



ECONOMY REPORT OF VIETNAM

GROUNDWATER PROGRAMME

1. Summary

In the period from July 2006 to June 2007 the Department of Geology and Minerals of Viet Nam carried out hydrogeological survey at 1: 50,000 scale in some areas, groundwater monitoring in three regions (the Red river delta, the Mekong river delta and the Central plateau) and groundwater assessment in some areas, especially the specially difficult areas in 7 provinces in the Northern mountainous region, 5 provinces in the Central Plateau and the provinces in the remote area of Southern plain

GROUNDWATER PROGRAMME

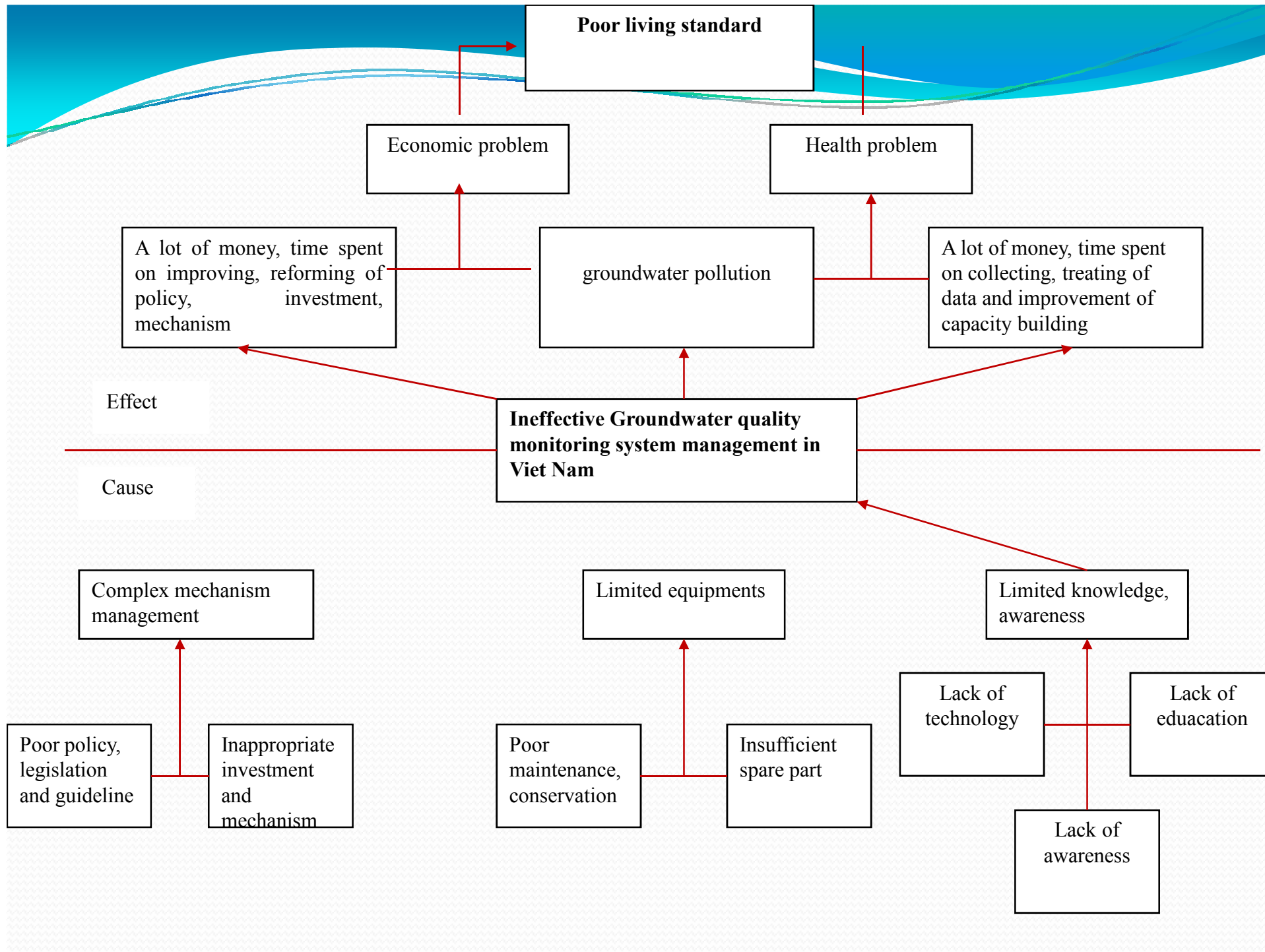
a. Results

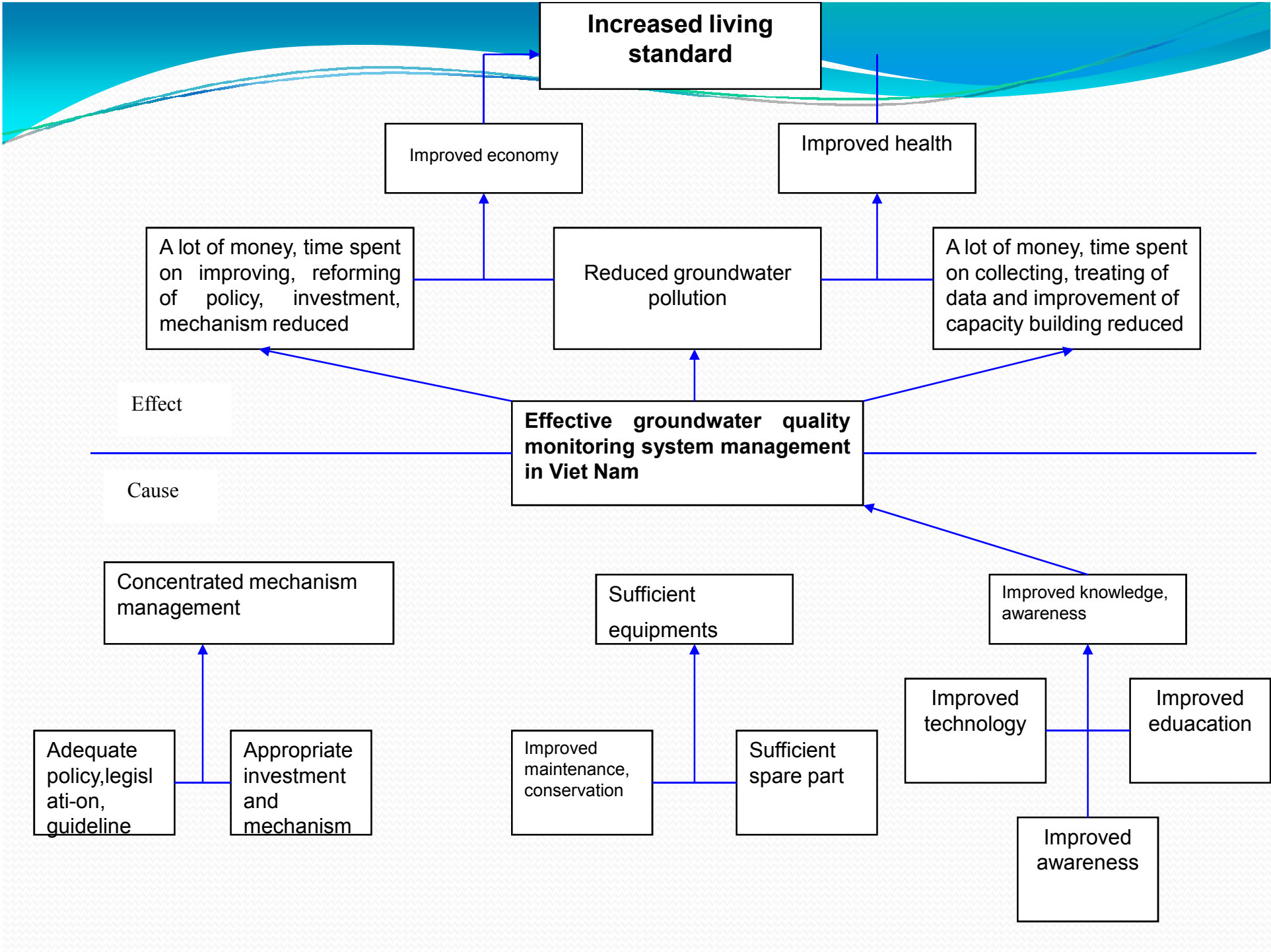
- Total boreholds: 641
 - North: 212
 - South: 224
 - Centre: 107
- Have monitored 583, N: 187, S: 204, Highland: 192
- Making the annual calendars
- Have Analised the water levels and contents

GROUNDWATER PROGRAMME

b. Shortcomings

- Monitoring thinly scattered
- Rarely researching the deep levels
- Old equipments
- Old structures
- Lacking of fee and fund





GROUNDWATER PROGRAMME

2. Annual Review of Technical Programmes / Activities

2.1. Hydrogeological survey

- Project “Hydrogeological mapping at 1:50.000 scale of Song Cau -Tuy An area, Phu Yen province”
- Project "Hydrogeological mapping at 1: 50,000 scale of Tan Uyen area, covering 1,825 km²
- Project "Hydrogeological mapping at 1: 50,000 scale of Lao Bao area, Quang Tri
- Project "Hydrogeological mapping at 1: 50,000 scale of Ninh Thuan, Binh Thuan provinces (near 8,000 km²)

GROUNDWATER PROGRAMME

2.2 . Assessment of groundwater resources

- The project “Investigation and assessment groundwater in some key areas of 5 Central highland provinces” has been completed
- The project “Investigation and assessment groundwater in some key areas of 7 province of Northern mountain region”
- Projects being implemented:
 - Project "Groundwater investigation on remote areas of Southern region (phase 3)";
 - Project “Evaluation of groundwater resources of Moc Hoa area, Long An province” (462 km²)

GROUNDWATER PROGRAMME

- Assessment of groundwater resources in Lai Vung area, Dong Thap province (540 km²)
- Assessment of groundwater resources in water scanty areas of Ninh Tuan and Binh Thuan provinces
- Groundwater investigation and evaluation of Meo Vac area, Ha Giang province.
- Groundwater investigation and evaluation of 15 mountain and midland provinces of North Viet Nam.
- Groundwater investigation and evaluation of western planned areas of Nghe An province
- Investigation and evaluation of groundwater in Neogene sediments of Hanoi area

GROUNDWATER PROGRAMME

3. Future Activities and Assistance Required from international donors in Support of Future Activities

