

DEMAND AND DEVELOPMENT OF GEOSPATIAL DATA IN VIETNAM

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Summary:

Overview reports on the development, application, exploitation and management of geospatial data in the industry, local and business enterprises in Vietnam. The point through the results achieved on the mechanism to provide information to meet the geospatial data needs of the State and society. At the same time pointed out the difficulty in exploiting the Exchange, between sectors, localities and enterprises. In addition, the report reviews the extent update the existing data sets .

The report also reviews the role and potential of the community and the State of development of investment participation, provision and use of the geospatial data in Vietnam through which raised two properties (merits and limitations) produced their exclusive problem and data mining of geospatial data in State agencies.

The report said that Vietnam should have time to lecture the Government approving consensus strategy, deployment plan, enacted the law under the legal text, from which the basis of developing management models more effectively geared to geospatial data infrastructure in Vietnam (VNSDI)

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1. Preface

Geospatial data [3] is the data or information on the location of the entity on the Earth's surface defined by coordinates and geometry associated with the properties of the entity and at the same time from the data can modeling map about them. With such a definition, can see geospatial data is to include many types of traditional map data such as topographic map, plane photography, satellite imagery and other thematic (special) map and this is the new digital topographic maps and geospatial background database the form of closely held on purpose In which geospatial background database is derived nuclear technology application geospatial analysis (geographic information Systems-GIS)-a technology that is considered the breakthrough success of scientific and technological revolution in the field of geospatial data in which mainly the development of cartography technology, satellite technology, information technology-Telecommunications (ICT). On the other hand, GIS technology has an impact back to promote the production of traditional maps, digital maps and geospatial database is more accurate, faster, cheaper and more widely our application. Today, GIS is a tool to support decision-making (DSS) in the territorial planning, management, control and protection of the environment, national defense security service and serve the needs of the community population, GIS support for CEOs of large companies decisions in the forecast, adjusted production plans, business and beyond that GIS (with GIS Desktop) are considered as tools to create the opportunity for all individuals can produce geospatial data and join the Exchange on the market at large through the global information network.

However, on the basis of the practice in the countries of the world and many scientific studies have shown, the production and exploitation of geospatial data on the basis of a common infrastructure (the English Name is "Spatial Data Infrastructure" and abbreviated to "SDI") created should an environment of cooperation and information sharing, provide the technical platform, institutional and political guarantee of national unity to meet the needs of users in the context of sustainable development. The countries of the world are also being perfected gradually building and management model based on the NSDI information needs and in accordance with the technical capacity, the country's resources on the certain time. NSDI model means there is no "best" or "unique" in developed countries can be applied immediately to the other country without the research and innovation.

For Vietnam, the construction and development of VNSDI is a complex task, not only face challenges due to the concept of need privacy or not yet adequate involvement of the community in information technology and telecommunications (ITC) in the field of developing geospatial data, but also faced with how to choose the management model NSDI respond to the specificity of the social context, the politics, the culture in the future.

2. These characteristics naturally, Vietnam's social and economic development needs geospatial data

Vietnam is a country with a population of over 90 million people, with an area of over 330 thousand km² of land and 1 million km² of sea areas, of which there are an estimated 19,000 km² coastal region, economic development zone, 41,000 km², 310,000 km² region of the continental shelf and the exclusive waters 630,000 km² Economics. Vietnam land-border and sea-waters adjacent to the area such as China, Philippines, Brunei, Malaysia, Cambodia and Thailand. On climate, Vietnam in tropical rain storms, many, regular annual bear many of the disaster. On the other hand, from the years 90 ' of the 20th century, Vietnam began the transition from economic mechanism subsidy into market economic mechanism. The problem posed is to conduct the shifting of land according to the development of innovation in order to organize a more effective management of land resources, water resources, mineral resources, marine resources, forest resources, etc. Moreover, besides the achievements gained during the years of social-economic development, currently incurred the bureaucracy, corruption, waste, speculation, etc. are difficult, hindering sustainable development. The main characteristics of natural geography and social economy on Vietnam's is the reason requires to have the set of geospatial data covering the whole territory covered on mainland and at sea and especially on the large river basin with neighbouring countries.

