

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

National Geodetic Reference Frame of Myanmar

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Survey Department**

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Myanmar's Profile

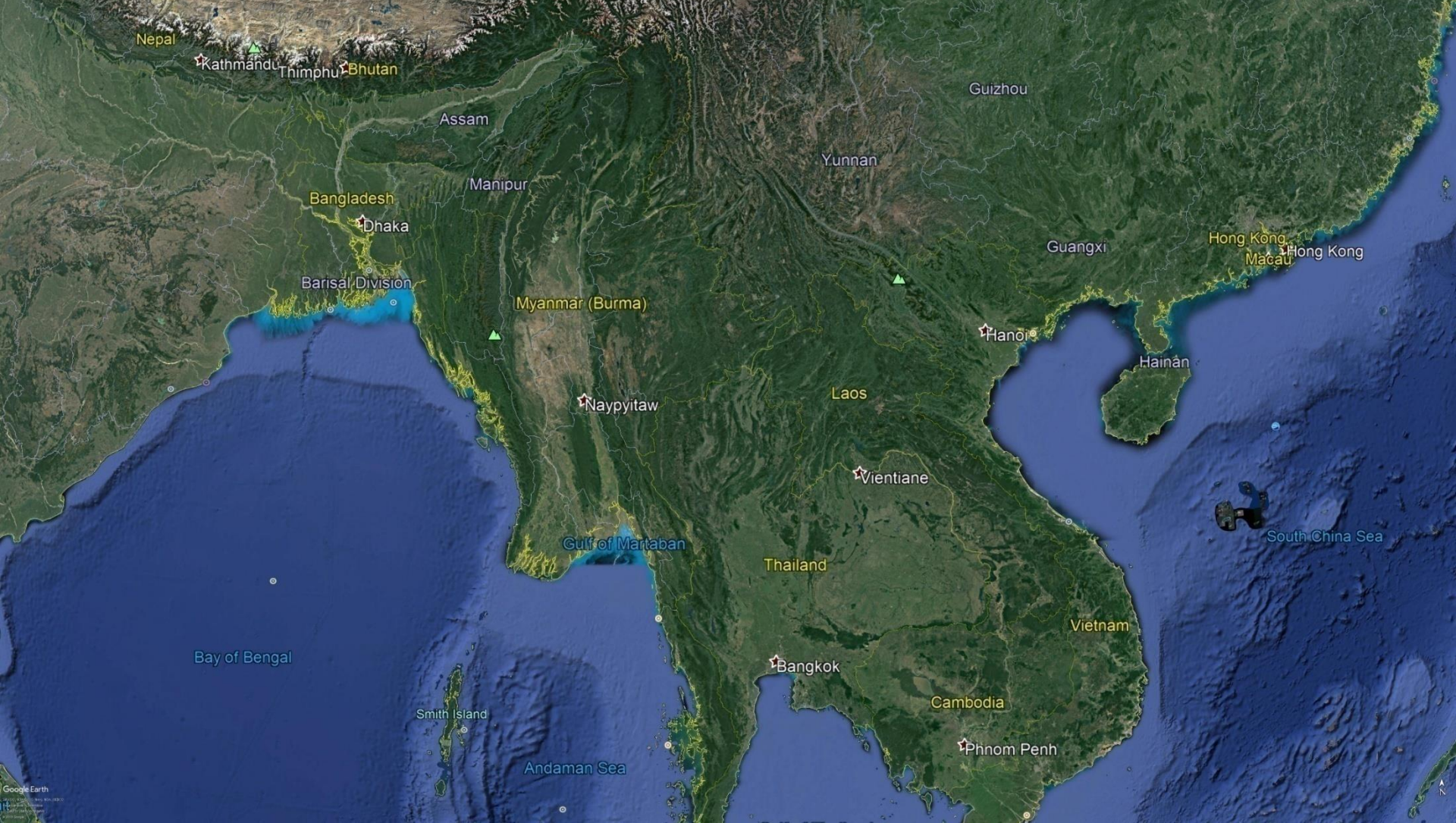
Profile of Survey department

National Geodetic Reference Frame of Myanmar

Challenging

Summary

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.

Survey Department

- 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.

