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FISCAL DISTRIBUTION OF PUBLIC WORKS IN THE WATER SUPPLY SECTOR IN NIGERIA (1994 – 1996)

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ABSTRACT

The distribution of fiscal resources to public water supply projects in Nigeria might be compared to the allocation of revenue amongst the three tiers of government in the Nigerian federation, which usually subscribes to some normal basis. Such normal basis takes the population, population density and geographical area of the States into consideration. To aid in such comparison, data was collected on average budgeted expenditure of the twenty State Governments on public water supply projects from 1994 to 1996. Multiple linear regression and analysis of variance (ANOVA) were used to analyse the data. The results obtained had an R^2 value of 2.4%, the calculated value of the F-statistic was lower than the tabulated value. At the same time, the probability value of α was considerably higher than the 0.05 limit. It was inferred that the population, population density and geographical area of the States had no significant effects on the allocation of funds to State-sponsored public water supply projects. Conclusions were drawn that unlike revenue allocation, the basis for fiscal distribution of public water supply projects in Nigerian States did not appear to have the population, population density and geographical area of the States as important parameters. It was recommended that future distribution of such projects take into account these three parameters. This could be implemented through the creation of awareness on the importance of these parameters via conferences, workshops, and seminars for policy makers.

INTRODUCTION

Water is an essential necessity for life. Though it covers about seventy per cent of the earth surface. it is hardly distributed in sufficient quantities. As well, where water is of sufficient quantity. it may be deficient in terms of quality. Water supply projects are designed for human consumption. domestic and industrial uses. agricultural purposes, electricity generation. and for disease eradication. In developing countries such projects are usually funded by the public sector. Within the Nigerian federal system of government, water projects come under the exclusive and concurrent legislative lists. This arrangement recognises the need for the federating units to have full freedom of financial operations. (Adarkar. 1933; Adedeji. 1969; Bahl and Linn. 1992).

In Nigeria. national resources are shared using some normal basis that considers the following factors: - (i) need. (ii) equity. (iii) stability and (iv) national interest. Need is usually established through the consideration of population. population density and geographical area. Public water supply projects sited in Nigerian States are funded from the States' share of national resources. They are not constitutionally subject to the same normal basis as national revenues. The aim of this paper is thus to establish if the basis for the allocation of funds to water supply projects considered the need of individual States as expressed by the sizes of their populations. population densities. and geographical areas within the period 1994 to 1996. This three-year period came immediately after the political crisis of 1993. The last year of the study period (1996) happens to be the midpoint of the most recent uninterrupted incidence of military rule. The selected three-year period for this study (1994 – 1996) also coincides with the only National Rolling Plan (which normally lasts for three years) that was conceived and executed completely under the last military regime. (Nigeria. 1999).

Most contemporary environmental problems such as the greenhouse effect and global warming have been linked to declining water availability leading to increased desertification of large areas of the earth surface. In the arid northern part of Nigeria, the use of water for irrigation is important. Water supply has been a recurring aspect of development plans since 1946. The 1962 – 68 Plan allocated £24. 258, 000.00 to water supply for domestic and industrial uses. Some water treatment works established in Nigeria predate Nigeria's existence as a single entity. Examples include the old Abeokuta waterworks, completed in 1911; Ijebu-Ode (1927); Oyo (1928); Ile-Ife (1936). The first National Borehole Programme was conceived in 1981, and was intended to provide, at selected villages throughout the country, a total of one thousand five hundred boreholes. Each borehole would be equipped with a submersible pump, a generator, a generator house, wellhead pipe work, and a twenty five thousand gallon overhead water storage tank. As at 1994, however, the water supply situation in the country left much to be desired. No single State had been able to satisfy demand for potable water within the urban localities (Dean, 1972a; Alavi, 1984a; Adesanya and Hanidu, 1984a; FMWR&RD/JICA, 1994a; Sehmi and Kundzewicz, 1997).

PUBLIC WORKS FINANCING IN NIGERIA

Public works encompasses all construction works carried out by or on behalf of the public sector. Such works include civil engineering, heavy/industrial engineering, and general building works. Public works have had a long and chequered history in Nigeria, commencing in the late 1800s. Initially, public works were intended to secure as large an area for colonisation as possible. Later on it became necessary for the effective administration of the area under British influence. After independence it became a source of national pride, with the construction of prestige projects. In contemporary times, public works has been viewed as an avenue to embezzle public funds. Under military regimes, public works has been used to obtain legitimacy from the governed. (Nwosu, 1977).