3. Current status of development and application of geospatial data in Vietnam

3.1. On policy-related legislation of developing geospatial data

During the period of struggle for national independence and spent time about several dozen years after completely uniform (1975) in Vietnam tend to uphold the role of geospatial data in the service of national defense security and ensuring National sovereignty. Therefore, geospatial data (primarily the kind of traditional maps) are always considered the secret documents and exclusive priority only used in State management agencies, limiting the use of population on purpose. The geographic map and aviation image was delete the information before allowing the use. The exchange of the mapdata abroad is through complex procedures. However, the mapdata is provided free, the process of production, maintenance and provide mapdata not yet really dynamic, the slow mapdata was updated. Investment capital grow geospatial data are mostly State budget, lack of participation data development of social community.

In 1996, the State has had advocates launch national program IT-2000 on development of information technology in the period 1996-2000, to promote the development and application of information technology to serve the industrialization modernization, towards three main objectives: the widespread application of information technology in all areas; Develop a national information network covering the whole country coverage; industrial development and information technology become the spearhead economic industry. GPS technology, satellite images are applied in Vietnam, producing and supplying the map data faster, have higher accuracy.

The end of the year 2000 ' innovation management policy as advocates considered a map published not be confidential and be released widely. From there, the geospatial data user community expanded than before, geospatial data is served not only for State management activities that also cater to the businesses to the State and private sector and for serving communities. The process of providing, improved data transfer more advantages, information about the content, categories, procedures for the sale was announced on the internet. Prices provide data was initially built to recover a portion of the costs in order to encourage, to support the user at the same time reinvestment data maintenance services.

In 2005, [6] Congress passed the electronic transaction Law, the year 2006 through the information technology Law, law on access to information (2016). The State has issued the Decree specified the public on the electronic portal of the authorities about the kind of information security, the regulation on information on the administrative procedures, information on planning , information about investment projects, etc.. The State has through out the industry guidance documents on the management of the database of underground works of the town; construction of statistical development strategies and using statistical information of the population in the planning and building development plans;. construction of information management system for fishing on the sea and construction of databases and information systems of the the national goal of building a new countryside.

Since 2006,[6] the Ministry of natural resources and the environment of building national geographic information standards uniformly for all the activities related to the use , swap and collect geographic information data in Vietnam on the basis of the reference geographic information standards of geographic information standards Committee world ISO/TC211. For the first time in Vietnam has encouraged the mining structure geographic background database content in the ratio: 1/2.K 1/5.K, 1/10.K and 1/50.K and unify the text construction process Guide related that make up the important policies for the deployment of geospatial data construction towards VNSDI. In addition, in the next years, the geographic nameplaces standard of maps and cadastral standard are also built and issued the uniform application throughout the country;

In 2013, the task of building, updating, managing, exploiting the infrastructure of geospatial data are official delivered to the Department of surveying, mapping and geographic information in Vietnam of Ministry of natural resources and the environment;

In 2018, surveying and mapping Law [4] was passed by Congress and the effect from 01/01/2019 rules of construction, management of the infrastructure component of geospatial data includes: policies organizations, institutions, standards, technology, data and resources. Surveying and mapping law regulations on construction, infrastructure components to manage data national geographic space, including: policy, institutional organizations, standards, technology, data and resources. According to this law, the Prime Minister directed, coordinated the building of VNSDI. Ministry of natural resources and the environment, in collaboration with ministries, ministerial agencies, government agencies, provincial people's Committee building strategy development, planning implementation NSDI submission to Government for approval; the organization integrates geospatial data of countries; build, operate the geospatial portal Vietnam. Ministries, ministerial agencies, government agencies, provincial people's Committee in implementing organization development strategy implementation plan, VNSDI. The Organization, individuals are involved in construction, development of geospatial data.