Myanmar Survey Department Organization Chart

Ministry of Natural Resources and Environmental Conservation

Administration sub Div

**Survey Department
Head Office**

Project Planning sub Div

**Training &
No(1) Survey
Division**

**Geodetic &
No(2) Survey
Division**

**International
Boundary & Civil
Construction
Survey Division**

**Aerial Survey
&Photography
Division**

**Map
Reproduction
Division**

Survey
Training
Center

No(1)
Survey
Sub
Division

Geodetic
Survey
Sub
Division

No(2)
Survey
Sub
Division

Intl;
Boundary
Survey Sub
Division

Civil
Construction
Survey Sub
Division

Aerial
Survey
Sub
Division

Aerial
Photo
Sub
Division

Map
Drawing
Sub
Division

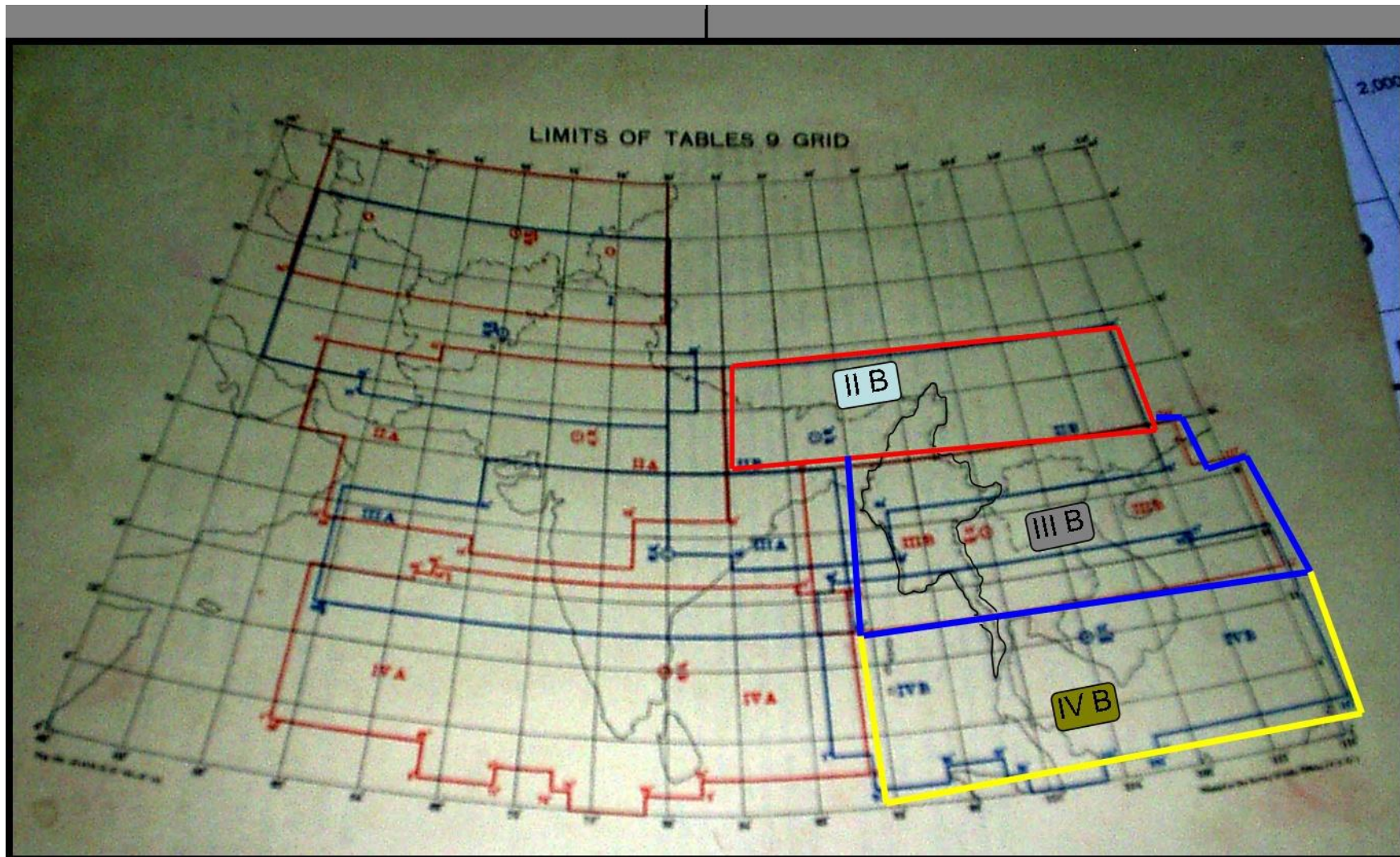
Map
Printing
Sub
Division

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



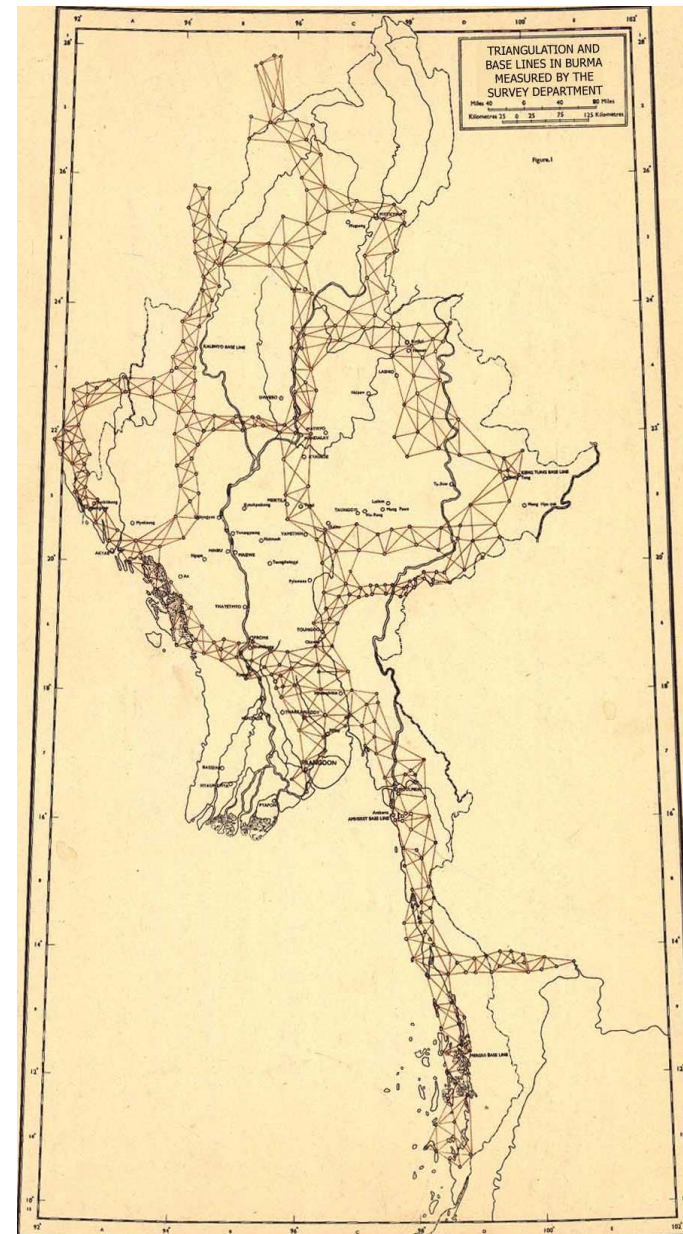
fiber 1

fiber $n/2$

fiber n

- ❖ 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.

Triangulation Series



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

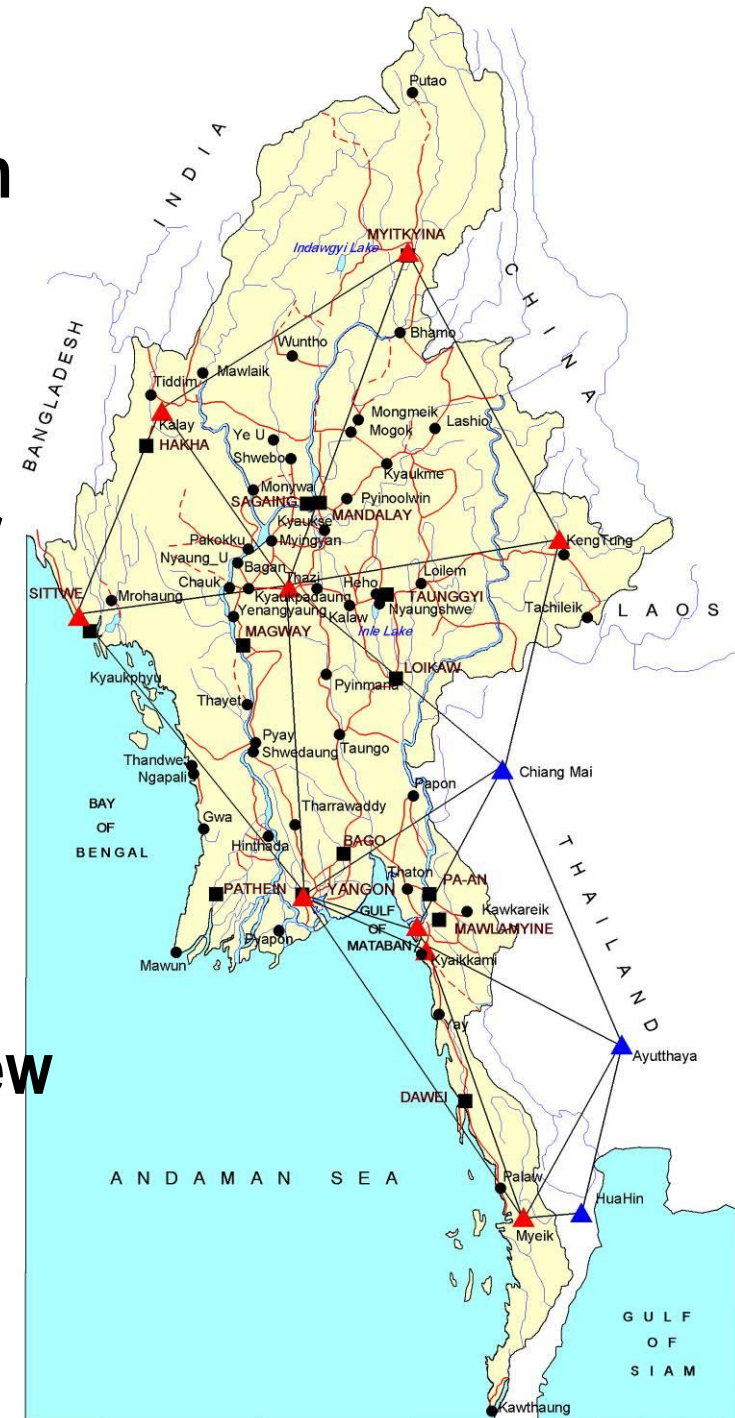
GNSS OBSERVATIONS

➤ 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

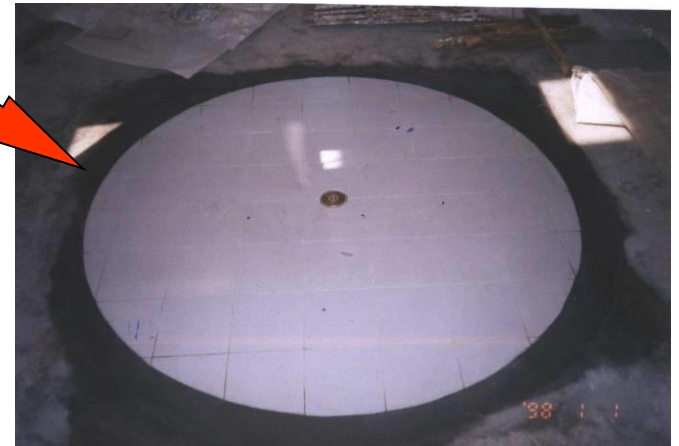
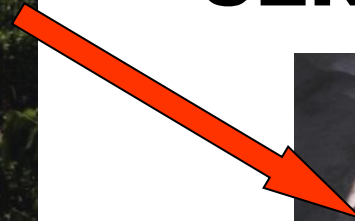
- **NEW HORIZONTAL GEODETIC DATUM OF MYANMAR**
 - TRUE NORTH ORIENTATION WITH WGS84
 - NO SCALE ERROR
 - NO DISTORTIONS
- **INITIAL STATION NGWE YA TAUNG**
 - JUNCTION POINT OF ELLIPSOID AND GEOID
 - GEOID - ELLIPSOID SEPARATION VALUE 0.00 m
- **TRANSFORMATION PARAMETERS dX , dY , dZ TO WGS84**
- **REFERENCE ELLIPSOID : EVEREST 1830**

