An investigation of the design and construction problems in Nigeria

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Problèmes de projet et de construction au Nigéria

Entwurfs- und Ausführungsprobleme in Nigeria

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SUMMARY
As with Nigeria, the author presents the particular problems of an oil exporting developing country, in the face of a gigantic construction programme. The problems of delay in construction following an insufficient infrastructure and the explosion of construction costs caused by inflation are also considered.

RESUME
A l'exemple du Nigéria, l'auteur cherche à présenter les problèmes particuliers d'un pays en voie de développement, exportateur de pétrole, face à un gigantesque programme de construction. Les problèmes de retard dans les délais d'exécution, à la suite d'une infrastructure insuffisante sont évoqués, de même que l'explosion des coûts de construction occasionnée par l'inflation.

ZUSAMMENFASSUNG
Am Beispiel von Nigeria versucht der Verfasser, die besonderen Probleme eines ölexportierenden Entwicklungslandes bei der Bewältigung der zahlreichen, grossen Bauaufgaben darzustellen. Besondere Beachtung werden dabei den Problemen der zeitlichen Verzögerung der Bauzeit infolge ungenügender Infrastruktur und der Explosion der Baukosten infolge Inflation geschenkt.

1. INTRODUCTION

Before discussing the problems of the building industry in Nigeria, it is necessary to mention some of the fundamental geographical features which may have a direct or indirect influence on this subject matter.

With an area of around 92 million ha., the Federal Republic of Nigeria, Fig. 1, is the largest country on the west coast of Africa. Based on the 1963 census figure, the projected population of about 80 million in 1976 makes it the most populated country in Africa. There are three areas of high population density.

It lies between longitudes 2° and 15° east of the meridian and latitudes 4° and 14° north of the equator. Owing to its latitudinal extent, Nigeria has varied physical conditions, human types and economy. In general, rainfall diminishes from the south-east and south, towards the north and north-east. In the south-east there is an excess of rainfall all the year; in the north there is adequate rain only in two or three months of the year. There is also a corresponding vegetational range.

There is a great variety in human outlook and organisation. This is evident between the four main groups - Hausa and Fulani in the north, Yoruba in the south-west and Ibo in the south-east. The size and variety of the Federation is likewise reflected in its varied economic resources. She is one of the few large timber exporting countries of West Africa, and is rich in mineral resources.

2. BOOM IN THE CONSTRUCTION INDUSTRY AND PRESENT PROBLEMS

As the world's eighth largest exporter of crude petroleum, Nigeria as well as other members of OPEC benefited from the recent increases in world oil prices. The so-called "oil-money" has reflected in the economic strength of this fast developing country. With the large revenue available in the country, the need for its inhabitants to acquire improved housing and living conditions are growing rapidly. The Federal Government has recognised these needs and is making every attempt to improve the present situation. As a result of this, the Third National Development Plan, 1975-1980 (Table 1), has called for a total investment of about £20 billion. Almost half of this will be spent on construction.

Naturally, the sudden boom in the construction industry of Nigeria is creating various problems. Although these problems[1] are numerous and diverse in nature, the most serious ones are discussed in this section.

2.1 Demand for Foreign Expertise

Although Nigeria has numerous highly qualified indigenous Contractors, Engineers, Architects, Quantity Surveyors and other allied professionals, the present construction boom calls for additional foreign expertise. As stated in the Plan, "while serious effort will be made to assist indigenous contractors to improve their skill, it will be necessary during the Plan period to continue to attract a good number of reputable foreign contractors into the country to augment the overall construction capacity". The shortage of indigenous expertise could also be illustrated by a keynote address to the Commonwealth Association of Architects' Conference held in Accra in 1976. Speaking at this occasion, the Nigerian president of this Association, Mister Oluwole Olumuyiwa, said that the quality of

African architectural expertise was as good as anywhere else in the world, but pointed out that, while it is true that there is acute shortage of architects in Africa, it might not be correct in respect of quality. Although his reference was to Architects, the situation is the same for most Nigerian construction and design expertise.

