

Building, Developing and Managing the National Geospatial Data Infrastructure in Vietnam

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SUMMARY

The main content of the report presented outstanding results in the building, development, and management of spatial data infrastructure in Vietnam. On that basis, and based on the provisions of the Law on Survey and mapping in 2018 on the National Spatial Data Infrastructure, the report presents the Orientation for the building, development, and Management of National Spatial Data Infrastructure of Vietnam.

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1. INTRODUCTION

Spatial information has become really necessary, serving as base information to show other information. All geospatial data needs to be managed and exploited on the basis of a common infrastructure consisting of many components, such as geospatial data, standards, policies and laws, organization and institutions, technology, human resource training, and community awareness, etc. On that basis, spatial data infrastructure (SDI) is built with local, national, regional and global levels.

The UN has launched an initiative to establish an organization for global geospatial information management called UN-GGIM (United Nations initiative for Global Geospatial Information Management). UN-GGIM aims at playing a leading role in setting the agenda for the development of global geospatial information and to promote its use to address key global challenges. It provides a forum to liaise and coordinate among the Member States, and between the Member States and international organizations. From 24 - 26 October 2011, the First High-Level Forum on Global Geospatial Information Management, and the First Session of the United Nations Committee of Experts were held in Seoul, the Republic of Korea. This was the first time that experts from 90 countries met in the context of a United Nations initiative to enhance global cooperation in the field of geospatial information management. The Forum concluded with the acceptance of the Seoul Declaration on Global Geospatial Information Management (GGIM).

In 2011 UN-GGIM decided to establish a UN-GGIM-Regions with the important role of contacting the UN-GGIM Secretariat to carry out activities during the period between two Special Committee meetings, facilitating regional development and discussion. In February 2012, a joint conference organized by UN-GGIM, Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP), Global Spatial Data Infrastructure Association (GSDI) and International Federation of Surveyors (FIG) held in Kuala Lumpur and adopted the Kuala Lumpur Declaration, in which there is an important content 'Agree that spatially enabled societies and governments, recognizing that all activities and events have a geographical and temporal context, make decisions and organize their affairs through the effective and efficient use of spatial data, information and services'.

UN-GGIM and many other international organizations jointly organized the Conference in Kuala Lumpur and adopted the Kuala Lumpur Declaration, which contained an important content 'Agree that spatially enabled societies and governments, recognizing that all activities and events have a geographical and temporal context, make decisions and organize their affairs through the effective and efficient use of spatial data, information and services'.

In 2012 the 19th United Nations Asia-Pacific Map Conference meeting in Bangkok, Thailand issued a resolution to rename the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) becomes the Regional Committee on United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP). Vietnam, who joined PCGIAP, continues to participate in UN-GGIM-AP.

SDI developed in a country in the form of national spatial data infrastructure (NSDI) as a direct aid to building e-government and administrative reform, economic development, social stability, environmental protection and response to climate change. NSDI in each country is the basis for building global SDI - a positive information support tool for people to accurately determine the steps of socioeconomic development and Earth protection.

This report presents the current situation of NSDI development and management in Vietnam and in the coming time.

2. SITUATION OF BUILDING, DEVELOPING, AND MANAGEMENT OF GEOSPATIAL DATA INFRASTRUCTURE IN VIETNAM

2.1 The process of building and developing the SDI

In Vietnam, the development of spatial data and the development of spatial data infrastructure are set out quite early. Since the early 1990s, Vietnam 's Surveying and Mapping sector began the process of technological innovation, first with a GPS technology application. Application of GPS has helped to complete the National Coordinates Network covering the whole country. In 1998, the Government approved a feasible project to build a national database of land resources (including geographic database and land database). The project started in 1999, is one of 7 national databases.

The National Geodetic Reference System VN-2000 has been the coordinate reference system used uniformly in the whole Vietnam since 2000. New systems of aerial photography; topographic mapping by aerial photogrammetry and stereo-plotting; map reproducing and editing; 5 DGPS Permanent Continuously Operating Stations for seabed topographic mapping, forestry land survey and national border demarcation was installed and operated. The national height system, the national gravity system was modernized in the late 2000s and early 2010s. New topographic maps system at the scale 1/50,000 covering whole country was established and completed in 2004. The sea hydrographic charts system at the scale 1/250,000 is being edited with updating survey, the seabed topographic maps system at the scale 1/50,000 for territorial waters was deployed.

