

"STATUS AND FUTURE OF TOPOGRAPHICAL MAPPING
IN NIGERIA"

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ABSTRACT

This paper gives a brief history of topographical mapping in Nigeria, and presents the status of National Aerial Photographic Coverage of the Country at 1/40,000 and 1/25,000 scales as well as the status of Topographical Mapping at scales 1/50,000 and 1/25,000 as National Base maps. The activities on other small scales derived mapping at scales 1/100,000, 1/250,000 and 1/500,000 are described. Topographical Mapping of International and Interstate Boundary demarcation and surveys are also described. Problems encountered in the execution of all the above are briefly discussed and the future of Topographical Mapping in Nigeria is assessed in line with the Federal Government of Nigeria "5th National Development Plan, (1988 - 1992)."

INTRODUCTION

There is a dearth of information on the status of Topographical Mapping and Cartographic activities in its broad sense in most Developing Countries. This is, however, intolerable when its economic importance in the inventorisation of national natural and human resources as well as for the national planning of accelerated orderly development and exploration of natural resources of a Nation is considered. Prof. G. Konecny [2] 1986 said: "It has become abundantly clear that Cartography in its broad sense forms the basis of a land information system which constitute a model of the earth's surface. We need such a model to make an inventory of our natural and human resources. Only on the basis of such an inventory can rational planning of human activities be made possible. Therefore mapping has direct implications on the economic activity." Its importance in defence and national security of a Nation cannot be overemphasized. Natural resource planning requires a map coverage of 1:50,000 of all areas with economic activity. This requirement is generally not met in the world today and we are lacking in information.

Furthermore, the results of the United Nations' study conducted by Prof. A. Bradenberger on the state of world Cartography in 1980 shows that there is a great problem in getting these information. However, what is available shows that only Europe, North America and perhaps Asia have made significant headway on mapping at 1/50,000 and other topographic scales. For instance, 24% of Africa is mapped at this scale while South America is only 27% mapped. The situation is of course worse for 1/25,000 scale series [2]. Reference Table 1 for details. Nigeria is a very large country with a land mass stretching over an area of about 923,768 sq.km. The task of mapping such an extensive country under the various constraints of inadequate facilities and manpower is not an easy one. This paper, therefore presents the current status of the Topographical Mapping in Nigeria as a contribution towards the noble assignment of providing Global inventory of world topographic mapping status.

STATUS OF NATIONAL AERIAL PHOTOGRAPHIC COVERAGE

1/40,000 SCALE AERIAL PHOTOGRAPHY

For the purposes of Topographic Mapping of Nigeria, at 1/50,000 basic maps scale the whole country was covered 100% by 1/40,000 aerial photography. The flying commenced by 1957. The flying was carried out under various technical assistances (e.g. Canadian Aero Surveys, British Directorate of Overseas Surveys, African Aero Service Limited), and some oil companies operating in Nigeria (e.g. Gulf and Agip oil companies) and mainly by contracts to overseas mapping companies. The flying was done in stages and at different times between the period 1957 and 1974 with the whole country being divided into twenty-three (23) Blocks. By 1974 the entire country was already completely covered with 1/40,000 scale aerial photography though some gaps and cloud covered areas were later found during its use for map compilation. Reference Table 2 for summary.

1/25,000 SCALE AERIAL PHOTOGRAPHY

In 1971, after the civil war, the massive need for rehabilitation programme coupled with the oil wealth of the country in early/mid seventies necessitated the planning of gigantic programmes. The existing 1/50,000 maps produced from aerial photography of 1/40,000 were found inadequate as National Topographic base maps and hence the need for a larger Basic Mapping Scale particularly in the southern parts of Nigeria. By 1972 the decision to map the Southern parts at 1/25,000 had been taken due to the high concentration of population, rapid development and expansion. In 1976 it was decided to cover the entire country with 1/25,000 aerial photography for the