The principal problem in employing foreign expertise is their lack of previous knowledge of the social, climatic and economic conditions[2] of Nigeria. These problems range from small projects, where foreign staffs are employed as supervisors, to multi-million Naira (N) complex projects, where foreign firms or consortia are engaged as main consultants or contractors. Basically, the lack of tropical design experience and construction methodology seems to be a major handicap to most foreign personnel and firms. As a result of this, buildings which portray European or other western culture and outlook are gaining ground. The adaption of unsuitable design technique and the choice of wrong materials give rise to the design and construction of buildings which may be found unsuitable in the foreseeable years.

These problems could be alleviated by the training of more Nigerian professional and technical staff, and financial support to able indigenous firms. Where foreign consultants are engaged for massive projects, at least a two-man team of Nigerian professional experts (either from the industry or from the University) should be appointed by the Government to oversee the general concept of the project and also to provide necessary guidelines at the design and construction stages. The Nigerian professional institutes, such as the Nigerian Institute of Architects, the Nigerian Institute of Building and others, should run "induction" courses for new foreign staff joining the construction industry. These courses should provide participants with sufficient materials for tackling the differing climatic, social and economic conditions in Nigeria as compared to their country of origin.

2.2 Construction Delays and Inflation of Building Cost

There is a great shortage of building materials in most parts of the country. This gives rise to hoarding, inflation and the use of inferior alternatives. The Plan recognises the shortage of building materials and aims at minimising existing bottlenecks. Effort is being made to increase investment in domestic production of cement and other essential building materials. The use of local materials such as burnt bricks will be vigorously promoted under the Plan to minimise dependence on imported substitutes.

However, as the industry depends heavily on imported materials, the delay in supply and scarcity of certain materials hinders progress on most sites. From Table 2 it can be seen that a large proportion of the materials needed in the industry for implementing the 5-year development Plan, will be imported. The summary of a recent survey[3] of building material prices in selected towns in Nigeria is shown in Table 3. It is clear from this Table that there is a wide fluctuation in material prices. The causes of these variations in prices were attributed to the following six main factors:

- Location of the local building material manufacturing industries
- Transport costs from sources of supply and sites
- Untarred and bad roads to hinterland
- Fuel shortages
- Degree of supply and demand at each location
- Excessive profit margins of the building material merchants.

These problems have been recognised by the Federal Commissioner for Housing Urban Development and Environment, Wing Commander Mouktar Mohammed. Further serious attempts are therefore being made to increase the use of local materials. It is hoped that the extensive use of Nigerian local materials will not only provide more cheap materials, but may lead to the production and development of more suitable building components.

2.3 Inadequate Statutory and Scientific Guidelines

As Nigeria was previously a British colony, there has been a tendency to rely on most standards and practices which were handed down during the colonial administration. These techniques inherited by the Nigerian construction industry are not generally suited to its climatic conditions. Although the British Standards Institute's publications (Codes of Practices and British Standards) are still widely used, the recent construction failures in Nigeria have shown that the behaviour of some materials, such as concrete, in temperate countries differs in some peculiar ways from its behaviour in tropical countries.

The need for adequate statutory and scientific guidelines to suit the conditions in Nigeria has been widely recognised. For example, a symposium on a new code of practice on the structural use of concrete in building was held in Lagos in April 1976. Speaking on the occasion, the Director of the Nigerian Standards Organisation, Mr. D. O. Ogun, stressed that the boom in the construction industries in the country has prompted the organisation to establish a building and construction technical committee of experts to provide guidelines on various building materials. After considerable research, a new code of practice for concrete structures has been produced by the committee. Research work is also continuing in most Nigerian Universities and other Government agencies to produce more relevant guidelines for the construction industry.

Although the growing catalogue of building failures, now reaching serious proportions, could be seen as symptomatic of fundamental problems in the construction industry, the blame for such failure does not lie within one sector only. In Nigeria, the Building Contractor is generally blamed for most of these failures, whereas the Architect, or Engineer, could have been responsible. It is therefore essential that a thorough scientific investigation be carried out before the cause of any failure could be established.

3. CONCLUSIONS

As the boom in the Nigerian construction industry has created a situation where local personnel and materials are unable to meet with the demand, it is essential that foreign expertise and materials are attracted into the country. The Government should, however, increase its efforts towards the training of local technical staff, and the use of local materials should be exploited.