3.1. Future Activities

- Continue the groundwater monitoring program in the national natural resources and environmental monitoring system.
- Start the project "Upgrading and rehabilitation of the national groundwater monitoring network" (2008-2010)
- Construction of national groundwater monitoring network in North Central coastal area (2008-2010) covering 11.000 km²

GROUNDWATER PROGRAMME

3.2. Assistance Required from international donors

International donors are requested to support groundwater monitoring and groundwater pollution evaluation projects

4. Others

Two research projects are being implemented:

- Application of modelling method for assessment of groundwater reserve in Ho Chi Minh city and surrounding areas
- Application of modelling method for assessment of groundwater reserve in the Red river delta



GEO-ENVIRONMENT SECTOR

1. Summary

In the period from July 2006 to June 2007, many activities related to the coastal zone, geohazards and environmental geology have been carried out by the units of the Department of Geology and Minerals of Viet Nam and the Viet Nameese Academy of Sciences and Technology.



GEO-ENVIRONMENT SECTOR

2. Annual Review of Technical Programmes / Activities

2.1 Activities implemented by the Department of Geology and Minerals of Viet Nam

- Project “Survey and assessment of the risk of landslide along the Hieu river” was one of emergency tasks which has been accomplished by DGMV



GEO-ENVIRONMENT SECTOR

It has been identified that the landslides and erosion are due to complicated activities of the groundwater in the karstic cavities under the unconsolidated sediments with small thickness (<8m) and the flow of the Hieu river with tide actions

- Project “Delineation of areas with toxic minerals, assessment of the environmental status in Lao Cai, Lai Chau, Dien Bien, Son La areas to serve sustainable development planning” implemented by the Radioactive and Rare Earth Geological Division



GEO-ENVIRONMENT SECTOR

- Project "Investigation of radioactive environment status in some mines in Lai Chau, Lao Cai, Yen Bai, Phu Tho, Quang Nam province" implemented by the Radioactive and Rare Earth Geological Division:

As a result of investigation, in the above 7 areas 45 radioactively unsafe zones covering 190 km², have been delineated, where 16883 households are living

A report and a radioactive environment status zoning map have been prepared for each particular area

GEO-ENVIRONMENT SECTOR

- Project “Investigation and assessment of the status of environmental pollution due to mining activities in the Central region and Central Highland provinces” implemented by the Office of DGMV, and Central Viet Nam Mineral Branch.

