

KENYA

Kenya has a coastline that stretches over 536 km of the Indian Ocean, a total land area of 569,140 sq km and a population of 39,002,772¹. Recurring drought and flooding during rainy seasons are natural hazards experienced by Kenya. The December 26, 2004 tsunami event generated significant damages on the coast of Kenya. This section provides a summary report of the assessment visit conducted by an IOC-IHO expert team in Kenya from 24 to 28 May 2010.

The team was welcomed by her Excellency Dorothy N. Angote (Ms.) CBS, Permanent Secretary, Ministry of Lands. The team had the opportunity to meet and discuss with the Survey of Kenya² and other institutions in Kenya likely to be concerned with this project, and to present the Coast-Map-IO project to the Kenyan National Hydrographic and Oceanographic Committee. The assessment results are summarized in Table 11.



¹ <https://www.cia.gov/library/publications/the-world-factbook/geos/ke.html>

² Mr. Ephantus Murage Mundia, Director of Surveys, Ministry of Lands



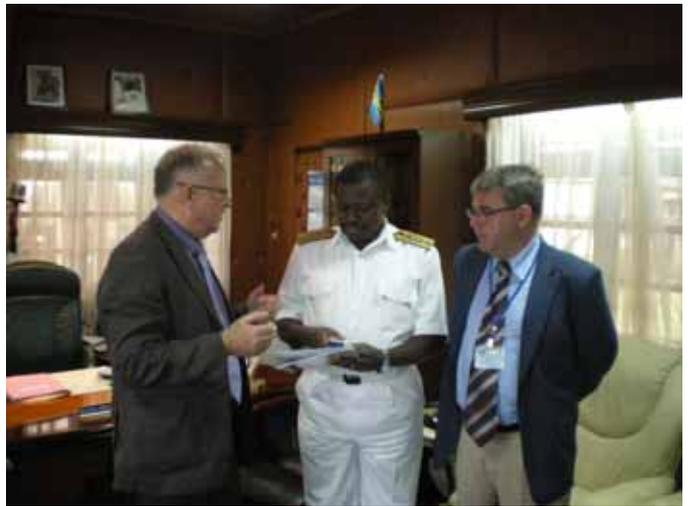
Welcome by the Permanent Secretary, Ministry of Lands



Participants in Meeting at Ministry of Lands, Nairobi



Participants in KNHOC Meeting at KMFRI, Mombasa



Visit to the Commander in Chief of Kenyan Navy

Table 11. Kenya National Assessment Summary, April 2010

Status	Needs
<p><u>Mapping and research agencies: potential fields of competence</u>³</p> <ul style="list-style-type: none"> • Survey of Kenya, Ministry of Lands: land topography; hydrographic surveying; data acquisition, processing and management; geodetic networks. • National Tsunami Early Warning Center of the Kenya Meteorological Department (KMD-NTEWC): tsunami modelling; inundation map construction; weather / climate modelling; tide / water level measurement. • Regional Center for Mapping of Resources for Development (RCMRD): provision of quality geo-information and allied products for sustainable development of regional countries, including associated training; maintenance and management of geodetic and topographic equipment at regional level. • Kenya Ports Authority (KPA): availability of platforms (launches) for hydrographic surveys in port areas. • Kenya Marine and Fisheries Research Institute (KMFRI): limited hydrographic survey capability; oceanographic and hydrographic data acquisition, processing and management. • Kenya Navy: availability of platforms and logistical support for hydrographic surveys. • 	
<p><u>Summary of available products and data</u></p>	
<ul style="list-style-type: none"> • Bathymetry 	
<ul style="list-style-type: none"> ○ Survey of Kenya: multibeam bathymetric data from 2000 m to 3500 m for EEZ delimitation; UKHO survey sheets used to compile nautical charts covering Kenyan coast and the charts themselves. 	Digitizing tools
<ul style="list-style-type: none"> ○ KMD-NTEWC: <i>none</i> 	
<ul style="list-style-type: none"> ○ RCMRD: <i>none</i> 	
<ul style="list-style-type: none"> ○ KPA: <i>none</i> 	
<ul style="list-style-type: none"> ○ KMFRI: <i>none</i> 	
<ul style="list-style-type: none"> ○ Kenya Navy: <i>none</i> 	
<ul style="list-style-type: none"> • Topography 	

