

**MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT
DEPARTMENT OF SURVEY AND MAPPING OF VIETNAM**



OVERVIEW

GEODETTIC NETWORK OF VIETNAM

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GENERAL DESCRIPTION OF GEODETTIC NETWORK





Department of Survey and Mapping of Vietnam

Department of Survey and Mapping of Vietnam (established on 14 December 1959) is the National Mapping Organization of Vietnam belong to the Ministry of Natural Resources and Environment (MONRE)

The main function:

- **Unity State management over survey and mapping activities;**
- **Managing basic geodetic survey;**
- **Organizing basic survey and mapping in inland, air space and territorial water of State Socialist Republic of Viet Nam.**

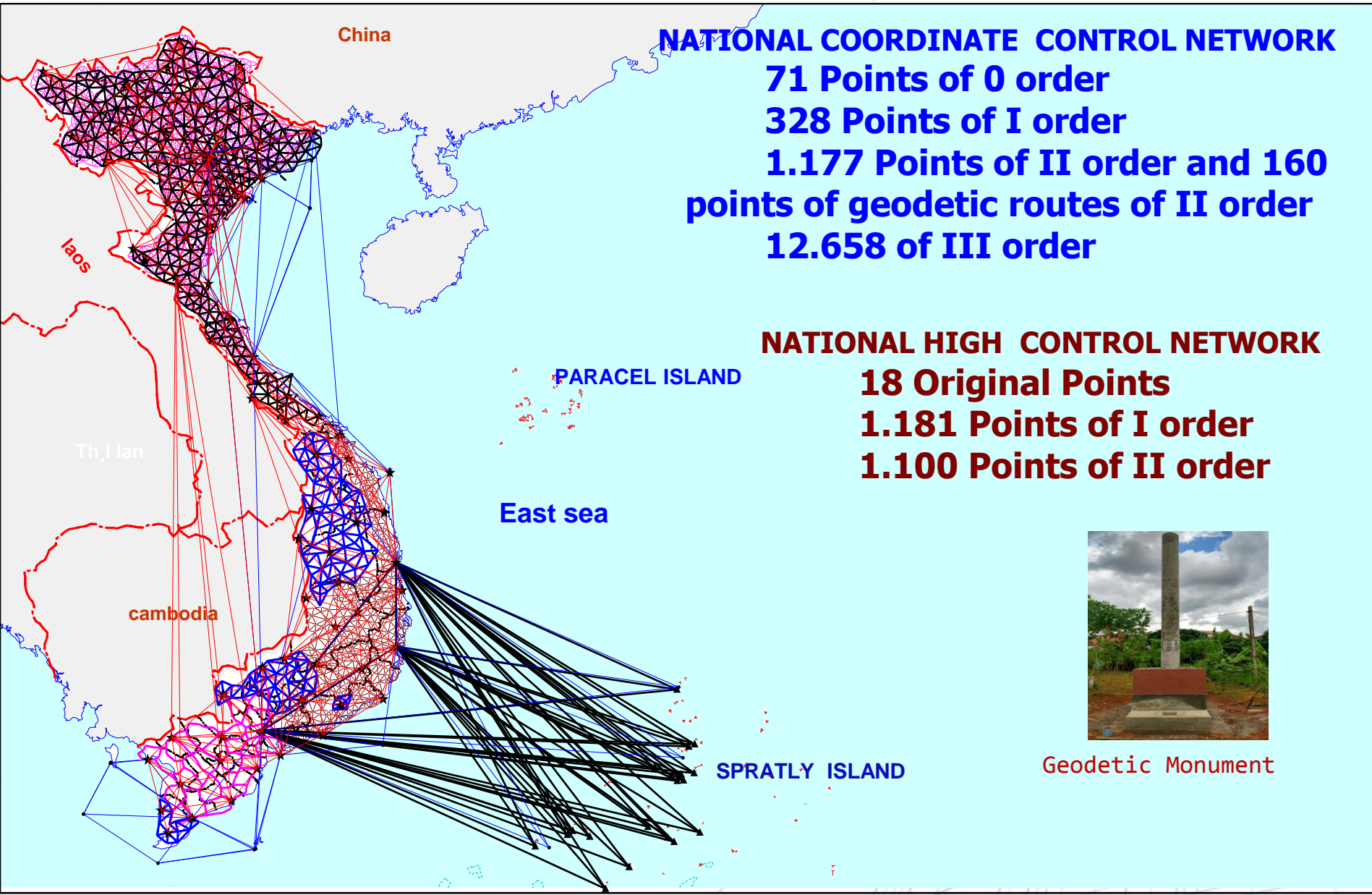


General information on Vietnam geodetic network

- **National geodetic network** included: National system of coordinates, elevation and gravity.
- Those systems base on **VN 2000**, which published in 2001. VN 2000 included some information as following:
 - **Elipsoid: WGS 84**
 - + Major axis: $a = 6378137.0 \text{ m}$
 - + Oblateness: $f = 1: 298.257223563$
 - + Rate of axis rotation angle: $\omega = 7292115.0 \times 10^{-11} \text{ rad/s}$
 - + Earth's gravitational constant : $GM = 3986005 \times 10^8 \text{ m}^3\text{s}^{-2}$
 - **National Coordinate Origin:** N00 in Ha Noi.
 - **Coordinate system:** UTM international coordinate system is established on basis of universal transverse mercator