production of 1/25,000 National Topographic base maps to meet the various accelerated development programmes needs of the country. The country was therefore divided into fourteen (14) blocks for aerial photographic coverage at 1/25,000. The blocks were contracted out to seven (7) survey and mapping firms (indigenous and foreign) with the contract documents signed between 1972 and 1976. Flying commenced simultaneously in 1972 and continued at different flying seasons till 1979. There were various problems that prevented the complete coverage of the entire country at this scale. These included:- unfavourable flying weather conditions particularly in the southern and riverine parts of the country which are perennially cloud covered. The haze and dust covered northern portion. These resulted in very few favourable flying days during the period February to March and late November to early December. The contracts were on the other hand awarded at a lump sum without provision for payment of demurrage. The aircrafts, however, had to be flown in and out of the country to catch the few favourable flying days, or may have to standby. A number of the contractors could, therefore, not complete the photography of all the portion awarded to them. Up till now only about 70% of the entire country is covered by aerial photography at 1/25,000 scale. The contract of the uncompleted portions have been determined and would soon be re-awarded. Reference Table 2 for summary of the status of coverage as at the end of 1987.

STATUS OF TOPOGRAPHIC MAPPING

1/50,000 TOPOGRAPHIC MAPPING

Prior to 1949 the basic topographic maps of Nigeria were made (between 1930 - 1949) at a scale of 1/62,500. During these period maps were being drawn and lettered manually. In order to harmonise Nigerian Maps with the world scale series (e.g. International Map of the World 1/1,000,000 scale) the National Topographic basic maps were converted to 1/50,000 in 1949. From 1949 mapping at the scale of 1/50,000 with 50 feet contour interval became the National basic map series. The number of 1/50,000 topographic maps covering the entire country is One Thousand three hundred and forty-three (1,343) map sheets. Out of this number about One thousand one hundred and sixteen (1,116) planimetric and contoured sheets have been published since then forming about 83%. Some others (160 sheets) are at different stages of completion (e.g. either planimetry or contoured manuscript available but not yet published). This category forms another 12% making a total of about 95% map coverage of the entire country available at scale 1/50,000 basic map series. The remaining 67 sheets about 5% are at different intermediate stages of mapping by direct labour.

The major problems in this area are that:- 1. the photographs available are those taken between 1957 and 1974 which are already out of date and no more of good quality. 2. There are gaps here and there in some of the photography or they are cloud covered. However, it is hoped that the outstanding map sheets could be produced by derived mapping from the new 1/25,000 scale basic map series just embarked upon when they are produced. It is, however, observed that most of the published 1/50,000 map series all based on aerial photography obtained between 1957 and 1974 are already grossly out of date and require revision and metrication. Reference Table 3 for details of the status of coverage of 1/50,000 map series.

The mapping of the International boundaries of Nigeria at 1:50,000 scale with its neighbours (Peoples Republic of Benin in the west, Niger Republic in the North, Chad Republic in the North-east and the Republic of Cameroun in the West) has not received the desired attention for a long time. In the last ten years some attention was given to this aspect of topographic mapping. However, in the last five (5) years various activities including Demarcation and Survey of some parts of the country's entire International (4026 km.) Boundaries made up of Nigeria/Benin (770 km.), Nigeria/Niger (1,500km.) Nigeria/Chad (76km.) and Nigeria/Cameroun (1680km.) assumed greater importance. Series of meetings were held with representatives of the neighbouring countries to discuss demarcation and other survey activities on these boundaries, the most important meeting being the tripartite meeting at Parakou in Benin Republic between Nigeria, Benin and Niger Republics to determine the Tripoint on River Niger. Specifically some work was done on the demarcation and survey of the (200km.) Onigbolo (Southern) sector of the Nigeria/Benin Boundary by Nigeria/Benin representatives. Attempts at charting all boundaries around Nigeria were made culminating in the line index map for the proposed spot images to be acquired at 1:50,000 scale along the boundary (averagely 50km. corridor) for mapping of all boundaries of Nigeria with its neighbours (about 4026km. in length) to produce up-to-date Maps at Scale 1:50,000 with 10 meter contour interval during the 1988 - 1992 period.

