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THE MARKET ENVIRONMENT FOR ARTISANAL DIMENSION STONE IN NAIROBI, KENYA

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Abstract

This paper reports on a study involving the market environment for artisanal dimension stone in Nairobi, Kenya. Taking the point of view of exchange relationships within a market systems framework it maps out economic interactions involving actors in this market such as suppliers of raw materials, producers, marketers and users of artisanal dimension stone. This strategy enabled the study to understand the enabling environment for the production and use of artisanal dimension stone that is characterized by the following factors: a rising population that sustains the demand for the built environment products, a vibrant construction market, building regulations that favour the use of stone, availability of cheap and abundant unskilled labour and low standards of stone finish involved, availability of natural rock, a regulatory system that can compromise, lack of support by government institutions and an informal system of transaction that is non-compliant with conventional requirements such as labour and environmental laws but ensures ease of entry into the market environment. Such understanding brings potential for rectifying the negative perceptions about this market environment through policy development and change.

Key words: artisans, dimension stone, exchange relationships, market environment, micro enterprise, Nairobi, Kenya

Introduction

In construction parlance stone is used to refer to a piece of rock detached from the Earth's crust for use as a building material. One of the forms stone can be used in building construction is dimension stone—referring to 'natural rock which has been selected cut and worked to a specified size or shape' (Ashurst and Dimes 1989: 115). Going by the definition of artisanal materials by Wells and Wall (2003) as materials produced by individuals who use methods based on hand tools with simple division of labour and little capital equipment, artisanal dimension stone, therefore, refers to building stones of regular dimensions that have been extracted and worked by hand as opposed to machines.

Since time immemorial, artisanal dimension stone has been used for constructing buildings in many cities and countries of the world to the extent that it is considered a traditional material in such cities and countries. Although it had been used in the construction of buildings in the pre-colonial cities of the coastal region in Kenya e.g. Mombasa, Malindi and Lamu such is not the case for Nairobi where dimension stone was introduced about a century ago through colonial intervention. Prior to this the traditional or artisanal materials used for the construction of buildings by the local communities in the Nairobi area such as the Maasai included twigs, mud, cow dung and cow hides (Rukwaro and Mukono 2001).

Upon establishing Nairobi as the Railway headquarters and the headquarters of the Colony, the European settlers quickly found out that their newfound settlement was endowed with natural rock suitable for use as building blocks. This resource whose geological identity has been given as Kerichwa Valley Tuffs or the Nairobi Stone (Williams 1967) was the main material of which the early colonial Nairobi was built. Some of the earliest buildings within the central business district constructed of the Nairobi Stone such as Kipande House and the Provincial Commissioner's Office have been declared national monuments.

This paper examines the current exploitation of natural rock deposits by artisans in their endeavour to produce dimension stone for sale in the building industry of Nairobi. A sample of dimension stone produced by these artisans is shown in Plate 1. The paper is based on a wider empirical study concerning the business environment associated with the use of

artisanal dimension stone for constructing the walls of buildings in the city. The research is a follow up on a group of studies under the aegis of ITDG¹, which had noted an expansion in the use of artisanal materials in African cities including Nairobi (see Wells and Wall 2003 and Wells 2000). Although the scope of the main study was cast wide in the business environment, this paper only reports on the exchange relationships—what it terms the market environment.



Plate 1: A pile of artisanal dimension stone ready for buyers at one of the sites in Miarau quarries.

The paper applies the marketing systems framework (Figure 1) to capture all the variables that compose the market environment for the artisanal dimension stone. The market environment is characterized by exchange relationships between the key players such as suppliers of inputs for manufacturing the product, the manufacturer of the product and the buyers of the product. These exchange relationships are also governed by several forces that come into play in the market environment. The marketing systems framework forms a conceptual map upon which this paper traces these exchange relationships for a better understanding of the economic issues surrounding the use of artisanal dimension stone.

The Marketing Systems Framework

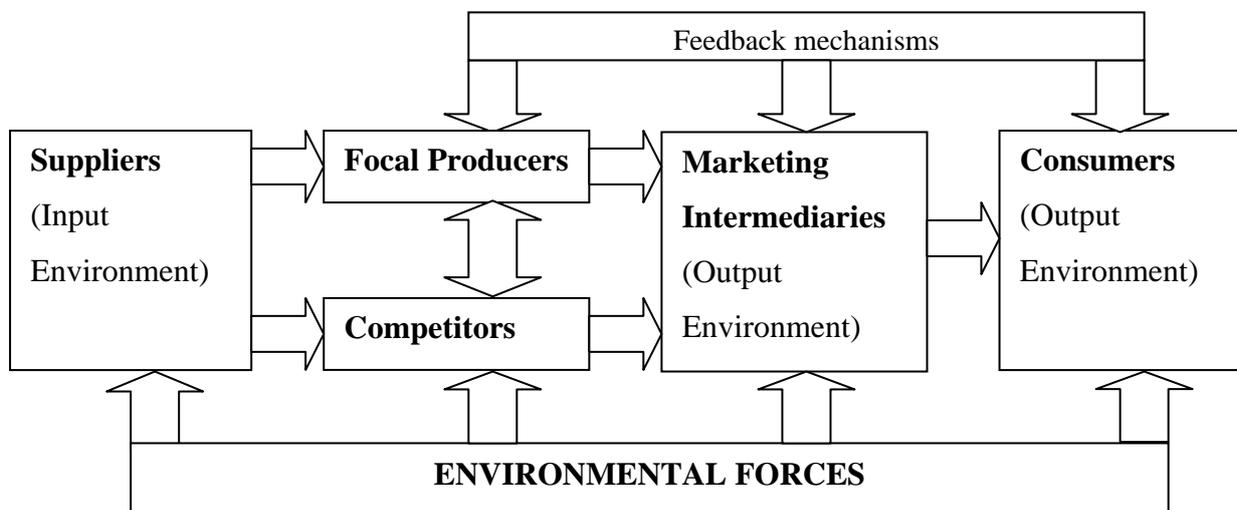
The marketing systems framework of Kotler and Armstrong (2010) is applied as a heuristic technique in this study to model the market environment as shown in Figure 1. The concept of market in this case applies to a set of actual and potential buyers of a product who have a particular need or want that can be satisfied through exchange relationships (Kotler and Armstrong 2010). In order to obtain a clearer understanding of exchange relationships, distinctions have been made in the literature between it and communal relationships see for