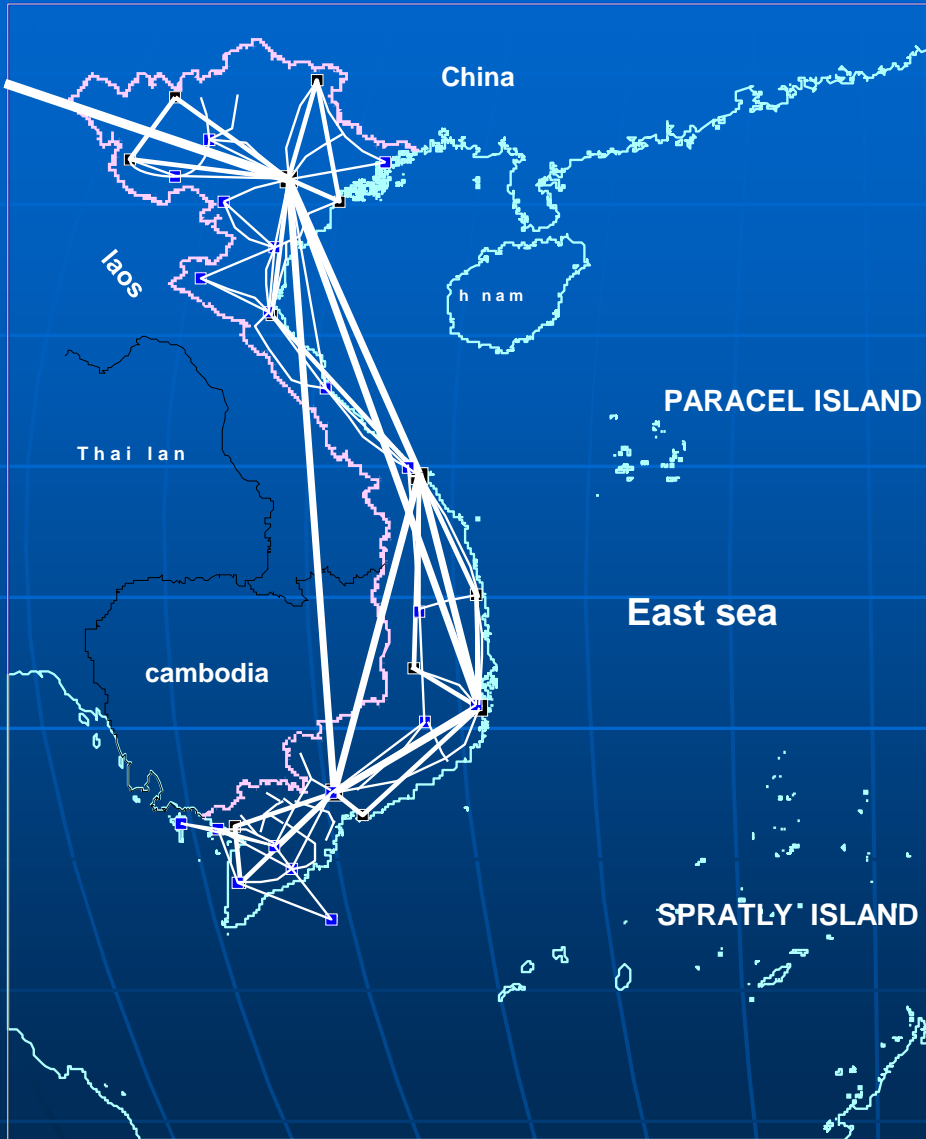
GEODETIC DATA



Geodetic Monument



GRAVIMETRIC NETWORK

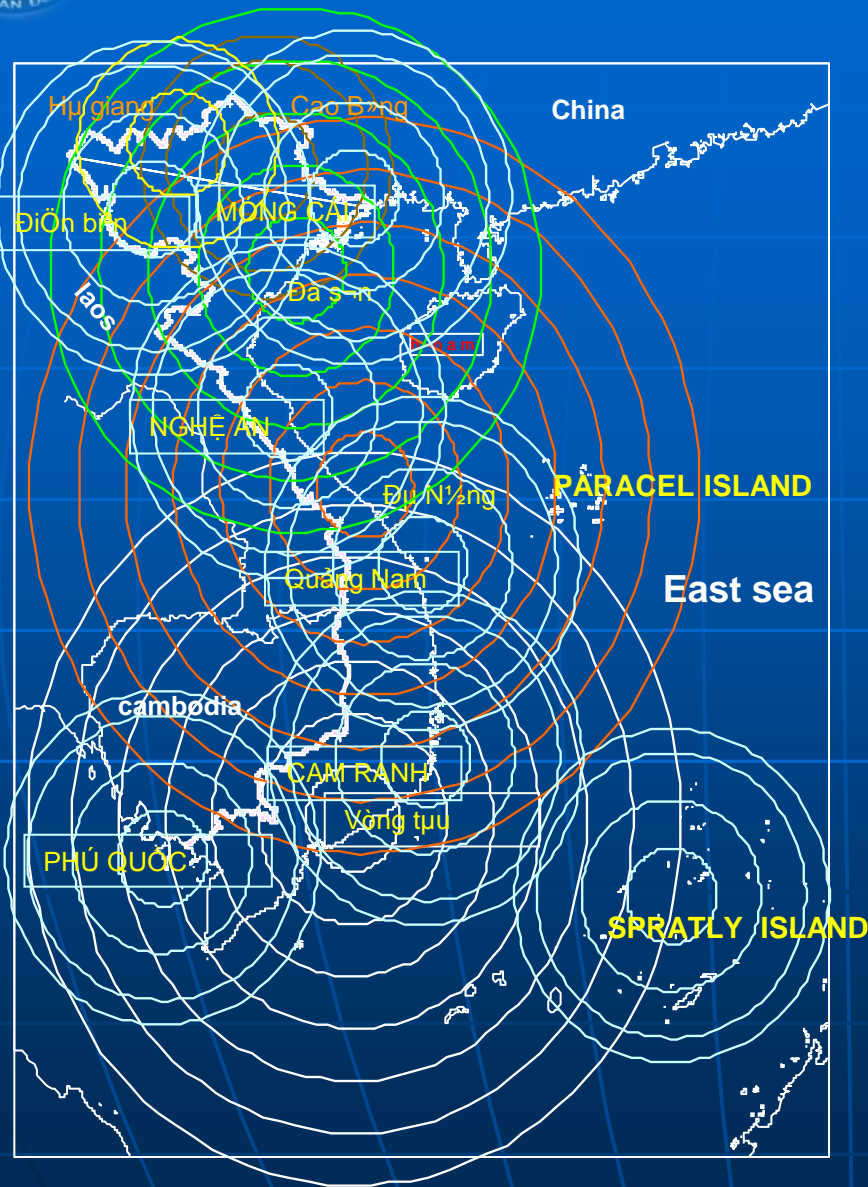


Gravimetric network of I, II, III, IV orders

- Measuring from 1975 to 1980.
- Adjusted in 1982
- Completed in 1988



GPS BASE STATIONS



12 Existing stations

- 06 Stations belong to MONRE.
- 06 Stations belong to Military
- 12 permanent GNSS stations working as separately Cords Station, not connected in a network



DEVELOPMENT OF GNSS





GENERAL INFORMATION

- **Objective:** Provide correction signal for marine mapping and navigation. Connect all current and new-built CORS stations in unified system for multi-purpose
- **Activity:** Daily Logging GPS signal and transmitting correction signal. Working over ten years as independence stations
- **Accuracy:** about 1-3m
- **Funded:** Vietnam Government
- **Project management:** Ministry of Natural Resources and Environment (MONRE)
- **Project coordinate:** Department of Survey and Mapping of Vietnam (DOSMVN)
- **Period:** From 2016 to 2019
- **Scope of project:** Whole Vietnam Territory



PURPOSE OF PROJECT

- **Modernizing** the infrastructure of survey and mapping, promote the application of new technologies, contributing to labor productivity growth in surveying and mapping, building up the frame of dynamic Coordinate System, participate in the International Geodetic Network
- Formed GNSS CORS network unified: Integrated GPS single stations, formed unified system based on GNSS CORS connection protocol TCP/IP.
- **Provide real-time correction signal:** Provide real-time correction signal with accuracy of 2-4 cm level by the method NTRIP
- **Provide raw data for static survey:** Provide raw data at start points for static GNSS survey, post-processing GNSS survey
- **Provide data for scientific research :** Determine the earth moving, provide information for other study fields
- To encourage participation in the National CORS network: Building standards guide and encourage the participation in the National CORS network and data exploitation.