The Executive arm of government through the overseership of the Nigerian Civil Service controls public works. The public sector in Nigeria identifies those bodies that are owned, funded, and controlled by the government. Owing to the extent of government involvement in all aspects of national life, the size of the public sector is disproportionately large. As at 1986, the Federal Civil Service, an aspect of the Federal public sector employed over 255,000 persons. The Federal public sector is the most important financial institution in the country, by virtue of its size, unitary nature of funding and decisions on expenditure, and financial uniformity within the system. (Nwosu, 1977; FOS, 1987).

The control of expenditure within the public sector operates through annual budgets. The annual budget is the main regulatory mechanism for the funding of water supply activities by the public sector. Such activities have over the past two decades been funded almost entirely from the proceeds of crude petroleum sales and foreign aid. Budgets for federal expenditures have also been described as mere window dressing, not being based on any empirical synthesis of needs within each sector of the economy. Recurring national political and economic crises, social turbulence, bad governance, and instability in leadership have adversely affected public works activities. (Adebayo, 1981).

PUBLIC WATER SUPPLY PROJECTS

Each individual human being requires a minimum of 50 litres of water per day for bathing, drinking, cooking etc. However people in most parts of the world exist on as little as 10 litres. Globally, over one billion people do not have access to safe drinking water. Regional and international efforts on adequate water provision have been intensified in the past two decades. In

Nigeria, recent initiatives include the FGN/Japan (JICA) Water Resources Inventory Survey and the guinea worm eradication projects of the federal and state governments. NGO's and international bodies. (Cairncross *et al*, 1980; Anon, 2002).

Development plans in Nigeria since the 1950s have considered the problem of providing potable water to both urban and rural populaces. The process of deciding where to locate water supply projects, on what scale and how many to provide is made more complex in Nigeria by (i) the size of the country. (ii) political divisions of the landmass into semi-autonomous states. (iii) limitations of available funds, (iv) competing objectives of the provision of water supply. In Nigeria project identification is synonymous with decisions taken on the levels of proposed expenditure on water supply programmes at national. state and local government levels. Parameters commonly considered in this respect include equity of beneficiaries. population, landmass, and population density, which is a measure of population pressure. However, such project identification become seriously flawed when it fails to consider sufficient alternative options based on further parameters like scale, timing, technology, location, organisation, counterpart funding, external funding, development assistance, climate characteristics, inflation, degree of urbanisation, proportion of total landmass under cultivation, size and accessibility of surface and ground water resources, existing and available sources of water supply, economic status profile of beneficiaries, and multiple uses. Furthermore, recorded experience from the evaluation of existing projects is commonly not available to guide selection among options at the identification stage. (Cairncross, *et al* 1980; Morenikeji, 2000)

FIELDWORK AND DISCUSSIONS
The Distribution Of Public Water Projects In Nigeria

There exist wide variations in the level of funding of public water supply projects by different States in Nigeria. Fiscal distribution of public water supply projects involves an examination of monies spent on such projects over a number of differing locations within a given period of time. Factors that might be expected to influence such a distribution in individual States of a federation such as Nigeria are population, population densities, and geographical area. These have traditionally been used to allocate resources among the federating units. The experiment carried out by this study employed multiple linear regression and analysis of variance (ANOVA) to test if the population, population densities, and geographical area of States in fact influence the levels of allocations to water supply projects. Scatter plots of the data were also produced (see table1 and Figs 1, 2 and 3). Data on average annual financial allocation was obtained from the National Rolling Plan (1994 – 96) published by the National Planning Commission, Abuja. The Federal Office of Statistics, Abuja, provided data on population, population densities, and geographical area. (NPC, 1993).

DISCUSSIONS

A very low R^2 value was observed (2.4%), indicative of very weak, almost non-existent correlation. The calculated F statistic was lower than the tabulated values, and the probability value obtained from the experiment exceeded the 0.05 limit set for α. It was thus inferred that no significant relationship existed between the independent variables (population, geographical area and population density) and the dependent variable (level of allocation to water supply projects sponsored by the government of the sampled States). This inference was supported by an examination of the scatter plots of the variables. It was observed that Cross River, Sokoto, Kebbi and Abia States had the highest allocations. Neither of the

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tates had the highest population. eographical area or population density. On the other hand. States such as Niger (with the largest area). Rivers (with the highest population). and Anambra (with the highest population density) did not have greater-than-average allocations. The results of these experiments lend weight to observations that resource sharing formulas in Nigeria give undue importance to the principle of derivation. Nigeria was under military rule at the time of this study: the quest for legitimacy might also have been a significant factor in the allocation of resources by the military authorities in power at the time. (Adedeji. 1969: Nwosu. 1977).