¹ ITDG stands for the Intermediate Technology Development Group, of Rugby UK—currently known as Practical Action

example Clark and Mills (1979). Unlike the communal relationships where benefits are given without quid pro quo, in exchange relationships, the parties concerned in a transaction ‘give benefits with the expectation of receiving comparable benefits in return or in payment for benefits previously received’ (Clark et al. 1986: 333; see also Clark et al. 1998).

This study examines the exchange relationships generated by the use of artisanal dimension stone in Nairobi. The term use in this case concerns a consumption process that involves the application of artisanal dimension stone in masonry (a walling material in the construction of building). Within this context, because use generates the need for production, the exchange relationships generated go far back to include the marketing intermediaries and suppliers of inputs for the production of artisanal dimension stone. This perspective is necessary because studies that have been undertaken on the subject matter have not considered the exchange relationship aspects in such a comprehensive manner.

Figure 1: Main elements of the market environment



Source: After Kotler and Armstrong (2010: 32)

In the marketing systems framework (Figure 1) the elements of the exchange relationships that constitute the market environment for a product can be broken down into: the suppliers; focal producers and competitors; marketing intermediaries; consumers and; environmental forces. In this study the suppliers refer to individual or group entities that avail inputs to the producers of dimension stone. For purposes of the production of artisanal dimension stone the research established that the inputs include natural rock, equipment, and labour.

The focal producers on the other hand refer to the organizations that this study focuses on i.e. all the artisanal units engaged in the manufacture of dimension stone in the study area. Their competitors include all other manufacturers of building materials used in wall masonry in the Nairobi market such as machine-cut dimension stone, concrete blocks, bricks, timber walling etc. However in this case we limit the scope of the market to dimension stone hence the competitors may be grouped under producers of machine-cut dimension stone. Therefore both the focal producers and competitors can be referred to as producers of dimension stone. On the other hand consumers are the final end users of the product under study i.e. dimension stone.

According to Kotler and Keller (2006) in most cases producers do not sell their goods directly to the final end users. Between the two there are a number of intermediaries that perform a variety of functions. These intermediaries may include wholesalers and retailers, brokers, transporters et cetera. The exchange relationships among all these actors in the market environment i.e. suppliers, the producers and competitors, market intermediaries and consumers are determined by environmental forces or what Kotler and Armstrong (2010) termed as 'major environmental forces'. In this study the environmental factors are considered as part of the enabling environment.

Ethnographic research methods

The study relied on both secondary and primary data. Secondary data is mainly sourced from the national statistics publications. These include the Population and Housing Census data on the housing situation and the Statistical Abstract data on the building industry in Nairobi. Primary data, on the other hand, were obtained through ethnography. A fieldwork was conducted in order to obtain a real experience of the quarrying of dimension stone by artisans and, additionally, to triangulate the information obtained from the literature review where applicable.

A case study approach was adopted for data collection; but not used as a comprehensive strategy as suggested by Yin (2009). Currently there are three main clusters/areas involved in the quarrying of artisanal dimension stone for the Nairobi market i.e. Kahawa, Ngong and Njiru. In this research, one area (Kahawa) was chosen as case study for collecting data on issues concerning the market environment of artisanal dimension stone. The information obtained in the Kahawa case study can be assumed to be indicative of the situation in the rest of the clusters nonetheless unique differences may occur in specific areas. The Kahawa cluster is composed of three sub-clusters: Miharau, Kwa-Hinga and Zimmermann. A research team visited the quarries within these sub-clusters to collect primary data using ethnographic methods of interviews and field observations. The observations were recorded in terms of field notes and in terms of still photographs taken by a handheld camera. Plates 1-3 are examples of photographs recording the observations made in the field and included here to give the reader a fuller insight into the circumstances of the quarrying of dimension stone by artisans in Nairobi, Kenya.

While visiting the quarries open interviews were used to capture data on general issues and also detailed information on working practices and market activities. The interviews were conducted with the objective of informing this study on how marketing systems of artisanal dimension stone work, the actors involved and their relationships. Artisans found on site were asked a range of questions including whom their customers were and how they reached them, what prices they charge for their products, and how they transported their products. In terms of production, they were asked how they organized themselves for work, who played what role in the mining process, how they obtained permission to use the land, what formal or informal licences they got in order to quarry the stone, what type of building materials they produce, and what their inputs were. The interviews were carefully pre-planned, executed and recorded following good research practice. Responses to these questions may not be representative of the views of all artisans but give a realist view of the market environment associated with the production and use of artisanal dimension stone in Nairobi.

Additionally, by way of triangulation, the responses were cross checked against what was available in the literature base concerning stakeholders, their roles and relationship within the market environment as reported from the ITDG initiated studies. While conducting the

interviews on site, the researcher team was also able to triangulate the information from the respondents by making direct field observations, watching as stone was quarried, worked and sold off among other activities.

The information obtained has been critically analysed and the results of these combined methods helped in identifying the elements that characterize the market environment of artisanal dimension stone.

