

ECONOMIC AND SOCIAL COUNCIL

**Ninth United Nations Regional Cartographic
Conference for the Americas
New York, 10-14 August 2009
Item 5 (b) of the provisional agenda***

Country reports

National Report of Kenya *

*** Prepared by Survey of Kenya.**



REPUBLIC OF KENYA

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REPUBLIC OF KENYA

COUNTRY STATEMENT

The Republic of Kenya is one of the East African States. It covers an area of 582646 Square Kilometres, Kenya is located between longitudes 34° and 40° East and latitude 5°30' North and 5° South. The country has an estimated population of 37.5 million people.

The mandate of the Ministry of Lands is to ensure effective and efficient management of land resource in the country by providing the necessary land information and technical services to the members of the public.

The Ministry manages, controls and administers, the land resource in order to maximize its utilization, as a major economic and social asset. This involves planning for all land based activities of the country and can be undertaken harmoniously at various levels. The Ministry also ascertains and registers all rights and interests on land as a basis for improvement of quality of life and sustainable development. It is therefore responsible for land use planning, land adjudication and settlement, surveying and mapping, land valuation, land registration and land administration through the following departments.

- Physical Planning
- Land Adjudication and Settlement
- Surveys and
- Lands
- Administration & Planning.

The various technical departments depend on one another for collection and supplying of information needed for the day to day operations including analysis, storage and retrieval for policy formulation and decision making.

The Ministry has updated ten topographic map Sheets at 1 to 50,000 and several thematic maps at various scales.

It has also upgraded its surveying and mapping equipment by acquiring Digital Photogrammetric Workstations (DPW) and also acquired Global Navigation Satellite Systems (GNSS) and Total Stations. The Ministry has also established in the year 2006 a National Hydrographic Office to undertake hydrographic surveys in Kenya's territorial waters for preparation of charts required for safe navigation, determination of maritime boundaries and jurisdiction, exploitation of marine resources and protection of marine environment.

The Ministry has initiated development of a National Spatial Data Infrastructure (NSDI) which was started in the year 2001 and is now in its implementation stages. The NSDI will provide a platform for efficient access, sharing and dissemination of land and other geographic information (spatial data).

During the period under review the Ministry initiated the formulation of a National Land Policy and the development of a GIS based National Land Information Management System (NLIMS) for efficient management of land resource for sustainable development.

The Ministry of Lands is faced with the following challenges in order to fulfil its mandate:

1. Implementation of the National Land Policy, finalization and implementation of a National Spatial Data Infrastructure Policy to facilitate easy access and dissemination of land and other geographical information.
2. Establishment of a Global Coordinate Reference System to facilitate use of emerging surveying and mapping technologies.
3. Establishment and maintenance of a GIS based National Land Information Management System.
4. Operationalisation of the National Hydrographic Office to facilitate production of charts and other nautical information.

The Ministry of Lands has not been able to address the above mentioned challenges due to financial constraints and inadequate skilled human resource capacity.

Country Report of Kenya

1.0 Introduction

The purpose of this report is to inform the conference of recent activities that have been undertaken in Kenya within the last four years in the area of surveying and mapping. The report will mainly cover developments in cartography, photogrammetry, spatial data infrastructure, and hydrography.

Survey of Kenya is a national mapping agency for the government. It has been in existence since 1903. Currently, Survey of Kenya is the lead agency among other stakeholders involved in the development of Kenya national spatial data infrastructure(KNSDI). Survey of Kenya is one of the departments in the Ministry of Lands. Ministry of lands has four other departments namely: Lands, Physical Planning, Land Adjudication and Settlement and Administration. Administration department coordinates operations in the ministry and provides critical support to all the technical departments(<http://www.ardhi.go.ke/>). A discussion of existing training institutions as well as professional organizations is also included.

1.1 Location

Kenya is one of the East African States. Kenya is located between longitudes 34° and 40° East and latitude 5°30'North and 5° South. It has an area of 587,000 square kilometres of which 11,000 square kilometres is covered by water. 17% of the land is classified as high and medium potential while 83% is classified as arid or semi-arid. The country has a population of 37.5 million people(http://devdata.worldbank.org/AAG/ken_aag.pdf). The economy rely mainly on agriculture, tourism, small scale Industries, fisheries, mining, and forestry.

