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REPORT ON SEA LEVEL MEASUREMENT FOR GHANA

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1.0 INTRODUCTION

1.1 This report has been prepared for the GLOSS/Odin Africa Training Workshop on Sea Level Measurement and Interpretation at Oostende, Belgium. The Training Workshop will be held from 13th to 24th November 2006

2.0 SEA LEVEL STATIONS

2.1 There are two stations for sea level measurement in Ghana. The first was installed at the Takoradi Harbour around 1928 to determine tidal predictions for ships entering and leaving the Harbour. It also provided data for other hydrographical works along the coast of the Region. The Tide gauge was operational until 1998 when it completely broke down. The Equipment employed there was the mechanical float type. Between 1998 and 2004 only visual staff readings were kept.

2.2 In 2004 the Indian Government through its National Institute of Oceanography installed a new gauge at the Takoradi Harbour and a weather equipment. With the help of two (2) scientists from NIO, the Takoradi Gauge became fully operational in July 2004. Data collection began in earnest. The equipment which were donated were as follows

- i. The PPTR Sensor (2 No.)
- ii. The Data Logger (3 No.)
- iii. A Laptop computer (1 No.)

. Figure 1 below is the On-shore unit showing the data logger.



Figure 1



Figure 2

Figure 2 above shows the visual staff next to the sensor mounted along the triangular metal frame.



Figure 3

Figure 3 shows the downloading of data from the data logger (On-shore unit).

- 2.3 Takoradi Tide Gauge is on Longitude $01^{\circ} 44'W$ and Latitude $04^{\circ} 53'N$. There is a Fundamental Bench Mark at the gauge which is part of the National Framework survey
- 2.4 The second Tide Gauge was set up at the Tema Harbour around 1964. This also had the mechanical float type. During the expansion of the Tema Harbour in 1990, the Building housing the equipment was demolished. The reconstruction of the new building started last year and is yet to be completed. The Indian Government also donated a similar equipment as the one currently in use at Takoradi for the Tema Harbour. It will be installed when the building is completed at the Harbour.
- 2.5 The location of the Tema Harbour is Longitude $00^{\circ} 00'E$, and Latitude $05^{\circ} 37'N$.
- 2.6 Below find a map of Ghana (Figure 4) showing the location of the Takoradi GLOSS station on the Gulf of Guinea.

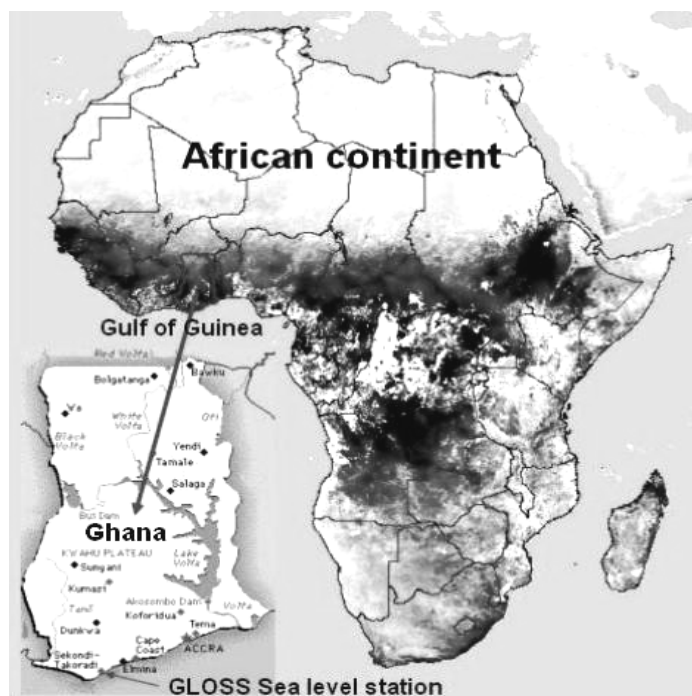


Figure 4

3.0 TECHNOLOGY OF GAUGE EMPLOYED

- 3.1 The system makes use of the measurement of the hydrostatic pressure corresponding to the water column that lies over the pressure transducer and to determine the height of this column from the knowledge of the effective depth-mean density of the water body that lies in the vicinity of the pressure transducer.
- 3.2 The pressure transducer measures the absolute pressure which is stored in the logger. The logger-resident program is designed to average the data samples collected over 15 minutes at two

seconds intervals (2 sec.) and then to store the averaged data with a time stamp. The data that is finally stored comprises date, time, absolute pressure and compensated temperature.

- 3.3 On the new and full moons, the visual staff is also read over a period of three days on a 24 hour basis. The water density is also read once in two weeks. These with data from the Meteorological Services are used in arriving at the Tide Forecast.
- 3.4 A write up of the full technology applied is attached as an appendix.
- 3.5 Over a period of time the height of the pillar at the Tide Gauge has not been re leveled to ascertain its accuracy. A team has been put on the job to take measurements to check the accuracy of the height of the pillar. All the measurements are referred to Chart Datum.

4.0 DATA AVAILABILITY

- 4.1 Primary data is recorded at the Takoradi Gloss Station.(1)This data is made up of (a) Absolute Pressure recordings (b) the Visuall Staff recordings (c) water density recordings and (d) meteorological data received from the Meteorological District Office in Takoradi. These are sent to Survey Headquarters (2) by post and E-mail and also to National Institute of Oceanography in India by E-mail. The data is sent on a monthly basis.
- 4.2 The data is partially processed in Accra and stored. There is interaction between Accra and India on the processing of the data.
- 4.3 Final processing of the data is done at the National Institute of Oceanography in India (3).