3.2. Results of development and application of geospatial data

To assess the results of the development and application of geospatial data in Vietnam, this report reviews the extent to ensure the needs of the geographic information background served to establish new specialized data through the addition of more details more information about a special subject. So, we can say the geographic information background is general geospatial data for needed for many agencies, organizations and individual users for corresponding selection purposes and territorial space suit. In the pass, with geographic information background was understood to be system national topographic maps with the rate ranges are defined in advance. The end of the year 2000' has new digital geographic maps and geographic background database with information classes can subclass and can integrate several layers into the "background" geographically customized user needs to establish specialized data. Here are reviews of results develop geospatial data Vietnam through each stage and two array base: (1) development and application of geospatial background data and (2) development and application of geospatial special data..

3.2.1 The results of development and application of geospatial background data: geographic map and geographic background database

Before the 90s' geographic map in Vietnam were built including the categories as follows: topographic map systems built according to Gauss-kruger projection with Ellipsoid Kravxopski locate the Hanoi national coordinate system-72 (abbreviated HN-72) was produced

because the the State department of surveying and mapping (old). In addition, the types of geographic map due to the US Army building according to the UTM projection with Ellipsoid Everest is still used as the geographic background for a map, especially the provinces of South Vietnam..The territory of Vietnam related in the sea is still used mainly chart of countries like the Soviet Union, (formerly) or the Chinese, English, French.

By the end of 1995, Vietnam has completed a new aviation images in the rate from 1/1/15.K to 1/35.K used to establish geographic maps, cadastral and for other purposes;

In 2000 Vietnam completed the construction of the reference and national coordinate system VN-2000 (the VN-2000) connected with grid coordinates international IGS, simultaneously issued instructions to convert existing data from before about a single system VN-2000;

In 2005, Vietnam finished first the digital geographic maps of the rate 1/50.K covered mainland and editorial geographic maps of paper 1/250.K, 1/500.K, 1/1000.K covered mainland and on the sea;

From late 2007, the State of affairs for the Ministry of natural resources and the environment to deploy and complete (2012) geographic background database and digital topographic map of 1/10.K covered throughout the country and in the years that have complete the geographic background database and digital geographic map with the ratio from 1/2. K to 1/5 K in the urban areas, industrial areas, key economic zone. Next the editor geographic background database of rate 1/50.K covered throughout the country (land portion). Structure of Geographic background database are packaged according to the Geodatabase format with Metadata. Exchange format GML (Geography Markup Language); Metadata is built in detail to each type of geographical object contained in the categories feature and for the full data package and is integrated directly into the Geodatabase for the convenience of the use. The product digital geographic map is packed according to the piece of the map includes 7 DGN format file with layers of information: topographic surface elevation, boundary systems, hydrology systems, traffic systems, the coating plant, the population and economic infrastructure, nameplaces. There are also more digital terrain model (DTM) packed by piece map 1/50. K covered the area under the (land portion) with the filesape of the ESRI file format and is described as a square grid (Grid).

3.2.2 Development and exploitation and application of geospatial special data

On **the policy** of the development and application of geospatial data has just mentioned above, the State has invested funds to deploy many thematic and specialized projects. There is a long time, the branches, the local departments, organizations, business firms have conducted

digitized from the map type are used in Vietnam, recently they are mined using geographic background database and digital geographic map. However, not only the traditional map that both the geographic background database and digital geographic map we have not been regularly updated and their content is not enough to play the role of "data frame" in the system of NSDI. Most users of geographic background database and digital geographic map to keep investment costs, time to update while not yet having specialized data standards. However, in Vietnam have conducted a number of specialized data project through each moment as follows:

In 1998, the State construction projects on the basis of national data on land resources (including geographical database and land database);

-Construction project integrated data base resources and national environment (2004-2009);

-Project to build a database of land measured drawing maps, created the original registration records with the update process, the land fluctuations were completed with about 70% of the number of plots of land all over the country , of which about 70% of the number of records that are created in the form of. Some of the typical system such as ELIS (Department of information technology), ViLIS (General Department of land management), TMVLIS (General corporation of resources and the environment of Vietnam) and many other companies. The GIS technology platform used is also very varied as ArGIS of ESRI (USA), MapInfo, AutoCAD and others. Database management systems using Oracle, SQL Server, Access, etc.. Also had some research the entire application open source build issue in LIS to save investment costs for the technology background;