1/25,000 TOPOGRAPHIC MAPPING

Mapping at the scale of 1:25,000 with 10 metre contour interval began actively in December 1981 using the aerial photographs acquired between 1972 and 1979. [1.] An area of approximately 257,350 square kilometres is currently being mapped both by direct labour and contract. These form Twenty-one (21) blocks out of a total of Seventy-nine (79) blocks the entire country was divided into for this purpose. There are five thousand four hundred and fifty-four (5,454) sheets covering the entire country.

The strategy for implementation was to give priorities to the state capitals and thereafter other important towns/urban centres. In this regard mapping of thirteen (13) blocks around state capitals were first embarked upon during the 3rd Development Plan, (1976 - 1981) both by contract and by direct labour. These included Lagos, Abeokuta, Ibadan, Enugu, Benin-City, Calabar, Makurdi, Minna, Yola, Jos, Kaduna, Maiduguri and Kano blocks. Later during the 4th Development Plan (1982 - 1987) the other state capitals and two other urban towns were also added for mapping by contract and by direct labour. These included Port-Harcourt, Akure, Bauchi, Sokoto, Ilorin, Owerri with Mokwa and Auyo as non-state capitals. Work is at present at different stages of completion in this mapping exercise. At the moment as at 31st December 1987 Two-hundred and twenty-four (224) sheets (about 4%) have been compiled but yet unpublished. There is, therefore, five thousand two hundred and thirty (5,230) sheets (about 96%) still outstanding. Reference Table 3 for details of status of coverage at 1/25,000. One of the major problems affecting this project was the lack of adequate and consistent funding by Government to provide necessary facilities, particularly utility four-wheel drive vehicles for direct labour field projects. Other problems include:-

1. Lack of adequate local mapping facilities which forced indigenous mapping companies into partnership with overseas mapping companies. This necessitated remittance in foreign currency to pay for part of the job (about 50% of the project) that had to be undertaken overseas. It became very difficult if not impossible in most cases to pay for work done overseas as and when due through the Central Bank of Nigeria with the financial problems of the last few years leading to stringent foreign exchange controls. This, coupled with the gradual and surgical depreciation of the National Currency (the Naira), virtually grinded work to a halt in most contract mapping projects.
2. The present prohibitive cost of survey and mapping equipment, materials and spare parts due to the effect of the Foreign Exchange Market (FEM) in Nigeria makes it difficult to acquire new ones and even to maintain old ones thereby incapacitating survey and mapping companies involved in the execution of the projects. [3]

The Delineation and Demarcation of Nigeria Interstate Boundaries are very sensitive political issues. The requests are very sporadic and urgent in nature particularly when neighbouring Local Government area boundaries are in dispute. There are several interstate Boundary disputes. Consequently, there is the need to map also the corridor of Interstate Boundaries to have permanent fixation of boundary lines. The most volatile interstate boundaries requiring urgent mapping are about seventeen in number. These seventeen (17) out of the former forty-two (42) interstate boundaries (about 9,760km.) and now forty-seven (47) interstate boundaries (about 10,920km.) (with the creation of Katsina and Akwa-Ibom States in 1987 in the country) required urgent attention to avoid incessant border clashes. Despite the

constraints caused by hostile communities around some of the country's Interstate borders, some physical presence and work at various stages were recorded particularly in the last five years. These include preliminary meetings, reconnaissance, Field verification, field completion, Boundary Demarcation and Surveys and tracing of river courses forming boundaries between states. Attempts at charting some volatile interstate boundaries within Nigeria were made culminating in an index map for the proposed aerial photography to be flown at 1/25,000 scale that would be used to start production of up-to-date boundary maps at scale 1/25,000 with 10 meter contour interval for these areas (10km. corridor) during the 1988 - 1992 period.