³ See addresses and focal points at Annex 11A

Status	Needs
<ul style="list-style-type: none"> ○ Survey of Kenya: Topographic map series at 1: 50,000 scale covering the entire coast of Kenya, partly digitised. 	Digitizing tools
<ul style="list-style-type: none"> ○ KMD-NTEWC: <i>none</i> 	
<ul style="list-style-type: none"> ○ RCMRD: <i>none</i> 	
<ul style="list-style-type: none"> ○ KPA: <i>none</i> 	
<ul style="list-style-type: none"> ○ KMFRI: <i>none</i> 	
<ul style="list-style-type: none"> ○ Kenya Navy: <i>none</i> 	
<u>Summary of resources available</u>	
<ul style="list-style-type: none"> • Human 	
<ul style="list-style-type: none"> ○ Survey of Kenya: 7 Cat B hydrographers and 1 Cat B nautical cartographer. 	training in basic hydrography for several officers; training for 2 Cat A hydrographers and 1 Cat B nautical cartographer.
<ul style="list-style-type: none"> ○ KMD-NTEWC: 3 officers trained in tsunami modeling and inundation mapping. 	Training in tsunami modelling for 1 officer.
<ul style="list-style-type: none"> ○ RCMRD: <i>unknown</i> 	
<ul style="list-style-type: none"> ○ KPA: <i>none</i> 	
<ul style="list-style-type: none"> ○ KMFRI: several PhD physical oceanographers; 2 officers trained in bathymetric data acquisition, processing and management, and 2 officers trained in tsunami modelling and inundation map construction (within Coast-Map-IO). 	
<ul style="list-style-type: none"> ○ Kenyan Navy: 1 Cat B hydrographer. 	Training for several Cat B hydrographers and several officers in basic hydrography.
<ul style="list-style-type: none"> • Platforms 	
<ul style="list-style-type: none"> ○ Survey of Kenya: <i>none</i> 	
<ul style="list-style-type: none"> ○ KMD-NTEWC: <i>none</i> 	
<ul style="list-style-type: none"> ○ RCMRD: <i>none</i> 	
<ul style="list-style-type: none"> ○ KPA: several launches 	
<ul style="list-style-type: none"> ○ KMFRI: <i>none</i> 	
<ul style="list-style-type: none"> ○ Kenyan Navy: several vessels and launches 	
<ul style="list-style-type: none"> • Equipment/Software 	

Status	Needs
<ul style="list-style-type: none"> ○ Survey of Kenya: 1 workstation for digital Photogrammetry & cartography; 5 computers and plotters; ArcGIS software. 	<p>Caris GIS, Hypack & Caris Hips; GIS Workstations to maintain Hydrographic Database; Survey Equipment e.g. 2 portable Single-Beam Echo-sounders (SBE), 1 portable Multi-Beam Echo-sounder (MBE), 2 DGPS receivers, 1 velocity profiler; 1 Side Scan Sonar (SSS); 1 current meter; 1 sub bottom profiler.</p>
<ul style="list-style-type: none"> ○ KMD-NTEWC: 4 tidal gauges installed at Kilifi, Lamu, Shimoni and Malindi; tsunami modelling software (CoMit). 	<p>2 tide gauges,</p>
<ul style="list-style-type: none"> ○ RCMRD: 40 computers; training facilities; numerous geodetic equipment. 	
<ul style="list-style-type: none"> ○ KPA: <i>unknown</i> 	
<ul style="list-style-type: none"> ○ KMFRI: 1 portable single-beam echo-sounder and 1 GPS receiver, supplied from Coast-Map-IO. 	
<ul style="list-style-type: none"> ○ Kenyan Navy: <i>none</i> 	