As a result of investigation by rapid field measurement of pH and DO; NO₂, CO, SO₂ and suspended dust; mercury vapour in the air and in the soil; radon concentration in the air, the soil and water of 100 mines in 10 Central region and Central Highland provinces, the environment status of mines in three groups: fuel, metallic and construction material, have been assessed

GEO-ENVIRONMENT SECTOR

- The project “Investigation of geo-hazards in southern central coastal region” (n-shore from Khanh Hoa to Binh Thuan province) has been completed with the following results
 - Coastal erosion: 68 eroded sections with the total length of 59.8km have been recognized
 - Riverbank erosion: the total length of medium to strongly eroded sections is 58,000m
 - Landslides and mudflow : 19 points and point groups of typical landslides and mudflow have been delineated
 - Sand drift : there are 08 places which are suffering from the sand drift, comprising an area of 284km²
 - Flash floods: The statistics show that flash floods occurred at 11 locations



GEO-ENVIRONMENT SECTOR

- Project “Geological, mineral resources, environmental geology and geohazard survey of South central shallow offshore area with 0-30m water depth at 1/100,000 scale and some key areas at 1/50,000 scale”:
- The area of 1: 100,000 scale survey was 9,750km², and 1: 50,000 survey was 389km², with the following results :
 - The quaternary sediments have been differentiated in the principle of age and genesis. A unified geological section and stratigraphic column have been established for the zone from inland seaward to 30m water depth of the South Central region

GEO-ENVIRONMENT SECTOR

- The presence of the Q_1 basalt on the sea floor of South Central region has been confirmed, the existence of an old shoreline of Early Holocene has been identified
- Tens of faults have been discovered by shallow high resolution seismic bands and described, of which many are still active in Quaternary
- The sea water in the area is being polluted by metals such as Zn, Cu, Pb, Mn, Cd; the sea bed sediments are being polluted by Hg, Cu, Pb and have the risk of being polluted by Sb, As
- On the basis of environmental geology investigation, the South central offshore area has been divided into 14 subareas

GEO-ENVIRONMENT SECTOR

2.2. Projects being implemented

- Project “Mineral potential survey and evaluation of the shallow offshore area of Soc Trang province at 1/100,000 scale”, covering 7,200km², within Soc Trang province, of which the area with mineral prospect covers 3,870 km².
- Project "Investigation of geology, mineral resources, geodynamics, environment, geohazards of Quang Ninh - Hai Phong offshore area at 1: 100,000 scale, covering 4,600 km²



GEO-ENVIRONMENT SECTOR

3. Future Activities

- Start implementing the project “Establishment of the network for forecasting and warning of environmental accidents to 2010, with vision to 2020” led by the Ministry of Natural Resources and Environment.
- Continue the projects on geological, mineral resources, geohazard and environmental geology survey of shallow offshore area of Viet Nam.
- Continue the projects on geohazards survey in the mountainous and coastal areas of Viet Nam



GEO-ENVIRONMENT SECTOR

- Start the implementation of the project "Investigation and evaluation of positional resources and geo-ecological landscapes in the coastal and island areas of Viet Nam" (2007 - 2010).
- Continue the project on modernization and strengthening the seismic stations network of Viet Nam to serve earthquake notification and tsunami warning (2008 – 2010).



GEO-ENVIRONMENT SECTOR

- Start the implementation of the key national research project “Evaluation of earthquake and tsunami risks in the offshore and island areas of Viet Nam and recommendation of preventive measures” (2007 – 2010).
- Continue the operation of Earthquake Notification and Tsunami Warning Centre under the Institute of Geophysics (from July 2007)

A scenic landscape featuring a calm pond in the foreground, reflecting the sky and surrounding greenery. In the background, there are several tall palm trees and a fountain with water spraying upwards. The sky is blue with scattered white clouds. The text is overlaid in a yellow, serif font.

MINISTRY OF NATURAL RESOURCES
AND ENVIRONMENT (MONRE)

DEPARTMENT
OF GEOLOGY AND MINERALS OF VIET NAM
(DGMV)

