

NATIONAL REPORT OF THE UNITED REPUBLIC OF TANZANIA ON SEA LEVEL STATUS

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1.0 INTRODUCTION

The United Republic of Tanzania is a Maritime State of the Indian Ocean with approximately 223,000 square kilometers of its Exclusive Economic Zone (EEZ) and a coastline length of about 1,500km. Along the coast of the main land there are three off lying big Islands namely Zanzibar, Pemba and Mafia, also there are many small Islands. In addition it has extensive inland maritime areas such as Lake Victoria, Lake Tanganyika and Lake Nyasa. The map of the United Republic of Tanzania is given in figure 1.

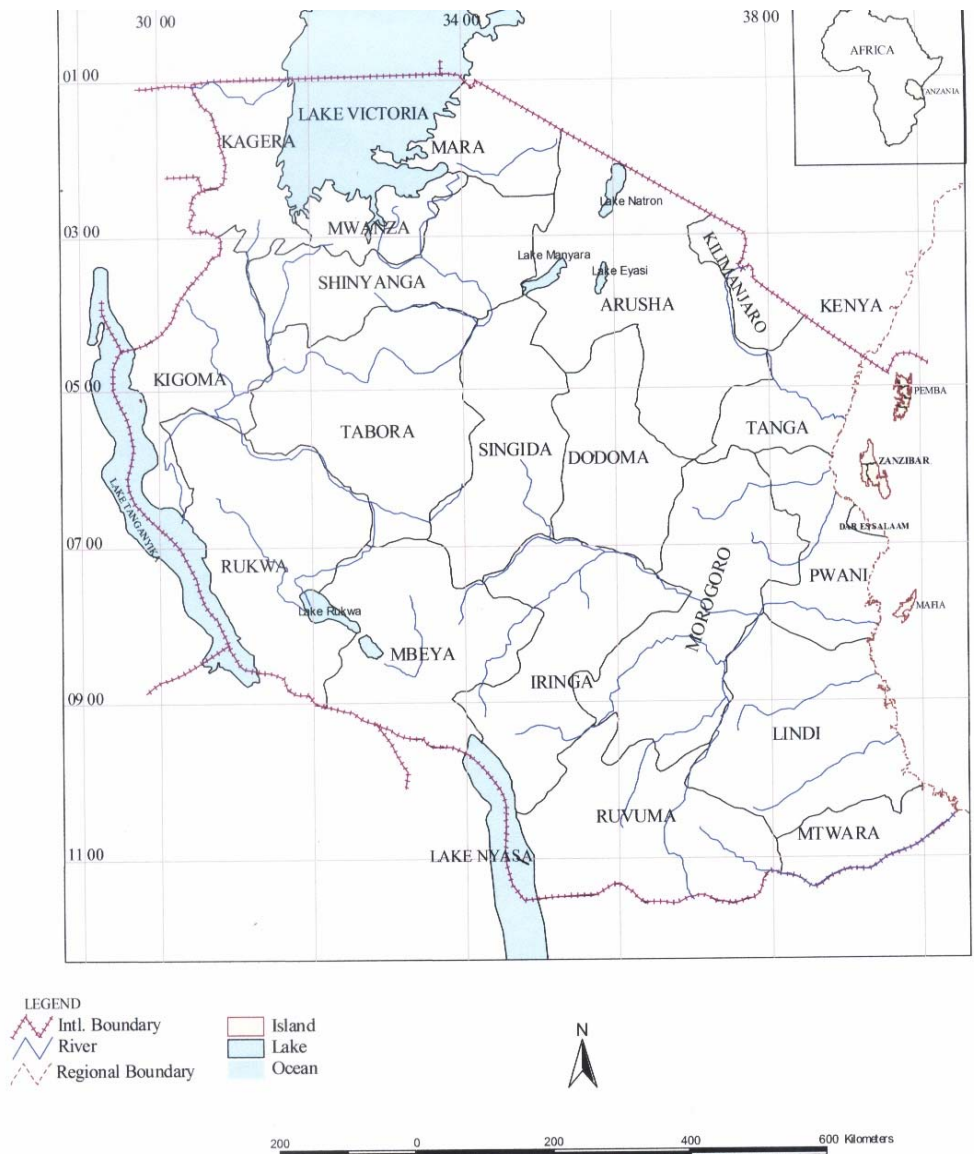
The Republic's Continental Shelf is predominantly narrow, dropping sharply in water depths exceeding 60m. The 200m isobath is 2km from the coast at the narrowest point and 80km at the widest point¹.