CONCLUSIONS

1. Land Survey of Kenya, with its competent personnel, has experience and expertise in topographic and bathymetric database management. It has qualified hydrographers and a nautical cartographer. Therefore, Survey of Kenya should play the role of Focal Point for Coast-Map-IO.
2. There are almost no hydrographic activities in Kenya. The Hydrographic Division of Survey of Kenya holds copies of the hydrographic survey sheets produced by the British Hydrographic Office up to the 1980's. Survey of Kenya also holds topographic maps at 1:50,000 scale covering the entire coast of Kenya, part of them have been digitised.
3. An initial version of the seamless Coast-Map-IO bathymetric and topographic database could be established from digitising the existing hydrographic survey and topographic sheets/maps. This will subsequently be complemented by the data which will result from surveys in progress and planned.
4. Survey of Kenya is the national institution responsible for hydrography, through its Hydrographic Division, and for land topography. It would therefore seem logical that the Coast-Map-IO database be hosted by Survey of Kenya, although provision of appropriate training and tools would be required.
5. The National Tsunami Early Warning Center of the Kenya Meteorological Department (KMD-NTEWC) has some expertise and holds tools in tsunami modelling and inundation map construction, although provision of additional training and tools would be required for KMD-NTEWC to be self-directed.
6. Kenya Navy holds a number of platforms (vessels and launches) which hopefully can be made available to conduct hydrographic surveys, in cooperation with Survey of Kenya.
7. The Regional Center for Mapping of Resources for Development (RCMRD) can provide training facilities and possibly be a regional centre of maintenance and management for hydrographic and geodetic equipment, if appropriate training is provided.
8. The existing Kenyan National Hydrographic and Oceanographic Committee (KNHOC), chaired by the Director of Survey of Kenya, could play a significant role in coordinating the activities of all national agencies involved in Coast-Map-IO, providing KNHOC continues receiving appropriate support at Government level.
9. As a potential beneficiary of Coast-Map-IO, the Kenya National Disaster Operation Centre would be expected to actively support the project.