ORGANIZATION CHART OF THE DEPARTMENT OF GEOLOGY AND MINERALS OF VIETNAM

DIRECTOR GENERAL
DEPUTY DIRECTORS GENERAL

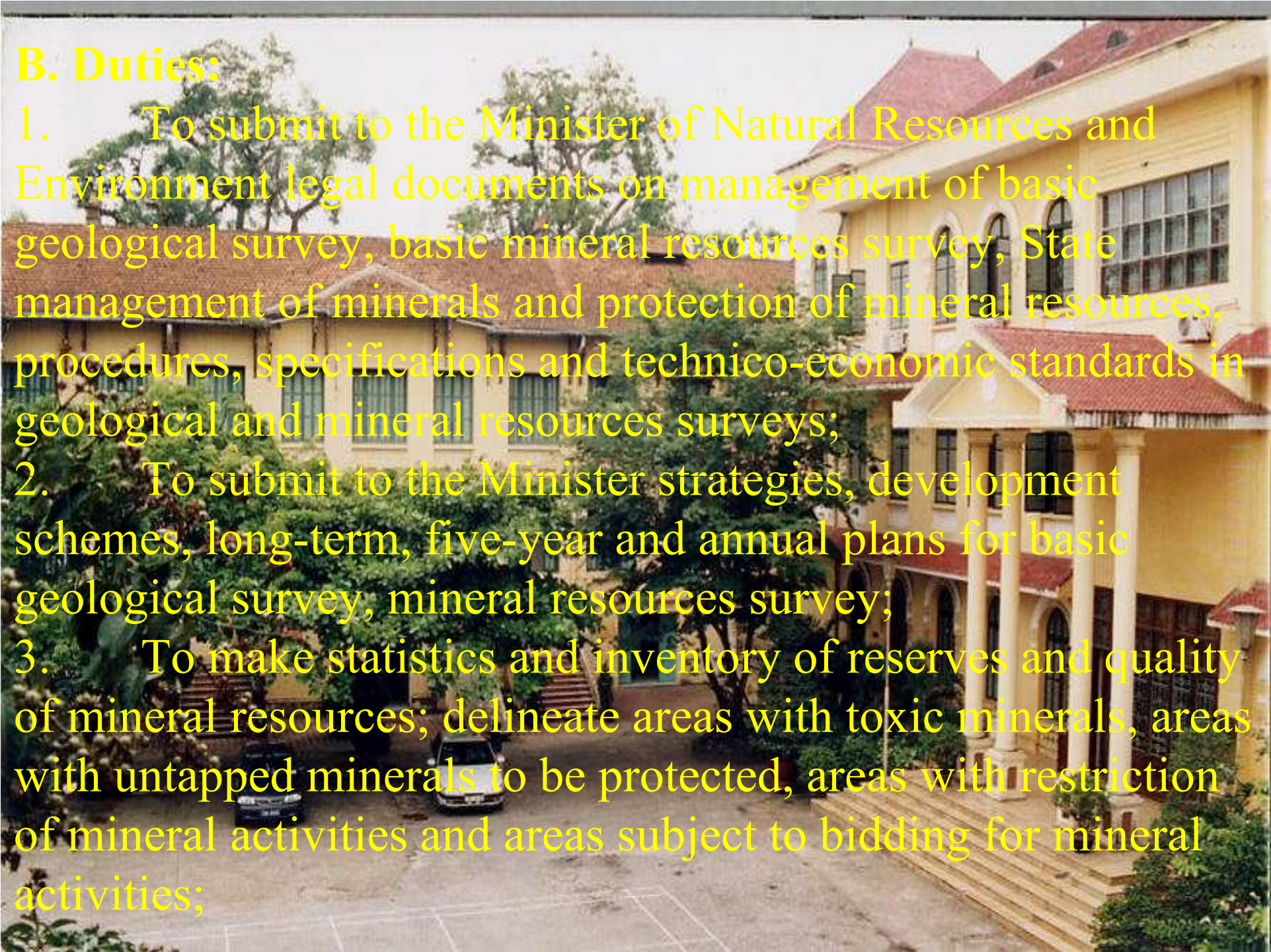


Functions, duties and powers

The functions, duties and powers of the Department Of Geology and Minerals of Viet Nam are prescribed in Articles 1 and 2 of Decision No 08/2004/QĐ-BTNMT dated 26 May 2004 of the Minister of Natural Resources and Environment, in particular as follows:


A. Functions

The Department of Geology and Minerals of Viet Nam is an organization directly under the Ministry of Natural Resources and Environment, having the function to assist the Minister in State management of geology and mineral resources, comprising: basic geological survey, basic mineral resources survey, mineral activities, protection of mineral resources and to organise the implementation of basic geological survey, basic mineral resources survey, assessment of mineral resources potential and the discovery of mineral deposits throughout the country



B. Duties:

1. To submit to the Minister of Natural Resources and Environment legal documents on management of basic geological survey, basic mineral resources survey, State management of minerals and protection of mineral resources, procedures, specifications and technico-economic standards in geological and mineral resources surveys;
2. To submit to the Minister strategies, development schemes, long-term, five-year and annual plans for basic geological survey, mineral resources survey;
3. To make statistics and inventory of reserves and quality of mineral resources; delineate areas with toxic minerals, areas with untapped minerals to be protected, areas with restriction of mineral activities and areas subject to bidding for mineral activities;



4. To participate and coordinate with the Peoples committees of provinces, cities directly under the Central authority, relevant Ministries and sectors in delineating areas with prohibition or temporary prohibition of mineral activities; to work out strategies and master plans for mineral exploration, exploitation, processing and utilization as assigned by the Ministry.

5. To submit to the Minister regulations on the authorities and procedures of grant, extension, withdrawal and permission for surrender of permits for mineral activities; permission for transfer and bequest of rights of mineral activities; regulations on bidding for mineral activities.

6. To submit to the Minister of Natural Resources and Environment for decision on the grant, extension, withdrawal, permission for surrender of permits for mineral activities, permission for transfer of rights of mineral activities, and for approval of areas for artisanal mining under the competence of the Ministry;

7. To submit to the Minister project proposals, reports on the results of basic geological survey, basic mineral resources survey for approval;

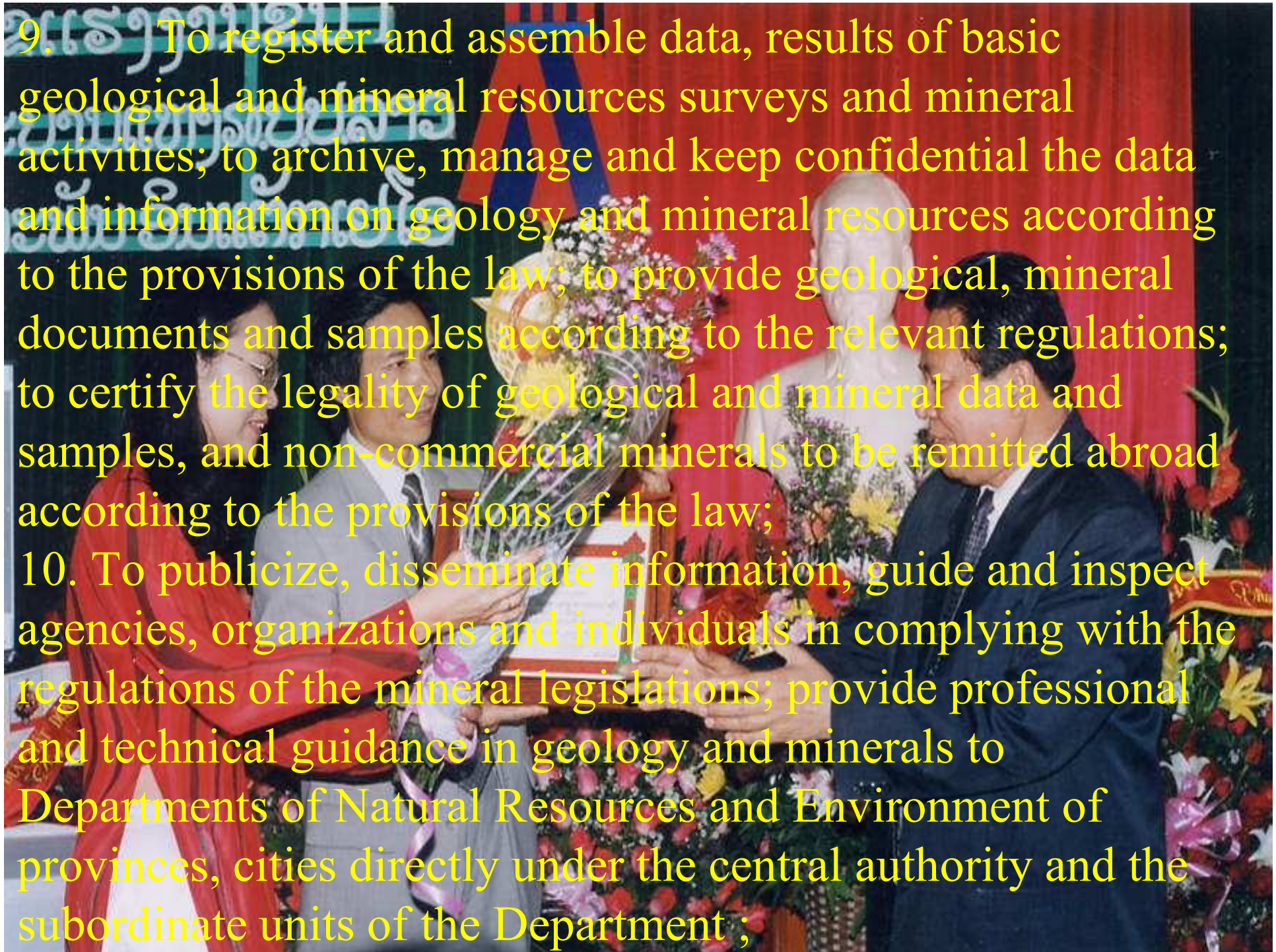
8. To organise and direct the subordinate units of the Department to implement the duties and plans on basic geological surveys, basic mineral resources surveys, comprising: geological survey, mineral survey, environmental geology, hydrogeology, engineering geology, urban geology, rural geology, marine geology and mineral resources, geohazards, geothermal energy, assessment of mineral potential, and discovery of new mineral deposits;