-The project completion and modernization of the system of land management of the World Bank (WB) with the goal of supporting advanced effect, efficiency and transparency of the work of land management in project implementation through the development and operate a land information system to meet the objectives than the maximum demand of the Government, enterprises and the people; continue to strengthen the management of land use, sustainable and effective in the context of the demand for the use of land resources in increasingly diverse and has many challenges due to the process of urbanization, industrialization land degradation, and pour. The project implemented in 9 province: Binh Dinh, Hung yen, Quang Ngai, Ben Tre, Tien Giang, Vinh Long, Khanh Hoa, Thai Binh, Ha Tay;

-Structural construction project integrated database environment and resources include information space on land, water resources, geology, minerals, environment, hydrology, meteorology, Ocean and Islands (2010, Ministry of natural resources and the environment);

-The project monitoring the environment and natural resources of the sea, Islands with remote sensing technology by The national remote sensing department hosted implementation. This is one of the projects in the overall project's basic investigation of natural resources of the sea in order to increase the efficiency and effectiveness of State management of natural resources and the environment of the sea and Islands;

-Project investigator, surveys the current state of the resources and environment of coastal province Ninh Binh; Investigate, evaluate and propose a solution for sustainable development Ly son island; the Census projects, reviews the phenomenon of Rip currents (Eddy flow) at the Binh Dinh Beach;

-Naval construction project map of seabed data information, in the water, the sea and the other related factors on the coastal mainland;

-Project to build geospatial database management serving the municipality of with the given target is intended to systematize and organize mass major urban infrastructure data and diversity on a clue and focused State management in The building and connect with the local share. In addition the Ministry of construction in collaboration with the province and the city to deploy GIS projects in order to solve complex problems in compensation management, green infrastructure, lighting, municipality in the province or city;

-Project to build data warehouse measure shared count in EVN. EVNIT is also involved in research collaboration to build and deploy the database independent geographic background sets not in accordance with the new add-on applications to support business operations, improving labor productivity;

-The project of seismic survey in the Mekong River Delta and the coastal region of southern Vietnam. The result of this work was the construction of geological structure data deltas, associated with shallow and deep sea, assess the extent of the region's oil and gas prospects. Since 1978, with series of international cooperation projects of exploration geophysics (seismic 2D, 3D gravity) were conducted throughout Vietnam and continental shelf Sea area by Geophysical ships Longva II (Norway) Poisk, Malugin, and Gambursev (Soviet Union). Geophysical systems the area covered most of the key areas were allowed to paint texture maps-geological tectonic, discovered and confirmed the promising structure, set the basis for the work of drilling-oil and gas exploration across the area. Create a map of Geophysics Vietnam. (Fig. 3.1 and 3.2); The Center for development studies and environmental safety of oil and gas extraction software Oilmap as a model of environmentally-friendly oil spill management users, designed to build oil spill response plan. Oilmap use of electronic chart systems, including sea-charts CMAP global from Jeppesen Marine at the same time it is also compatible with ESRI GIS software, ArcGis;

-Project to build shallow Sea floor geology map of the East and the regions, the rate of 1/1.000. K and a map of the geology of the East Coast and the regions, the rate of 1/1000 K.