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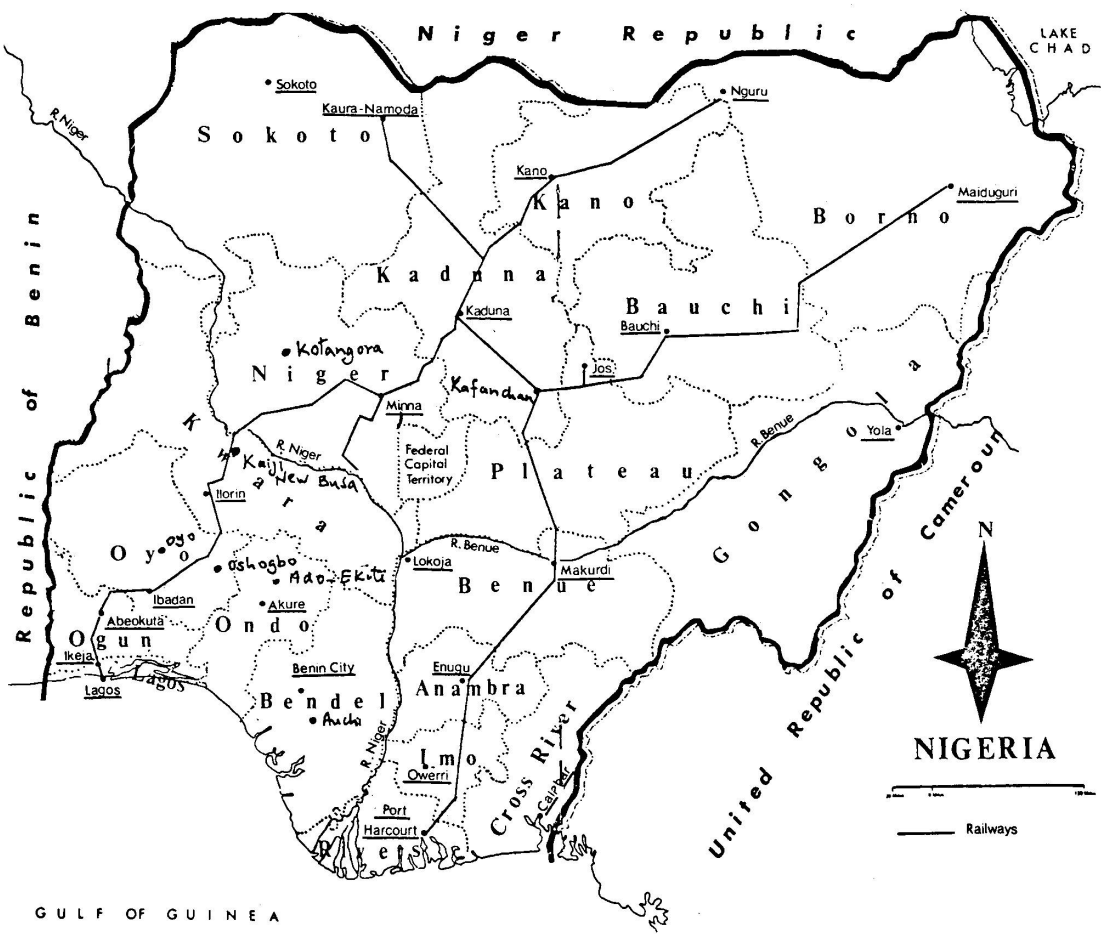