Exchange relationships between suppliers and producers

In the inputs market environment the fieldwork identified four basic factors involved in the artisanal production of dimension stones: natural rock, labour, entrepreneurship/finance or money and equipment. Natural rock excavated from the earth forms the main input. The natural rock, in most cases, is overlaid with red volcanic soil since the mining sites are former coffee farm lands. Between the soil and the rock there would be a stratum of murrum. Both are useful materials for the built environment, as the murrum can be used for infilling or road paving while the red soil is useful in gardening and landscaping. The dictionary meaning of murrum is that of reddish soil commonly used in Africa for paving roads (see Oxford Advanced Learner’s Dictionary)

The key actor in the production of artisanal dimension stone is the entrepreneur or the operator of the quarry who is responsible for initiating the activity by purchasing and assembling the necessary factors. The operator is the investor in the business of artisanal quarrying of stone. The operator’s role starts with payment to secure mining rights on a particular land that is endowed with natural rock. There is a premium payment made to the owner of the land where the land is privately owned or to an agency or government officer where the land is publicly owned. In the case of Zimmerman where quarrying takes place in public land without formal permission, an agency collects protection money some of which, according to the interviews with artisans, end up being paid to public officers. Payments may be in the amounts of Kenya Shilling 5,000 (for public land) and Kenya Shilling 10,000—50,000 (for private land). The premium payment will help the operator secure a measure of land on the ground to start quarrying.

Apart from the payments for land, the operator has to buy tools and pay for labour. The tools required are: excavation tools i.e. hand digging implements like mattocks, hoe, spades and hand-pushed wheel burrow and; rock cutting tools i.e. short chisels, long chisels, small and big hammers. The operator also pays for special services of the stone driller and the blaster; and may also have to employ a clerk in case (s)he is not going to run the quarry by her/himself at all times. Table 1 is a summary of the tasks involved in the artisanal production of dimension stone, the performers of these tasks and their modes and rates of payment.

Table 1: Performance and payment summary for stone quarrying tasks

Task	Performance	Payment Mode	Payment Rate
Removal of overburden	two men work together with hand Shovel and wheel burrow	paid per square metre	rate depends on depth of overburden
Drilling of holes for blasting	two men drill the hole manually using a 25-30 ft metal pole with a steel chiselled tip	paid per foot length of hole drilled	Kenya Shilling 30.00 per foot for rock; 25.00 for murrum
preparation of explosives and blasting	a licensed blaster is sometimes hired		

splitting and rough shaping of stone	a stone artisan/cutter breaks and roughly shape stone using hammers stone produced and chisels, assisted by a casual worker	paid per foot-run of stone produced	Kenya Shilling
clearing of wastes and piling of stone	done by casual workers	paid per day	
loading of stone onto truck	done by casual workers	group payment, divided according to number of workers participating	Kenya Shilling 50-100 per truck, depending on product

Source: Constructed with field information, see also Wells (2000, pp 30—31) and Wells and Wall (2003, p 331).

The official requirement for blasting is that a blaster licensed and supplied with explosives by the Department of Mines and Geology is to prepare the explosives and blast. In most cases, according to field observations, because only one blaster is available for many quarrying units he or his agent would sell the blasting materials and equipment to the artisans who would then go ahead to prepare them and blast. The blasting equipment consists of ammonium nitrate and a detonator (blasting cap) connected to a safety fuse. The going prices of these items at the time of the fieldwork were as follow. A cup full (vacuum flask cover is used!) of the ammonium nitrate was going for Kenya Shilling 40, a one and a half feet measure of the safety fuse was going for the same price while the detonator was costing Kenya Shilling 50.

Exchange relationships within the production units and for the output

At the centre of the marketing systems model are the production units flanked on either side by the input and output environments see Figure 1. In this case the producers are those enterprises involved in the quarrying of artisanal dimension stone. After examining the exchange relations with the external suppliers to the artisanal production unit, the internal exchange relationships are examined here in relation to the labour factor.

Artisanal production is a labour intensive technique relying on little use of machines or automation. Labour is therefore the defining factor of the industry. Both unskilled and skilled labour is applicable. Unskilled labour is required for excavation activities. Excavation is necessary for removing the overburden in order to expose the rock for blasting and cutting. Excavation is done using hand tools and equipments like: mattock, spades and wheel burrow. Unskilled labour is also required: Collection and piling of stones, loading of stones onto truck, helping hand for stonemason and clearing the foot of the rock for blasting. On the other hand, skilled labour is required for cutting the stone into proper dimensions. This is done using hand tools like chisels and hammers. The stonemason works with a hand man to help in leveraging and moving rock et cetera. Details of the payments due to labour are already given in Table 1.

After assembling all these resources through the exchange relationships, the operator will then be able to quarry and sell stones plus other products from the site. But every time the products are sold the operator will pay royalties to the land owner or agency per truckload of the product. On the output side, the fieldwork also identified products and by-products arising from the process of artisanal production of dimension stone. These are: dimension stone (main product), ballast, hardcore, red soil, murrum. The transactions involving the products and by-products of the artisanal production of dimension stone, as established by the study,

are shown in Table 2. The charges displayed in the table are for a seven-ton truck. For every truck load of the product or by product, royalty would be paid to the land owner reducing the operator's gain from the transaction by a similar amount. Dimension stone, however is not sold per truck but per foot-run depending on the dimensions of the stone being sold.