This report has been prepared for presentation at the GLOSS training Workshop Course on Sea Level Measurement, Interpretation and Related fields to be held in Oostend, Belgium from 13th - 24th November 2006.

This report provides an insight of sea level monitoring activities in the United Republic of Tanzania, by the application of self recording Tide Gauge Stations.

¹ Shigalla Mahongo, "Sea Level Measurement and Analysis in the Western Indian Ocean", 1999 pg 1.

Figure 1 : The map of The United Republic of Tanzania



2.0 STATUS OF SEA LEVEL MONITORING STATIONS

The network of sea level stations in the United Republic of Tanzania is comprised of only two operational stations, located in Dar es Salaam and Zanzibar ports. The Dar es Salaam port station consists of a mechanical float gauge whilst the Zanzibar port station has GLOSS status No. 297 and data transmission is by satellite.

Also in the past there were four tide gauges installed at Tanga, Mtwara (GLOSS Station No. 9), Mkoani in Pemba and Latham Island. At present they are all not operational. The tide gauge network in the country is shown in figure 2, and a list of the stations is given in table 1.

Figure 2 : Tide Gauge Network of Stations in The United Republic of Tanzania

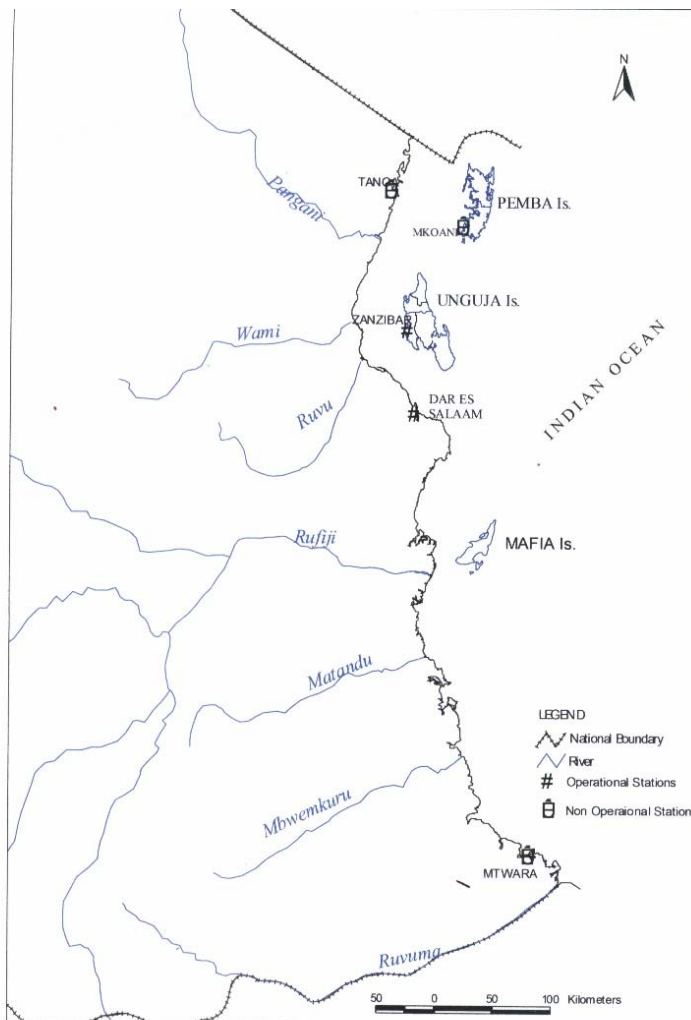


Table 1: List of Tide gauge Stations

S/No.	Station Name	Latitude "South"	Longitude "East"	Type of Gauge	Current Status
1.	Zanzibar	06° 09.3'	39° 11.4'	A satellite sea level transmitting station (tide logger, float and stilling well type) with Handar Encoder 436A and Encoder 436B. Data is in digital format.	Operational GLOSS Station No.297
2.	Dar es salaam	06° 49.2'	39° 17.3'	Vertical Water Level Recorder ALPHA - SEBA Hydrometre float and stilling well and data in analogical format.	Operational
3.	Tanga	05° 04'	39° 06'	Was Mumro 1H40 from 1956-1957 Also there was Munro 1H 109 float type from 1959-1962.	Not Operational
4.	Mtwara	10° 17'	40° 11'	Was Munro 1H 40 from 1962 to 1966.	Not Operational
5.	Mkoani (Pemba)	5° 21'	39° 38'	Munro 1H 109	Not Operational
6.	Latham Island	6° 30'	39° 30'	-	Not Operational