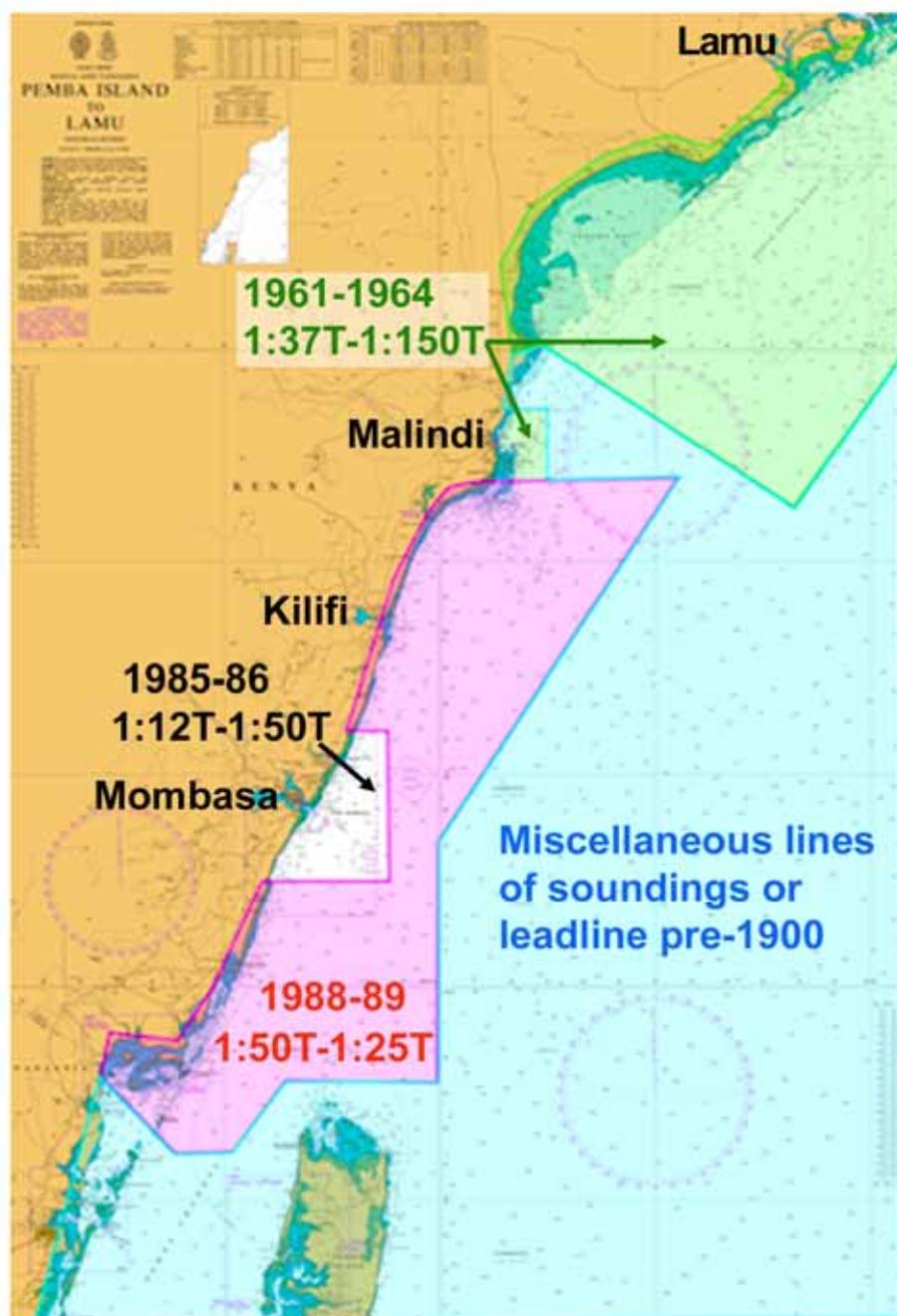
RECOMMENDATIONS

1. Due to its responsibility for hydrography and topography at national level, Survey of Kenya should be responsible for the establishment and management of the seamless Coast-Map-IO bathymetric and topographic database.
2. Appropriate equipment/software and training should be provided to the Hydrographic Division of Survey of Kenya, to manage the bathymetric and topographic database.
3. The existing hydrographic survey and topographic sheets / maps at Survey of Kenya should be digitised, as necessary, to create the initial database. Additional hydrographic surveys may be required in potentially vulnerable areas where data of good quality is insufficient.
4. Bathymetric and topographic data should be encoded according to international standards.
5. The National Tsunami Early Warning Centre of the Kenya Meteorological Department (KMD-NTEWC) should be responsible for tsunami modelling and inundation map construction, through cooperation with Survey of Kenya.
6. Additional tools and training should be provided to KMD-NTEWC, in support of tsunami modelling and inundation map construction.
7. Survey of Kenya should cooperate with Kenya Navy, in view of using the Navy's platforms (vessels and/or launches) to conduct hydrographic surveys, as needed.
8. Consideration should be given to using the training facilities and the competence in equipment management and maintenance of the Regional Center for Mapping of Resources for Development (RCMRD), for Coast-Map-IO needs.
9. Survey of Kenya should be the focal point for Coast-Map-IO. KNHOC should ensure and strengthen the necessary cooperation between the institutions involved in the project.
10. KNHOC should receive appropriate support at Government level.
11. Government of Kenya is invited to support participation of Survey of Kenya in the meetings of the Southern Africa and Island States Hydrographic Commission (SAIHC), to benefit from the IHO Capacity Building Programme.
12. Government of Kenya is invited to consider joining the International Hydrographic Organization.

MAPPING AND RESEARCH AGENCIES IN KENYA
Addresses and Focal Points

- Survey of Kenya
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Website: www.knsdi.go.ke/sokfinal/
- Kenya Meteorological Department (KMD)
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KMD, Ministry of Environment & Mineral Resources
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E-mail : mafimbo@yahoo.com
Website: www.meteo.go.ke/
- Regional Center for Mapping of Resources for Development (RCMRD)
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STATUS OF BATHYMETRIC DATA IN KENYA⁴



Lamu

Main Harbour and Approaches:
1990, 1:37.5T & 1986, 1:12.5T
Outer Approaches: 1961, 1:50T

Malindi

Main Harbour and Approaches:
1963, 1:37.5T

Kilifi

Main Harbour: 1888
and earlier leadline surveys.
Approaches: 1986, 1:12.5T

Mombasa

Main Harbour and Approaches:
1985, 1:10T
Outer Approaches: 1985, 1:50T

⁴ Additionally, a multibeam survey was conducted in 2009 from 2000 m to 3500 m depth, as part of the delimitation of the Kenyan continental shelf.