Table 2: operator's revenue and royalties for quarry sites and rates in Kenya Shillings

	Product	Zimmerman	Miarau	Kwa Hinga
Revenue	Dimension stone ²			
	Hard core	650	700	800
	Murram	500	700	800
	Red soil	500	700	800
Royalties	Dimension stone	300	600	800
	Hard core	100	250	300
	Murram	100	250	300
	Red soil	100	250	300

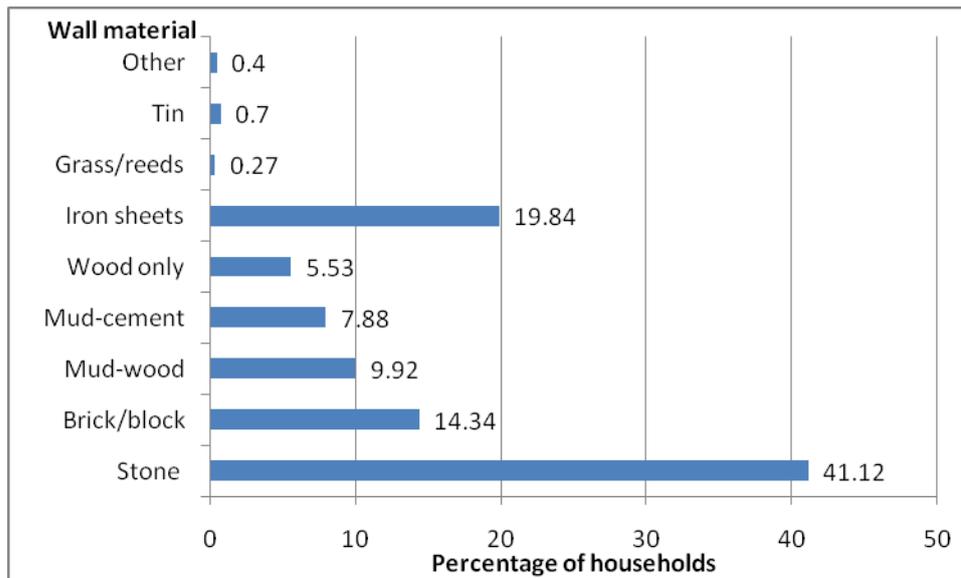
The sale price for dimension stone (see piles in Plate 3, for example) will vary depending on the type of stone (colour) and the dimensions usually 6" by 9" and 9" by 9". For instance, the price of a 9" by 9" block for the blue stone ranges about 24-26 shillings per foot run while the price of the 6" by 9" averages Kenya Shilling 14, according to the interviewees met on site.

Competitors in the wall masonry market

It is not possible to estimate the total number of buildings that have been constructed or that will be constructed with artisanal dimension stone in Nairobi. However, generally non-residential buildings are of machine-cut dimension stone masonry. For the residential buildings, the decennial census data can be relied upon to give an estimate. According to the 1999 census report on housing there are eight key materials used for the wall envelop of residential buildings in Nairobi: stone, bricks and blocks, mud and wood, cemented mud and wood, wood only, iron sheets, grass or reeds, and tin (Republic of Kenya 2002). Figure 2 presents the percentage scores of these materials according to the number of households occupying houses with walls mainly built of such material. This does not give the number of houses built of these materials but no doubt give an indication of their level of usage in residential construction for Nairobi.

Figure 2: Percentage of households according to type of main wall construction material in Nairobi

² Sold per running foot



Source: constructed with data from Republic of Kenya (2001: 5-1)

From Figure 2, it can be seen that stone is the material used to house most households in Nairobi at 41.12 per cent. Unfortunately the data does not distinguish between machine-cut and artisanal stone. At this juncture it is important to note that building regulations mainly allow stone and brick or block for wall construction. Section 52 the Building Code expressly states that: ‘All walls built of stone, bricks or blocks shall be hard, durable and suitable for the purpose for which they are used...’ (Republic of Kenya 1968: 27). The Building Code does not make provision for the use of any other material for wall construction. Hence the other materials used in wall construction as shown in Figure 2 are illegal or informal.

In the official context, therefore, the main challenges to stone in the market are the moulded materials i.e. bricks or concrete blocks. If this study is restricted to the stone market only, then the competitors of artisanal dimension stone producers for the Nairobi market are the machine-cut stone producers. These are located outside the city boundaries but whose products are transported into the city to be used in building construction. These operators are located mainly around the Juja-Thika area about 30-50 kilometres from the city centre. Plate 2 shows the product of the competitors.

Exchange relationships within the marketing channels

According to Kotler and Keller (2006) intermediaries constitute a marketing channel; also known as trade channel or distribution channel. Marketing channels can be defined as sets of interdependent organizations playing a role in the process of making a product available to the final user or consumer (Kotler and Keller 2006). Therefore the channels constitute pathways a product follows after production, culminating in purchase and use by the final end user (Kotler and Keller 2006). The list of intermediaries of a product may include merchants such as wholesalers and retailers, who buy, take title to and resell the product (Kotler and Keller 2006). In dyadic market analysis they are generally referred to as vendors. Other intermediaries include brokers, manufacturer’s representatives, sales agents, who search for customers and may negotiate on the producer’s behalf (Kotler and Keller 2006). Facilitators are another set of intermediaries for example transporters, warehousing providers, banks and advertising agencies who assist in the distribution process but neither take title to goods nor negotiate purchases or sales (Kotler and Keller 2006). This section

presents an analysis of the intermediaries involved in the use of artisanal dimension stone in Nairobi.