Since 1984, the Zanzibar tide gauge station has been operating smoothly, the station is linked to the UHSLC and IOC/GLOSS and is also considered to be one of the important Indian Ocean Stations for monitoring long term changes in the world sea level pattern.

Generally speaking the GPS technology is not used in the network. But periodic leveling is undertaken at the operational tide gauge stations. The last maintenance and leveling for Zanzibar station was carried out in February, 2003 and that for Dar es Salaam Station was performed in July, 1997.

2.0 RESPONSIBLE ORGANIZATIONS FOR OPERATIONAL TIDE GAUGE STATIONS

The Zanzibar tide gauge station is under the management of the Zanzibar Department of surveys and urban planning. The Dar es Salaam tide gauge station is maintained by Tanzania Ports Authority.

3.1 Zanzibar tide gauge station

The Zanzibar tide gauge is installed at the main quay at the port of Zanzibar and provides sea level data in digital format. At this station, formally the satellite transmission was at one hour intervals. In July, 2006, the UHSLC upgraded the station to 15 minute satellite transmission intervals. The sea level data processing for this station is carried out by the UHSLC. The picture of Zanzibar Station can be viewed in figure 3.

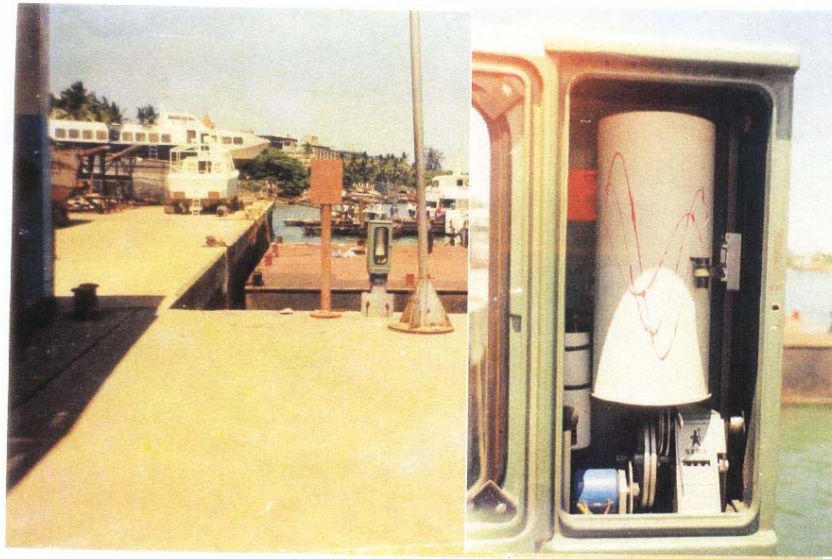
Figure 3 : Zanzibar Station



3.2 Dar es Salaam tide gauge station

The Dar es Salaam tide gauge is located at the Ferry Terminal, in front of the Marine Police offices. Recording of sea level data is by analogue charts, at 10 minute intervals. The Sea Level data processing for this station is carried out in the United Kingdom by two institutions, the UKHO and Proudman Oceanographic Laboratory (POL). The picture for Dar es Salaam Station can be seen in figure 4.

Figure 4 : Dar es Salaam Station



At the moment arrangements are being made by TPA to digitize the analogue charts for processing, with view to improve the tidal regime for Dar es Salaam port.

3.3 Photographs for Mtwara Port tide gauge location

Figure 5: The arrow shows previous location for Mtwara Tide Gauge



Figure 6: The arrow shows where the Mtwara Tide Gauge was previously installed



Figure 7: The arrow shows Mtrwara Port main quay



Figure 8: The Arrow shows where there is Mtwara Port entrance channel



The previous tide gauge at Mtwara port no longer exist, the only information we have is that the tide gauge was installed at the main quay, in the eastern side of the quay close to the boat steps as shown by arrows in figures 5 and 6. The suitable location for the new gauge would be on the same location as used to be the old one or any other ideal place as may be decided by UNESCO experts, depending on the convenience of users and the type of the gauge.