INITIAL GEODETIC STATION OF MYANMAR



**NGWE YA TAUNG
STATION**

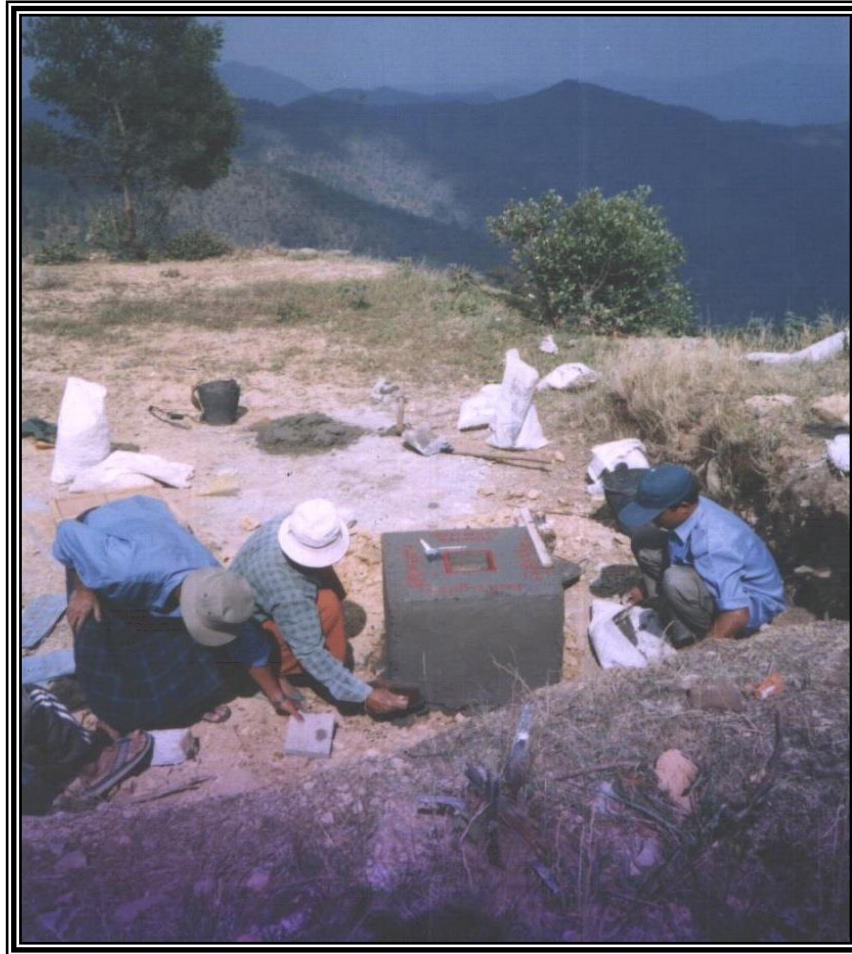
**ORIGINAL
CENTRE MARKER**



**Tidal Benchmark at Kyaikkami
(Initial Vertical Station of Myanmar)**



MONUMENTATION OF 1st-ORDER GEODETTIC NETWORK



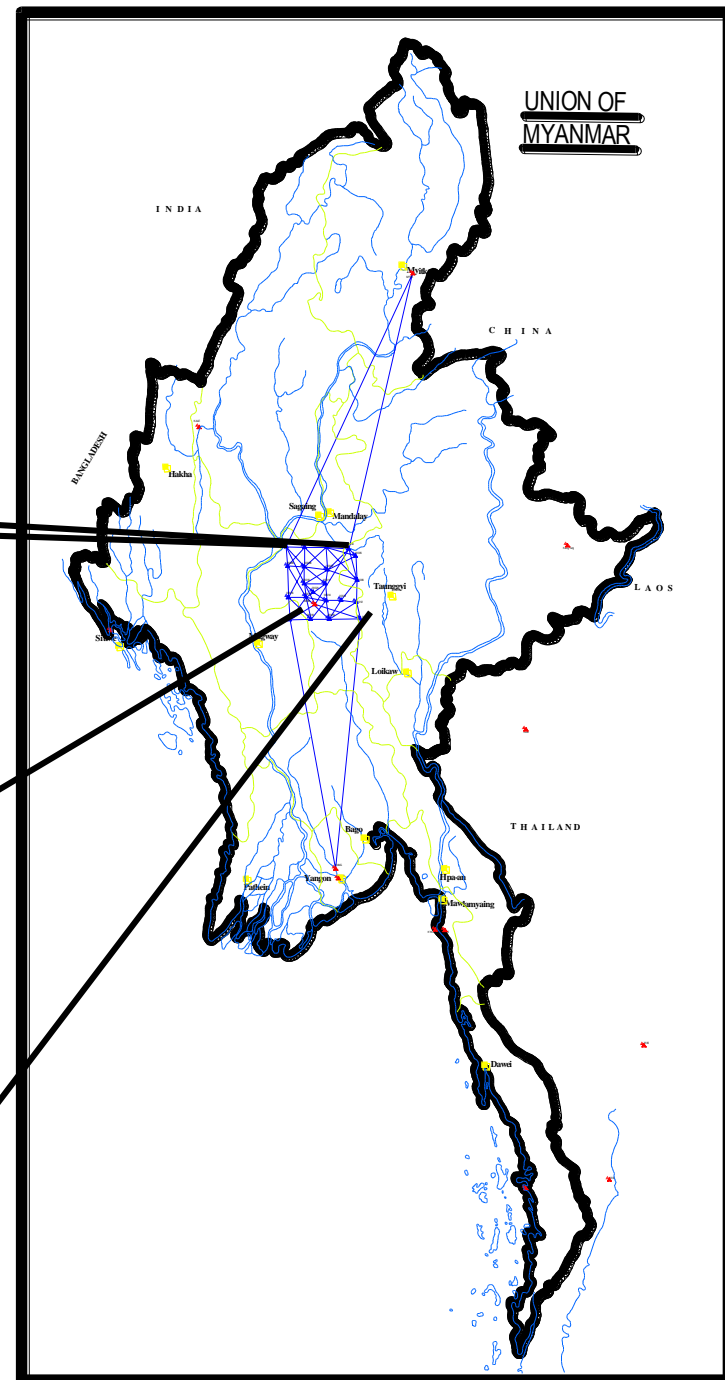
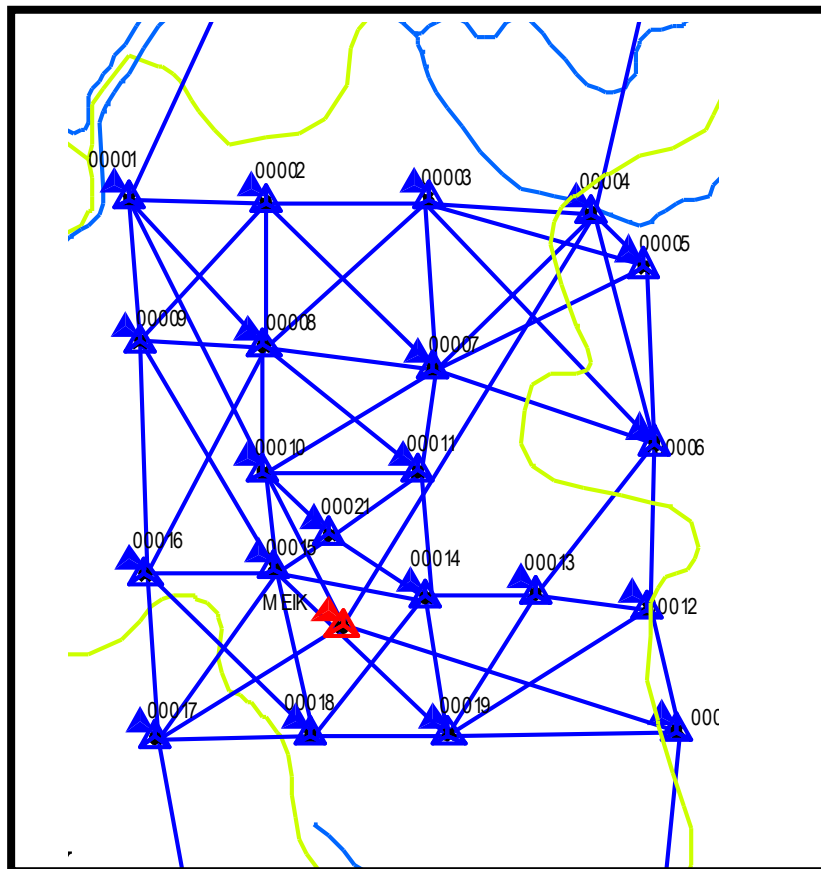
GPS Observations of 1st-Order Network



1st-Order GPS Network (Pilot Project)

