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THE STATUS OF CENSUS CARTOGRAPHY  
AND GEOGRAPHY IN THE SUDAN

A Report Prepared By:  
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## EXECUTIVE SUMMARY

### Cartography Preparations and Recommendations

The 1:100,000 scale maps already prepared by the mapping unit may be useful in census district offices, but cannot contain sufficient detail to be useful at an enumerator's level. Accordingly, in the report under the category "Priorities," the major recommendation suggests that the mapping unit concentrate on preparation of Enumeration District (ED) maps for eleven of the largest cities, including Juba, the southern provincial capital. Given time, work could also progress on ED delineation of the smaller urban places, and on enlargement of some 1:100,000 maps for some of the important rural areas, such as the Gezira. Given the magnitude of the job, however, it would appear that the staffing, logistical, administrative and time constraints will probably hinder or prevent the completion of many of these tasks.

### Technical Issues

A number of subjects which must be addressed by the mapping unit are discussed in the report. These include area geocoding techniques; definition of an urban place (without which preparation of urban maps cannot go forward); map preparation steps, including delineation and cut-out procedures; map inventory work; map search and review; boundary problem resolution; use of housing unit and other map symbols; and preparation and use of report forms and a work calendar. In addition, it is recommended that special maps be made for use in nomadic areas. Finally, an ED map display should be prepared for the use of the Director of Statistics, so that he can show census mapping procedures and sample ED maps to visitors and appropriate officials.

### Census Cartography Work Plan

Given time, supplies and personnel constraints, the preparation of maps for the enumeration should, in the main, be limited to the larger urban areas, where undercounts may be particularly common and troublesome. Recommendations in this regard are noted above; the work plan is described in the report under the section "Mapping Procedures and Characteristics." In addition, it is suggested that post-enumeration work priorities should include preparation of 1) high quality maps for the proposed household surveys, and 2) graphics, showing census results. A specific listing of proposed illustrations and some recommendations in regard to their selection and characteristics are included under the section entitled "Publication of Census Graphics." It should be stressed that the importance of this latter task is of equal magnitude with that of preparing the ED maps.

## Field Operations and Training

Field work indicates that the mapping of the larger cities, including slums, can be done properly if the assignment is given first priority. Work on training activities must also begin immediately. As noted in the report, training is an essential ingredient in census map preparation and use. Accordingly, recommendations are included for training supervisors and enumerators (map reading, orientation, canvassing techniques, etc.) and for writing map manuals for use during the census. The work steps and the training of cartography staff in making urban ED maps and the training of census map trainers are also described.

## Conclusion

Work was started on mapping urban areas and in the writing of a training map manual for enumerators. As noted, however, lack of time may have an adverse effect on both the quantity and quality of the census maps which are finally prepared. Nevertheless, the work done in this regard, albeit modest, should be useful in two ways: first, as a base for future census mapping; and second, as an indicator to census administrators that properly prepared and properly used maps can improve the accuracy of the final count.

The Director of Statistics indicated a keen interest in the preparation of post-censal graphics; he also concurred in the belief that good quality maps must be prepared for the household survey in order not to bias the sample. He suggested that a return trip next summer might be of real value in regard to both of these work assignments.

## ABBREVIATIONS

AID	Agency for International Development
ED	Enumeration District
GOS	Government of Sudan
HU	Housing Unit
ISTC	International Statistical Training Center
PES	Post-Enumeration Survey
SD	Supervisor's District
U.N.	United Nations
UNDP	United Nations Development Program
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund

## I. STATUS OF CENSUS CARTOGRAPHY

It has been the intention of the Census Office and the Cartography Section to prepare enumeration district (ED) maps for the entire country. This is a major task, because the map base for Sudan is old and incomplete.

Because of the lack of petrol and transport, as well as other difficulties, progress has been slow. The 1:100,000 maps prepared by the Cartography Section for general census use will serve as a good base for future work. There is little time to do much else.

ED maps for the larger urban places can be prepared, however, and this work has now been assigned high priority.

## II. PRIORITIES

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The census date has been extended three months; accordingly, the enumeration is now scheduled for early February 1983. Maps should be in the hands of field staff in sufficient time to be reviewed and used in training programs. It is, therefore, anticipated that the Section must complete its work by the end of November (see Figure II-1).

In view of the short time remaining, four priorities have been assigned.

### Priority I

Enumeration district (ED) maps will be prepared for the greater metropolitan area of Khartoum (urban). If time allows, additional cities will also be completed (urban). These are Port Sudan, Juba, Nyala, Wad Medani, El Obeid, Atbara, Kassala, Kosti, El Fasher, and El Dammar.

Given the magnitude of the task and the remaining time, however, only enumeration district maps for greater Khartoum can be prepared with a degree of certainty. Field staff can be brought in for training to make ED maps for the other aforementioned cities, but they would still need close supervision; qualified supervisors for this work cannot be spared currently from the Cartography Section.

### Priority II

District maps at a scale of 1:100,000 will be prepared for the entire country (rural). Maps for seven of the Northern provinces have been made and updated; the remaining task is to delineate peoples' council boundaries and town areas. This work represents a major forward step in preparing a current, useful, and nationwide set of maps. The maps will be used by field offices to provide names, locations, and travel routes in areas under their jurisdiction. They may also be used by supervisors for similar purposes. At this scale, however, they cannot provide the map detail needed for enumeration work. It is to be hoped that in the future, the 1:100,000 series can be enlarged (to 1:25,000, for example) and updated for use by rural enumerators in the next census.