MAIN CONTENTS

- **Build up National CORS Network with 65 CORS Station, including:**
 - **24 Geodetic CORS stations:** Build up 24 stations to establish Geodetic Network with space of 150–200Km per station.
 - **NRTK CORS Station:** Build up 41 stations (14 stations in North Part, 7 stations in Middle Part, 20 stations in South Part, make NRTK Networks with space of 50-80Km per station.
 - **Processing and Control Center:** Location in Hanoi; manage, monitoring, receiving, processing, providing data.
 - **Building Standards, guidelines** for of participation in the National CORS network and data exploitation.
 - **Compiled guidelines, principles** and methods used services from CORS System



GENERAL REQUIREMENTS

- **Technology:** The selection of technology solutions to ensure the criteria included the newest technology.
- **About suppliers Technology:** Make sure to select suppliers with the most experience and ensure the integration, exploitation and use of the current system infrastructure as well as equipment and GPS/GNSS is now in Vietnam.
- **About lifetime:** Technology and equipment are modern, open and meet the requirements of Natural Resources and Environment, maintain stably operation in 2030.
- **About application:** This is a multi-service projects, the approach should be closely coordinated with other fields to guide and develop applications to serve the economic development objectives; and generate revenue to operating costs of the system. Ensure the transmission of data as well as links from the user to application data of the System.



SPECIFIC REQUIREMENTS

The basic requirements for the location and quality of monument:

- Location of monument was selected at long-term stability area, which not affected by geological activity, construction, traffic. The system must be integrated with meteorological observation stations.
- Locations of CORS Geodetic monuments are based on the analysis result of geology tectonic activity of Vietnam territory.
- Monument location in open area; signal transmission to antenna are not affected, unaffected by Electromagnetic-waves stations in the area.
- Monument must be built with deep drilled mold body to a stable floor, to ensure the observation of the smallest shift, ensure the possibility of construction with practical conditions in Vietnam.
- Limiting the impact of multipath transmission.



SPECIFIC REQUIREMENTS

Requirements of GNSS equipment:

Antenna:

- Synchronized with the GNSS receiver
- Support the collection of signals from existing GNSS systems
- Minimize factors affect antenna.
- Withstand the harsh working conditions
- Antenna phase center is identified.
- Choke Ring Antenna.

Receiver:

- Synchronized with the Antenna
- Supports multi-system , multi-channel , multi- signal
- Support connection according to standard TCP / IP, can be configured by remote control
- Withstand the harsh working conditions
- There is enough storage memory, and receive the signals with a frequency of at least 1 second/1 epoch.
- Low energy consumption.



SPECIFIC REQUIREMENTS

Power system requirements:

- Meet the power supply for the receiver and the connected devices continuously transmit data
- There are backup power: UPS batteries or guaranteed minimum usage time of 72 hours continuously
- There are solutions based power supply source of solar energy .
- There are lightning protection systems

Connection requests and data transmission:

Fiber connections required. In the absence of fiber connections will consider to connect via ADSL or 3G

Other requirements:

- Equipment cabinets designed for outdoor use, with the ventilation system, safety lock, suitable for Vietnam weather
- Systematic meteorological sensors



DEVELOPMENT PLAN



DEPLOYMENT PLAN

- The project began to be implemented from 2016 to the end of 2019
- The next years will be in the period increased socialization, increased CORS stations on demands.
- The project deployment plan as following:
 - ❑ **In 2016, the project targets is defined as:**
 - ✓ Establish Technical Design - Detailed estimates
 - ✓ Establish bidding plans , bidding documents up
 - ✓ Under construction monuments for Geodetic CORS stations.
 - ❑ **In 2017, the project targets will be:**
 - ✓ Under construction monuments for NRTK CORS stations;
 - ✓ Under construction the Processing and Control Center
 - ✓ Installation of equipment for Geodetic CORS stations



DEPLOYMENT PLAN

❑ In 2018, the project targets is defined as:

- ✓ Installation of equipment for all CORS stations
- ✓ Measurement to determine the coordinates in Vietnam coordinate, elevation Systems for CORS stations
- ✓ Complete infrastructure connection in the entire net CORS stations and Processing and Control Center
- ✓ Perform a trial operation systems , products services, formed the service delivery model
- ✓ Building a legal framework as a basis to guide the State units and private organizations to participate in the National CORS networks



DEPLOYMENT PLAN

In 2019, the project targets will be:

- ✓ Training, operation and technology transfer
- ✓ Complete all the documents and reports related to the project
- ✓ Proposals some Geodetic CORS stations to participate in the International networks

From 2020, the target will be:

- ✓ Additional construction NRTK CORS stations at remaining areas by participation of State units and private organizations to increase the CORS network stations up to 120-150
- ✓ Maintain safe operation and reliability of the entire NRTK CORS system



DEPARTMENT OF SURVEY AND MAPPING OF VIETNAM



THANK YOU!