United Nations/Fiji Workshop on the Applications of Global Navigation Satellite Systems

National Geodetic Reference Frame of Myanmar

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Myanmar's Profile

Profile of Survey department

National Geodetic Reference Frame of Myanmar

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Location of Myanmar
GEOGRAPHY

➢ Myanmar is the largest country in mainland Southeast Asia.

➢ It shares borders with Thailand, Laos, China, India and Bangladesh, and has a coastline on the Andaman Sea and the Bay of Bengal.

➢ The climate is tropical, with monsoonal rains making flooding and landslides common during the rainy season (June to September).

➢ Forests cover almost half the country, making forestry a major source of export earnings.

➢ However, excessive logging has resulted in deforestation in both rural and urban areas.
PEOPLE

➢ More than a third of the population live in rural areas.

➢ Yangon (or Rangoon), with over 4.5 million people, is the capital and largest city.

➢ Myanmar possesses a great diversity of ethnic groups, comprising Burmans, Shans, Karens, Rakhines, Mons, Chins, Kayahs and Kachins.

➢ Buddhism remains the major religion, with Christianity, Hindi and Islam also practised.
Since 1905, under the British rule, all the surveying works have been undertaken by the Survey of India.

At the end of World War II, the British government separated surveying works of Myanmar from Survey of India.

On 1st November 1946, Burma Survey Department was formed under the Ministry of Finance and Revenue by the British government.
National Geodetic Reference Frame

First Map System

- Topographic Maps that have been used since pre-world War II. Its were based on Lambert Projection.
Lambert Grid Zones of India and Adjacent Countries
Geodetic Datum was Indian Datum on Everest 1830 ellipsoid with Lambert conical Orthomorphic Projection.

Topographic maps on scale of one inch, half inch and quarter inch to a mile (1”=1 mile, 1”=2 miles, 1”=4 miles)

Maps were printed during 1935-1944.
Why Myanmar Datum 2000?

• Large percentage of old geodetic hill stations was either destroyed or difficult to access.

• Accuracy of the horizontal geodetic network was found insufficient for modern GPS-surveying and mapping.

• Coordinate system was based on yards and feet.
Why Myanmar Datum 2000?

- Myanmar is a State where extent of North-South direction is larger than that of East-West direction.
- In such condition, UTM mapping system is suitable for Myanmar.
- In year 2000, Myanmar survey department had created Myanmar datum 2000 by the technical supporting of Finnmap Co. Ltd.
Myanmar Datum 2000

- Observations using 8 units of Ashtech Z12 Geodetic GPS Receivers
- Each baseline observed minimum 2 x 12 hours
- Minimum 2 independent solutions for each baseline
- Average baseline length ~ 300 - 500 km
- Longest baseline YANGON - MYEIK 575429.806 m
- Baseline accuracies 0.1 PPM
- WGS84 (ITRF) position accuracy of new stations 0.01 - 0.05 m

GNSS OBSERVATIONS

- 9 STATIONS (Old Triangulated Station) IN MYANMAR
- 3 WGS84 (ITRF) STATIONS IN THAILAND

- Baseline accuracies 0.1 PPM
- WGS84 (ITRF) position accuracy of new stations 0.01 - 0.05 m
MYANMAR DATUM 2000

- NEW HORIZONTAL GEODETIC DATUM OF MYANMAR
  - TRUE NORTH ORIENTATION WITH WGS84
  - NO SCALE ERROR
  - NO DISTORTIONS

- INITIAL STATION NGWE YA TAUNG
  - JUNCTION POINT OF ELLIPSOID AND GEOID
  - GEOID - ELLIPSOID SEPARATION VALUE 0.00 m

- TRANSFORMATION PARAMETERS \( dX, dY, dZ \) TO WGS84

- REFERENCE ELLIPSOID : EVEREST 1830
INITIAL GEODETIC STATION OF MYANMAR

NGWE YA TAUNG STATION

ORIGINAL CENTRE MARKER
Tidal Benchmark at Kyaikkami
(Initial Vertical Station of Myanmar)
MONUMENTATION OF 1st-ORDER GEODETIC NETWORK
GPS Observations of 1st-Order Network
(9) Primary Stations GPS Network

Year 2000

- Network Accuracy 0.1 ppm
- Position Accuracy 0.01 - 0.05 m
1st-Order GPS Network (Pilot Project)
Year 2000

- Network Accuracy 0.5 ppm
- Position Accuracy 0.02 m
1\textsuperscript{st}-Order GPS Network (Year 1, Phase II)
Year 2001-2002

- Network Accuracy 0.7 ppm
- Position Accuracy 0.03 m
$1^{st}$-Order GPS Network (Delta Area)