OTHER SMALL SCALE DERIVED MAPPING

1:100,000 TOPOGRAPHIC MAPPING

These map sheets are compiled or derived from the 1:50,000 scale map series. Compilation started in 1953. There are three hundred and forty-two (342) map sheets covering the entire country. One hundred and eighty-four (184) sheets (about 54%) have been published to date either as contoured or planimetric sheets only. Seventeen sheets (about 5%) have been compiled but not yet published making a total of 59% of the sheets available. About One hundred and forty-one (141) sheets, forming about 41% are still outstanding for compilation.

1:250,000 TOPOGRAPHIC MAPPING

These map sheets are derived from the 1:100,000 scale map series. Production of this series started in 1957. There are One-hundred (100) map sheets covering the entire country. About 54 sheets (54%) of the total number of sheets have been published. Out of this, fifty-two (52) map sheets (52%) have been published with contours whilst two (2) map sheets (2%) have been published with planimetry only. Five (5) sheets (5%) have been compiled and are at fairdrawing stage. Forty-one (41) map sheets (41%) are still outstanding.

1:500,000 TOPOGRAPHIC MAPPING

There are two series on this scale, (the old and the new). The old series were derived from two series namely:- the 36 map sheets at scale 1:100,000 series and the 72 map sheets at scale 1:50,000 series. It consists of fifteen (15) map sheets (each covering $2\frac{1}{2}^{\circ}$ latitude and 3° longitude) which were first published in 1924. This old series are already 100% completed. The new series comprising of a total of thirty-three (33) map sheets (each covering 2° latitude and

2° longitude) covering the entire country were introduced in 1960. Out of these, thirteen (13) map sheets or 39% of total coverage have been published with contours. There are twenty (20) sheets (about 61%) outstanding. Out of these twenty sheets, three sheets have been suspended due to no coverage (about 10%), whilst seventeen (17) (about 51%) are at different stages of derivation. Reference Table 4 for the status of all small scale derived mappings.

FUTURE OF TOPOGRAPHIC MAPPING IN NIGERIA

In 1980, the Organisation of African Unity (O.A.U.) "Lagos Plan of Action for Economic Development of Africa 1980 to the year 2000" decided, among other things, to: "recognise the importance of their National Mapping Institutions and to rate them high among their National Priorities and to provide sufficient budget for them and to take steps to establish them where none exists". In 1986 the O.A.U. "Africa's Priority Programme for Economic Recovery from 1986 to 1990" urged that: "member states should accord priority to the role of Cartography and Remote Sensing in the exploration, exploitation and development of natural resources by increasing the financial allocation to the Sector"[4] In reponse to the above call and the proposals presentated to the Federal Government of Nigeria by the Federal Surveys, the Federal Government of Nigeria appreciates, more than ever, the tremendous importance of Surveying and Mapping to the accelerated and orderly development of the nation, and in the exploration and exploitation of its natural resources. Consequently the Nigerian Government has taken the following constructive actions.

- (1) The allocation of substantially better funds and according higher priority, than ever before, to Surveying and Mapping.
- (2) The setting up of high powered permanent National Boundary Commission and the establishment of interstate boundary committees.
- (3) Approved the elevation of the Survey Division of the Federal Ministry of Works and Housing to the status of a Department with four (4) Divisions and each headed by a Director and the elevation of the post of "Director of Surveys" to the new status of "Surveyor General of the Federation."
- (4) Approved the setting up a National Advisory Committee on Surveying and Mapping to provide a forum for Map Makers and Map Users for examining the Surveying and Mapping needs of the country and advising Government accordingly.