AN OVERVIEW

Nigeria's extensive landmass. population as well as political and economic history are important considerations for any commitment of resources to water supply. Revenues accruing to the Nigerian federation have been traditionally shared in certain fixed ratios among the three tiers of government. Such division from pre-independence times considered the size of each State, its population and the population density. The proportion of the revenue derived from each state is another factor.

With the aid of multiple linear regression analysis, this paper has attempted to establish whether the population. population density and geographical area of each State have significant influences on the level of allocations to water supply projects located in such States. The results showed that such factors do not have significant influences on the level of allocations. given a R^2 value of 2.4%. The wide variations obtained in scatter plots suggest that allocations to water supply have not followed population. population density and geographical area considerations.

CONCLUSIONS, RECOMMENDATIONS AND IMPLEMENTATION.

Water supply is an intensely public affair. usually employed for varied objectives - political. economic. social and technological. The coherent and consistent application of certain agreed *datum* in the allocation of resources to meet such objectives is a *sine qua non*. This paper concludes that during the period 1994 to 1996. allocations to States-sponsored public water supply projects located in individual States of the Nigerian federation do not appear to have taken into account the population. population density and geographical area of such States. Allocation of resources for water supply purposes thus differs from allocation of revenues amongst the States of the Nigerian federation in this respect.

It was recommended that in this new democratic dispensation. dispassionate empirical allocation of resources should be embraced. Funding for Federal. State and Local government-sponsored water supply projects should be based on the population. population density and geographical area of benefiting areas. This has not been encouraged in the past. as the results of the study shows (R^2 = 2.4%). Consistent adherence to statistical parameter-based resource allocation will assist in the entrenchment of probity. accountability and transparency.

In order to develop a culture of statistical parameter-based resource allocation. empirical analysis of Federal. State and Local government budgets for the water supply sector should be commissioned by the governments of each tier. Research institutes such as the National Water Resources Institute could assist with professional advice in this direction. Enlightenment on the merits of statistical parameter-based resource allocation should be provided through the organization of seminars. workshops. and conferences. Governments should sponsor the publication

of statistical analyses of annual budgets for
water supply.

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REFERENCES

Adarkar, B.P., (1933) The principles and
problems of federal finance. London. UK.
King and
Son. P. 219.

Adebayo, A., (1981) Principles and practice
of public administration in Nigeria.
London, UK. John Wiley and Sons. Pp.
1-186.

Adedeji, A., (1969) Nigeria federal finance.
Ibadan. Nigeria. Oxford Univ. Press. Pp.
2-11.

Anon. (2002) 'Africa needs water to end
poverty, says confab.' Lagos, Nigeria.
The Guardian. April 19. P. 10.

Bahl, R.N. and Linn, J.F., (1992) Urban
public finance in developing countries. New
York.
USA. Oxford Univ. Press. Pp. 38-489.

Cairncross, S., Carruthers, I., Curtis, D.,
Feachem, R., Bradley, D., and Baldwin,
G., (1980) Evaluation for village water
supply planning. London, UK. Pitman
press. Pp. 1-157.

Federal Office of Statistics, (1987) Annual
Abstract of Statistics. Lagos, Nigeria.
Federal Office of Statistics. Pp. 2-201.

Federal Office of Statistics, (1993) Annual
Abstract of Statistics. Abuja. Nigeria.
Federal Office of Statistics. Pp. 2-20.

Morenikeji, W., (2001) 'Revenue generation
for physical planning and social
development at the local government
level'. Paper delivered at the FUTMIN
Refresher Course for Local Government
Staff (Unpublished). Minna, Nigeria. Pp.
1-7.

National Planning Commission (NPC),
(1993) National Rolling Plan 1994-96.
National Planning Commission, Abuja.
Nigeria. Pp. 1314 – 1414.

Nigeria, Federal Republic of. (1999) The
constitution of the federal republic of
Nigeria 1999. Lagos, Nigeria. Federal
Ministry of Information. (Printing
Division). Pp. 100-105.

Nwosu, H.N., (1977) Political authority and
the Nigerian civil service. Enugu,
Anambra. Nigeria. Fourth Dimension
Publishers. Pp. 1-173.