Year 2000

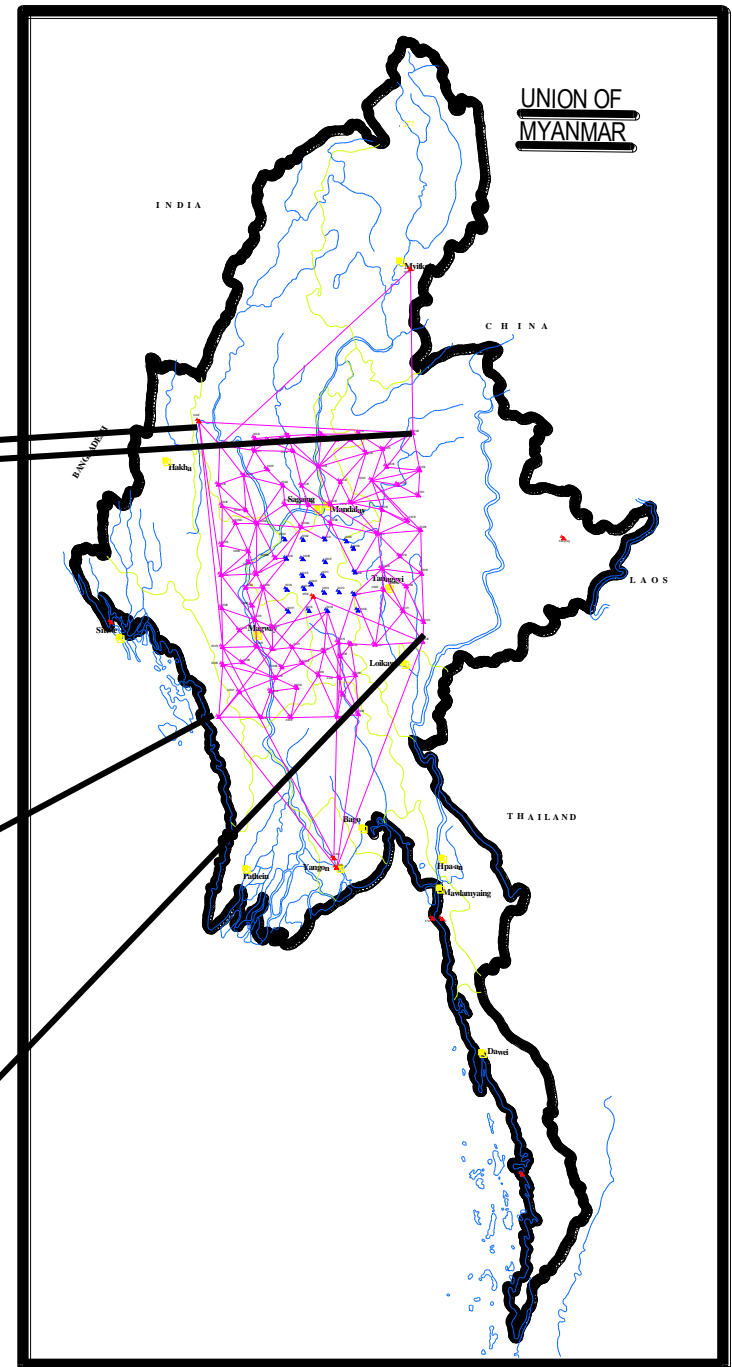
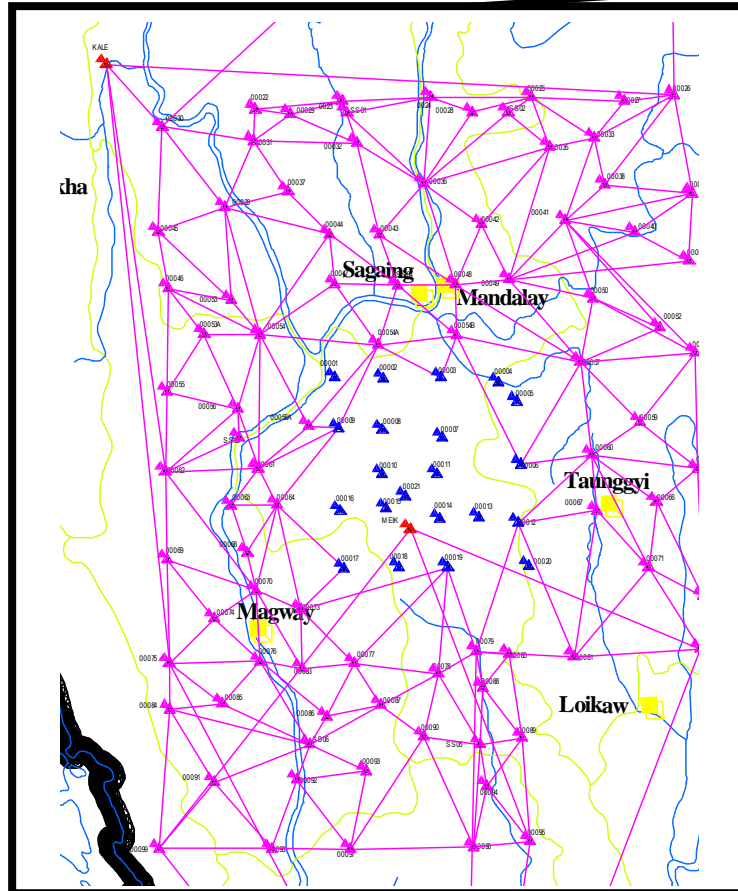
- Network Accuracy 0.5 ppm
- Position Accuracy 0.02 m



1st-Order GPS Network (Year 1, Phase II)

Year 2001-2002

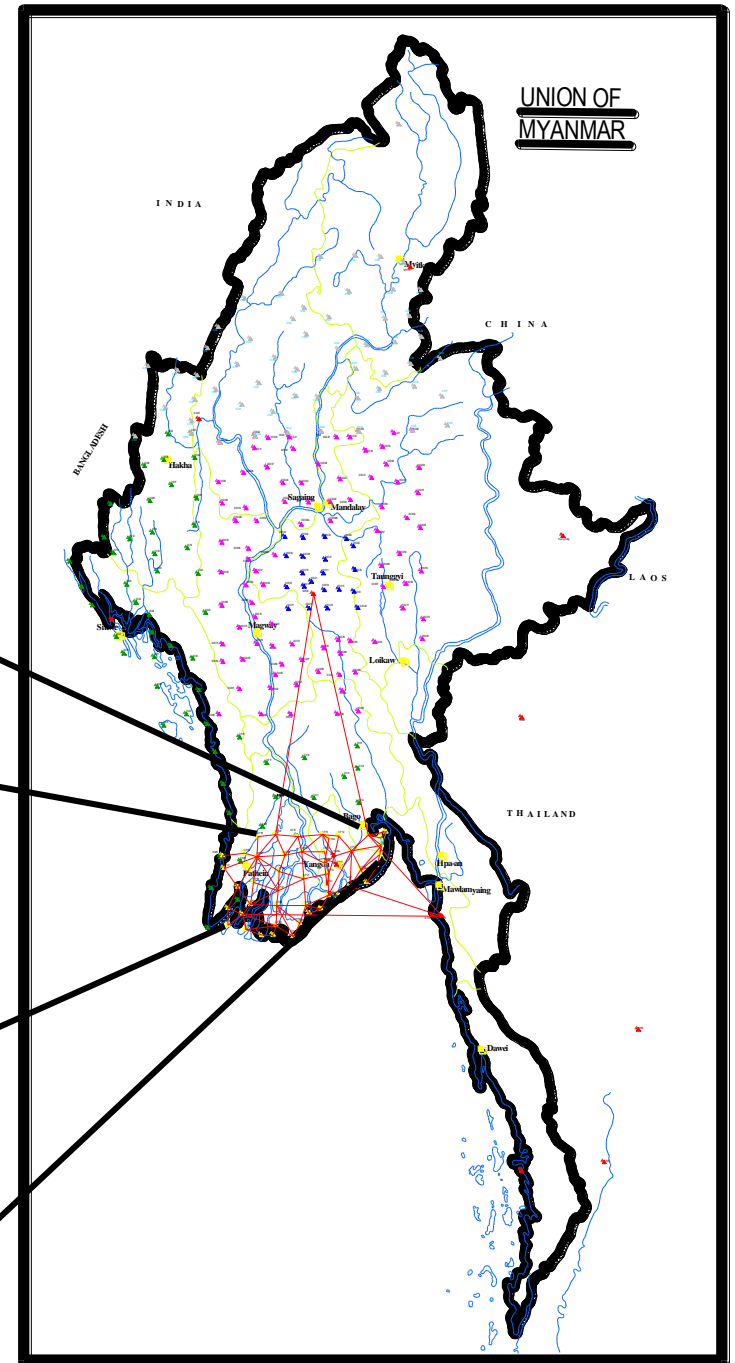
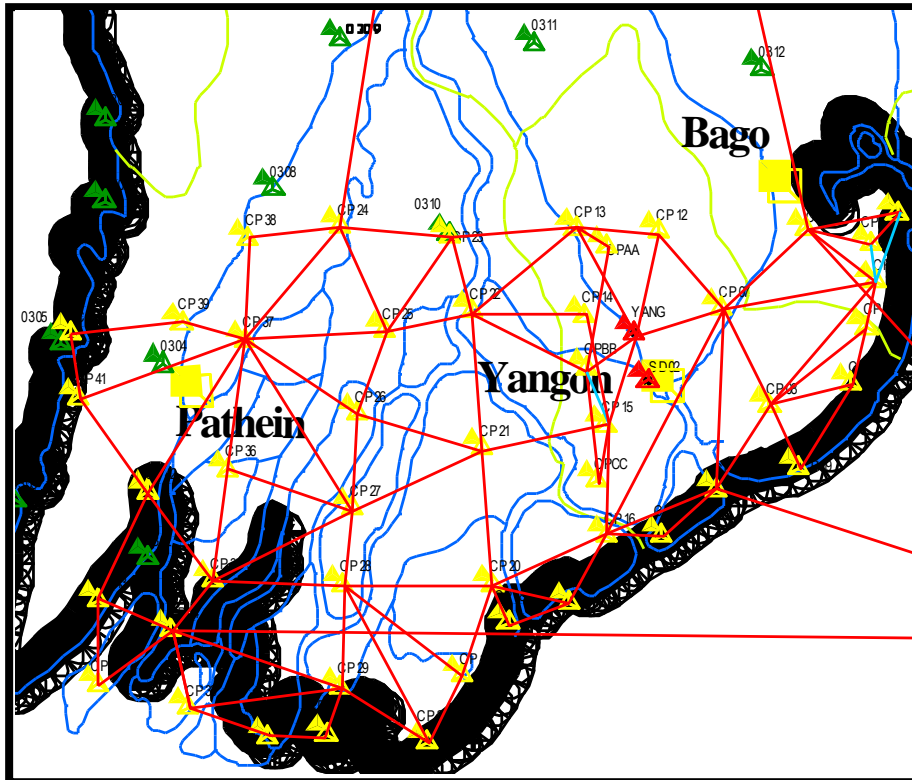
- Network Accuracy 0.7 ppm
- Position Accuracy 0.03 m