The bench mark for the new tide gauge has to be re-established from the nearest bench mark outside the port. The electric power and telephone lines are readily available in the port of Mtwara and the Port is fenced for security purposes.

The responsibility for the tide gauge should be vested to Tanzania Ports Authority and the contact in Mtwara would be the Port Master or the Port Engineer on behalf of the Port Master. The contact address is as follows below.

The Port Master
Tanzania Ports Authority
P.O. Box 530
Mtwara
Tanzania
Telephone: +255 23 2333125
Fax: +255 23 2333153
E-mail: pmmtwara@tanzaniaports.com

The available sea level data of the tide stations is held by different institutions around the world as shown in table 2.

Table 2: Availability of Sea Level Data and Sources

S/No.	Station Name	Data Available	Data Source
1.	Zanzibar	1 st March, 1984 to-date	GLOSS, NODEC, JASL, PSMSL, UHSLC
2.	Dar es Salaam	6 th July, 1986 to 30 th September, 1990 8 th July, 1977 to-date	JASL, PSMSL, UHSLC TPA
3.	Tanga	1962-1966	PSMSL
4.	Mtwara	1956-1957 1959-1962	GLOSS, PSMSL, UKHO

GLOSS: Global Sea Level Observing System
Website: <http://www.pol.ac.uk/psmsl/programmes/gloss/info.html>

JASL: Joint Archive for Sea Level
Website: <http://www.uhslc.soest.hawaii.edu/uhsic/jasl.html>

NODC: National Oceanographic Data Centre (USA)
Website: <http://www.nodc.noaa.gov>

PSMSL: Permanent Service for Mean Sea Level
Website: <http://www.pol.ac.uk/psml>

TPA: Tanzania Ports Authority
Website: <http://www.tanzaniaports.com>

UHSLC: University of Hawaii Sea Level Centre
Website: <http://www.ilikai.soest.hawaii.edu>

UKHO: United Kingdom Hydrographic Office
Website: <http://www.ukho.gov.uk>; www.ukho.gov.uk/easytide

4.0 SEA LEVEL PRODUCTS

The main products produced from sea level data are the predictions of heights and times of low and high water for each day of the year. Tidal information is of paramount importance in ports operation. The tide predictions for Zanzibar are produced by the UHSLC. Also the UKHO and POL produce tide predictions for Zanzibar as well for Dar es Salaam port. The tide for this country is semi diurnal type.

4.1 Importance of Tidal Data

In many aspects, accurate predicted tidal data is of great importance. For instance accurate tide predictions would be required when undertaking the following activities:

- ❑ Storm surge warning
- ❑ Long term climate studies
- ❑ Marine engineering constructions
- ❑ Vessels movement in ports.

5.0 CONCLUSIONS AND FUTURE PLANS

TPA intends to install tide gauges at Tanga and Mtwara ports for navigation purposes and other port operations. But the envisaged tide gauges will not be to GLOSS standards. If there are plans for IOC/UNESCO to erect GLOSS tide gauges in the near future at these two stations, then there is no need for TPA to do duplication efforts.

If the tide gauge stations will be improved in Tanzania, by employing GLOSS tide gauges at Tanga and Mtwara stations, then the effect of rise in sea level caused by global green house effect and other phenomenon can be easily monitored.

It will be very useful to have multi-parameter gauge stations, equipped with additional sensors for measuring meteorological and oceanographic parameters. Also the stations should have facility to use GPS techniques for vertical reference.

The green house effect has caused the opposite effect on the Lakes in Tanzania, whereby the water level is declining at an alarming rate instead of rising. The water level in the three great lakes, Victoria, Tanganyika and Nyasa has declined significantly. For instance in Lake Tanganyika at the point where Dr. Livingstone met Stanly onboard his boat, at Ujiji, in Kigoma town, at present this point is on land and the Lake is 700m away from it. In view of this the IOC/UNESCO should also take in to consideration to deploy GLOSS stations on the great Lakes for environmental research purposes.