FIGURE 1: FEDERAL REPUBLIC OF NIGERIA

SUMMARY OF PUBLIC SECTOR CAPITAL PROGRAMMES 1975-80

Nmillion

Sector (1)	Total all Govts. (2)	Federal Govt. (3)	Total all States (4)	Benue-Plateau (5)	East-Central (6)	Kano (7)	Kwara (8)	Lagos (9)	Mid-Western (10)	North-Central (11)	North-Eastern (12)	North-Western (13)	Rivers (14)	South-Eastern (15)	Western (16)
A: ECONOMIC															
1. Agriculture	1,645.852	750.845	895.007	64.768	95.408	142.556	66.303	14.826	63.521	68.139	73.754	65.441	48.150	63.526	128.617
2. Livestock	344.046	173.176	170.869	10.314	15.227	24.682	7.299	17.090	8.383	12.280	20.801	20.080	5.700	10.648	18.365
3. Forestry	109.730	30.014	79.716	9.055	5.355	4.610	9.300	0.500	4.975	5.826	8.438	4.530	2.000	12.701	12.426
4. Fishery	101.554	58.561	42.993	3.367	1.398	1.600	1.700	15.451	2.289	0.100	1.397	0.751	5.538	5.639	3.763
5. Minings and Quarrying	2,680.425	2,680.425	–	–	–	–	–	–	–	–	–	–	–	–	–
6. Manufacturing and Craft	5,315.871	4,907.227	408.644	28.938	69.271	23.966	37.804	32.246	43.500	21.289	22.463	8.200	36.228	39.419	45.320
7. Power	1,075.238	932.038	143.200	12.000	10.000	8.000	15.000	0.200	10.000	10.000	20.000	20.000	8.000	10.000	20.000
8. Commerce and Finance	559.355	323.433	235.922	16.900	25.700	16.086	28.650	15.500	12.180	14.175	19.600	10.305	43.100	23.573	10.153
9. Transport	7,303.068	6,274.342	1,028.726	98.990	88.728	55.340	63.990	36.265	200.000	59.723	119.956	108.180	51.650	69.184	76.720
10. Communications	1,338.944	1,338.944	–	–	–	–	–	–	–	–	–	–	–	–	–
Sub-Total	20,474.082	17,469.005	3,005.077	244.332	311.087	276.840	230.046	132.076	344.848	191.532	286.409	237.487	200.366	234.690	315.364
B: SOCIAL															
11. Education	2,463.822	1,656.193	807.629	71.702	78.239	68.647	46.129	30.642	60.807	75.600	90.511	63.264	74.300	65.931	81.857
12. Health	759.928	314.160	455.768	30.670	62.621	32.430	28.500	53.901	39.690	23.810	42.900	30.550	34.805	22.850	43.041
13. Information	380.225	234.341	145.884	9.415	19.837	6.500	15.900	5.300	5.900	6.193	16.137	16.170	12.310	15.110	17.112
14. Labour	43.187	43.187	–	–	–	–	–	–	–	–	–	–	–	–	–
15. Social Development and Sports	139.603	24.950	114.653	8.148	22.592	6.203	5.760	19.266	3.920	3.770	11.501	6.751	9.350	8.778	8.614
Sub-Total	3,786.765	2,272.831	1,513.934	119.935	183.289	113.780	96.289	109.109	110.317	109.373	161.049	116.735	130.765	112.669	150.624
C: REG. DEVELOPMENT															
16. Water Supply	930.038	317.413	612.625	58.120	57.540	40.000	45.500	44.400	73.975	41.100	42.201	43.489	7.600	31.200	127.500
17. Sewerage, Drainage, and Ref. Disposal	428.495	154.499	273.996	9.706	28.000	13.240	6.000	70.000	58.000	9.200	7.500	4.500	26.000	4.600	37.250
18. Housing	1,837.430	1,650.000	187.430	5.000	20.500	30.930	8.000	11.000	30.000	10.000	18.000	10.000	10.000	10.000	24.000
19. Town and Country Planning	754.867	250.453	504.414	24.299	70.706	21.243	9.200	117.525	31.007	23.102	31.087	38.730	55.500	35.009	47.006
20. Co-operative and Community Development	193.294	16.187	177.107	12.782	17.000	17.773	6.500	35.344	11.851	10.548	23.516	16.644	1.200	13.655	10.294
Sub-Total	4,144.124	2,388.552	1,755.572	109.907	193.746	123.186	75.200	278.269	204.833	93.950	122.304	113.363	100.300	94.464	246.050
D: ADMINISTRATION															
21. Defence and Security	3,325.517	3,325.717	–	–	–	–	–	–	–	–	–	–	–	–	–
22. General Administration	1,124.128	709.210	414.918	24.809	35.955	46.421	25.250	34.960	27.092	36.617	39.866	50.472	40.877	34.160	18.439
Sub-Total ..	4,449.645	4,034.727	414.918	24.809	35.955	46.421	25.250	34.960	27.092	36.617	39.866	50.472	40.877	34.160	18.439
Nominal Total	32,854.616	26,165.115	6,689.501	498.983	724.077	560.227	426.785	554.414	687.090	431.472	609.628	518.057	472.308	475.983	73.477