1st-Order GPS Network (Delta Area)

Year 2002

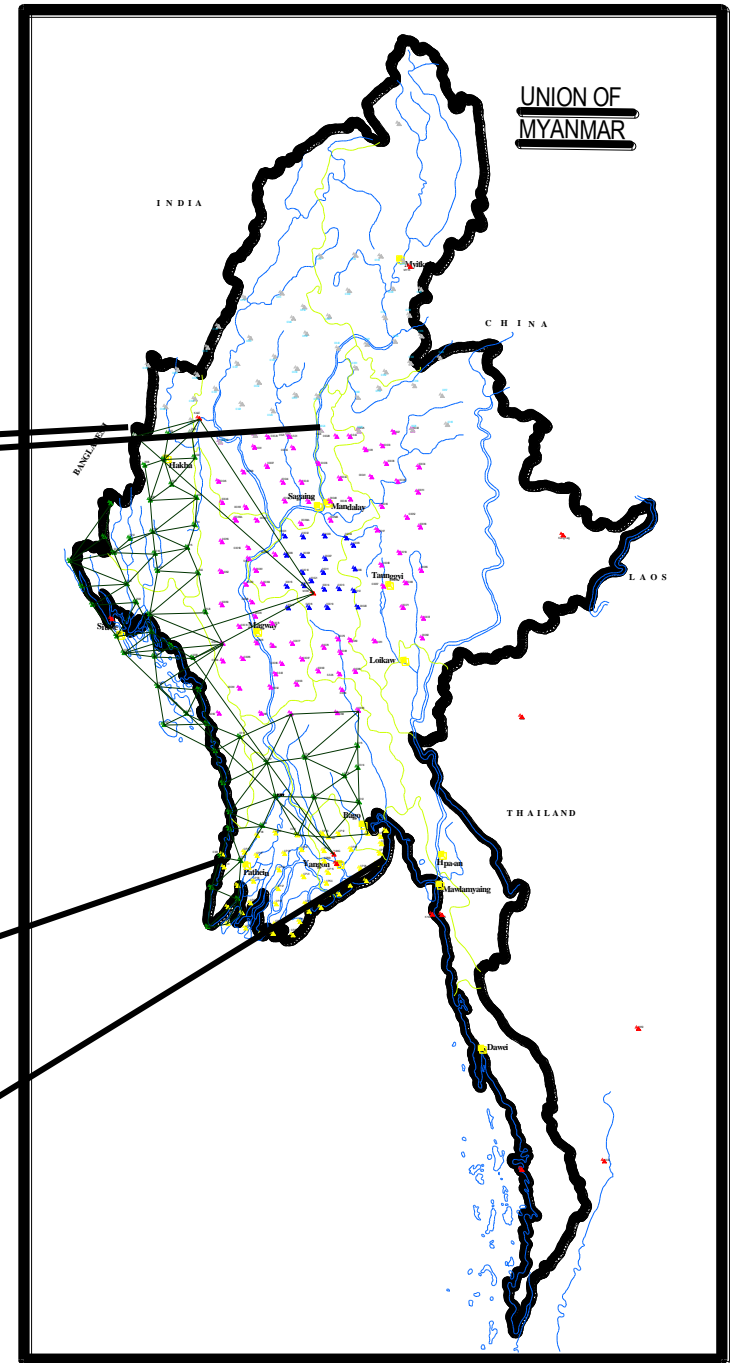
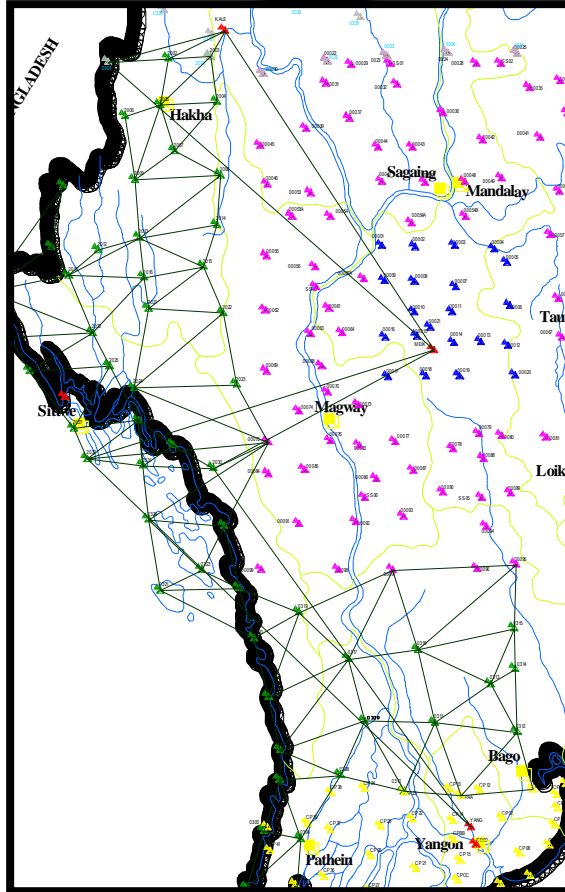
- Network Accuracy 0.5 ppm
- Position Accuracy 0.03 m



1st-Order GPS Network(Year 2, Phase II)