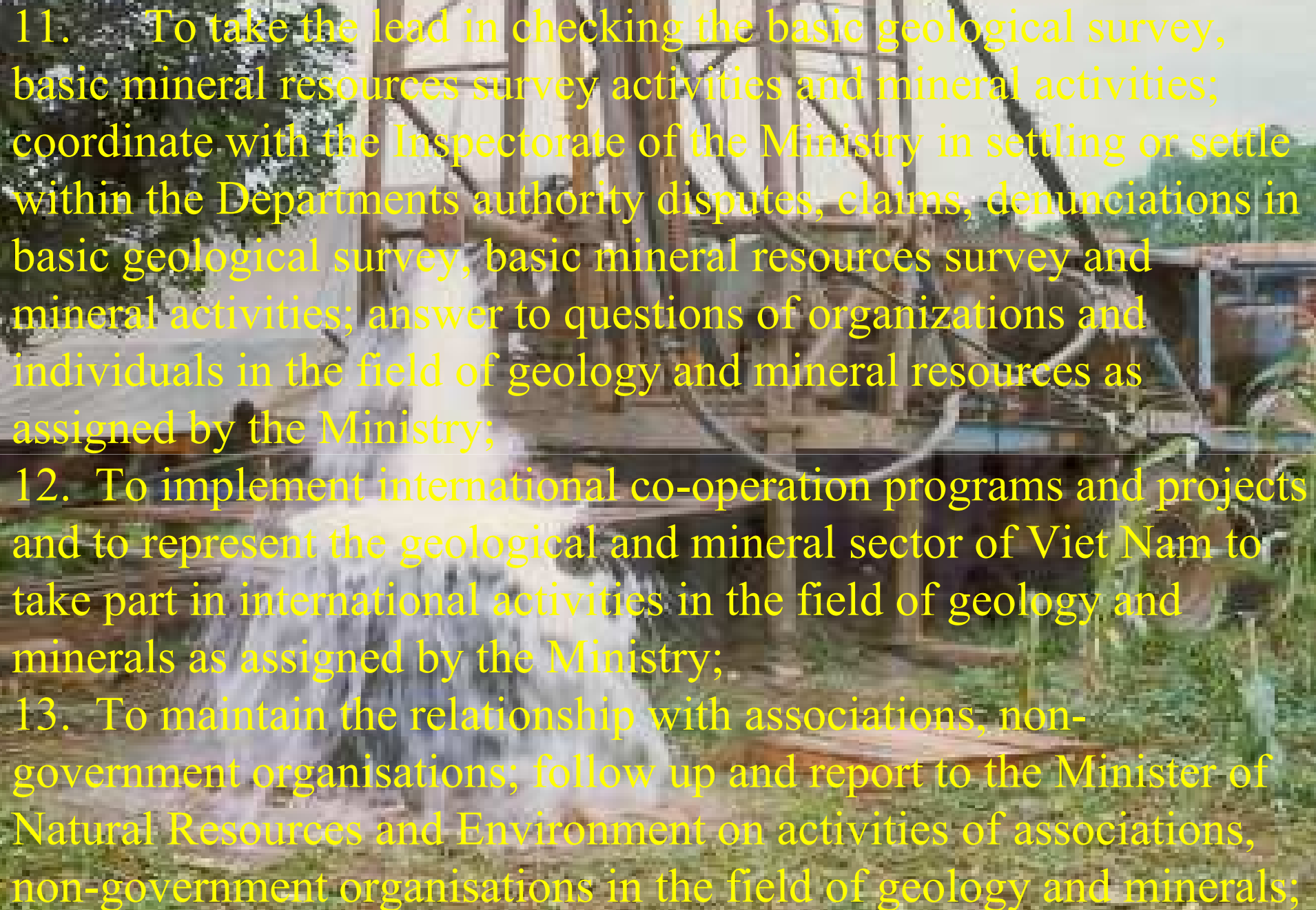
To implement scientific-technological research programs, projects; apply advanced sciences and technologies to the basic geological, mineral resources surveys and State management on minerals;



9. To register and assemble data, results of basic geological and mineral resources surveys and mineral activities; to archive, manage and keep confidential the data and information on geology and mineral resources according to the provisions of the law; to provide geological, mineral documents and samples according to the relevant regulations; to certify the legality of geological and mineral data and samples, and non-commercial minerals to be remitted abroad according to the provisions of the law;

10. To publicize, disseminate information, guide and inspect agencies, organizations and individuals in complying with the regulations of the mineral legislations; provide professional and technical guidance in geology and minerals to Departments of Natural Resources and Environment of provinces, cities directly under the central authority and the subordinate units of the Department ;



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11. To take the lead in checking the basic geological survey, basic mineral resources survey activities and mineral activities; coordinate with the Inspectorate of the Ministry in settling or settle within the Departments authority disputes, claims, denunciations in basic geological survey, basic mineral resources survey and mineral activities; answer to questions of organizations and individuals in the field of geology and mineral resources as assigned by the Ministry;
 12. To implement international co-operation programs and projects and to represent the geological and mineral sector of Viet Nam to take part in international activities in the field of geology and minerals as assigned by the Ministry;
 13. To maintain the relationship with associations, non-government organisations; follow up and report to the Minister of Natural Resources and Environment on activities of associations, non-government organisations in the field of geology and minerals;



14. To organize scientific conferences, seminars, workshops; edit and publish documents on geology and minerals as allowed by the provisions of the law.