Since 2007, geographic data standards and place name standards were approved to put into use. In 2010, international place name catalogue was also approved. At present, geographical object name catalogue for is being in implementation. Since 2008, geographic databases at scale 1/10,000 covering whole country has been plotted in association with making cadastral maps for forestry land administration; geographic databases at the scale 1/2,000 or 1/5,000 has been established to cover urban areas, industrial parks and economic zones. GIS with base map at

the scale 1/5,000 for the whole Mekong Delta area was completed in 2009. Geographic databases at the scales 1/2,000, 1/5,000, 1/10,000, 1/50,000 and 1/1,000,000 were completed in accordance with the unified data standards. Geoid model and digital elevation model (DEM) of the whole country were completed in 2009.

Since 2010, the following geospatial data development projects have been implemented (WB&MoNRE, 2011; Chan, 2016):

- Project "Building the structure of integrated geospatial database of natural resources and environment" including geospatial information about land, water resources, geology, mineral resources, environment, meteorology, hydrology, sea and islands.
- Project "Building the overall architecture of natural resources and environment information system".
- Project "Building natural resources and environment database", including land, water resources, geology, mineral resources, environment, meteorology, hydrology, sea and islands.
- Project "Building Wide Area Network (WAN) of natural resources and environment" to link geospatial databases of land, water resources, geology, mineral resources, environment, meteorology, hydrology, sea and islands.
- In 2018, the project to build a continuously operating reference station (CORS) has been started and will be completed in 2019.

2.2 The results of building and developing NSDI Vietnam

Below is a summary of the outstanding results of NSDI development in Vietnam.

2.2.1 Policy and legislation:

- In 2002 and 2015, the Government of Vietnam issued a Decree on surveying and mapping activities.
- In 2008, the Government of Vietnam issued a Strategy for the Surveying and Mapping up to 2020.
- In 2018, the National Assembly of the Socialist Republic of Vietnam adopted the Law on Geodesy and Map, which included a section on NSDI. This law takes effect from January 1, 2019.

2.2.2 Organization and institution:

- In 2013, the Government of Vietnam issued a Decree defining the functions, tasks, powers and organizational structure of the Ministry of Natural Resources and Environment (MoNRE), including the task of "Building, updating, managing and exploiting the spatial data infrastructure".

- In the Decree of the Government of Vietnam issued in 2016, the MoNRE continues to be assigned the task of "Building, updating, managing and exploiting geospatial data infrastructure" and Vietnam Department of Surveying and Mapping was renamed the Vietnam Department of Surveying, Mapping and Geographic Information.

2.2.3 Standard:

Up to now, the issued standards include: Basic geographic information standards; Standard geographic data; Cadastral data standard; Standard place names shown on the map, some standards for thematic data.

2.2.4 Technology:

Technologies applied in NSDI development in Vietnam include:

- GNSS satellite positioning technology serves to build the types of coordinates and measure the coordinates of detailed points and dynamic objects.
- Electronic total station technology, electronic hydrography for measuring types of coordinates, elevation, detailed points, and large scale mapping.
- Flight technology captures ground images from airplanes with an optical camera equipped with a GPS location tracking device.
- LiDAR (Light Detecting And Ranging) technology - a combination of laser-length measuring technology, satellite navigation technology, and digital imaging technology - to study and accurately determine the true surface of the earth including Geography on it in 3D space.
- Technology for cleaning film and creating high-resolution digital images.
- The technology of aeronautical and satellite image drawing to establish terrain, background maps, cadastral maps, and thematic maps.
- Technology for automatically drawing seabed topographic maps with single-beam, multi-beam ultrasound, rib scanning system (Side Scan Sonar) and GPS positioning, DGPS is installed on board.
- Technology for organizing geographic databases, land databases, geographic information systems (GIS), land information systems (LIS).
- Digital technology for establishing, editing, synthesizing, editing and making maps of all types of maps.
- Remote sensing technology for the purpose of monitoring natural resources and environment, including measuring and mapping purposes.

- Simulation technology for training, coaching, and advising military operations.
- Ground 3-dimensional laser scanning technology in the fields of civil construction, industrial construction, construction of traffic works, basic survey, construction of simulation models as required, cave surveys, heritage preservation.