Year 2003

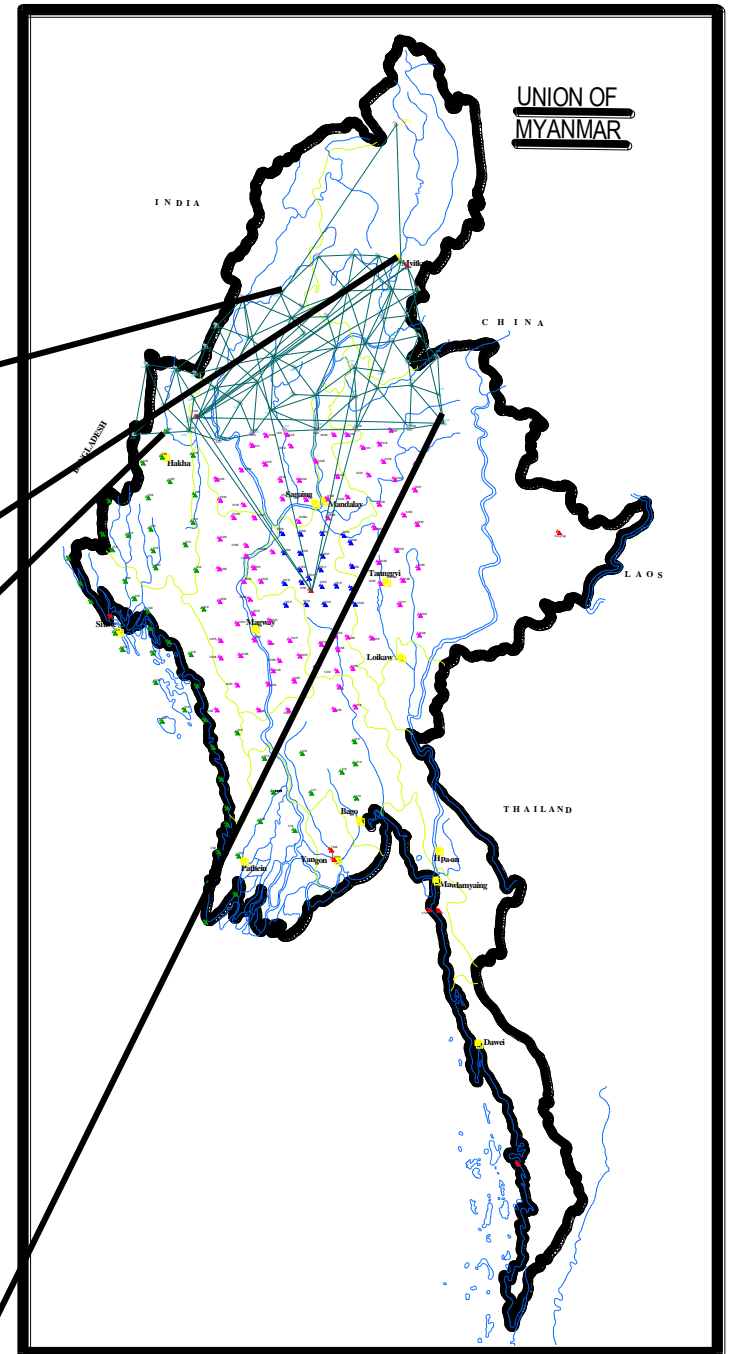
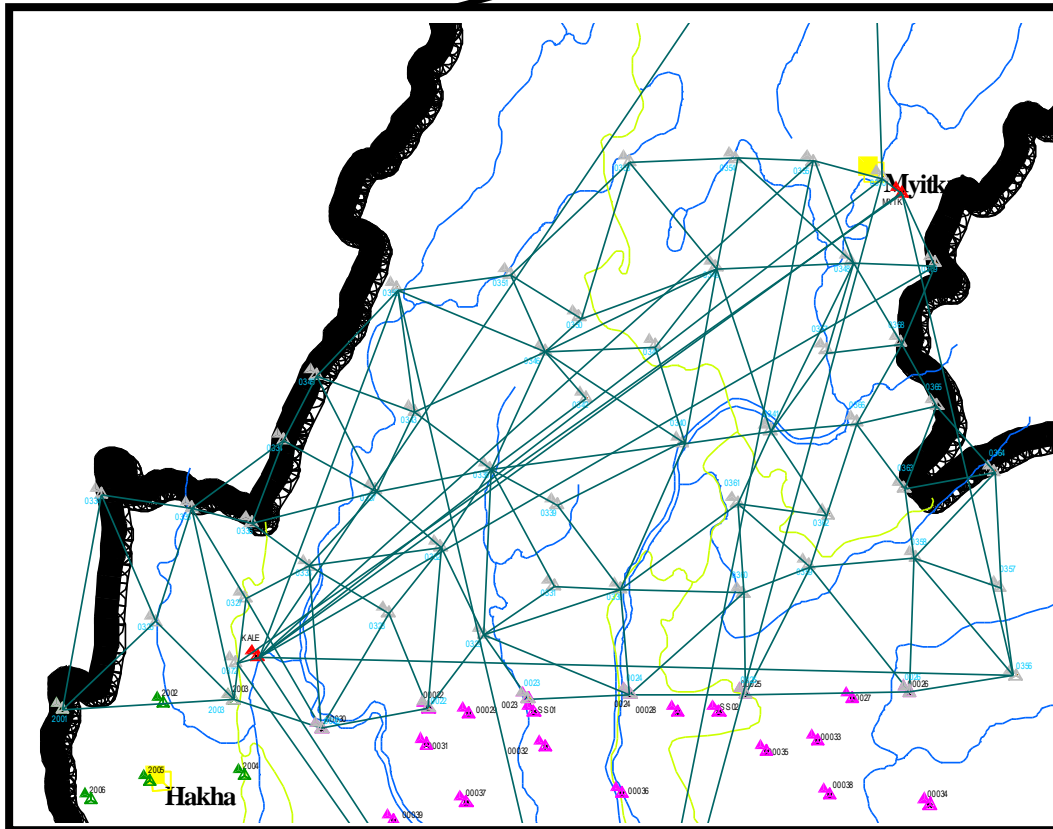
- Network Accuracy 0.5 ppm
- Position Accuracy 0.02 m



1st-Order GPS Network (Year 1, Phase III)

Year 2003-2004

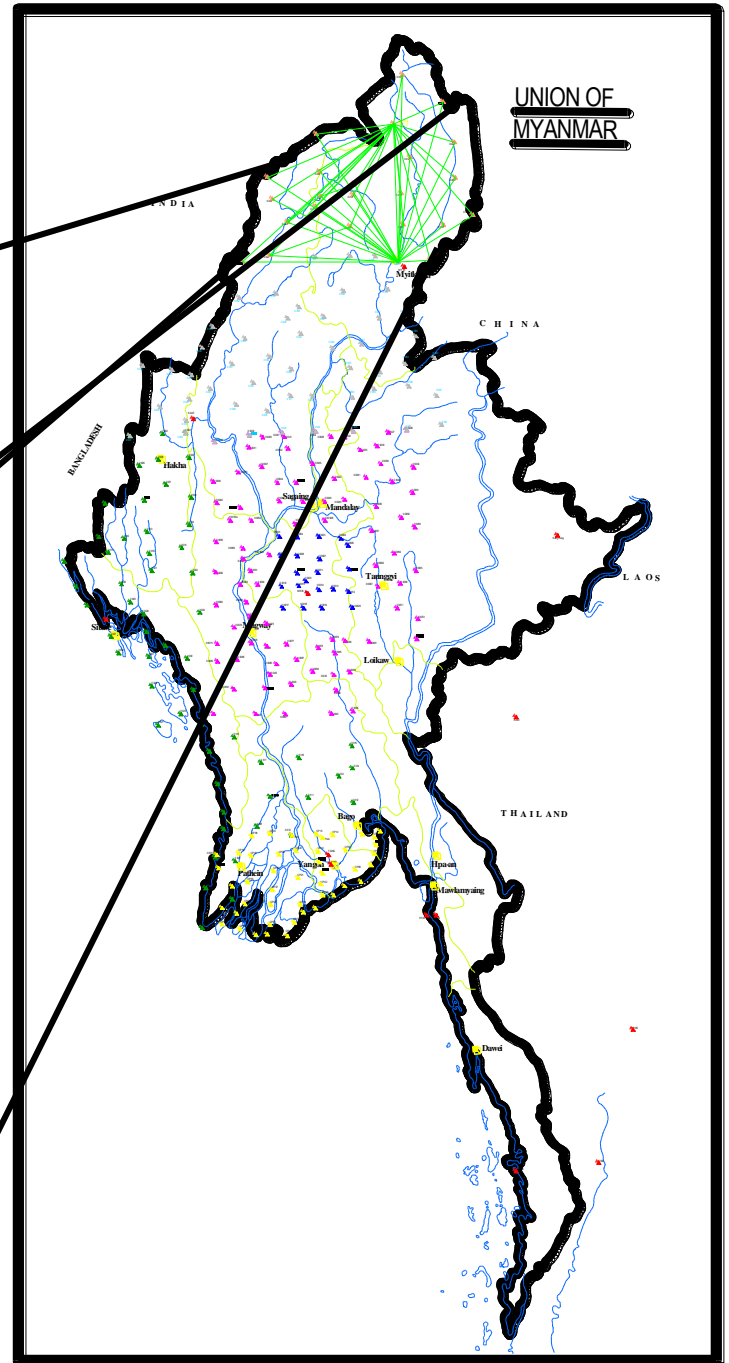
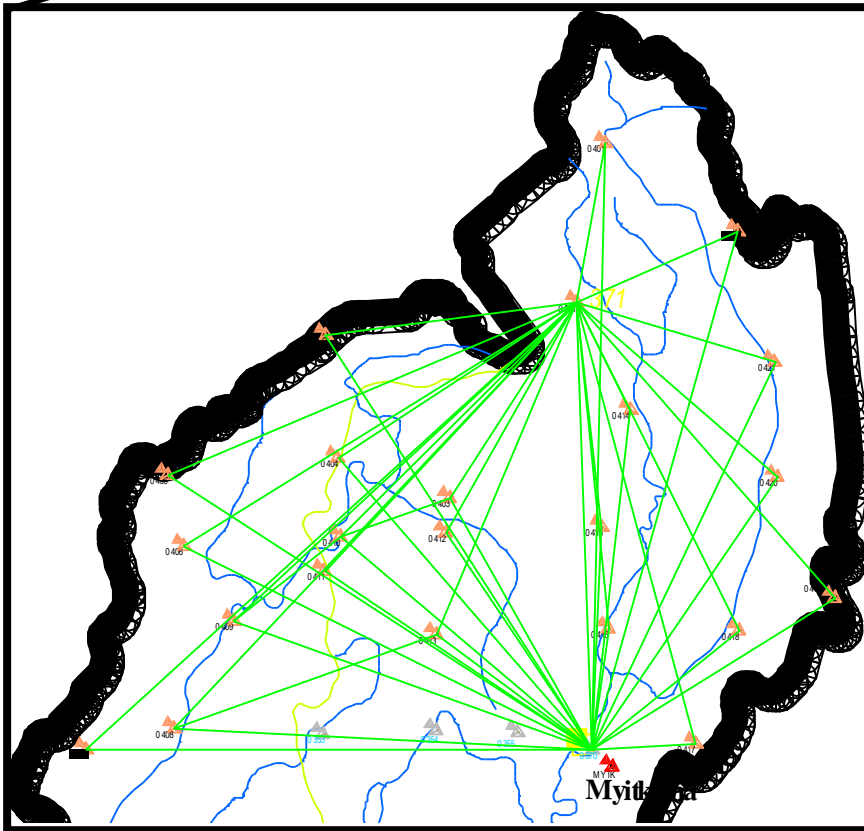
- Network Accuracy 0.5 ppm
- Position Accuracy 0.02 m