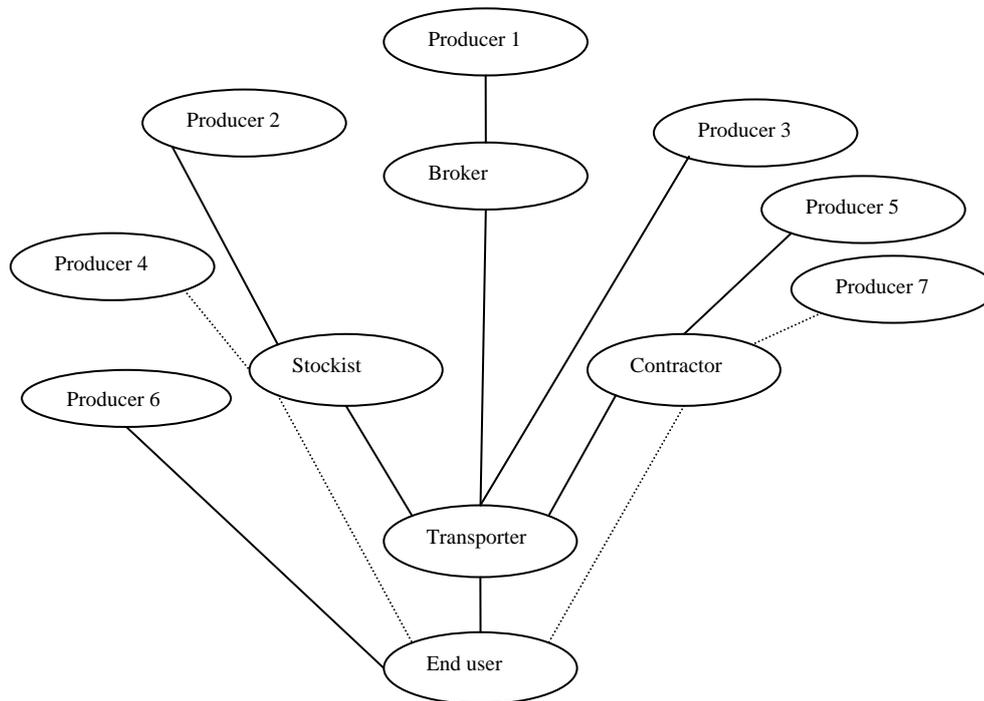


Plate 2: Machine-cut dimension stone at a stockist's yard in Kahawa, Nairobi.

The study established transporters, stockists and brokers as some of the intermediaries involved in the marketing and distribution of artisanal dimension stone in Nairobi. The transporters move the roughly shaped dimension stone from the quarry site on behalf of the buyer; to the building site in case of a developer or to the selling yard in case of the stockist. The stockists are a category of the merchant intermediary or vendor who may buy directly from the producers but, unlike the builders or developers, their intention is not to use but to sell or stockpile for eventual sale in their localities to final end users. Opinion may vary on their relations with artisanal producers who may sometimes see them as exploitative but stockists play a significant role in the supply chain of artisanal dimension stone. Given that artisanal producers generally operate under limited supplies of money, they cannot afford to keep stock of stones for a long time in the absence of ready buyers. In the absence of user buyers (builders) the stockists come in to buy the dead stock and unlock the producers' cash flows. Secondly, the stockists help to widen the distribution of artisanal dimension stone by taking it from the quarry to their yards where it can be sold to even piecemeal buyers, who otherwise would have not made it to the quarry, in small amounts that can be taken away in wheel burrows, hand carts or pickups.

For mapping out the possible pathways of artisanal dimension stone from the production point to the consumption (building) site, the study relied on the example of Wuyts et al (2004) on vertical marketing systems. Although considering a triadic perspective of vertical marketing systems, Wuyts et al. (2004) suggested that multiple analyses are possible for more than three tiers; hence this study adopted a polyadic perspective as shown in Figure 3.

Figure 3: The most probable polyadic configurations for artisanal dimension stone in Nairobi (without contractors and stockists sourcing through brokers)

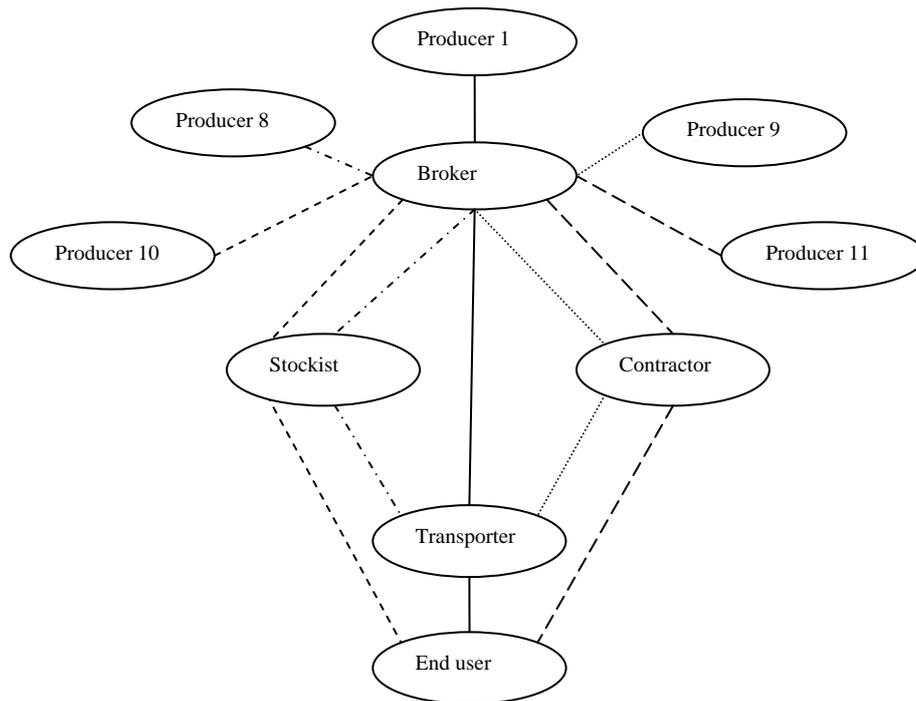


From Figure 3, seven most probable pathways can be identified:

- Producer 1—the artisanal production unit sells to a developer introduced by a broker and the developer hires transport services to haul the stone to the building site
- Producer 2—the artisanal production unit sells to a stockist (vendor) who hires transport services to haul the stone to the sale yard for resale to developers
- Producer 3—the artisanal production unit sells directly to a developer who hires transport services to haul the stone to the building site
- Producer 4—the artisanal production unit sells to a stockist (vendor) who uses own transport means to haul the stone to the sale yard for resale to developers
- Producer 5—the artisanal production unit sells to a contractor who hires transport services to haul the stone to the building site
- Producer 6—the artisanal production unit sells directly to a developer who uses own transport means to haul the stone to the building site
- Producer 7—the artisanal production unit sells to a contractor who uses own transport means to haul the stone to the building site.