15. To manage activities related to geological and mineral service and other services carried out by subordinate units of the Department in accordance with the provisions of the law.

16. To manage and use efficiently financial sources and properties allocated by the State; to manage capital construction investment projects in accordance with the provisions of the law and the assignment by the Ministry;

17. To manage the organisation, staffing and organise courses of training and intensive improvement of technical and professional capabilities for officials, employees of the Department as assigned by the Ministry.

18. To make statistics and prepare periodical and immediate reports on the implementation of the assigned duties

19. To implement other tasks as assigned by the Minister of Natural Resources and Environment.



Earthquakes, landslides, and flash floods In the North West of Viet Nam

Ngo Thien Thuong

Geological Mapping Division of Northern Viet Nam

Department of Geology and Minerals of Viet Nam.

The economy report to be read in the training course: “Human capacity building for natural resources development and its environmental impacts”.

Some lines about the natural hazards in Viet Nam

- Only in the 90s (1990-2000), in Viet Nam:
- 7,495 people has been died and lost;
- 750,000ha of rice and argicultural products has been wrong;
- 5.5 million houses has been collapsed or damaged;
- 8,823 ships, boats has been sant;
- Total damage is about 2 bln USD.

(by VN People Police Newspaper N^o 884, April 28st 2000).

Abstract

- In recent years, geo-hazards are increasing all over the world as well as Viet Nam. They have been causing for great loss of lives and properties. Viet Nam Government has been well warning of these dangers and early investing infrastructural basement in the right researches in areas of having risk highly on geo-hazards, especially in the Northwest region where geo-hazards are occurring so seriously. With different types of hazards, the most dangerous types are earthquakes, landslides, and flash floods.

Introduction (about NW of Viet Nam)

- The North-western region of Viet Nam is a beautiful and splendid land where has potentiated overhauling, safe and sustainable economic development. It borders on China in the North; lies by the Red River fault in the East and Northeast; the West and Southwest is Laos and the Song Ma fault, the South and Southeast is Tonkin Gulf, where geohazards frequently take place of which most dangerous and significant types are earthquakes, landslides and flash floods.