TABLE 1 SOURCE: FEDERAL REPUBLIC OF NIGERIA
THIRD NATIONAL DEVELOPMENT PLAN 1975-80

ESTIMATES OF MATERIAL INPUTS REQUIRED FOR IMPLEMENTING THE PLAN

(1)	Unit (2)	Quantities, Public Sector: Housing Barracks Prisons (3)	Offices Hotels etc. (4)	Stores Warehouse (5)	Factories Shops (6)	Schools (7)	Hospitals (8)	Health Centres Clinics (9)	Roads Bridges Tarmac (10)	Water and Sewerage (11)	Miscellaneous (12)	Public Sector Total (13)	QUANTITIES Private Sector Total (14)	QUANTITIES Total Plan (15)
1. Cement	million tons	3.48	1.19	.38	.67	4.68	.42	.28	6.71	.85	95	19.61	3.46	23.07
2. Reimbursement	million tons	.92	.86	.01	.05	1.19	.11	.05	1.36	.24	.17	4.96	.92	5.89
3. Construction Timber	million cu. ft.	42.89	10.88	.28	.70	32.23	26.80	1.42	—	—	11.59	126.79	21.73	148.52
4. Joinery Timber	million cu. ft.	14.38	2.15	.03	.28	16.49	.80	2.03	—	—	02	36.18	5.74	41.92
5. Structural Steelwork	thousand tons	—	—	—	80.5	.1	—	—	460.0	45.0	..	585.6	195.0	780.6
6. Galvanised Pipes	thousand tons	45.8	8.9	—	1.1	38.0	5.1	.7	—	—	—	99.6	23.0	122.6
7. Copper Pipes	thousand tons	—	2.9	—	—	—	2.0	1.3	—	—	—	6.2	1.9	8.1
8. Extruded Aluminium Section	thousand tons	.8	8.9	—	—	—	1.0	1.5	—	—	—	12.2	7.0	19.2
9. Rolled Steel Section	thousand tons	179.2	2.9	—	2.5	68.0	2.0	—	—	—	—	254.6	34.2	288.8
10. Asbestos Cement Pipes	thousand tons	144.6	2.9	—	1.8	33.1	1.0	—	—	—	—	183.4	29.5	212.9
11. Pipes (Cast Iron)	thousand tons	—	—	—	—	—	—	—	—	81	—	81	—	81
12. Pipes (Steel)	thousand tons	—	—	—	—	—	—	—	—	63	—	63	—	63
13. Roofing														
(i) Felt	thousand tons	35	3	—	—	38	2	2	—	—	—	80	6	86
(ii) Asbestos Cement Sheets	thousand tons	42	—	—	7	233	5	7	—	—	—	294	16	310
(iii) Aluminium Sheet	thousand tons	7	18	—	70	15	3	—	—	—	—	113	235	348
14. Air-conditioning	thousand refr. tons	15	193	—	—	51	20	15	—	—	—	294	147	441
15. Electrical Installation	Megawatts	308	357	—	70	322	268	41	—	—	4	1,370	435	1,805
16. Flexible Floor and Wall cov.	thousand sq. yds.	6,877	709	—	..	338	201	308	—	—	7	8,440	2,903	11,343
17. Ceramic Floor Tiles	thousand sq. yds.	12,500	5,679	41	910	3,354	1,005	5,848	—	—	53	29,390	8,046	37,436
18. Ceramic Wall Tiles	thousand sq. yds.	8,223	7,967	85	210	4,120	623	446	—	—	74	21,748	6,885	28,633
19. Fibre Ceiling Sheets	thousand sq. yds.	6,216	3,433	—	—	17,996	482	1,047	—	—	33	29,207	4,980	34,187
20. Glass	thousand sq. ft.	36,830	17,279	28	1,575	60,434	3,752	2,430	—	—	156	122,484	25,118	147,602
21. Paint	thousand gallons	1,639	310	46	210	2,658	181	122	—	—	3	5,169	1,068	6,237
22. Sanitary Wares														
(i) Lavatory Basins	thousands	165	57	2	14	398	5	18	—	—	1	660	108	768
(ii) Sink	thousands	64	5	—	7	8	21	3	—	—	—	108	19	127
(iii) Water Closet (Clay Ware)	thousands	105	54	3	14	349	5	11	—	—	—	602	109	711
(iv) Urinal Bowls	thousands	—	12	2	2	190	1	2	—	—	—	209	16	225
(v) Shower Tray	thousands	—	—	—	—	—	1	1	—	—	—	2	—	2
(vi) Steel Sink	thousands	88	1	—	—	5,478	1	—	—	—	—	5,568	21	5,589
(vii) Steel or Cast Iron Bath	thousands	85	3	—	—	4,895	1	—	—	—	—	4,984	32	5,016
23. Bitumen	million tons	—	—	—	—	—	—	—	3.96	-	—	3.96	—	3.96
24. Aggregates	million cub. yds.	10.4	3.6	1.1	2.0	12.6	1.3	.8	144.2	4.9	5.5	186.4	10.3	196.7