2.2.5 Geospatial data have been collected, including (WB & MoNRE, 2011; Tran, 2016):

- The coordinate data are based on the National Geodetic Reference System VN-2000 connected to the International GPS Service (IGS). The elevation data are based on the Haiphong National Elevation Reference System. The gravity data are based on the Potsdam Gravity Reference System.
- Geodetic coordinates networks of the "0" and 1st and 2nd orders include over 1,700 points covering the whole country and major islands; the 3rd order includes over 12,000 points. The CORS network under construction, when completed will consist of nearly 100 stations. Elevation network of 1st order consists of 1211 points, the 2nd order consists of 1117 points, the total length of 3rd order is 2792 km and of the 4th is 7524 km. The national gravity network consists of 11 base points, 31 points of 1st order and 102 satellite points.
- Digital topographic maps at the scales 1/1,000,000, 1/500,000, 1/250,000, 1/100,000 and 1/50,000 covering the whole country were completed. Digital topographic maps at the scale 1/10,000 covering whole country and at the scale 1/5,000 and 1/2,000 covering urban areas are implementing. The topographic map system includes the information layers of relief elevation, administrative boundary system, hydrologic system, transport system, vegetation cover, population distribution and economic infrastructure, and place name.
- Geospatial databases and information network of natural resources and environment including land, water resources, geology, mineral resources, environment, meteorology, hydrology, sea, and islands are implementing.
- Marine hydrographic chart system at scale 1/250,000 is being re-edited on the basis of collecting available marine charts in association with updating survey. The seabed topographic map system at the scale 1/50,000 is being implemented in the coastal zone.
- Cadastral records, including cadastral books and maps and real property certificates, are completed at about 90% of total land parcels made in digital form.
- Other maps, including national and administrative boundary maps, administrative maps, current land use map, land use planning map, soil map, etc. have been completed and are being updated in accordance with the Government's plans.
- Catalogs of administrative and international place names were published. Place names of geographic objects are being implemented.

3. ORIENTATIONS FOR BUILDING, DEVELOPING AND MANAGEMENT OF VIETNAMESE NATIONAL GEOSPATIAL DATA INFRASTRUCTURE

The Law on Surveying and mapping has been approved by the Vietnam National Assembly and takes effect from January 1, 2019. The Law has 6 articles regulating the development and management of national geospatial data infrastructure. The Vietnam National Geospatial Data Infrastructure (VNNSDI) has six components, including policies, organizations and institutions, standards, technologies, geospatial data, and resources. The orientations for building, developing and managing VNNSDI is to successfully implement the provisions of the Law on Surveying and mapping, specifically as follows:

3.1 The content of building and developing VNNSDI:

- Develop strategies and plans for implementing VNNSDI;
- Develop mechanisms, policies, and resources to organize the implementation of the development strategy and plan for implementation of VNNSDI;
- Select, develop technology, develop technical standards and regulations on VNNSDI;
- Building and integrating geospatial data;
- Building and operating the Vietnam Geospatial Portal and geospatial data services and applications.

3.2 The responsibility of building, developing and managing VNNSDI:

- The Prime Minister directs and coordinates the construction of NSDI.
- The Ministry of Natural Resources and Environment presides and coordinates with ministries, ministerial-level agencies, agencies under the Government and provincial People's Committees to develop development strategies and plans to implement the NSDI to submit to the Government approval; organization of national geospatial data integration; build and operate the Vietnam Geospatial Portal.
- Ministries, ministerial-level agencies, government-attached agencies, and provincial-level People's Committees organize the implementation of development strategies and implementation plans for NSDI.
- Organizations and individuals involved in building and developing geospatial data.

3.3 NGDA themes and Datasets

Building national geospatial data is to build, develop, improve and update the following data themes and datasets:

3.3.1 Framework themes:

- Geodetic control
- Topography
- Imagery
- National borders
- Administrative boundary

- Geographic names

3.3.2 Specialized data themes:

- Cadastre
- Land use
- Water – inland
- Geology
- Soils
- Forest
- Underground work
- Civil aviation
- Sea charts
- Natural disaster prevention, rescue, environmental incident recovery, climate change response
- Transportation
- Planning

4. CONCLUSION

Vietnam has so far focused on building and developing geospatial data components and has achieved some initial results. The development of other components of NSDI is limited and not yet synchronized.

From 2019 with the implementation of the provisions of the Law on Surveying and mapping, the build, development, and management of VNNSDI will be implemented synchronously and will make new achievements.

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BIOGRAPHICAL NOTES

Dr. Bach Giang TRAN graduated with a doctorate in geodesy in Bulgaria in 1976. Since 1976, he has worked at a scientific research agency of the State Department of Surveying and Mapping, has participated in projects of application of Doppler technology, GPS technology, modernizing the national gravity network. Since 1995, he has been the Director of the Department of Surveying and Mapping of the General Department of Land Administration, has participated in projects to build national coordinate systems, national elevation systems, innovating surveying and mapping technologies. From 2005, he has been Director of MoNRE's Department of Surveying and Mapping to retire in 2008, has participated in projects to build basic geographic information standards, cadastral data standards, and geographic data development. Since 2007, he has been the Vice President and from 2013 to now is the President of VGCR, has participated in setting up a project to build a CORS network, the Law on Surveying and mapping project.

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