A valley in NW of Viet Nam

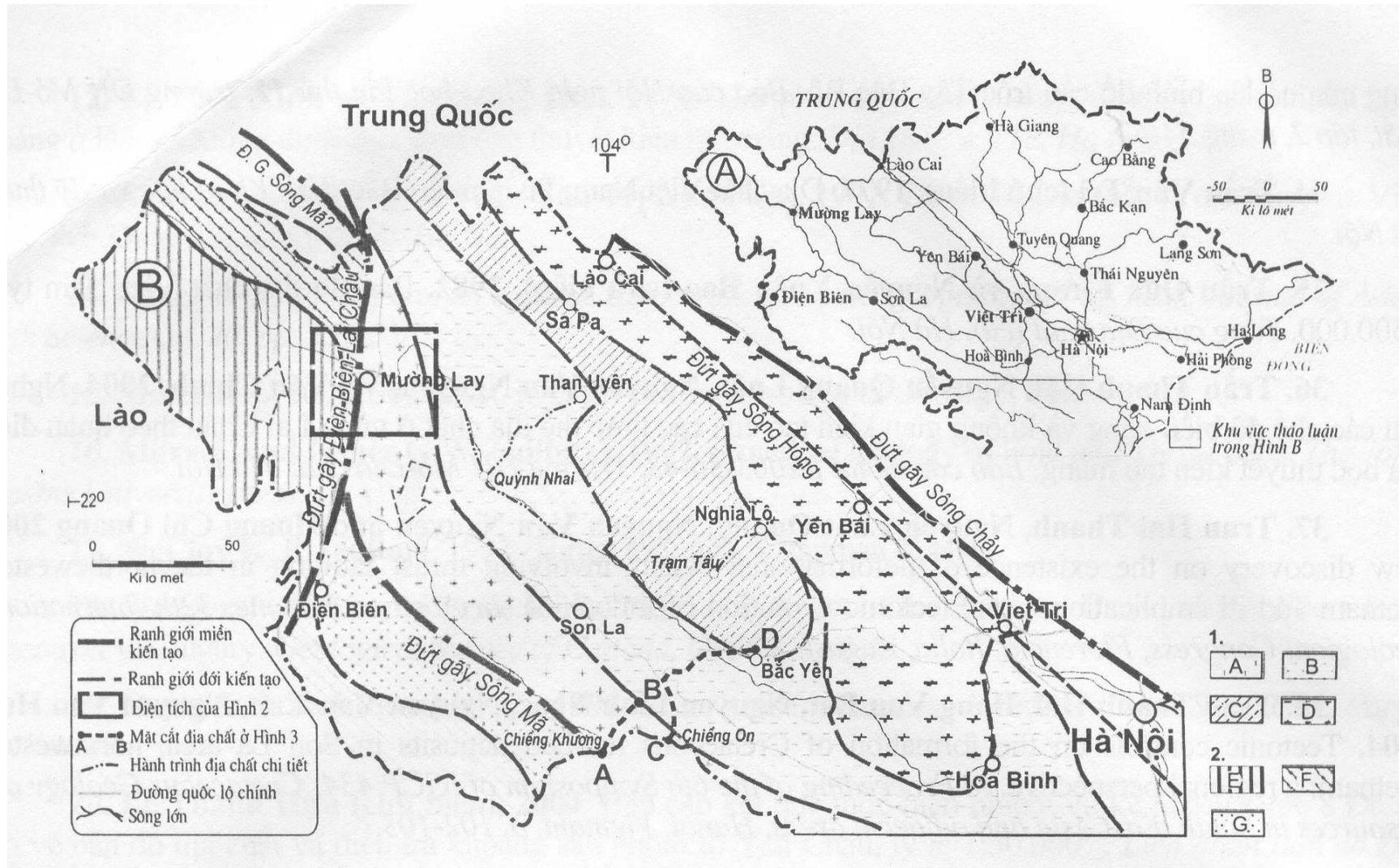


The Position of the Northwest of Viet Nam

Nam



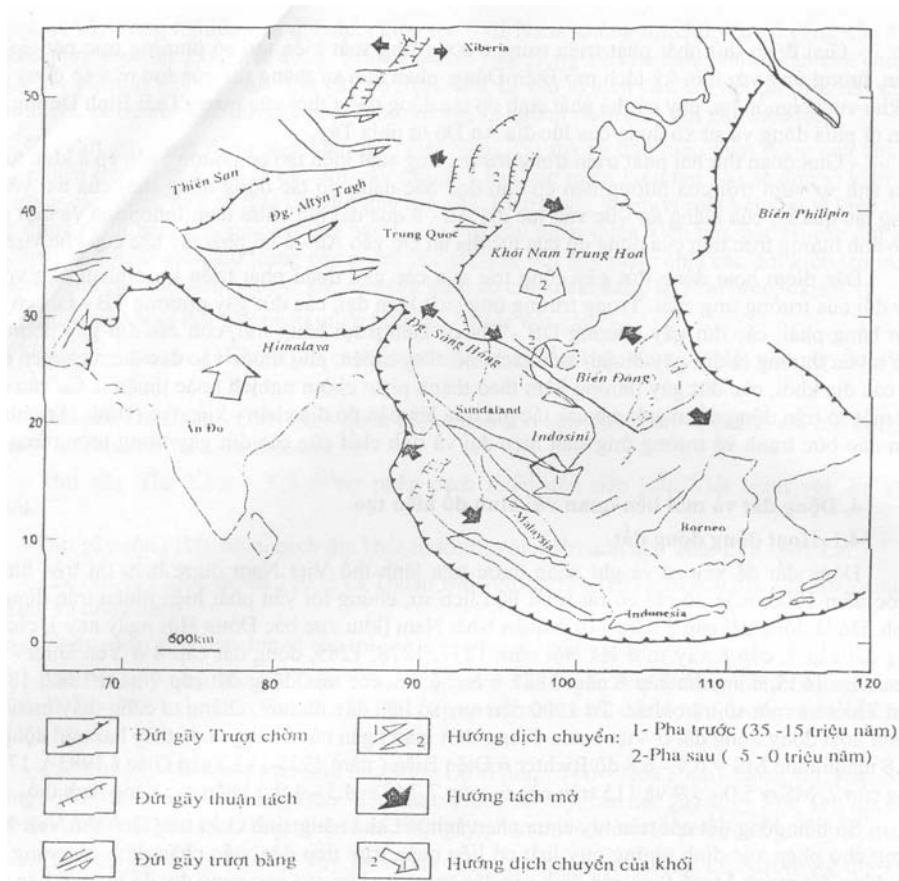
Tectonic faults in NW of Viet Nam



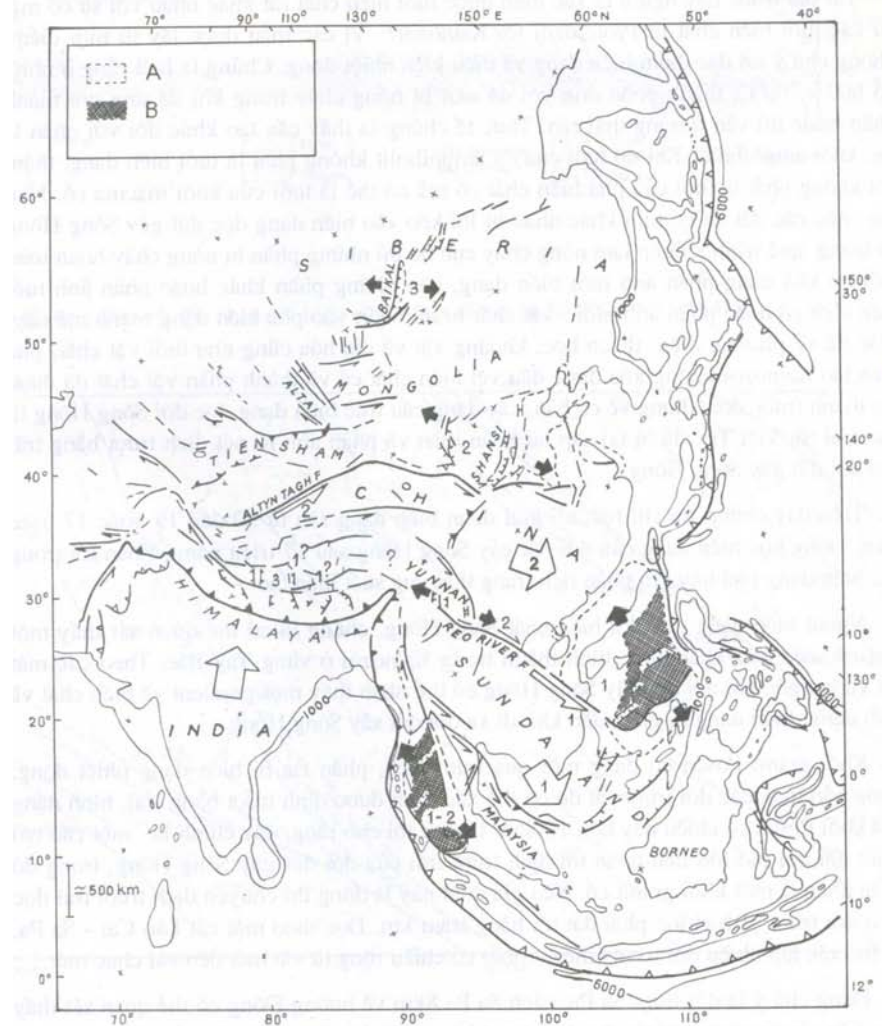
Red River fault is one of the famous and important tectonic fault in the Asian continent. It has been presented in Tsukuba, Japan on March 1998 by Dr Dao Van Thinh

- ***About the Dien Bien - Lai Chau fault***
- This is a deep fault reaching Moho surface. Originating depth is 50 - 60km. Eventual depth is 0 - 2km with the width of the maximal zone reaching 20 - 30km. The most deforming zone could be 1 - 5km wide within the Viet Nam territory extending about 150km (from Ma Li Pho to Tay Trang). This fault still prolongs as far as South Bangkok (Thailand) with total length of almost 2,000km. Prolonging direction is sub - meridian (NNE) ranging 0 - 12°. The sliding slope changes within 90 - 110°. This is an activating and seismo - generating fault that is named to be strongest in NW of Viet Nam.
- ***About the Tuan Giao - Tua Chua fault***
- It is a deep fault reaching the Konrad. Originating depth reaches 35km. Eventual is 0 - 1km. It is a faulting zone comprising of 02 main faults parallel to each other with maximal width of 1 - 3km. The most deformed zone is 300 - 700m wide. It is 160km long within Viet Nam land (from Sin Ho to Noong E village). It still extends southwards for nearly 300km and joins the Dien Bien - Lai Chau one. Its direction is sub - meridian (NNE) ranging within 0 - 20°. Sliding plane dips eastwards ranging within 80 - 120°. This is an activating and seismo - generating fault that is grouped as strongest in the NW of Viet Nam (after the Dien Bien - Lai Chau fault only).