It is observable that within these polyadic configurations, triadic relationships (Producer 3, 4 and 7) and dyadic relationships (Producer 6) are also possible. Secondly, the distribution channels described for producers 1—7 do not involve cases where contractors and stockists source the dimension stone through brokers. These cases are in turn captured through Figure 4 as shown below.

Figure 4: the most probable polyadic configurations for artisanal dimension stone in Nairobi (with contractors and stockists sourcing through brokers)



From Figure 4, four more probable pathways can be added to the seven already described from Figure 3. These are:

Producer 8—the artisanal production unit sells to a stockist (vendor) introduced by a broker and the stockist hires transport services to haul the stone to the sale yard for resale to developers

Producer 9—the artisanal production unit sells to a contractor introduced by a broker and the contractor hires transport services to haul the stone to the building site

Producer 10—the artisanal production unit sells to a stockist (vendor) introduced by a broker and the stockist uses own transport means to haul the stone to the sale yard for resale to developers

Producer 11—the artisanal production unit sells to a contractor introduced by a broker and the contractor uses own transport means to haul the stone to the building site.

It is important, however, to note that the eleven marketing/distribution scenarios obtained from figures 3 and 4 are merely the most probable. In no way are they exhaustive of all the possibilities. Certain possibilities such as the producer using own transport means to deliver dimension stone either to the developer’s or stockist’s site have been left out. So too are situations where the producer is a self-builder and produces stone for own use. Concerning the first scenario, Wells (2000: 30) noted that: ‘The majority of concession holders [artisanal mining operators] cannot afford to invest in lorries to transport the stone to market. Stone transport has therefore remained a separate business’. From field interviews and observations, the study concluded that artisanal dimension stone is marketed/distributed through a kind of ‘pull strategy’ whereby the artisanal manufacturer does not have a sales machinery to push its product to the buyers but waits for them to come to the site to buy the stone after production. Therefore, the marketing options for the producer of artisanal dimension stone are limited.

Actual and potential customers for artisanal dimension stone

Developers or builders are the final end users of artisanal dimension stone, thereby forming the main customer base for artisanal dimension stone. They may differ according to whether they come from the formal or informal sectors of the building industry in Nairobi. They also may differ according to whether they are developing for residential or non-residential uses. As customers who use the final product in the construction of buildings, they have their agents. These may include architects, quantity surveyors, structural engineers and other professionals who can choose to specify or not the artisanal dimension stone as a building material on behalf of the developers. The contractors who work for the developers also fall under the category of agents.

In the formal process section 5 of the Building Code requires that the developer must first submit the proposed building's plans to the City Council of Nairobi for approval. Building construction should only start when and if approval has been granted. Rukwaro (2009) notes that the approval process is intended to ensure that the building being constructed meets certain minimum standards including those to do with the materials to be used. When construction of the building starts or is executed without first obtaining an approval, the development will be considered informal. It may not be easy to quantify informal development but studies by Wells (2001) and Huchzermeyer (2007) have indicated that such developments are rampant in Nairobi. In contrast to informal development, formal development can be quantified by counting the number of building plan approvals (according to K'Akumu 2007, this is the statistic that, in Kenya, may stand for building starts) or counting the number of reported building completions. Table 3 indicates the number of building plans approved by the City Council of Nairobi from 1998—2005.

Table 3: Number of building plans approved by the Nairobi City Council for development by private and public sector builders

	1998	1999	2000	2001	2002	2003	2004	2005
Private developers								
Residential	604	789	649	542	1,984	1,563	3,433	6,191
Non-residential	215	126	97	60	107	86	310	741
Public developers								
Residential	68	21	0	0	16	0	1	0
Non-residential	0	38	55	24	92	54	252	112

Source: Republic of Kenya (2007 p.147)

From Table 3 it can be seen that the building industry is active with both the private and public developments going on in both residential and non-residential sectors although the public sector is not as active as its private counterpart. The data shows that there are ups and downs in the construction of buildings within the formal process but the mere presence of building activities constitute a potential market for artisanal dimension stone. Similarly, the statistical source reported that in the year 2005, 829 residential and 8 non-residential buildings measuring a total of 256 and 244 square metres respectively were reported for completions (Republic of Kenya 2007). According to Wells and Wall (2003) artisanal dimension stone is mainly used in the informal development hence the formal sector forms a potential customer base.

The enabling environment

With regard to Figure 1, it has been noted that the environmental forces constitute the enabling environment for the study product i.e. dimension stone in this case. Kotler and

Armstrong (2010) pointed out that the ‘major environmental forces’ include demographic, economic, physical, technological, political/legal and social/cultural factors.

The demographic factors involve the fact that Nairobi’s population is growing at a faster rate thereby creating the need to build houses to accommodate the new households. The housing census statistics of 1999 indicate that the annual rate of household formation was 2.28 percent compared to the general urban rate of 2.085 percent and the overall national rate of 1.63 percent (Republic of Kenya 2002: 13). Apart from the need to build houses, the growing population also creates the need for other services thereby creating the need to construct non-residential buildings to accommodate the provision of such services. This situation has created a vibrant construction industry.

Table 3 has already given a hint on the kind of construction activities going on in Nairobi’s building economy. The presence of these activities in the industry actually constitutes the enabling environment for the production and use of the artisanal dimension stone. The fact that about 45 percent of residential housing is constructed of illegal materials as shown in Figure 2 and discussed below is another potent factor for enabling the production and use of the artisanal dimension stone in Nairobi.