Sehmi, N.S. and Kundzewicz, Z.W., (1997)
'Water, drought and desertification in
Africa'. In Rosbjerg, D., Boutayeb, N-E,
Gustard, A., Kundzewicz, Z.W., and
Rasmussen, P.F. (eds) Sustainability of
water resources under increasing
uncertainty. Wallingford. UK. IAHS
Press. Publ. No. 240. Pp. 57-65.

Table 1: Multiple Linear Regressions of Population, Population Density, and Geographical Area on Allocations to Water Supply Sector.

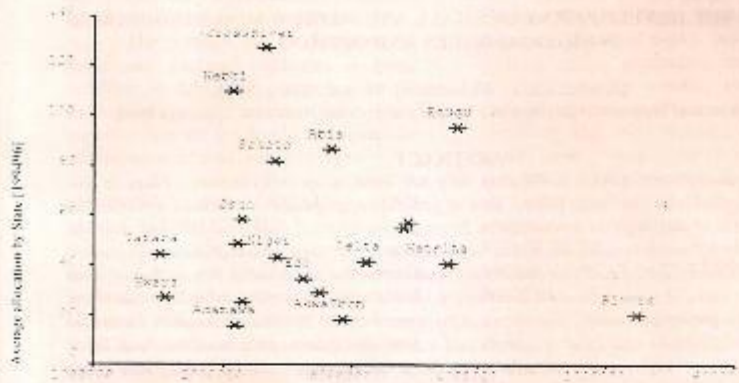| Exp. No.	Variables		Results of Experiment					Inference	
	X	Y	Regression Equation	R² %	F_tab	F_cal	Pvalue	Strength of Relationship	Rank
1	Pop PopnDsty GeoArea	Alloc WS	AllocWs = 71.59 – 0.0000075Pop + 0.02094PopnDsty – 0.0000791GeoArea	2.4	3.24	0.133	0.939	Very weak	NS

Key: NS = Not Significant

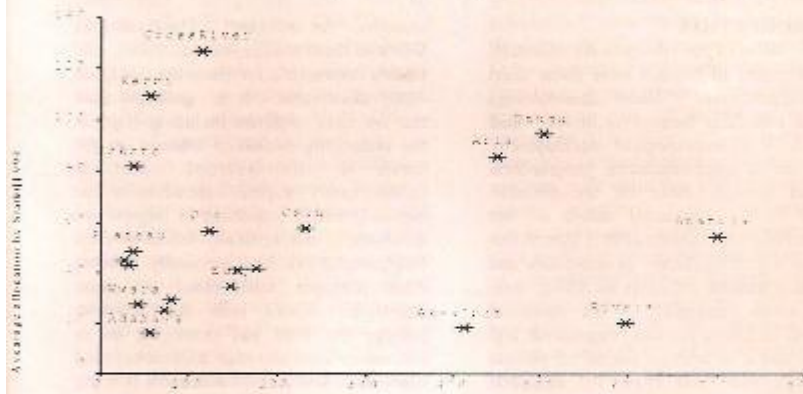Fig 21: Scatter plot of Population of States Vs Average Allocation by States

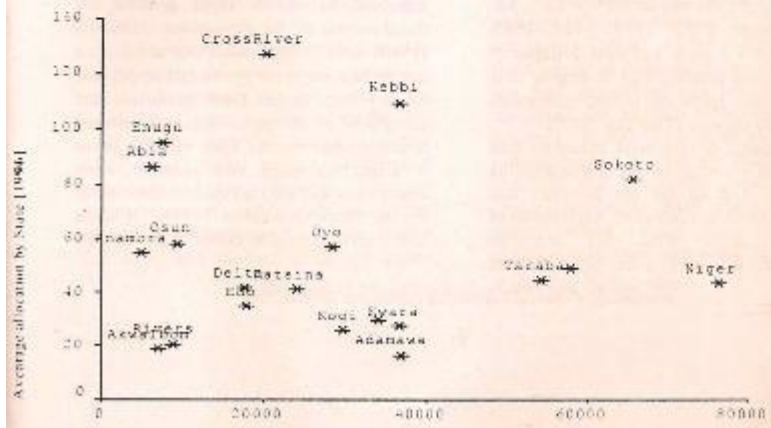Fig 22: Scatter plot of Population density of States Vs Average Allocation by States

Fig. 23: Scatter plot of Geographical area of State Vs Average Allocation by States