### Priority III

The creation of maps of urban places of 10,000 or more population are assigned third priority. These maps are not being prepared at this

Figure II-1

DEPARTMENT OF STATISTICS

CARTOGRAPHY SECTION

TOWN MAPPING ( GREATER KHARTOUM )

A C T I V I T I E S	April 1982	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan. 1983
1- Greater Khartoum Boundary										
2- Collection of Existing Maps										
3- Boundaries of Quarter Councils										
4- Unification of Scales										
5- Field Work:										
5.1 - Identification of Streets and Important Features										
5.2 - Estimation of Housing Units										
6- Delineation of EA'S										
7- Preparation of EA Maps										

time. Unless there is a major delay in taking the census, sufficient time to do this work is not available. There are approximately 300 urban places in the country, and these will be enumerated without the use of maps. (Priority I area maps, which represent the largest cities, will be prepared.)

#### Priority IV

Household survey maps have fourth priority. This work will be done after the census. Because sample maps should be of high quality, they will all have to be prepared as field sketches, done preferably by staff of the Cartography Section.

III. MAPPING PROCEDURES AND CHARACTERISTICS  
(PRIORITY I)

### III. MAPPING PROCEDURES AND CHARACTERISTICS (PRIORITY I)

#### Map Characteristics

The characteristics of the maps are summarized below.

<u>Item</u>	<u>Features</u>
Scale	Uniform scale within the city. Scales may range from 1:2,500 to 1:12,000. Graphic scale must be shown. No other type of scale will be indicated on the maps.
Area Covered	Greater metropolitan area.
Map Characteristics	Common set of symbols. Limited number of symbols. Housing units are not to be shown. Administrative boundary symbols (rationale). Names of important features (e.g., roads). (Rubber stamps or stick-ups may be used for north arrow, graphic scale, and legend.)

#### Work Plan for Individual Cities

The principal tasks specified in the work plan are summarized below.

1. List all town councils and quarter councils; geocode all places.
2. Obtain maps for quarter councils.
3. Convert quarter council maps for census use.
  - a. Put on graphic scale and all pertinent symbols showing known features.
  - b. White-out non-essential information.
4. Include in field work slum areas in urban periphery. A separate geocode number can be used to identify areas settled, since 1973, in the periphery. Check the accuracy of the map; make corrections as necessary, and add all pertinent names and features. Divide

the area into units (sectors) of approximately 50 or 100 HUs each. Letter all sectors in serpentine fashion, starting in the northwest corner.

5. Delineate the EDs. Using a clean and corrected copy, divide maps into EDs. There should be approximately 200 HUs per ED. Show the boundary by a wiggly line. Also show the supervisor's district (SD). The SD consists, on average, of five EDs. Geocode all EDs and SDs; for example:

<u>Sector</u>	<u>HUs</u>	<u>ED</u>	<u>SD</u>	<u>SD</u>	<u>ED</u>	<u>HUs</u>
A	100	001	01	01	001	210
B	60	002	01	01	002	130
C	80	001	01			
D	30	001	01			
E	120	002	01			

6. Follow the cut-out procedure. Run off an appropriate number of copies of the map (the original, plus one copy each for the town council, the field office, the supervisor, and the enumerator). Cut out maps for the enumerator. Show the periphery, as necessary. Check to see that all maps contain the ED number and boundary, north arrow, legend, and symbols. Use rubber stamps or stick-ups, as necessary, to put this information on each map.

#### IV. GEOCODING

The following geocoding scheme is suggested. As a general rule, every third, fourth, or fifth number in rank order should be used in an alphabetical listing of places, because this numbering scheme can then be adjusted easily to include a new place or some other kind of administrative area change.

Example: 04, 08, 12, 16, 20, 24, etc.

Region	Province	Town Council or Peoples' Council	Quarter Council or Village Council	Supervisor's District (SD)	Enumerator's District (ED) <sup>1</sup>	Urban <sup>2</sup> or Rural	Area Between 1973 and 1983 Boundary
00	00	00	00	00	000	0	0

---

<sup>1</sup> The use of the last digit is generally reserved for special EDs and split EDs.

<sup>2</sup> The urban definition encompasses all places defined as "urban" in 1973 and other designated places.

V. URBAN DEFINITION

## V. URBAN DEFINITION

Opinion varies in the Department of Statistics about the definition of urban places. Below are two points of view expressed at a meeting held on June 9, 1982, in the Census Office.

1. The 1973 definition should be retained. A radical alteration could stimulate adverse reaction by data users and administrators who could complain about comparability from census to census and who might disagree with the new definition and subsequent findings.
2. The 1973 definition was, in part, subjectively determined and thus should be changed. The definition included places of 5,000 or more people and other centers which local officials defined as "administratively or commercially important." The term "local official" included a wide spectrum of persons in the hierarchical structure of government, from the province to the council level. The phrase "administratively or commercially important" has not been defined. The regional variances in opinion and the subjective interpretations of officials were accordingly incorporated into the selection of "urban" places.

In formulating recommendations on an urban definition, several points should be made.

1. Countries should use the following criteria to designate urban places:
  - a. Size of Agglomeration. This may range from 500 to 30,000. It is commonly used because it can be readily determined or estimated.
  - b. Administrative Center. Also commonly used, this characteristic is easy to ascertain in establishing and geocoding a list of urban places before enumeration.
  - c. Density. To determine density, area measurement, which can be difficult, costly, and time-consuming to obtain, is required.
  - d. Economically Action Population Engaged in Non-Agricultural Pursuits. It may be difficult, costly, and time-consuming to obtain this figure before enumeration begins.