1st-Order GPS Network (Year 2, Phase III)

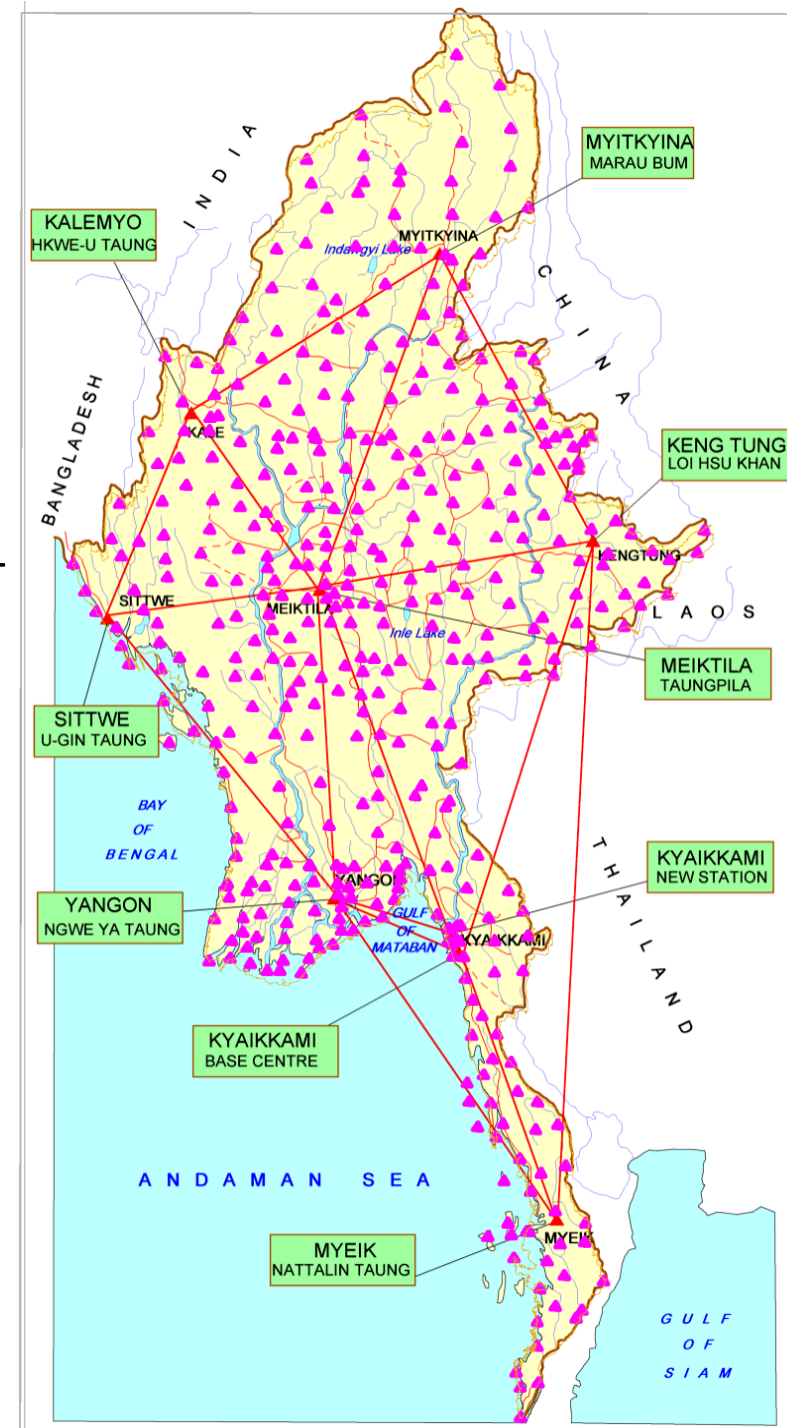
Year 2004

- Network Accuracy 0.4 ppm
- Position Accuracy 0.04 m



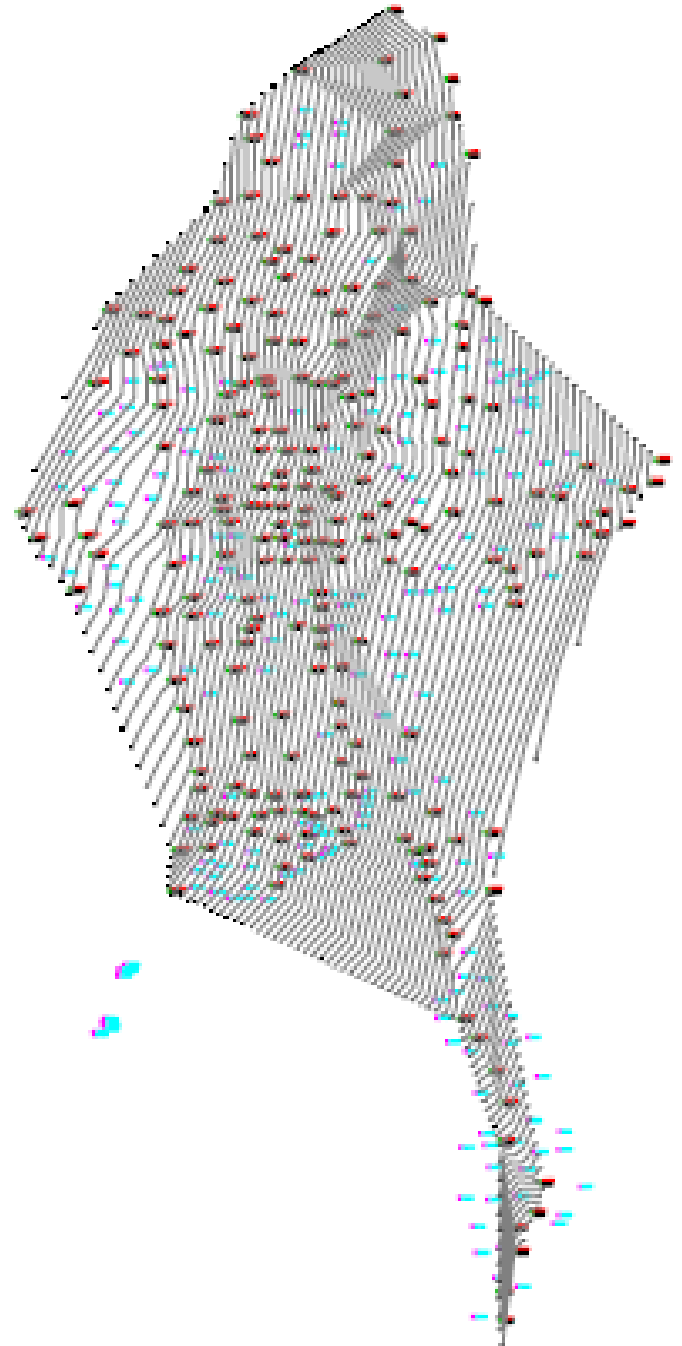
0-Order and 1st-Order GPS Network in Myanmar (483 stations) Years 2000-2007

- Average distance between 1st -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



