory leaked. Almost all houses that were roofed with these tiles had to be starked with corrugated iron sheets in order to prevent further leakages.

Poor quality only helps reinforce the scepticism about the generally low performance of low-cost building materials, thus further limiting their acceptability. At the Mbeya Ceramics Institute, we were shown defective roofing tiles produced using a manual machine. Since the machine was manually operated, there was no way of ensuring that the pressure that was being applied was constant throughout the day. As labourers got tired, the pressure applied got less and less, hence producing irregularly shaped tiles.

5. Discussion

In the following discussion we propose to use the results of this study in order to evaluate the success or failure of ONB. This will set the ground for the formulation of a conceptual framework based on people-environment interaction.

5.1. Some Major Implications

What significant lessons can be learnt from this study? On the one hand, it fully supports Rapoport's argument (1969, 25) suggesting the need for revisions on the general belief that equates technological advances with material progress without thinking of the social consequences of such advances. This implies that social values take precedence over technological advances.

On the other hand, the study suggests that, in order to introduce not only a new technology, but also a new material, strategies must be developed to overcome social inertia from people such that effective change can be both socially and culturally acceptable and desirable. Mboya (1969), for instance, argues that, when any innovation is introduced too rapidly and without appreciation of social adaptation, resistance may solidify. The innovation may eventually be rejected and effective change may be nil.

The choice of building materials reflects competition for status and the desire to demonstrate affluence and personal distinction by building one's house as both a tangible and intangible object. Any choice process involves the ability to perceive and evaluate the role that the object will perform. This also applies in the choice of building materials where various components of the building materials such as physical aspect, toughness, or sturdiness are matched against the image they will present outsiders concerning the social standing of the owner.

As we have argued, what this means is that there are certain building materials which are perceived as inferior, not necessarily in functional terms, but because of the image they convey. Also, for many people, building materials such as stone and concrete convey the image of 'ever-lasting', or indestructible, for both users and observers (Becker 1977, 2; Sadalla *et al.* 1980).

Our study data also suggest that other factors hinder and delay efforts to encourage large-scale acceptability of low-cost building materials. The most notable one is related to users' changing values resulting from a number of environmental variables. For instance, socialization and cultural contact have contributed to disintegration and rejection of many of the traditional values and norms. This prejudice has also influenced the choice of building material.

Urban planning and building regulations disallow the use of low-cost materials in urban areas (see, for example, Macoloo, 1988, 171; Ofori, 1985, 73). As mentioned in the introduction, local politics and propaganda have similarly contributed to increased prejudice against the use of low-cost building materials. Almost everywhere, both colonial and independent governments have made attempts at encouraging people, urban dwellers in particular, to use modern building materials.

For many people a better house is one that is built of modern building materials (See Tanzania, 1981, 33, 35). These are most desirable and fashionable building materials. Various attempts by many governments to shift this perception have had very little success.

Now, because of the hard times facing the building materials industry, most governments are advocating the use of low-cost building materials. It can be argued that this 360 degree shift in attitude by most governments, encouraging the use of low-cost building materials, has probably been introduced prematurely. That is, in many of the developing countries not every one has had the opportunity to make use of those building materials associated with *Western* values.

In some developed countries, the reverse is now taking place. For example, mud houses that were once regarded in derogatory terms, are now perceived as signs of social prestige (Dether, 1982). This has been possible mainly because, in these countries, almost every one has had a taste of both 'worlds'. People are now in a position to decide which of the two materials is the best, taking of course in consideration climatic conditions. Thus, there is an increasing campaign to discourage the use of cement and corrugated iron sheets for housing, particularly in hot, dry and humid tropical climates.

As mentioned above, the Tanzanian government expected that by allowing the use of low-cost building materials, even in urban areas, many people would be motivated to improve their housing. However, several findings of our study point to the opposite. Although no evaluation of ONB has been made as yet to establish its success or failure, available evidence strongly suggests that the impact of the operation has only been modest (See, for example, Caplan 1981, 98). Several reasons account for this modest success, namely:

(i) many of those in the RCUs were incompetent and ill-prepared (Tanzania 1982, 22);

(ii) inflation and the general shortage of building materials meant that very little building material could be purchased from the approved loans of up to Tshs. 5,000; and

(iii) the nation-wide campaign for adult education made many people reject bad houses, but also traditional building materials.

The line of argument developed and pursued in this paper is one that stresses that people choose building material so as to enhance their self esteem. Specific associations people make about the tangible and intangible characteristics of building materials serve to define personal or group identity. Thus, environmental variables can help understand building material choices as a desire for both self-identity and acceptance, in a given space and time. From the findings of this study, it can be argued that the selection of building materials by informants is based on more than simple cognitive associations and entails mutual and dynamic interactions with the environment.