- e. Urban Services (e.g., percentage of housing units with piped water or electricity, types of schools, police protection, commercial establishments, etc.). Obtaining the threshold criteria for designation can be difficult, costly, and time-consuming.
  - f. Combinations. Several Central American countries, for example, use size and urban services (percent of housing units with electricity). Most common are combinations of size and administrative function.
  - g. Other Criteria. Among other criteria are agglomerations with streets which have names (Cuba) or agglomerations in which alcoholic beverages are sold (Ethiopian proposal).
2. The recommendation of the United Nations (U.N.) is problematical. The U.N. accepts the urban definitions of individual countries, but it also suggests that all agglomerations of 20,000 or more be considered "urban" in any event. In the larger cities, however, problems arise in delineating the greater metropolitan area population, because only administrative areas are often aggregated to provide such figures. In actual practice, statistical areas have to be defined to obtain a realistic population figure for the greater city. (Dr. Robin Mills, University of Gezira, suggested that the term "urban" in Sudan encompass places of 20,000 or more people.)
  3. For geocoding purposes, urban places should be so designated before the census begins. This is done because schedules and field techniques and assignments vary somewhat for urban and for rural areas. Proper geocoding can easily provide data users with the populations of all rural places designated as urban in 1973.

### Recommendations

Two recommendations on the urban definition are proposed:

1. The urban definition should embrace agglomerations of 10,000 or more, plus administrative centers to the district level. Also, settled peripheral areas contiguous to the high-density centers of greater Khartoum and Greater Port Sudan should be included in the definition.
2. A list of urban places down to 8,000 (applying a factor to each 1973 figure, if available) should be prepared. The geocoding of unqualified places of fewer than 10,000 persons can be assigned a rural designation after the enumeration.

## VI. STAFF TRAINING IN CARTOGRAPHY

The following subjects should be covered in the staff training program in cartography:

- census map requirements, orientation, and canvassing techniques;
- scale conversion;
- map sketching; and
- area measurement.

For sketching, it is essential that magnetic compasses be made available.

### Training of Enumerators and Supervisors

Training in the use of maps is as essential as preparing the maps themselves. Clearly, a map has no value in the hands of an enumerator who does not know how to use it.

Training of supervisors and enumerators must be short, precise, and understandable. These personnel will receive other kinds of pertinent and important instruction. Accordingly, the amount of map instruction must be limited.

The following subjects should be covered in training:

- Characteristics and use of maps (north arrow, legend (symbols), boundaries, and graphic scale).
- Locating one's self, and canvassing and orientation techniques.
- Map Corrections.

In rural areas, where map scale does not permit use of enumeration district maps, the training should stress the following points:

- All persons belonging to a village must be enumerated. This includes all small clusters of satellite housing units located at some distance from the center of the agglomeration.

- All temporary work camps in the area must be accounted for in the enumeration. Supervisors should be told to list, locate, and assign all such places to specific enumerators to avoid undercounts or double counts.

## VII. TRAINING MANUAL FOR ENUMERATORS

### Familiarity with Map

Enumeration will be undertaken in an area with specified boundaries. This area, called an enumeration district, will be given a special number that each enumerator should remember. The enumerator will be given a map of the ED to facilitate the work. To understand how to use the map, the enumerator must be familiar with its features. These features, which are described below, include the north arrow, graphic scale, legend and symbols, and boundaries.

#### A. North Arrow

The north arrow should help the enumerator "orient" himself to the general directions north, south, east, and west. When using the map, the enumerator always should have the north arrow pointing north. The map should also be held so that its features are lined up (or oriented) parallel with ground features. When the direction changes, the map should be turned also. (See Diagrams VII-1 and VII-2. Note that the enumerator turned the map as he changed direction, that is, he "oriented" himself, but the north arrow on the map always pointed to the north.)