Year 2002

- Network Accuracy 0.5 ppm
- Position Accuracy 0.03 m
1st-Order GPS Network (Year 2, Phase II)
Year 2003

- Network Accuracy 0.5 ppm
- Position Accuracy 0.02 m
1st-Order GPS Network (Year 1, Phase III)
Year 2003-2004

- Network Accuracy 0.5 ppm
- Position Accuracy 0.02 m
1st-Order GPS Network (Year 2, Phase III)  
Year 2004

- Network Accuracy 0.4 ppm
- Position Accuracy 0.04 m
0-Order and 1\textsuperscript{st}-Order GPS Network in Myanmar (483 stations) 
Years 2000-2007

- Average distance between 1\textsuperscript{st} -order stations 30-60 km
- Average Network Accuracy: 0.5 ppm
- Average Position Accuracy: 0.04 m in relation to the 0-order stations

- Average distance of 30-60 km between 1-order stations is sufficient for 1:50,000 topographic mapping.

-All stations have both WGS84 and Myanmar Datum 2000 coordinates (Geodetic and UTM Zone 46/47 coordinates)
GEOID MODEL OF MYANMAR

1 METER CONTOUR INTERVAL
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Total Number of GCP: 871
## DIGITAL MAPPING (Years 2000-2007)

- **DATUM**: MYANMAR DATUM 2000
- **PROJECTION**: UNIVERSAL TRANSVERSE MERCATOR PROJECTION (UTM)
- **UTM ZONES**: 46 AND 47
- **MAP SCALE**: 1:50000
- **TOTAL MAP SHEETS**: 1134 MAP SHEETS
Current Condition

➢ Earthquakes pose a hazard for many locations throughout the country as Myanmar is located on one of the two main earthquake belts in the world.

➢ After year 2000, at least 4 earthquakes occurred along the Central Lowland where the Sagaing Fault passes.
Myanmar’s Natural Disasters

Myanmar regularly experiences cyclones, storms, floods, landslides, earthquakes, drought and forest fires. Over the last 10 years, Myanmar has been impacted by two major earthquakes, three severe cyclones, floods and other smaller-scale hazards. OCHA works closely with the Ministry of Social Welfare, Relief and Resettlement and humanitarian partners to ensure a more systematic, inclusive and coordinated approach to disaster management, preparedness and response.

2nd Myanmar ranks 2nd out of 167 countries in the Global Climate Risk Index
9th Myanmar ranks 9th out of 101 countries in the Index of Risk Management (INFORM)

Frequency of Earthquakes of Magnitude > 5 on the Richter scale

Earthquakes of magnitude > 5 on the Richter scale

Flood-affected townships in 2015

India - Eurasia plate, one of the two main earthquake belts

Most Cyclone-prone areas

Approximately 1.7 million temporarily displaced and 172 killed

In 2015-2016, the El Niño phenomenon has been one of the strongest since 1950, with a significant influence on weather patterns. This resulted in drought conditions with intermittent 'very severe' category cyclones in different parts of Asia and the Pacific.

According to the Myanmar Department of Meteorology and Hydrology, since mid-February 2016, Myanmar has been experiencing a severe impact of El Niño including extreme temperatures, unusual rainfall patterns, dry soil, high risk of fires and acute water shortages. The El Niño impact is expected to end in June 2016.
Damages from Earthquake (magnitude 6.8 earthquake struck Myanmar 25 km (16 mi) west of Chauk on 24 August 2016, 4 Killed)

High Tectonically active Region of the World

Myanmar Plate
Myanmar survey department need to re-observation on the nine Primary Pillars for their movement.

Recently, Myanmar survey department try to establish (5) CORS in Myanmar for National Geodetic Reference Frame and RTK network in Nay Pyi Taw area during 2019 budget year.

(5) CORS in Yangon area will be established during 2019 by the funding of JICA.
Planning of CORS

➢ To register the IGS Station
➢ To maintain the national geodetic reference frame
➢ To control the accuracy of Ground Control Point (GCP)
➢ To share the data to other department for the cadastral Mapping
CORS Network Plan
Challenges

➢ Establishment of CORS system across nationwide

➢ Technical Limitation hinder the progress of the work

➢ Financial Constraints always makes department planning of a project
Summary

➢ Topographic Maps that have been used since pre World War II time were based on Lambert Projection.
➢ In such condition, UTM mapping system is suitable for Myanmar. In year 2000, Myanmar survey department had created Myanmar datum 2000 by the technical supporting of Finnmap Co. Ltd..
➢ Nine Primary reference station were established and observed connect with ITRF 1996 base on Everest 1830 Ellipsoid.
➢ Myanmar survey department need to re-observation on the nine primary Pillars for their movement.
➢ Recently, Myanmar survey department try to establish (5) CORS in Myanmar
Thank you