1.2 Economic Policy Issues

Poor economic performance experienced in Kenya during the last two decades has made it necessary to review existing policies. The greatest challenge facing the government today is how to restore economic growth, generate adequate employment and reduce high levels of poverty. In response to these challenges, the government put in place an Economic Recovery Strategy (ERS) for wealth creation which started in 2003 and expired by the end of December 2007. This has been succeeded by Vision 2030 launched on October 2007. Kenya Vision 2030 is the new country's development blueprint meant to cover the period 2008 to 2030. It aims at making Kenya a newly industrializing, "middle income country providing high quality life for all its citizens by the year 2030". During the life of the Vision, strategies and action plans developed by ministries will be systematically reviewed and adjusted every 5 years.

Survey and mapping and GIS will be used as one of the key technology in accelerating economic growth through orderly development.

2.0 Cartographic Activities

A program of updating topographic map sheets was started in June 2008 by Survey of Kenya in various parts of the country using a combination of hand-held GPS and existing topographic maps. All the maps being updated were at a scale of 1:50,000. It was viewed that larger scale maps such as those of 1:10,000 and larger would not work well with the type and model of the hand-held GPS which was being used for the purpose. Positioning accuracy for a hand held is low. User manual for Garmin model GPSMAP60 guarantees positional accuracy to be less than 15 metres(Garmin,2006).

2.1 Map Updating Procedure

Each map was digitized along common layers such as Hydrography, relief, vegetation, settlement patterns (Built up areas) and Communication . Attribute data was created for each feature digitized and made compatible with Arcview software.

The mode of data collection was by picking new data in waypoints and tracking roads using GPSMAP60 a hand held GPS. This process created points and lines.

The project was aimed at revising ten topographical maps namely: Malindi, Gede, Mazaras, Mombasa, Nyeri, Karatina, Meru, Nkubu, Kerugoya and Embu all at the scale of 1:50,000.

After field data collection, maps were digitized and data transferred from the Garmin GPSMAP60. Consistency of data from the GPS were created using standards and codes developed by Kenya national spatial data infrastructure initiative. Field notes including interviews with the local communities assisted in the collection of attribute data. The GPS data was found to be suitable for 1: 50,000 and smaller scales. It was found that the features on the satellite images, photographs and the topographic map to be revised should be digitized before going to the field. This makes field work more productive.

The Software used for map updating exercise were ArcGIS for data capture and storage and Adobe illustrator for design.

Several problems were encountered in design implementation due to the capability of the software available with regard to specifications of topographic map. A lot of experimentation was necessary in order to come up with maps meeting the set standards in topographic mapping.

Line weights, line thickness, text and all other details were implemented using survey of Kenya specifications for topographic maps at a scale of 1:50,000.

As of now, 8 maps have been digitized up to proof stage and printed in pdf file format. After proof reading, editing will be done to make the maps ready for export to image-setter for final printing.

2.2 Summary of map updating projects

A summary of map updating projects that have been completed Table 1 below.

s/no.	Name of project/task	period	Details	Objective	Remarks
1.	Nairobi National Park	2007	1:40,000	Production of a revised digital map	<ul style="list-style-type: none"> • Conversion of analogue reprints to Digital files for press printing
2.	District mapping	2007	Scale dependent on area of district	22 provisional maps produced for Coast and Western provinces	<ul style="list-style-type: none"> • Data from District Survey. • Maps superseded due to creation/subdivision by OP.
3.	Georeferencing and Coordinate transformation	2007-2008	Topo-sheets at 1:50,000, 1:100,000 and 1:250,000	582 sheets processed to user requirements	<ul style="list-style-type: none"> • Fulfillment of request by CCK.
4.	Map of Coal Exploration in Mui Basin Kitui	2008	1:100,000	Physical map of Mui Basin indicating the proposed exploration blocks	<ul style="list-style-type: none"> • Map compiled from outdated data and a new edition may be required to depict the current situation on the ground
5.	Topographical map revision	2008/2009	1:50,000	Updating of 10 Y731 series maps using handheld GPS for data collection and digital map compilation methods.	<ul style="list-style-type: none"> • The results of data collected using handheld GPS showed that prior preparation of a field sheet from satellite imagery interpretation is a prerequisite. It is recommended that for future projects satellite images be acquired and interpreted first, as a preparation for field verification
6.	Kenya Route Map	2009/2010	1:1,000,000	To revise/redesign the current route map	<ul style="list-style-type: none"> • Vectorisation of old data 50% complete. • Source new road data from Ministry of Roads
7.	Topographical map revision	2009/2010	1:50000	To construct/revise 10 topographical maps along the Kenya Uganda border	<ul style="list-style-type: none"> • Project in the initial stages