Diagram VII-1

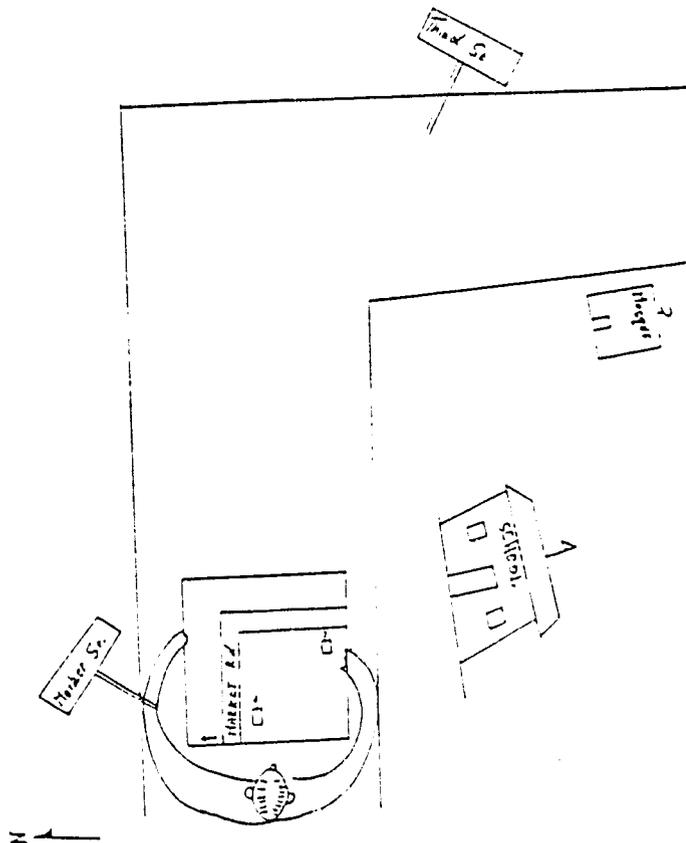
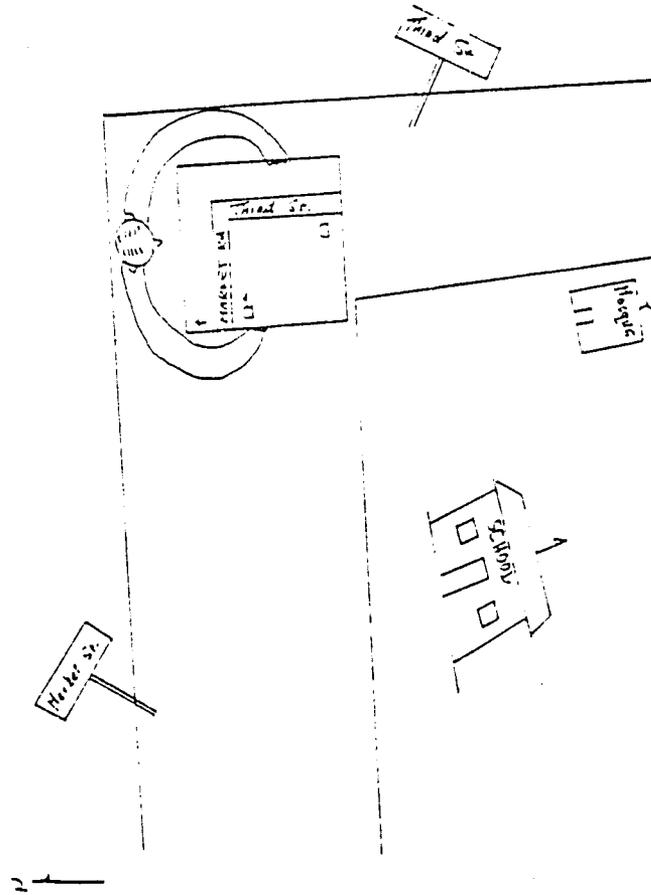


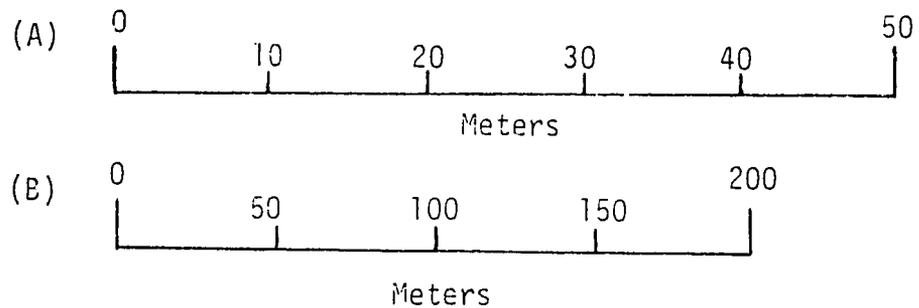
Diagram VII-2



B. Graphic Scale

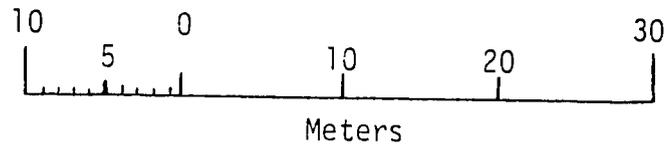
The graphic scale shows distance in meters, from 0 to a specified number (e.g., 50 meters, 100 meters, or 200 meters). Diagram VII-3 provides two examples.

Diagram VII-3



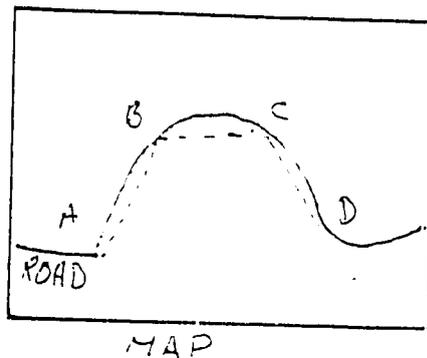
To the left of the zero mark is a small section showing smaller units in meters (see Diagram VII-4).

Diagram VII-4



To measure the distance between two points on the map (e.g., points A and B), the enumerator should take a piece of paper and mark off the distance. A curve, as on a road, is measured as a series of short, straight lines (see Diagram VII-5).