5.2. Conceptual Framework

Everyday individual experiences are characterized by choices. People constantly make choices as to what shoes or clothes to wear, where to go for recreation, where and what food to eat. Most significantly, choices take place in a specific environment and time. In turn, such environments have the ability to determine the type of behaviour, lifestyle, and activity which can take place within them. On the basis of this interaction between people and their environment choices can be understood. What is more, the interaction is reciprocal and changes over space and time.

Consider the following two cases. First that of a person who moves from one physical setting to another, such as through migration, say from a rural to an urban setting. Once she/he has reached a new destination, her/his behaviour can, at best, be compared to that of a person who joins a new club. Assuming that the new member is unfamiliar with the club's governing regulations, it will still be expected of him/her that he/she will strive to behave in such a way that his/her behaviour conforms to that of the dominant group. This is necessary for the new member in order to be accepted by the older members. In the same way, a specific environmental quality, which communicates both sensory and psychological meanings, will exert enormous pressure on the migrant to build according to the dominant characteristics of the buildings already there.

The second case is that of someone who walks into a shop with the intention to purchase a shirt from a wide range of shirts and prices. The choice behaviour of such a person will be determined by a number of factors such as fashion, colour, size, the quality of the fabric, the price range and so on. After weighing all these factors, the client then makes what he/she thinks is a rational choice. Of course, in this rational choice other shirts are discarded. The question then becomes: Why is it that this particular shirt was chosen amongst several shirts of similar size, colour, quality and price? Generally, clothes are associated with protection of the body and other private parts; but they are also connected to matters of fashion and status symbolizing the entire social order. One of the main issues in choosing a shirt has to do with the wish to conform to the fashion of the time and place, and this entails a concern for status and social identity. Clothes are intimately linked with the self and express an image of the physical body; so do building materials. The individual, whether consciously or not, chooses those building materials which will express the best image of his self, albeit within financial and availability constraints.

This then brings to mind the following question: What specific or symbolic meanings[10] do different people associate to their various material possessions? How influential are these meanings in the choice of building materials?

Symbolic meanings are of two types. The first is a judgment about what an object is and the second is about the connotative meaning an object acquires beyond its functional use (Nasar, 1989, 236-7). It is the second meaning, related to the non-function, that is more relevant for this study at a theoretical level.

6. Theoretical Analysis

A house, as an artifact, is built by using a variety of materials, mainly as a place for shelter, and more significantly, as an object which is intended to satisfy a variety of needs. To satisfy the primary function of shelter it is true that building materials have to meet functional requirements for safety, stability and comfort; but empirical and secondary data also suggest that materials are selected with other, non-functional, requirements in mind. As Jennings (1981) has shown, these requirements may range from convenience to socio-psychological aspects. More importantly, houses, of which building materials are major constituents in a dwelling structure, express the interaction between people and their environment.

Also, housing standards express potentialities for building material choices and reflect the building skills endowed in a given society. Although these are mainly secondary objective attributes, they are a part of various environmental variables. Meeting secondary objectives is also imposed by the need for conformity with environmental qualities in a given space and time. For example, the need to be within the legal framework applying is very important. Through a decision making-process, individuals match and then discriminate other alternatives in a given choice set.

According to the findings of our study, the need to satisfy subsidiary requirements, although remotely related to the primary functions, is very important in the individual's choice of building materials.

Despite and because of the high costs associated with the production and consumption of modern building materials, the use of cement and corrugated iron sheets in housing is linked with issues of social identity. The use of such materials has little to do with their local availability, or affordability; it has a high positive connotation related to status, progress, and modernity. Since these materials are very conspicuous, they indicate a deliberate intention, whatever the price, of showing one's status. Through political and legal institutions many governments have endowed the use of these materials with symbolic significance, so that they have become, for many people, essential components of social and cultural life.

7. Conclusions

This paper has used empirical data to highlight the role of environmental variables people interact with and their influence on the choice of building materials. We have shown that issues of social prestige and identity are normally instigated by the desire to be congruent with one, or more, environmental variables. As we have

10 For a detailed reading about the subject of 'meaning', the reader is referred to Rapoport (1982) and Csikzsentimihalyi and Robert-Halton (1981).

demonstrated, the need for fit has been, and will continue to be important in the choice of building materials. This paper has also shown that, given an opportunity, people will choose those building materials that suit them and that conform to the environmental variables of a given space and time.

We have also shown that individual choices satisfy tangible and intangible meanings of sensory and socio-psychological nature. Thus, choices express congruency with the individual, or group behaviour, lifestyles and aspirations towards specific social images. The findings of this paper strongly suggest that a material that does not portray a positive social image will be disregarded despite its relative availability.

Symbolic values take precedence over functional requirements (that is, safety, stability, comfort), cost and availability. This aspect will go on playing an important role, despite other constraints associated with inadequate technology and the unsuitability of such materials to climatic conditions.

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