2.3 Summary of new projects undertaken within the period 2005 – 2008 using GIS technology

S/No.	Name of Project	Period	Additional Information	Objective	Remarks
1	THE MAU COMPLEX	2009	Printed at scale of 1:50,000	<ul style="list-style-type: none"> To capture all additional and excisions done in the Mau forest. 	Transformation of existing coordinates from Cassini to UTM Map digitizing
2	KENYA/TANZANIA MARITIME BOUNDARY MAPS	March-April 2008	Printed at scale 1:3,500,000	<ul style="list-style-type: none"> To compile maritime maps for Kenya and Tanzania within the Indian Ocean. 	
3	SURVEY OF SOLIO RANCH	Feb- Dec 2008	A total of 5968 farm plots were surveyed	<ul style="list-style-type: none"> To settle the landless. 	
4	STATE HOUSES AND STATE LODGES	2008		<ul style="list-style-type: none"> To map the location of all state houses/lodges. Map all nearest air fields. Show nearest towns. 	Work was executed using hand held GPS
5	NAIROBI MISSING LINK ROADS	March 2009		<ul style="list-style-type: none"> To determine and authenticate the ownership of land along the link roads. Evaluate encroachment on the Road reserve. Pinpoint land for compulsory acquisition. 	Work done by compilation of digital Topo-cadastral Maps
6	REPUBLIC OF KENYA CONTINENTAL SHELF BEYOND 200 N	March – April 2009	Maps produced in A0 size and in A4	<ul style="list-style-type: none"> To establish the Exclusive Economic zone for Kenya. 	Figure

3.0 Photogrammetry

Photogrammetric equipment in the department is being upgraded, the department recently procured three JX-4G from Beijing Geo-Vision Company at a cost of U \$ 187,500 to speed up handling of digital photogrammetric data. JX-4G is a microcomputer of digital photogrammetric system with strong practical friendly interface and good quality control. It can be used for generating digital elevation models (DEM) and ortho photo images as well as for vector data capture. Figure 3 and 4 shows the set up of this instrument. Figure 1 and 2 shows the old system still in use but slowly will be phased out after existing projects have been completed.