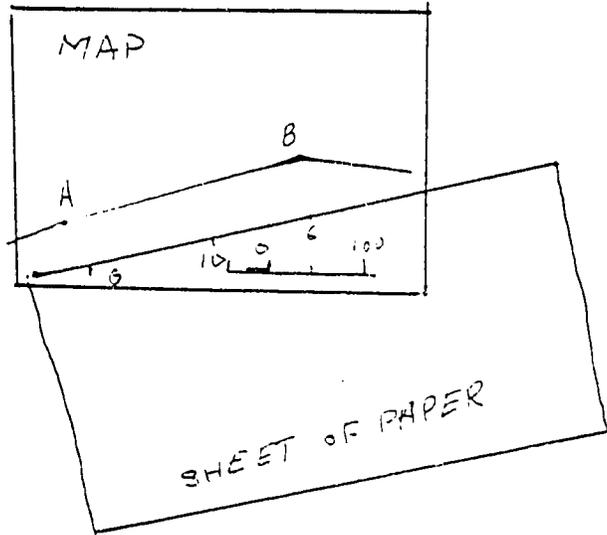
Diagram VII-5



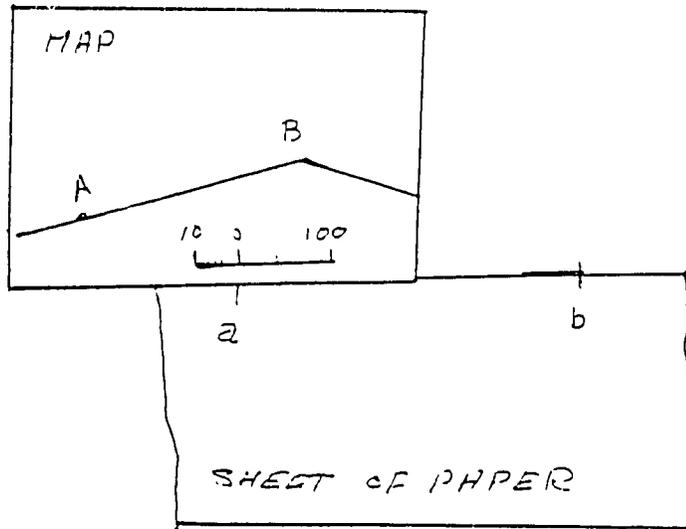
To measure curve A-D, distances A-B, B-C, and C-D are measured and then added together. After this step is completed, the enumerator should take the piece of paper and measure the distance on the graphic scale (see Diagram VII-6).

Diagram VII-6

(A)



(B)



### C. Legend and Symbols

A symbol is a graphic way to show a physical or man-made feature on a map. For example, a dashed line (-----) could be a road, and a square black box (■) could be a house or an important building. All the symbols are shown and identified in one part of the enumerator's map, called the legend. The enumerator should try to identify the features on his map. If he has a problem, he should consult his supervisor.

### D. Boundaries

The ED boundary is shown by a wavy line (~~~~~). No enumeration should be done outside this area.

Corrections should be made on the map. The enumerator should put an "x" through the incorrect names or features and draw or write in the correction.

The map must be turned in to the supervisor when the work has been completed. The Statistical Department will retain the map for its records.

### Canvassing

The enumerator should work systematically in the ED. His work is called canvassing. If there is more than one block in the ED, each should be completed in turn. The enumerator's supervisor will have numbered the blocks on the map in the order in which they should be worked. (If he has not done so, the enumerator should ask him to put the order of the blocks on the map).

As often as possible, the enumerator should always start in the northwest corner and work clockwise around the block. For callbacks, he should put a small square in the correct location on the map, identify it by the name of the head of household, or some other characteristic (e.g., unusual shape or building material) so that it will not be mistaken for some other housing unit upon return.

At the end of the day, two small parallel lines (//) should be put on the map at right angles to the road or path to indicate where the work stopped. At that same point, the date should be entered.

The direction of travel can be shown on the map with arrows. The supervisor will have put two or three arrows on the enumerator's map to start him off.

VIII. MAP INSTRUCTIONS FOR SUPERVISORS

### VIII. MAP INSTRUCTIONS FOR SUPERVISORS

After receiving the ED maps, the supervisors should check them to see that there are approximately 200 housing units in each ED. If one of the EDs has fewer than 200 HUs, it can still be given to an enumerator, who should be able to finish such an assignment quickly. If the enumerator has done a good job, he may, on the supervisor's recommendation, be given another assignment by the field office. If the ED is much larger (e.g., 350 or 400 HUs) as a result of recent new settlement in the area, for example, the supervisor will have to divide the ED. A visible physical feature (e.g., a path or a road) should be used to divide the area into two EDs with an equal number of HUs. It should be possible to move around the area easily. Each area must be given a letter; for example, if one area were ED 070, one part would be designated 07A and the other 07B. These code numbers should be put on the map. The map should then be xeroxed, and the area that is not to be canvassed should be crossed out. This copy should then be given to another enumerator.

On each ED map, the word "start" should be written in the northeast corner, and two or three arrows should be drawn to indicate the clockwise direction that the enumerator should travel. If the ED has more than one block, each block on the map should be numbered in the order in which the blocks should be worked. It should be possible to determine approximately where an enumerator is working in his ED on a particular day, if these suggestions are followed.

In reviewing the enumerators' work on the maps, the supervisors should look for the corrections on the maps, directional arrows, and a symbol and a date to indicate where the enumerator stopped work on a particular day.

The supervisor should try to be available for one hour at a central point at the beginning of each day, so that an enumerator can locate him and ask questions or resolve urgent and important problems.

IX. MAP INVENTORY

## IX. MAP INVENTORY

A map inventory, taken before a census, requires a thorough, comprehensive, in-depth search for maps throughout the country. Some of such work has been done by the Cartography Section, but the task has not been completed because of time constraints.

Many area-specific maps have been prepared by various persons and agencies in the Sudan for particular purposes. These include the Italian firm: MEFAT (21 volumes of data on the South, including numerous maps), Hunting Technical Services, Ltd., the West German Development Agency, the International Sorghum and Millet Institute, DHV Consulting Engineers, geographers and anthropologists from a variety of universities, the Jonglei Project Agency, and the Ministry of Agriculture and Irrigation. The list is indeed long.