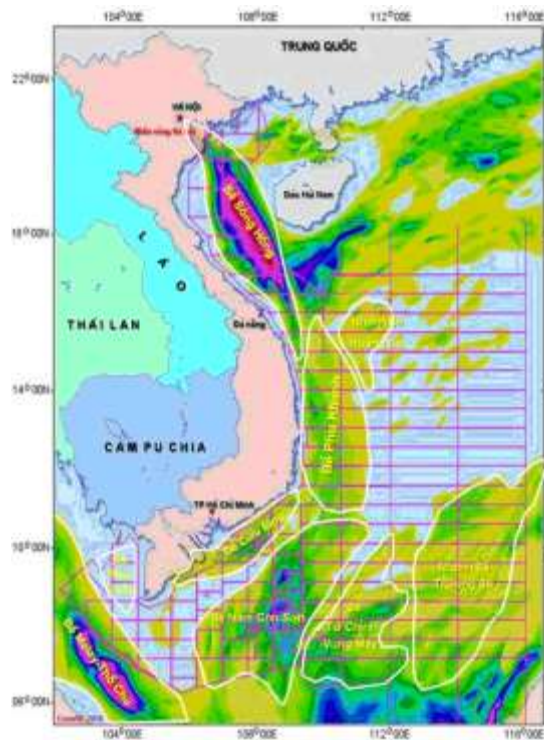


Figure 3.1. Geophysical survey data in Vietnam [2]

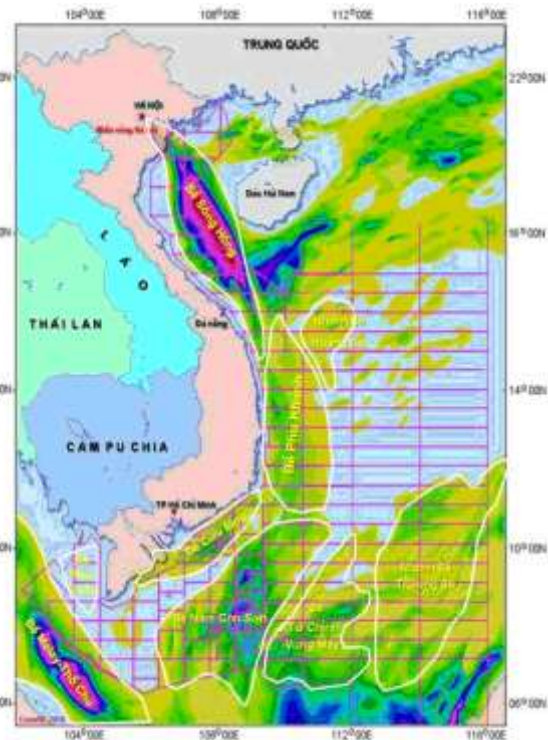


Figure 3.2. Distribution of data in the DongSea sediment [1]

In addition, the business of the private sector also participated in the development and application of geospatial data:

-The company FPT information system Information System – GIS FPT is a member of FPT group. FTP intensive GIS in the areas of: application software development, ERP services, information technology services, systems integration, and e-services provide it equipment. The GIS application solution built according the the company's own database;

-Application company Vietmap (Vietmap co., Ltd) is a leading private companies of Vietnam on map numbers, provide services and GIS application solutions. The GIS application solution built upon the company's own DATABASE, in accordance with the specific needs of each

customer such as land management, shop system, the base station song; GPS vehicle management system (GPS Tracking System) is a system application global positioning technology (GPS-Global Positioning System), a digital (Digital Map) and wireless data transmission technology via mobile phone networks (GSM/GPRS) to monitor the vehicle in real time.

3.2.3. Cooperation of the community in the field in the geospatial data area

The ICT community in Vietnam has had a number of telecommunications service providers, Internet service, wireless services, mobile services, software services and the number of people using this service are pretty crowded, not only in urban but also in rural areas. The cable system is connected to the household in the municipality. ADSL cable was connected to the Centre of all the district level administrative units and to 70% of the administrative unit. This is the network infrastructure adequate to NSDI development on nationwide. Most of the ministries and the Commission received provincial population has been the ICT infrastructure investment to build electronic information page and specialized data systems for the purpose of publicity and transparency of information management and information sharing.