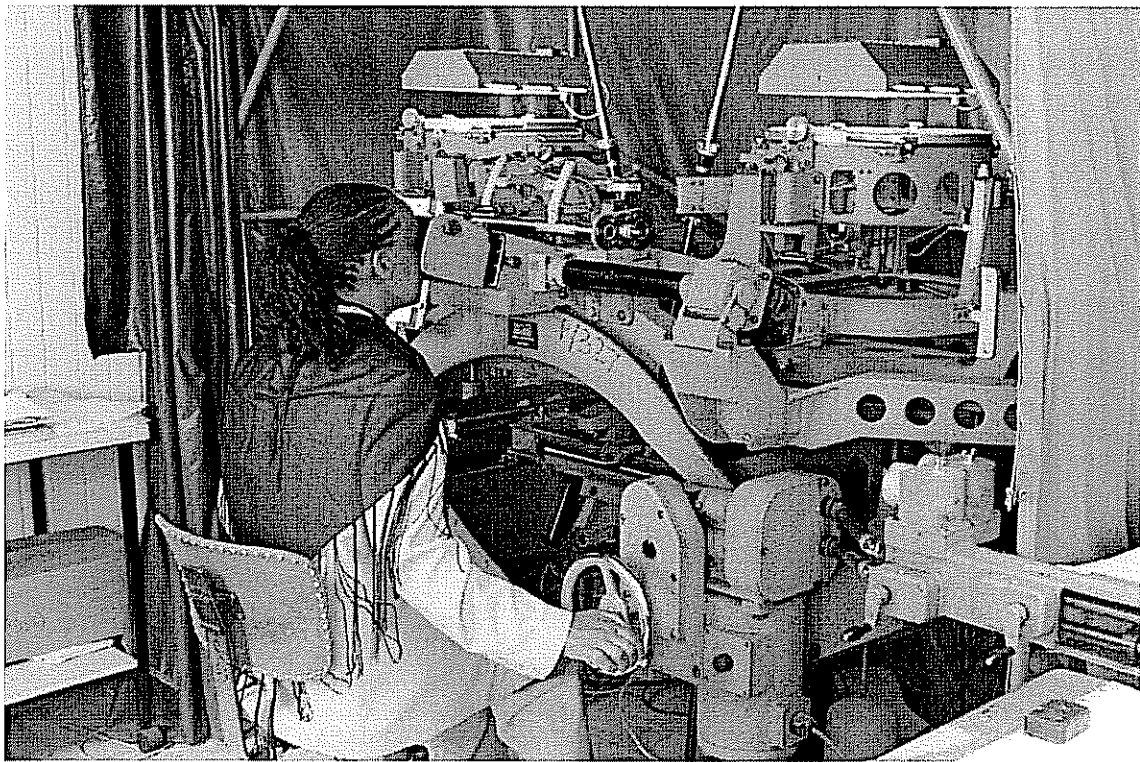


Figure 1: Shows analogue photogrammetric plotter connected to Wild A8 Machine

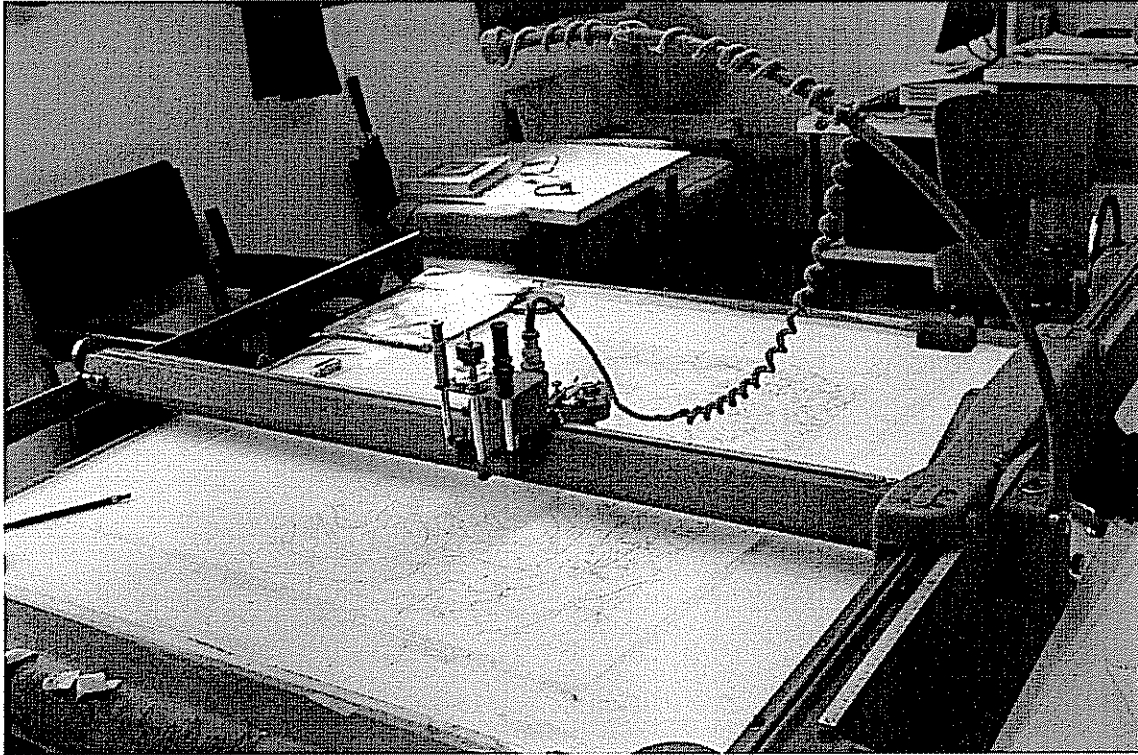


Figure 2: Shows the output pencil plotting on a flat machine table

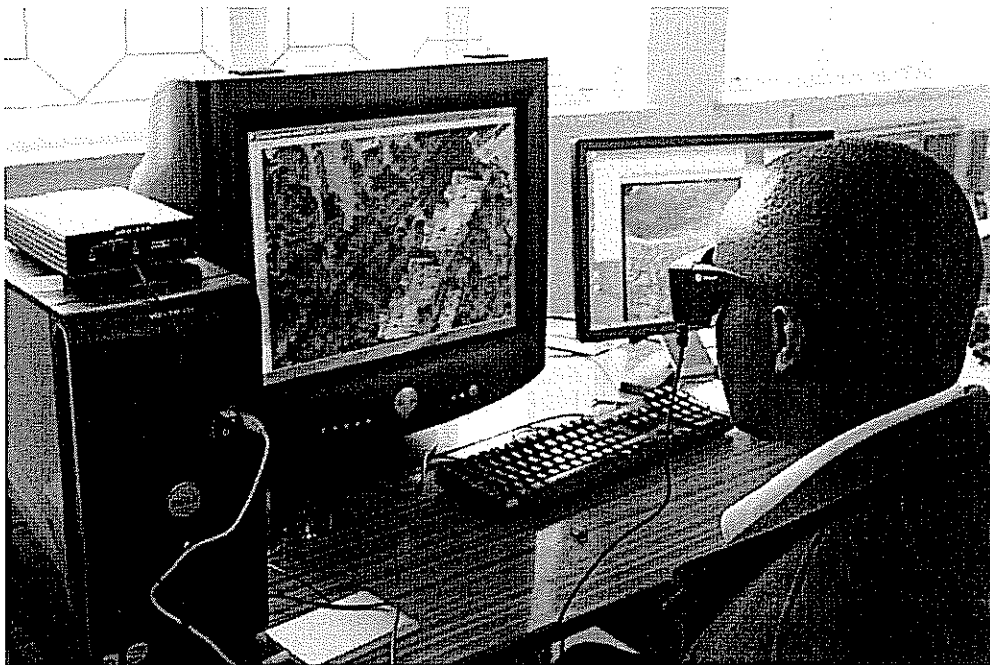


Figure: 3 Shows modern JX-4G Digital Photogrammetric System in use

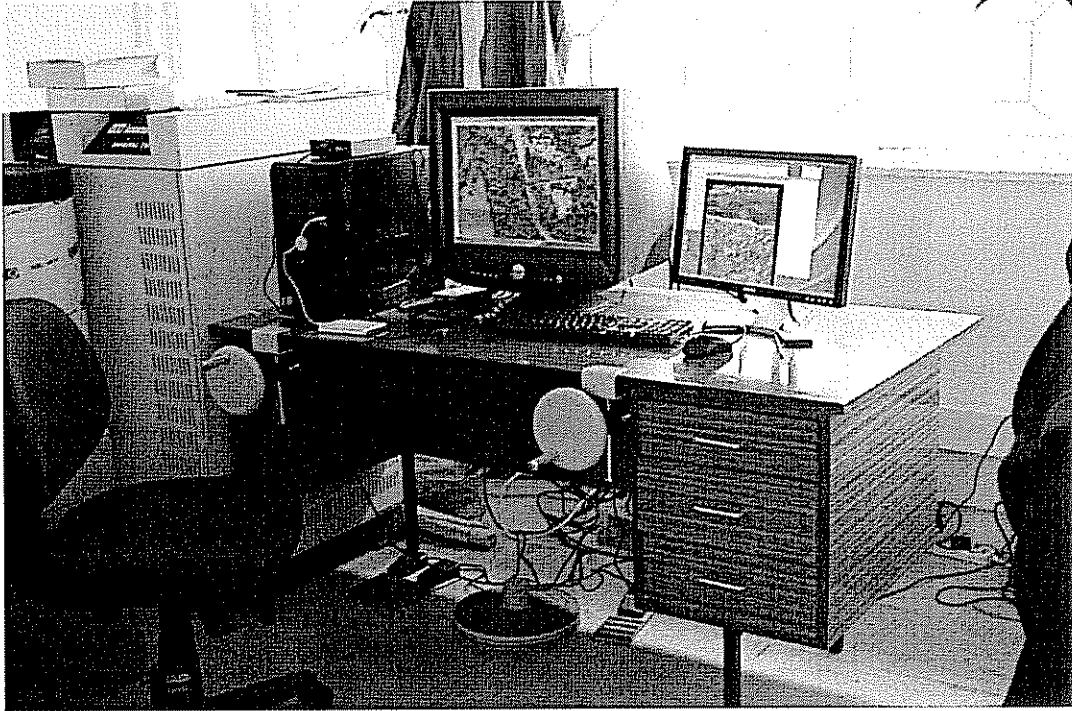


Figure 4: Shows JX-4G Digital Photogrammetric System parts connected (at Survey of Kenya July 2009). The departmental decision to change from analogue to digital photogrammetric equipment aims at achieving a higher accuracy as well as improving efficiency in the production of base maps . It renders the scope of handling data from various sources including high resolution satellite imagery possible.

4.0 IMPLEMENTATION OF KENYA NATIONAL SPATIAL DATA INFRASTRUCTURE IN KENYA (KNSDI)

The development of Kenya National Spatial Data Infrastructure (KNSDI) started in year 2006 and is being implemented in phases. Phase I involved the establishment of KNSDI standards, preparation of digitalization manuals, and establishment of guidelines for data sharing.

Phase II is concerned with the development of KNSDI draft policy document which is now awaiting approval by stake holders. If the policy is adapted, it will form the basis of legal and institutional framework for KNSDI management. KNSDI guidelines to facilitate data sharing have been developed and published. These guidelines address copyright issues, data pricing and data security. KNSDI web site has also been created and is www.knsdi.go.ke