### Recommendations

Two recommendations are offered to facilitate the inventory of maps.

1. The map inventory should be carried through to completion after the census. The final report should be annotated and cross-indexed, by area and subject, and published by the Statistics Office. Aside from the public relations aspects, the Statistics Office will be providing interested users with a valuable tool. It is conceivable that such a publication could be used to help coordinate the work of different agencies to prevent the overlap and duplication of efforts.
2. The report on the map inventory should be updated frequently (perhaps every two or three years) so that it will continue to be useful.

X. NOMADS

## X. NOMADS

There is a reasonably large body of literature on nomads in the Sudan, primarily on anthropology, sociology, and geography. In addition, individuals from universities, governments, and other organizations have lived with tribes for extended periods of time. Some organizations, such as the International Sorghum and Millet Institute and the Western Sudan Agricultural Research Project, have also prepared maps of certain areas showing tribes and movements. The list from the 1973 census of nomads and sheikhs also should be examined carefully.

### Recommendations

Three recommendations are offered to facilitate the collection of demographic data on nomads in Sudan.

1. Given the magnitude of the task, several professionals should immediately be assigned to gather information on nomads. Within approximately one month, the findings should be reviewed and a calendar prepared, showing work steps and timing.
2. Small-scale maps should be prepared using the results of the work outline in Recommendation 1 above. These maps should show water holes and camping grounds, as well as tribal affiliations, if possible. It will be particularly helpful to indicate the location of the tribal sheikh.
3. A committee should be appointed to determine an acceptable and workable definition of the terms "nomad" and semi-nomad." The committee should include a wide spectrum of representatives from organizations interested in nomadic populations. (The definition recommended by the U.N. adviser, Dr. El Khodary, would seem to be excellent; however, opinions and confirmation should probably be sought from a formally established committee to obtain a wide base of support for the terms used.)

XI. PUBLICATION OF CENSUS GRAPHICS

## XI. PUBLICATION OF CENSUS GRAPHICS

The objective in preparing graphic publications is to disseminate census findings widely. The primary purpose is not to show complicated areal patterns of data to edify a small and sophisticated audience of data users. For example, the publications should be directed to a large audience, including important government officials who are not direct data users, and school teachers and students. Accordingly, graphics should be simply presented so that the information is easily understood. The maps, in particular, should show areal patterns not readily grasped by reviewing tabulated data. Some suggestions are given below for consideration and possible inclusion in the publications program (see Figure XI-1).

Other suggested graphics depend largely on the availability of data. For example, maps, charts, and graphs for the country, specified regions or provinces, or certain major urban areas can show information on education, the economically active population, residence, nomads, housing, etc.

Costs for graphics generally are moderate. It is possible that much of the work, other than preparation of rough copy, can be completed by the Survey Department.

### Recommendations

To facilitate the publication of census graphics, the following action is recommended.

1. A small committee should be formed to review the graphics presentations. The committee memberships should include interested personnel from offices outside the Statistical Department (e.g., persons employed in health and education).
2. The chief of cartography should be sent for advanced training in Washington, D.C., following the enumeration. The International Statistical Training Center (ISTC) of the U.S. Bureau of the Census offers two four-month training courses each year, beginning in February and September. Training covers digital computer graphics and remote sensing. (Landsat 4, scheduled to be in orbit by July 1, 1982, will have a resolution of 30 meters; 10-meter resolution is planned by 1985.)
3. The purchase of a plotter should be considered so that computer graphics can be integrated into the publications program.

Figure XI-1

## SUGGESTED LIST OF GRAPHICS PUBLICATIONS

<u>Priority</u>	<u>Title</u>	<u>Area Covered (entire country, regions, provinces, other)</u>	<u>Type</u>	<u>Data Shown by Administrative Unit</u>	<u>Mode of Presentation</u>	<u>Color or B&amp;W</u>	<u>Size</u>	<u>Comments</u>
1	Population, 1983	Entire Country	Map	Province	Dots	B&W	Wall	Show Urban Population by Proportional Circles as Overlays
1	Provinces (15)	Province	Maps	Town Council	Line Drawing	B&W	Page	Show Major Roads, Rivers, Rrs, Administrative Capitals
2	Density of Population, 1983	Entire Country	Map	Province	Choropleth	B&W	Wall	
2	Population Change, 1973-1983	Entire Country	Map	Province or Town Council	Choropleth	Color (red & blue)	Wall	3 Values Showing Decline; 3 Values Showing Increases
2	Age/Sex Distribution, 1973-1983	Entire Country	Chart	--	Distribution Chart	B&W	Page	
2	Urban-Rural Population, by Province, 1983	Entire Country	Map	Province	Proportionate Circles	B&W	Page	
2	Urban Growth, 1973-1983	Entire Country	Bar Chart	Province	Bars	B&W	Page	
3	Age/Sex Distribution, by Province, 1973-1983	Province	Chart	Province	Distribution Chart	B&W	Page	
3	Population, Metropolitan Khartoum, 1983	3 Urban Areas	Map	3 Cities	Dots	B&W	Wall	
3	Population Growth, Metropolitan Khartoum, 1973-1983	3 Urban Areas	Bar Chart	3 Cities	Bars	B&W	Page	

## XII. CARTOGRAPHIC SECTION MAP DISPLAY

A display, showing the steps the Cartography Section takes to make ED maps, should be prepared. (See Exhibit XII-1.). This display should consist of four maps, all showing a selected quarter council area in Khartoum.