4.4 PRIMARY DATA SOURCES

- (i) Survey of Ghana
P. O. Box CT903, Cantonments, Accra. Ghana
E-mail

jtquarshie@ yahoo.com

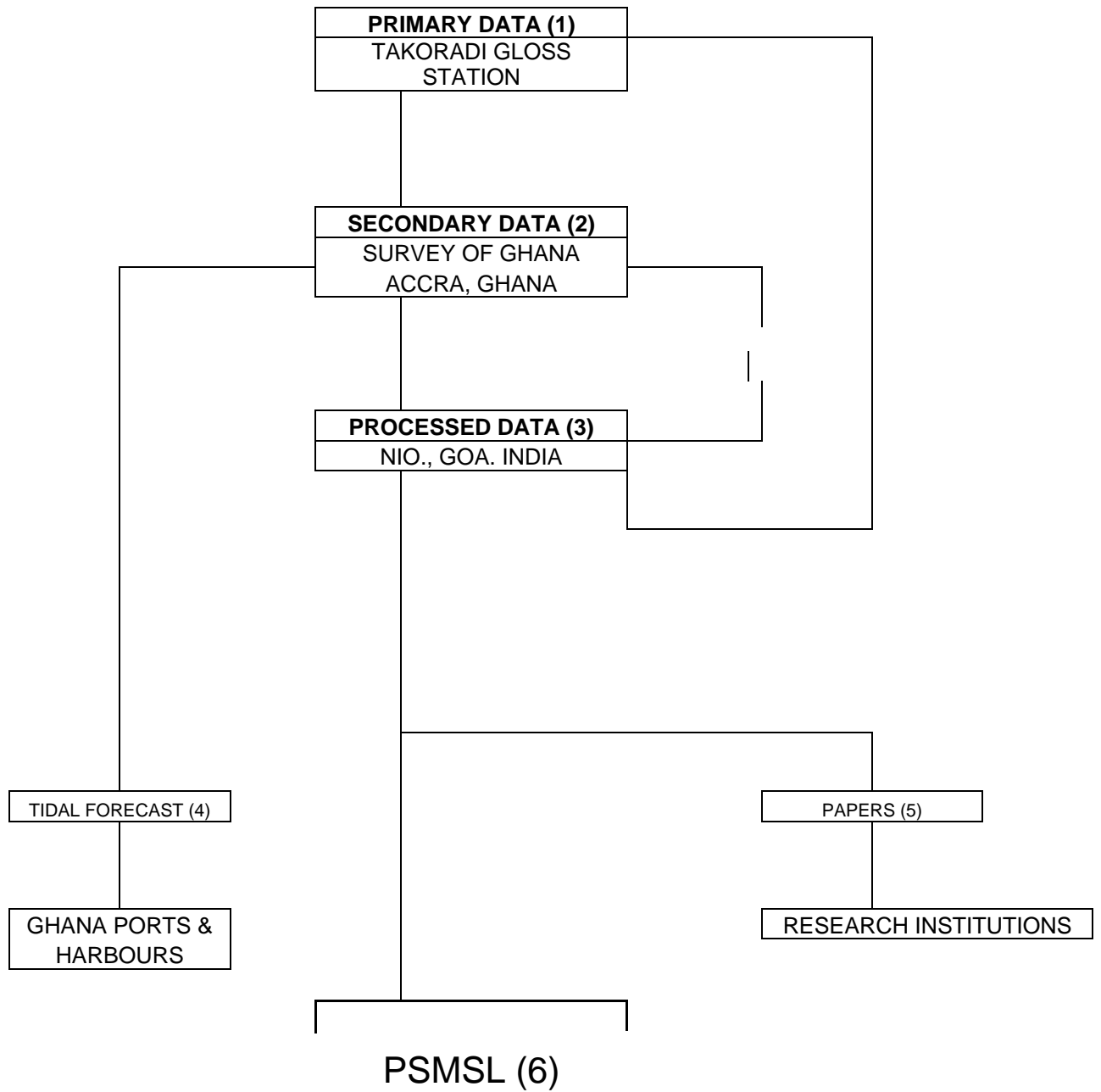
eknkebi@ yahoo.com

- (ii) PROCESSED DATA
Survey of Ghana
P. O. Box C903, Cantonments, Accra. Ghana
E-mail

jtquarshie@ yahoo.com

joseph @ darya.nio.org

TAKORADI GLOSS
STATION
DATA CAPTURE, ANALYSIS, DISTRIBUTION AND STORAGE



5.0 PRODUCTS FROM THE GLOSS STATION

- 5.1 The first product generated from the data is the annual Tidal predictions. These are prepared in India and sent to the Survey of Ghana (2) from where it is sent to Agencies that would need them. Primary of these agencies is the Ghana Ports Harbours Authority which uses the data to bring in and send ships out of the harbour.(4)
- 5.2 The second product is the papers that are written and sent to Research institutions and Publishing houses. Currently the Sumatra Tsunami of 2004 was recorded at this Gloss Station and a paper is soon to be published by the African Journal of Marine Sciences..
- 5.3 All data is sent to the Permanent Service for Mean Sea Level (PSMSL). The data from July 2004 to June 2005 has been lodged with the PSMSL. The data for July 2005 to June 2006 will soon be lodged with PSMSL.

6.0 ON-GOING PROJECTS

- 6.1 The Takoradi Station was primarily set up to provide data for tidal predictions to aid the movement of ships in and out of the Harbour. However, with the present set up, the Survey Department is poised to contribute its quota to scientific research. The Department is presently collecting data for analysis to find out the effect of the Harmattan winds on Sea Level measurements.
- 6.2 The height of the Bench Mark at the Gloss Station has been measured with the GPS. Spirit Levelling is presently on-going to link it with two other Fundamental Bench Marks in town. (3.5)