As discussed below, the Building Code only recognizes stone, burnt brick or cement block for wall construction in Nairobi. This makes bricks and blocks the only competitors of dimension stone in wall masonry. According to Wells (2001) the liberalization of the economy following the implementation of structural adjustment policies has promoted the use of artisanal dimension stone in Nairobi. This is because previously it was cheaper to build in concrete blocks than to build in dimension stone. However the freeing up of cement prices resulted into steep rises. Cement is the most costly component in the production of concrete blocks hence a steep rise in its price meant a rise in the costs of concrete block production which rendered it less cost effective to build with concrete block as compared to dimension stone.

Another economic factor that favours the production of artisanal dimension stone in Nairobi is the availability of cheap labour. According to Taylor (2000) the use of dimension stone in masonry diminished considerably during the past century mainly because of increased labour costs that rendered the processes of its extraction, cutting, and dressing uneconomic. Whereas this may be true for the developed world, it does not apply to a developing country situation like Nairobi where labour is available in abundance and hence cheaply. Secondly, Wells and Wall (2003: 330) noted that ‘private sector clients building in the informal system tend to be less particular about the standard of finish than public sector clients building in the formal system with its more exacting standards’. Hence the working of artisanal dimension for use in building construction in Nairobi does not required highly skilled and paid manpower.

The major physical factor influencing the production of artisanal dimension stone is the availability of natural rock as a raw material that can be converted into a material for use in the construction of buildings. Geological information indicates that Nairobi is lying on bedrock of volcanic deposits (Saggerson 1991, Williams 1967). The deposits that are extensively quarried ballast is the Nairobi Phonolite (Williams 1967) while the ones quarried for dimension stone is popularly known as the Nairobi Stone; originally termed ‘Nairobi Claystone’ (Williams 1967, Sikes 1939). Then there is also the physical need of human beings to be sheltered from the hostile attributes of the physical environment.

The exploitation of these deposits is enabled by the use of artisanal technology that does not demand heavy investments both plant and machinery and human resources. It has been noted from Table 1 that the tasks involved in the excavation, breaking and cutting/shaping of stone are performed by of hand or by the use of simple hand tools. No machinery is involved. According to Wells and Wall (2003) these tools are manufactured, supplied and repaired by actors from the informal sector. The labour involved, on the other hand, is generally unskilled if not semi-skilled. This creates an ease of entry situation to potential investors in the production of artisanal dimension stone.

The legal environment is composed of regulators. These are government agencies which regulate the activities of artisans involved in the production of dimension stone. There is the local government agency (the City Council of Nairobi) that regulates the market of dimension stone according to the Building Code and the Public Health Act requirements that specify the type of building materials that may be used in the city. Because the Building Code specifies dimension stone as one of the materials to be used in constructing the wall of a building, to this extent the law enables the use of artisanal dimension stone. Nevertheless the City Council also taxes the products from artisanal quarries by imposing a cess on each truck load of building materials, thereby constraining the operations of artisans.

Apart from the City Council, there is the public environmental agency known as NEMA (National Environmental Management Authority) that has been constituted through the Environmental Management and Coordination Act. The Authority does not tolerate any environmentally damaging behaviour through any economic activities and has been trying to apply regulatory measures on the artisans.

The Department of Mines and Geology is another significant government agency involved in the artisanal production of dimension stone. As has been stated, the Department is responsible for licensing the blasters and for selling explosives to them to use in the artisanal quarries. The department therefore enables the production of artisanal dimension stone by supplying one of the main inputs in the production process. However one of the issues that came out from the interviews is that the Department never issues enough explosives hence some explosives that are used in the quarries are obtained from the black market.

At the local level, the fieldwork established that the Provincial Administration officers are involved as regulators. The officers involved include the Assistant Chief, the Chief and the District Officer. The Police Department is also involved in the disputes that sometimes pit rival gangs in the quarrying business against each other. The police are also available to sort out disputes that may arise in the transactions.

The enabling environment is also characterised by lack of policy support from the central and local government. For example, the infrastructures on which artisanal activities rely upon, such as roads, are neglected by local government agencies (see for example a section of the main road into the Miarau quarries shown in Plate 3). Yet the same agencies officially tax these activities. The fieldwork established that a cess of Kenya Shilling 1,500 is charged on every truckload of stone by the City Council of Nairobi. The greatest threat from the government agencies, however, involves imposition of a government ban on the activity as was the case with the Zimmerman site during the field visits.

On the socio-cultural side it can be observed that one of the factors constituting the enabling environment for the production and use of artisanal dimension stone is the culture of *jua kali* exchange relationships. *Jua kali* roughly means informal economy as described by King (1996) hence entails a set of exchange relations that are not familiar in the conventional world but that works for the participants. All the exchange relations involved in the production of artisanal dimension stone as described in the foregoing sections are conducted informally, including the land transactions are done in a *jua kali* manner.

Avoidance of conventional exchange systems works both positively and negatively for the artisans. The positive aspects of it are that it simplifies transactions, excludes legal costs to keep prices as low as possible. On the other hand the *jua kali* way avoids compliance with legal requirements such as labour and environmental management laws and other regulatory requirements that sets the artisans at loggerheads with the regulatory authorities. However concerning the economic costs to the artisans in going the *jua kali* way is their loss of the formal market customers who are unwilling to rely on non-conventional exchange relationships with the artisans.



Plate 3: A section of the main access road into Miarau quarries.