The first map should be a copy of the original map. The second map should carry annotations and corrections of the map made by Cartographic Section personnel in the field. Among its features should be new HUs and blocks; nonexistent housing should be crossed out; landmarks (e.g., mosques or shops) should be located; a graphic scale should be added; new areas should be sketched in; street names should be listed or identified; and a quick count of housing units, shown by section, should be taken, using physical features to delineate the units. The third map should be a finished copy showing ED and SD numbers and boundaries. The fourth map should depict one of the EDs shown on the third map. This map should show the graphic scale, ED numbers and the boundary, peripheral arrows, a legend, and the canvassing instructions of the supervisor.

Exhibit XII-1  
Cartography Section  
WORK PROGRESS FORM

Reporting Period: \_\_\_\_\_  
(From) (To)

Area: \_\_\_\_\_ Geocode: \_\_\_\_\_

<u>Step</u>	<u>Number of Maps Required</u>	<u>Percentage Obtained</u>	<u>Percentage Converted to Census Use</u>	<u>Comments</u>
1. Map Gathering and Conversion				
2. Field Work	Number of Areas to Check:	Percentage Completed		
	Older Area:			
	New Area:			

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Work Progress Form

SUMMARY SHEET

Priority Area:      Percentage Completed  
                         Step 1, Step 2, Step 3

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1

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2

### XIII. THE SOUTHERN PROVINCES

The cartographic work for the Southern provinces has not moved forward as rapidly as is desirable. It should be possible, however, to duplicate most of the work completed or in progress in the North. The Southern headquarters should be able to complete the following tasks:

1. Update the rural 1:100,000 series. This will require the efforts of field staff to ensure that a complete list of villages is obtained and that these places are located reasonably accurately on the maps.
2. Prepare ED maps for Juba and, given sufficient time, for three other large towns. To do this, the 1976 Mofit maps should be updated and quick-counted in the field. To maintain quality control, EDs should be delineated by employees at census headquarters, in Juba, and not by census field staff.

#### Recommendations

It is recommended that:

1. Copies of all Mofit materials, particularly any of the work done on rural areas, be obtained without delay.
2. A cartographer from Khartoum be given the task of overseeing the cartographic operation in the Southern region. The situation needs to be quickly assessed and a work plan and calendar prepared as soon as possible.
3. Progress be monitored continuously. This is necessary to ensure that preparation of the map keeps pace with work in the North.

APPENDICES

Appendix A  
LIST OF PERSONS CONTACTED

Appendix A

LIST OF PERSONS CONTACTED

Department of Statistics

- Mr. Omer Ahmel El Tay, Director-General  
Mr. Naimalla El Bushari, Deputy Director-General  
Mr. Hassan Abdel Salem Suliman, Director of Administration  
Mr. Abdel Wahab Ali Modawi, Census Director  
Dr. Abdul Aziz Farah, Assistant Director, Statistical Division  
Mr. Mahmoud El Khadir Rrjgalla, Assistant Director,  
Statistical Division  
Mr. Ismail Bakheid Fadl-es-Seed, Chief, Field Operations  
Mr. Abdel Rahman Menaka, Field Office Chief, Wad Medani

Cartography Section

- Mr. Mohamed Abdalla Mohamed, Chief  
Mr. Ahmed El Amin El Mousharraf, Senior Draftsman

Others

- Mr. Ali Mohamed Neer, Assistant Director for Projects,  
Ministry of Irrigation, Wad Medani  
Dr. Faisal Abdel Gadir Mohamed, Program Officer, United Nations  
Fund for Population Activities  
Mr. Anthony Carter, Social Statistics Adviser, United Nations  
Children's Fund  
Mr. Jorgen Jensen, Cartographer, United Nations Development Fund  
Mr. William Wigton, Statistical Information Division,  
U.S. Department of Agriculture

Mr. Michael Bess, Contract Adviser, Agency for International  
Development, Ministry of Energy

Professor Robin Mills, Population Center, University of Gezira

Professor Hassan Mohamed Salih, Chairman, Department of  
Anthropology and Sociology, University of Khartoum

Professor Yagouh Abdalla Mohamed, Environmental Studies  
Program, University of Khartoum

Professor Mustafa Khogali, Department of Geography,  
University of Khartoum

Professor Mohamed Arbab el Sayed, Department of Geography,  
University of Khartoum

Appendix B

Sudan: Demographics Background

## Appendix B

### SUDAN: DEMOGRAPHICS BACKGROUND

Demographic and socioeconomic data for the Sudan are obtained from standard sources, such as censuses, household surveys, and civil registration. However, data for the latter are not comprehensive or reliable, and only ad hoc household surveys have been taken. Census problems relative to timing, coordination, equipment, transport, and personnel have also affected data quality adversely.

The experience of people working in national development planning in the 1970s seems to have convinced government officials that an improved statistical base from which to formulate plans and implement programs is essential. Accordingly, it is the mandate of the Department of Statistics, Ministry of Finance and Planning, to improve the quality, availability, and periodicity of the data. To this end, the Department has scheduled a census enumeration for February 1983, and also plans to undertake a series of integrated household surveys, starting in 1983, which will gather information on fertility, mortality, migration, employment, income, consumption, and social conditions.