TABLE 2 SOURCE: FEDERAL REPUBLIC OF NIGERIA
THIRD NATIONAL DEVELOPMENT PLAN 1975-80

	Materials	Unit/ Size/ Quantity	LOCATION AND PRICES (prices quoted in Naira)																	
			Lagos State				Oyo State			Ondo State			Anambra State	Rivers State	Bendel State		Niger State		Kaduna State	Kwara State
			Surulere	Igbobi	Ebute Metta	Ikega	Ibadan	Onogbo	Oyo	Akure	Ado-Ekiti	Owo	Enugu	Port Harcourt	Benin	Auchi	Minna	Kontagora	Kafanchan	Kainji New Bussa
1	Load of sand	1 tipper	34.00		34.00	23.00	20.00	12.00	12.00	11.00		12.00			25.00		12.00	12.00		
2	Load of gravel	1 tipper				75.00	40.00	17.00	18.00	28.00		30.00			70.00		34.00	34.00		
3	Ton of cement	1 ton	60.00	47.00	70.00	50.00	56.00	58.00	80.00	85.00	66.00	90.00	69.00	72.00	70.00	80.00	70.00	84.00	84.00	57.00
4	Roofing timber	cu. ft.					5.35	3.70	6.00	2.80		3.00	5.50	4.00			3.40	3.50	3.50	
5	Asbestos roofing	6′ long	5.00	3.00	4.60	5.00	4.40	2.65	4.00	5.50			6.85		6.80			6.50		
6	Asbestos ceiling	4′ × 4′	3.00	1.50	2.60	4.50	2.10	3.00		7.00		3.00			2.30	2.70				
7	Flush door			11.00	18.00	15.70	13.65	13.00	15.00	14.00			15.00	16.00		15.00		18.00		
8	Bath tub	5′ 6″	85.50	80.00	70.00		90.00	25.00			72.00	80.00	88.00	60.00	64.00			115.00		
9	W/C	1 No	44.50	45.00	42.00	45.00	50.00	54.00	45.00	45.00	52.00	58.00	52.00	40.00		48.00		55.00		
10	Kitchen sink	1 No	46.00	48.00			46.00				42.00	40.00	45.00		50.00					50.00
11	Emulsion paint	1 gallon	6.50	10.45	7.50	5.50	9.95	9.90	8.00	9.50	8.00	11.00	5.50	9.50	7.50	6.50	8.00	8.00	8.00	10.50
12	Gloss paint	1 gallon	7.50	12.60	9.50	6.50	12.00	12.00	7.00	11.40	7.00	12.00	8.50	10.50	9.00	7.50	9.00	10.00	11.50	12.00
13	M.S. Iron rod	Ton		360.00		350.00	300.00	370.00	360.00	360.00	390.00	380.00	356.00			358.00		504.00		380.00
14	Iron nails	Cwt.				27.00	32.20						38.00	32.00	32.00	32.00	16.50	16.50	32.00	27.00
15	Chubb mortice lock	1 No		6.00		5.20							7.30	7.50			2.50			6.50
16	12-in. Gal. steel pipe	3 m.	6.00	5.00	4.50	6.00	6.00	6.00	7.00	7.00		6.00						5.50		5.50
17	Plain louvre blades	150 mm.	0.97	0.80		1.22	1.25	1.06	1.25	1.16	1.50	0.90	1.22			1.22		1.30		0.95

TABLE 3 BUILDING MATERIAL PRICES IN SELECTED LOCATIONS IN NIGERIA