4.1 Standards that have been developed for KNSDI

Standard code.	Purpose
KSISO 19101	G1 – Reference model
KSISO 19109	G1 – Rules for scheme
KSISO 19111	G1 – Spatial referencing by coordinates
KSISO 19113	G1 – Quality principal
KSISO 19114	G1 – Quality evaluation Procedures
KSISO 19115	G1 – Meta data

A part from the standards, three digitization manuals have been prepared and provide guidelines for digitization of respective maps as follows:-

National topographic maps, topo-cadastral, and national reserve maps.

They explain three processes for digitization: - scanning, geo-referencing and layout.

KNSDI has adopted the following as fundamental datasets:

- Geodetic control
- Imagery
- Geographical names
- Administrative boundaries
- Parcel boundaries
- Transportation
- Hydrography
- Vegetation
- Elevation
- Utilities
- Buildings
- Geology

5.0 Hydrographic Surveys

Hydrographic surveys have been conducted by various agencies mainly from the United Kingdom, the United States, France, Canada, India and Russia. Some of the surveys are not reflected in the published charts.

In 2006, The French Agency National Hydrographic and Oceanographic Services (SHOM) carried out bathymetric survey with the 200M Exclusive Economic Zone (or the Continental Shelf) off the Kenya Coast and delivered to the Government of Kenya the following:

Bathymetric sheet at scale 1/3,500,000; hydrographic and gravimetric datasets; hydrologic profile. The East African Community through the Lake Victoria Basin commission Secretariat commissioned a consultant to conduct hydrographic survey of lake Victoria and to produce charts for the ports of Mwanza, Port Bell and Kisumu. This survey was undertaken in October 2007.

Currently, Kenya relies on United Kingdom Hydrographic Office for chart production. In 2004, Kenya produced and published the fourth Edition of the Kenya Territorial Sea and Exclusive Economic Zone Maps which have been deposited with the Secretary General of the United Nations, copies are available in both paper and digital forms. The delimitation of the continental shelf of the Kenya coast has just been finalized and is in the process of being forwarded to the Secretary General of the United Nations. The United Kingdom hydrographic office is to help the country in developing the hydrographic service. Hydrographic software has been procured to aid in the charting in future.

The Kenya Government in collaboration with the International Maritime Organization has established a regional Maritime Rescue and Coordination Center at the port of Mombasa. It is operated by the Kenya Maritime Authority, and covers the territorial waters of Kenya, Tanzania, Seychelles and Somalia.

Survey of Kenya has six (6) category B hydrographers, who have been trained in Japan and have recently obtained sea experience during the United States Navy surveys in Lamu and Manda Islands in Kenya. The Kenya Navy has (3) officers who have undertaken category B courses. One officer attended the multi-beam course in India in November last year.