#### Censuses

To obtain population data for the various regions in the country, the administration, under the control of the British governor, conducted a "census" during the period 1898-1903. Estimates were obtained from omdas and sheikhs, but they are considered to be unreliable.

The first national census conducted by the Sudanese government was to extend over a twelve-month period, starting in July 1955 (it actually took 14 months to complete). The length of the enumeration was justified on the basis of inadequacies in staff and transportation. The census was de jure, because it was felt that double counts would otherwise result over such a long enumeration period, if the survey were de facto. Rural population data were collected from a 10 percent sample. Data on nomads were obtained from sheikhs; nomads were defined as individuals who had allegiance to a "nomadic sheikh." The population in 1955-1956 was recorded as 10.2 million. The count was not considered reliable, for a variety of reasons; for example, there was political unrest at the time in the Southern region; the enumeration was not completed in Eastern Equatoria; not enough qualified enumerators could be found; language

problems emerged in areas in which Bari, Dinka, and Nuer were spoken; respondent opposition emerged in some areas as a result of poor publicity and prevalent superstitions (e.g., the "Evil Eye"); and not all nomadic groups were located.

Techniques used in the 1973 census represented an improvement over those of the 1955-1956 period, but many of the same problems of transportation, organization, staff, publicity, preparation time (only nine months), and coverage were encountered. Operations also were impeded because of the delayed installation of the computer system (almost a year after the enumeration).

The population was divided into three categories: urban, rural-settled, including cotton pickers; and nomads. Long schedules were used for urban places and for 10 percent of the rural-settled and the nomads. The final count of 12.2 million was quickly challenged, and reenumerations (for cotton pickers and nomads, and, on a sample basis, for the Blue Nile Province) resulted in a revised estimate, including an assumed 5 percent coverage error, of 14.9 million. To some observers, this still suggested a low and unrealistic growth rate since 1955-1956; in any event, the total was substantailly less than the earlier expected figure of 17.0 million. The census was de facto. An estimate of a 7 percent undercount for 1973 is now suggested by the Department of Statistics.

It is the objective of the Department of Statistics to provide census data decennially. Accordingly, the next census will be conducted in February, 1983.

The following information will be obtained from all respondents: age, sex, and household relationship. A longer schedule, as in 1973, will be used for urban places and for 10 percent of the rural-settled and nomads. "Pure nomads" are defined as those who tend animals primarily and move as a group; "semi-nomads" are those who generally live in permanent housing and may be agriculturalists (they do not necessarily move as a group, in unison). The long schedule will request information on education, employment (occupation, industry, and employment status), fertility, mortality, marital status, migration (country of birth, duration of stay, and usual residence), nationality, and housing characteristics (building material and type--traditional or modern, number of rooms, electricity, water source). Housing data will be collected only for occupied structures.

It is estimated that for 25,000 enumerations, 4,000 supervisors will be needed. Enumeration districts (EDs) will average 200 housing units each, and approximately five EDs will be assigned to each supervisor. The enumeration period should last

approximately 10 days, or two weeks. The census will be de facto. Training programs are scheduled to start in August 1982, and precounts for the larger agglomerations will be conducted in November 1982.

The office of the United Nations Fund for Population Activities (UNFPA) contribution is estimated (in U.S. \$) to be:

Personnel	\$ 53,800
Training	63,000
Equipment	1,231,350
Miscellaneous	440,500
TOTAL	<u>\$1,788,650</u>

The Office of the Government of Sudan (GOS) contribution is estimated to be LS 5,068,986.

Preliminary results showing totals for the province and, possibly, the districts should become available beginning in June 1983; final results should be available approximately a year later. A post-enumeration survey (PES) taking a one percent sample of EDs is also planned.

Four national committees are involved in censal operations. The National Coordinating Committee and the Central Census Committee deal primarily with policy issues. The Technical Advisory Committee concerns itself with detailed aspects of the census work. Membership in these groups covers a wide spectrum of government agencies (plus some university economists). The National Communications Committee is in charge of publicity for the forthcoming census. A census coordinator has been appointed within the Statistics Department to oversee operations and training.

#### Demographic Data

The following is a summary of demographic data on Sudan:

Estimated Population, 1982	20 M
Crude Birth Rate, 1981	49/1,000
Crude Death Rate, 1981	19/1,000

Annual Population Growth Rate	2.9 Percent
Total Fertility Rate, 1973	7.1 (range for Northern Provinces: 6.0-8.9)
Population Under 15 Years of Age, 1981	47 Percent
Life Expectancy, 1981	46.3 Years (Northern Sudan, 55.1; Southern Sudan, 37.9)
Mean Age at First Marriage	27.4 Years (Females) 34.4 Years (Males)
Education, 1973	0.3 Years (Women) (2.8 Years of Women in Greater Khartoum)
Urban Population	18.5 Percent (20.5 Percent in Northern Sudan; 10.3 Percent in Southern Sudan)
Nomadic Population	11 Percent
Foreign Nationals, 1973	300,000 (Considered to be Underestimated)
Sudanese Nationals Abroad	N.A. (Estimated by GOS as Greater than One-Half Million)

#### Department of Statistics

The Statistical Department has overall responsibility for statistical activities in the country, but it has tended to restrict its activities to the 12 provinces in the Northern region. The Statistics Division of the Directorate of Planning, Regional Ministry of Financial and Economic Planning, is in charge of statistical programs in the three provinces in the Southern region. The department in Khartoum, however, had devised plans to closely coordinate census operations for the forthcoming enumeration.