-CPLAR program on strengthening management capacity in the field of cadastral then the SEMLA programme. This program has the ODA is not refundable by the Swedish Government for the local administration. The program is divided into several projects on capacity building, policy, in which case part 5 on development and application of land information systems (LIS) at the provincial level was tested in the province;

-The project completion and modernization of the system of land management of the World Bank (WB) with the goal of supporting advanced effect, efficiency and transparency of the work of land management in project implementation through the development and operate a land information system to meet the objectives than the maximum demand of the Government, enterprises and the people; continue to strengthen the management of land use, sustainable and effective in the context of the demand for the use of land resources in increasingly diverse and has many challenges due to the process of urbanization, industrialization land degradation, and pour;

-The World Bank and the Ministry of natural resources and the environment conducted a study of the development strategy of the national information infrastructure for Vietnam and announced, has launched the petition on VNSDI development strategy with a view to the year 2020;

Projected state budget has invested primarily and through the actual survey, estimate the cost of building data in ten years [5]:

a) For land field: about 60 million USD per year to the surveying and has invested us 20 million USD each year for ICT equipment;

b) For the field of surveying and geospatial background data : about 10 million USD each year to collect geographic data and has invested 3 million USD each year for measuring and mapping device ;

c) For integrated management of data resources and environment: about \$2 million each year to build the database and 1 million USD each year for the construction of the network information system;

d) For satellite image acquisition area: approximately 2 million USD each year to gather satellite images and has invested 25 million USD to build radio stations satellite imagery;

e) For geospatial special data for construction and development of GIS industry about 10 million USD each year ;

2016-2020 period, the State will have support from the State budget funds to Technology-Information program (7920 billion equivalent to about 400 million USD). This investment budget was 11 of Ministry, the industry is agriculture and rural development; Of health; Public security; Defense; Planning and investment; education; labor, invalids; society; Culture, sport and tourism; Resources and the environment; Industry And Trade; Information;

-The University has taken the GIS were on the curriculum [7], [8]. GIS has been applied in the Planning Institute as urban planning Institute and the National Institute of rural construction planning in Hanoi, the Hanoi Department of architectural planning , Ho Chi Minh City, Da Nang, Da Lat, ... etc ...

THE CONCLUSION

The last time, Vietnam has a number of policies related to the development and application of geospatial data, but these policies have yet to truly sync, unity towards a spatial data infrastructure of the country.

Vietnam has quite a large investment to build the spatial data in the form of a topographic map, cadastral, land records, satellite images, GIS information systems. While the ICT technology business in Vietnam but fairly good access to the level of technology in the world but afraid to step into the business geospatial data.

On the basis of the law on surveying and map the effect from 01/01/2019 soon established a National Committee on spatial data infrastructure and geographical nameplaces (VNCOMSDI) such as the interdisciplinary committee operating under the provisions of the law on cartography. VNCOMSDI the organization participated in the evaluation of data frame and the

specialized data, participate in the coordination aimed at ensuring the timely transfer to the user through different channels including a space Portal door GOS (Geospatial One-Stop Portal-GOS P Ortal) connect to the server that contains the metadata, data list, list of services, the tool supports searching and some other support tools to help users search for the required data. From this portal, users can link with all server contains data space in network information to easily access the data, display data and data processing.

Have to say, the development of geospatial data in the model of SDI is the development of the technical revolution. With Vietnam, should gradually improve policies, institutions, technology, data, and resources are in the direction of building VNSDI. Strengthening cooperation with international organizations in the development of the infrastructure of spatial data of global and regional geography.

Ahead to complete the natural existing data and integrated planning to add several layers of thematic contents meet the needs of level of detail management of socio-economic development, in particular more data layers have been standardized in the nest officials in the Ministry of natural resources and the environment as the primary address space class with the associated object type to describe the boundaries of land plots, seabed terrain added to rate 1/10.K, 1/50. K, 1/100 K 1/100K, 1/500.K, and add aerial ortho mosaic and satellite ortho imagers. About the structure of the territory of the geospatial background data need to be extended to the territorial on the shared river basin, the water on the sea with adjacent countries in the region.

In the long term should facilitate institutional construction, guarantee the rights and legal interests of the Organization, personal development, application infrastructure for geospatial data. Boost commercialization of geospatial data and socialization activities related to development, thermal processing, retention of geospatial data as a public service, taking into account economic efficiency, satisfy the needs of the State and appropriate Community context economy and society in Vietnam./.

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