5.1 Challenges and Constraints

- Inadequate trained personnel to handle the full range of hydrographic activities. The department has only six hydrographers holding internationally accredited category B certificates in Hydrographic survey from the Hydrographic and Oceanographic department of Japan Coast guard. There is need to train more staff on this category and the category A for the division to be fully operational.
- There are no equipments to undertake hydrographic activities. Due to the high cost of the equipment the department would require a special allocation to purchase the equipment.
- Limited software licences to analyse data obtained
- Inadequate funding for the completion of mapping programmes.

APPENDIX 1- Sample photographs and Diagrams

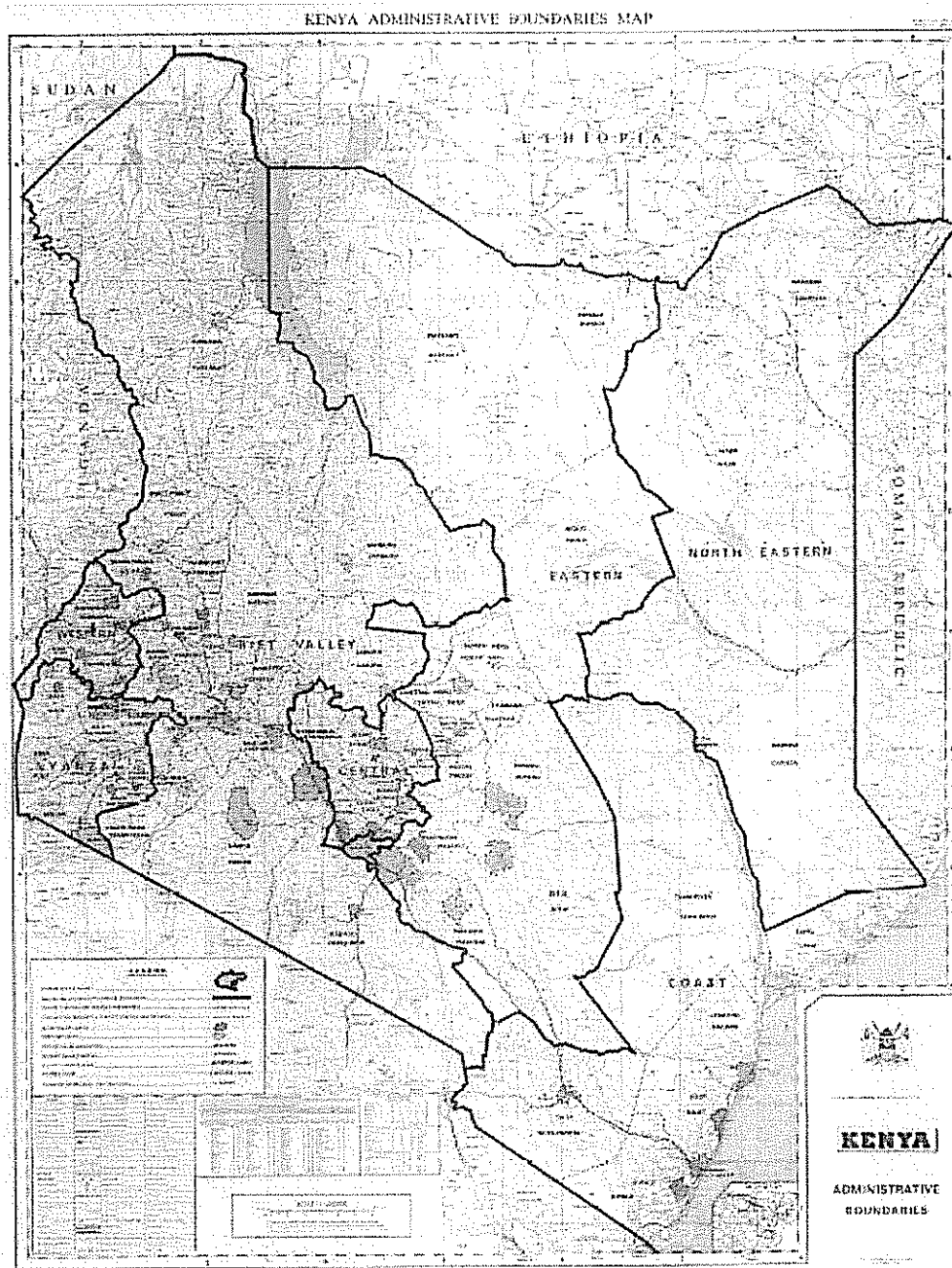


Figure 5 Shows Administrative Map of Kenya

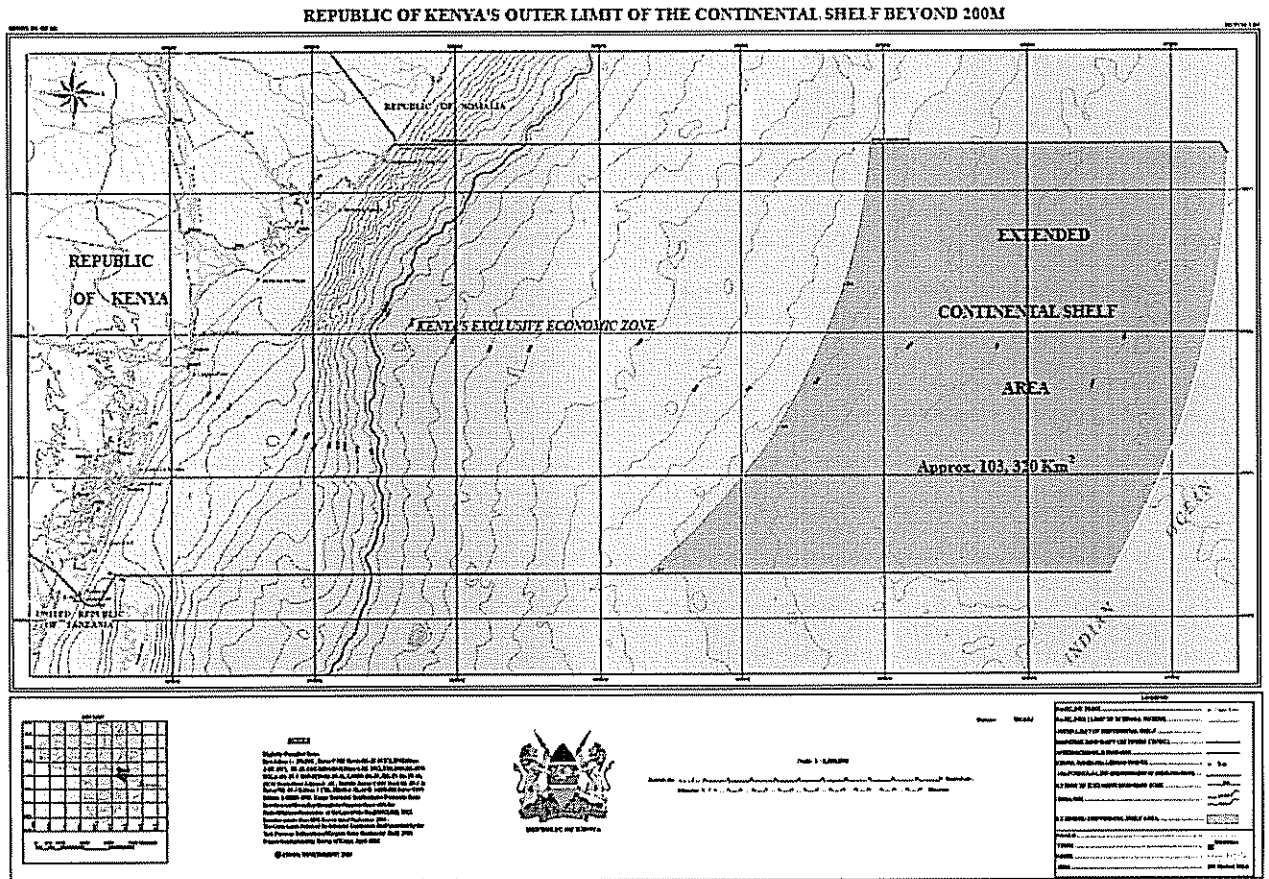


Figure 6: Shows Kenya Exclusive Economic Zone and the Extended Continental Shelf

**Shows: Leica Total Station Model TPS 1200 procured as part of modernization program.
Survey department has 14 units.**