Implications for economic policy and development

The study has noted that the attribute of dimension stone as a permanent material makes it acceptable under the building regulations for construction work whether it is obtained by artisanal means or not. The census of housing statistics quoted in Figure 2 showed that approximately 40% of families in Nairobi live in houses with walls built of stone (Republic of Kenya 2001). One of the weaknesses of the statistics, in this case, is that they do not identify the proportions of artisanal and industrially mined dimension stone used in building construction in Nairobi. Nevertheless it can be seen that dimension stone is a significant material for wall construction of residential buildings in Nairobi. This implies that,

potentially, artisanal dimension stone can contribute significantly to the development of housing in Nairobi if the sourcing is recognized, supported and developed.

Other artisanal materials that can be identified from official statistics sources include: grass, tin³ and *makuti* (palm fronds) for roofing; earth for floor; and stone, mud/wood, mud/cement, iron sheets, grass/reeds, and tin for walls (Republic of Kenya 2001). Most of these artisanal materials are not accepted by the building regulations for Kenya and Nairobi owing to their temporary or semi-permanent nature and hence are mainly used in the informal settlements; which makes dimension stone unique for being the only artisanal material that can be used in both formal and informal settings. This gives artisanal dimension a potentially wide reach in the building industry and the building materials market. Given this potential artisanal stone has for building in Nairobi, it is significant to study its production and marketing by artisans who are at the lower scale of social or industrial structure as this could improve their contribution to the social and economic development of the nation.

By analyzing the exchange relationships involved in the use of artisanal dimension stone the study is able to unravel the vertical economic inter-linkages that characterize this phenomenon in a developing country situation. The production and distribution of artisanal dimension stone provides several micro enterprise development opportunities both in terms of micro investment and micro financing. In the input environment, micro investors include the quarry operators, drillers, blasters, food vendors among others. Micro investors in the output environment on the other hand include transporters and stockists. Transporters invest in trucks and employ drivers and turn boys to haul artisanal dimension stone from the quarry to required destinations while stockists are sort of middlemen who buy artisanal dimension stone to stockpile in their yards or material shops. Micro enterprises are significant players in the developing economy Kenya included (Liedholm and Mead 1999). Therefore the micro enterprises functioning within the market environment of artisanal dimension stone, like micro enterprises in other sectors or sub-sectors, require policy support and development. Opportunities for micro financing potentially exist because all these micro investors would require some type of financing or other but this is not yet possible especially for the enterprises involved in the production since there is lack of official recognition of their activities that are sometimes affected by government bans.

The production and use of artisanal dimension stone has a great potential for contributing to local development to the extent that it uses local resources and fulfills local needs. The study has documented the use of natural rock, local labour power and skills, locally made tools and equipment in the production of artisanal dimension stone. Perhaps the only item that needs to be imported for the production of artisanal dimension stone is the explosive; all the rest are available locally. Stone being a heavy building material is used in local construction thereby satisfying local demand and needs. This development scenario leads to wealth creation at local levels since little money or less benefit is lost to the outside through the sourcing of inputs or external value addition to outputs. Unlike machine cut stone, the hand cut stone may require further dressing on the building site thereby further utilizing locally available skills. This makes a strong case for policy recognition and support for artisanal dimension stone.

³ Tin is not a conventional material in this context but refers to sheets of material salvaged by artisanal means from containers and used for roof or wall cover.

The contribution of the production and use of artisanal dimension stone to employment creation has turned out to be significant. Following the discussion of the micro investment opportunities, it can be noted that each micro investor identified would employ at least one extra person all who add up to employment opportunities. The employment opportunities provided, although temporary in nature, have the potential to play a significant role in livelihood support and poverty reduction. The production and use of artisanal dimension stone also exhibit some potential for social development. By employing excess and unskilled labour who otherwise would have turned to crime in an urban set-up, the activity is a significant social factor. Secondly, social ills associated with artisanal and small scale mining such as child labour and prostitution were not observed in the case study area. All stakeholders should therefore take the activity seriously.

Four decades ago Kotler and Levy (1969) sought to broaden the concept of marketing by arguing that all organizations, whether business or non-business, are generally concerned about target consumers' perception of their products hence marketing becomes an activity aimed at increasing the perception of the said products. The concept of product was not limited to goods and services but may include personalities, organizations and ideas. In this case dimension stone is both a good and an idea. As an idea, for example, artisanal dimension stone is not appealing to certain stakeholder groups such as regulators and the modern/formal sector actors for various reasons including its association with rudimentary technology and environmental degradation. Therefore social marketing as defined by Kotler and Roberto (1989) may be an ideal solution to the negative perceptions of artisanal dimension stone.

This study is partly an attempt to do the social marketing among scholars who have not been paying attention to this aspect of the construction economy, the policy makers and the industry players at large. It does this by casting the production and use of artisanal dimension stone as a significant phenomenon in the construction economy that needs to be understood well by stakeholders in the in the industry. From this juncture onwards other development partners can take over the promotion of the use of artisanal dimension stone.

Conclusion

The study has explored the market environment of artisanal dimension stone with the basic intention of obtaining a preliminary understanding of the subject matter from an exchange relationships point of view that so far has been lacking in the existing literature. The marketing systems framework adopted as a heuristic device in the analysis of the market environment associated with the use of artisanal dimension stone allowed the study to analyse exchange relationships and bring up the economic issues surrounding the phenomenon. This has demonstrated the potential and limitations of the use of artisanal dimension stone in promoting micro enterprises, employment and shelter construction, among others. Appropriate policy to address the potential and limitations in the production and use of artisanal dimension stone has therefore been recommended including the need to change the negative perceptions of some market actors like regulators, formal sector users and industry researchers. Such change of perception would be of great significance to the housing situation in Nairobi for addressing issues involved in material production, distribution and use. Local research has shown that, in the construction of buildings, materials are the highest contributor to unit costs (Kenya Building Research Centre 2006). Sorting out the economic issues involving the production of artisanal dimension stone therefore entails the potential for enhancing its role in shelter production in the city, among other benefits.

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