GCP LIST IN MYANMAR

Sr. No.	Year	GCP NO.	Total Number of GCP
1	2000-2001	0001 - 0099, 53A, 54A, 54B, 56A	103
2	2002	2001 - 2032	32
3	2003	0301 - 0372	72
4	2004	0401 - 0433	33
5	2005	0501 - 0585	85
6	2006	0601 - 0651	51
7	2007	0701 - 0743	43
8	2008	0801 - 0830	30
9	2009	-	-
10	2010	1001 - 1043	43
11	2011	1101 - 1125	25
12	2012	1201 - 1283	83
13	2013	1301 - 1350	50
14	2014	1401 - 1429 (Aerial), 1430 - 1464	64
15	2015	1501 - 1518 (Aerial), 1519 - 1553	53
16	2016	1601 - 1613 (Aerial), 1614 - 1648	48
17	2017	1701 - 1756	56
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: Natural disaster risks and past events (as of 31 May 2016)

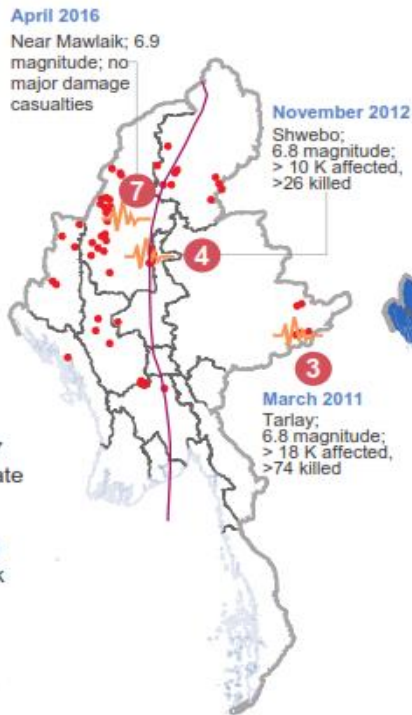


Myanmar regularly experiences cyclones, storm surges, floods, landslides, earthquakes, drought and forest fires. Over the last 10 years, Myanmar has been impacted by two major earthquakes, three severe cyclones, floods and other smaller-scale hazards. OCHA works closely with the Ministry of Social Welfare,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

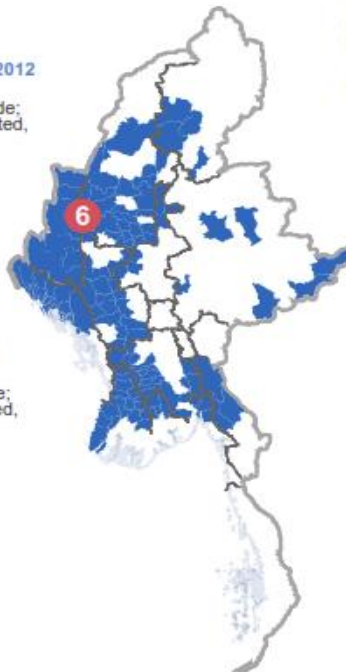
2nd Myanmar ranks 2nd out of 187 countries in the Global Climate Risk Index

9th Myanmar ranks 9th out of 191 countries in the Index of Risk Management (INFORM)

EARTHQUAKES



FLOODS AND LANDSLIDES



CYCLONES



EL NIÑO

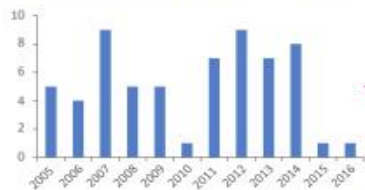


In 2015-2016, the El Niño phenomenon has been one of the strongest since 1950, with a significant influence on weather patterns. This resulted in drought conditions with intermittent 'very severe' category cyclones in different parts of Asia and the Pacific.



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.

Frequency of Earthquakes of Magnitude > 5 on the Richter scale



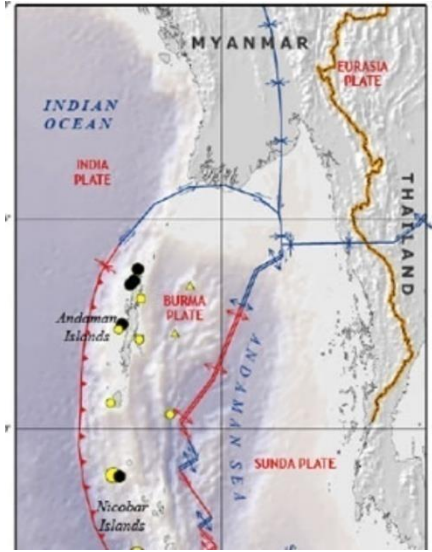
Major events timeline



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

CORS LOCATION

Write a description for your map.

Legend

- Feature 2
- Feature 3
- Line4
- SURvey Training Center

SURvey Training Center



SURvey Dept
TOLL GATE
PANTIN BRICK MILL



Google Earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

600 mi



CORS Network Plan

CORS LOCATION

Write a description for your map.

Legend

- 15 KM CIRCLE
- CORS
- Line 17 km
- Line 22.2KM
- Line 34.4

Survey Dept

MUSEUM

TOLL GATE

PANTIN BRICK MILL

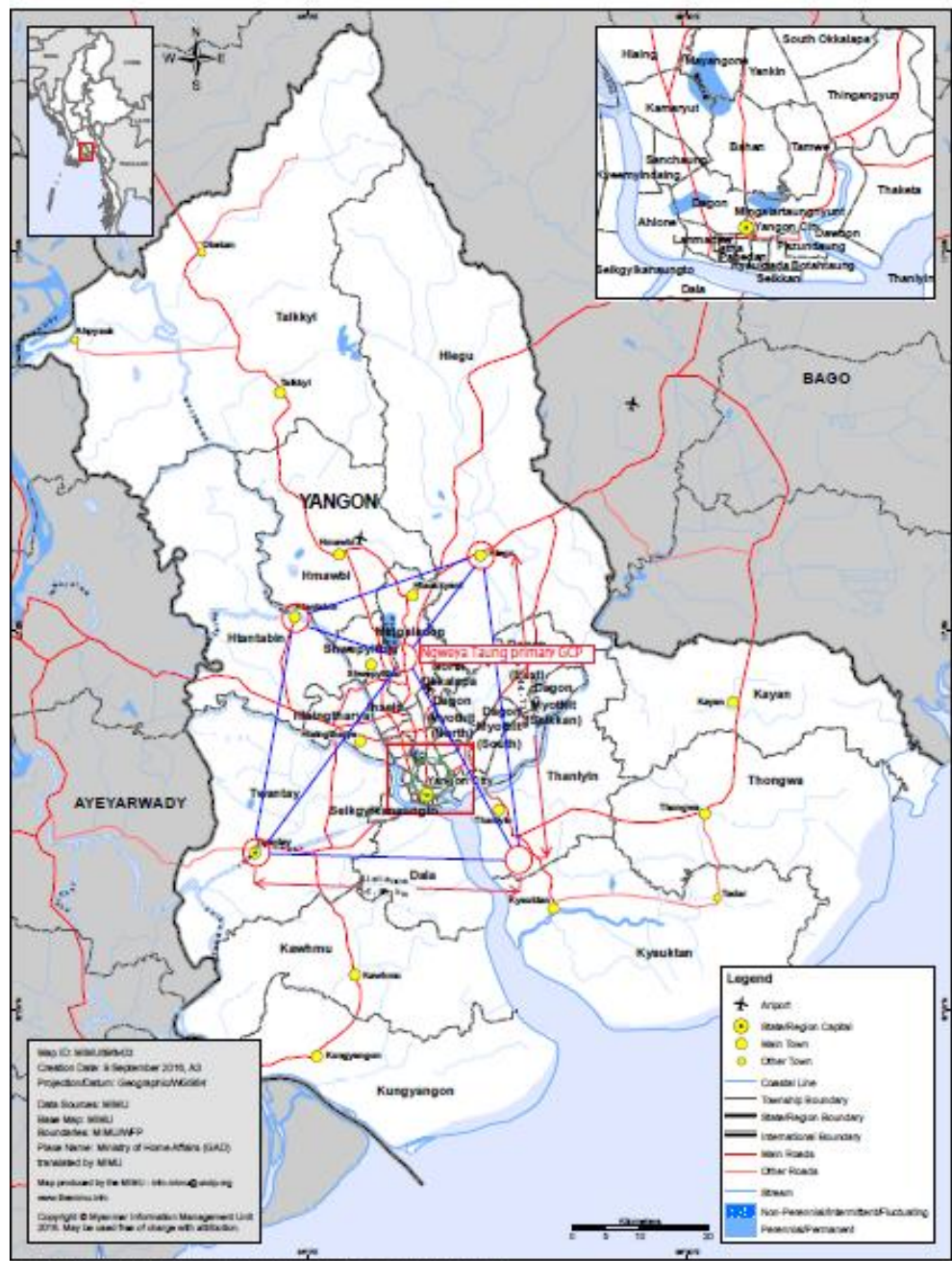
Google Earth

Image Landsat / Copernicus

20 mi



Yangon Region



Disclaimer: The names shown and the boundaries used on this map do not imply endorsement or acceptance by the United Nations.

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