In line with the above the Federal Survey Department has reviewed its objectives and policies and drawn up a dynamic and comprehensive "Action Programme" for 1988 - 1992 to meet these challenges. It has initiated action to rehabilitate and revitalise existing facilities, equipment and vehicles and also to reorganise the personnel structure and energise the personnel. It has also planned strategy for implementation of its programmes particularly in the areas of Topographic Mapping. Highlights among these include:-

- (1) Completion of the outstanding 1/25,000 aerial photographic coverage of the country.
- (2) Strengthening, extending and adjustment of existing geodetic network of controls.
- (3) Completion of the outstanding 1/50,000 Topographic Mapping.
- (4) Revision and metrication of existing outdated 1/50,000 maps.
- (5) Vigorously continuing the mapping of the new 1/25,000 scale base maps.
- (6) Continuation of the production of derived mapping at 1/100,000, 1/250,000 and 1/500,000 scale series with higher intensity to meet various planning and accelerated Development needs.
- (7) A comprehensive programme for the demarcation, surveying, mapping and maintenance of International and Interstate boundaries to meet security and peaceful coexistence development needs.
- (8) Application of Remote Sensing technology in mapping science using satellite imageries (landsat and spot) for the production of small scale maps including International boundary maps.
- (9) Acquisition of Survey Aircraft System and complete aerial film processing and Photo Laboratories.
- (10) Modernisation and expansion of existing facilities to cope with these demands.

CONCLUSION

By the 1979 Constitution of the Federal Republic of Nigeria, the Federal Survey Department is charged with the responsibilities of providing all the national topographic map series and for the bulk printing of maps published by both the Federal and state Survey Organisations [1]. Certainly, with all the above programmes, reorganisations, funding

prospects and strategy of implementation of Federal Survey Department, Topographic Mapping in Nigeria has a brighter future.

TABLE 1. STATE OF WORLD CARTOGRAPHY
UNITED NATIONS 1980

CONTINENT	SCALES			
	1:25,000	1:50,000	1:100,000	1:250,000
Africa	2%	24%	17%	78%
Asia without USSR	11%	51%	62%	80%
Europe without USSR	91%	91%	77%	95%
North and Central America	34%	61%	7%	88%
Oceania and Australia	13%	42%	42%	80%
South America	10%	27%	42%	50%
USSR	5%	61%	100%	100%
World	13%	42%	42%	80%
Annual Progress	0.28% 310 years	1.20% 40 years	0.28% 170 years	0%
Annual Updating	3.2% 30 years	2.7% 40 years	2.7% 40 years	0%

Source: Prof. C. Konecny 1986 [2]

TABLE 2. STATUS OF AERIAL PHOTOGRAPHIC COVERAGE OF NIGERIA

Scale	% Coverage Land Area Covered Period of Coverage	% Outstanding Coverage	Remarks
1:40,000	100% 923,768 Km ² 1957 - 1974	Some scattered areas.	Gaps and cloud cover problems
1:25,000	70% 646,638 km ² 1972 - 1975	30% 277,130 km ²	Weather pro- blems and inadequate funding

TABLE 3. STATUS OF TOPOGRAPHIC MAPPING OF NIGERIA

Scale	Total No. of Sheets	Published Sheets & (%)		Compiled sheets on hand (%)	Outstanding sheets (%)
		Contoured	Planimetry Only		
1:50,000	1,343	908 (67.5%)	208 (15.5%)	160 (12%)	67 (5%)
1:25,000	5,454	Nil	Nil	224 (4%)	5230 (96%)

TABLE 4. STATUS OF SMALL SCALE DERIVED MAPPING OF NIGERIA

Scale	Total No. of Sheets	Published Sheets & (%)		Compiled sheets on hand (%)	Outstanding sheets (%)
		Contoured	Planimetry Only		
1:100,000	342	107 (31%)	77 (23%)	17 (5%)	141 (41%)
1:250,000	100	52 (52%)	2 (2%)	5 (5%)	41 (41%)
1:500,000	33	13 (39%)	Nil	Nil	20 (61%)

Foot Note: All status as at 31st December 1987.

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