Movement of geoblocks (by Tapponnier P, 1994)

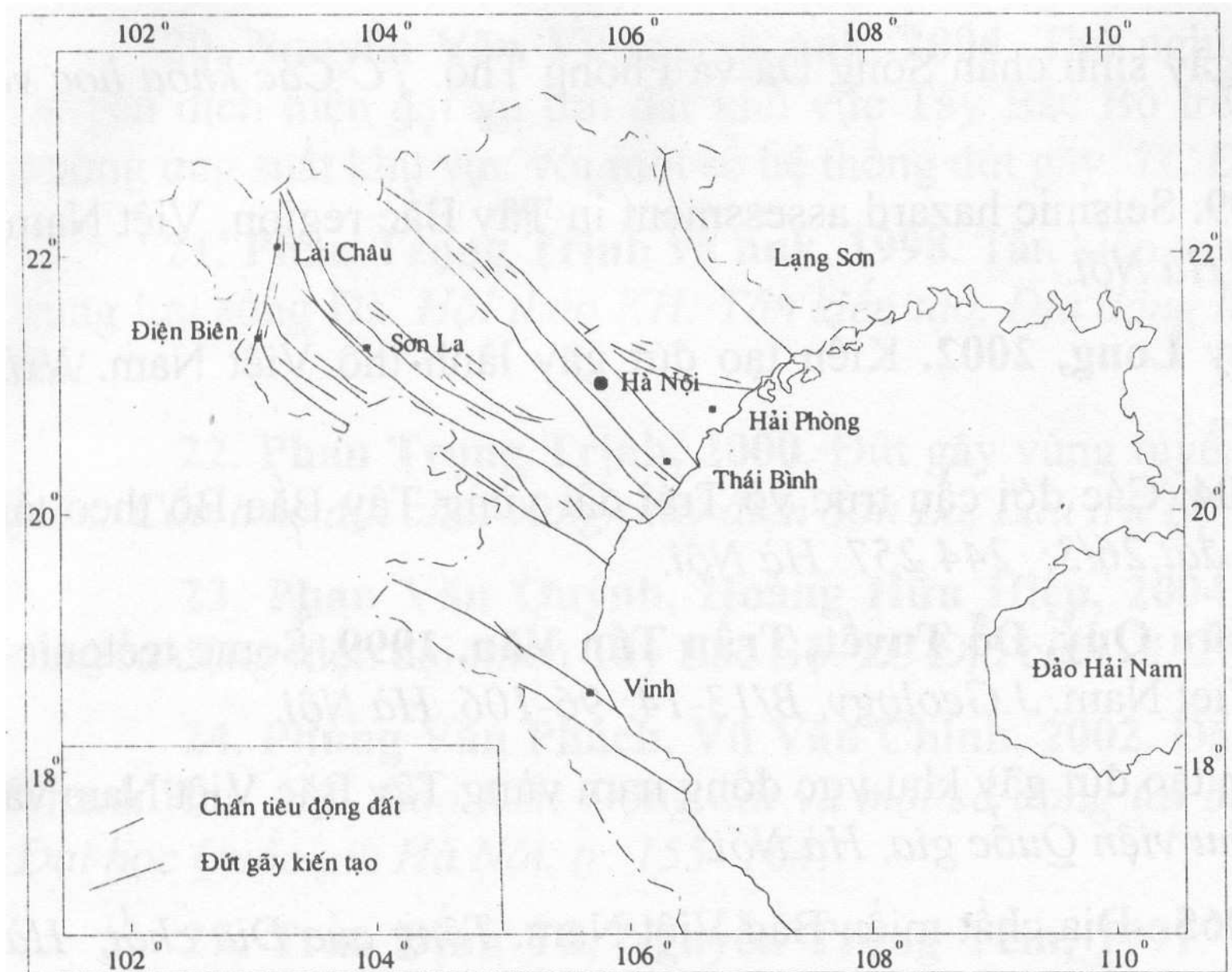


Hình 2: Khu vực nghiên cứu trong bối cảnh địa động lực Kainozoi Châu Á và Đông Nam Á (Theo Tapponnier P, et al, 1994)



Hình 1. Sơ đồ kiến trúc Kainozoi và các đới đứt gãy chính ở Châu Á' (theo Tapponnier và nhk, 1982). A. Vùng tách giãn Kainozoi; B. Vỏ đại dương Biền Đông và Anctaman

Earthquake centers and faults



Earthquakes in NW of Viet Nam

- Within April 1903 to 31st July 2003 in NW of VN have been 340 earthquakes with different levels.
- $M_s < 4$ of the Richter Scale: 244 events taking 71.76%
- $4 < M_s < 4.5$ of the Richter Scale: 43 events taking 12.64%
- $4.5 < M_s < 5$ of the Richter Scale: 43 events taking 12.64%
- $5 < M_s < 5.5$ of the Richter Scale: 8 event taking 2.35%
- $M_s > 6$ of the Richter scale: 2 events (happened in 1935 at $M_s = 6.75$ and in 1983 at $M_s = 6.7$) taking 0.58% (these two are the strongest in Viet Nam). They are:

➤ The first was in eastern Dien Bien city with magnitude $M_s = 6.75$ in Richter scale. Center depth $h = 25\text{km}$; tremor at the center was probably at 8 - 9 in Richter scale. Shakes broke out surface as widely as 10 - 15cm near outer center. The area of $M_s = 8 - 9$ was as large as less than 1,500km². Within Dien Bien area a lot of houses had been damaged.

➤ The second was in 11km NE of Tuan Giao town with magnitude $M_s = 6.7$ in Richter scale. Center depth $h = 23\text{km}$; shake at the center could reach 8 - 9 in Richter scale. The area of $M_s = 8 - 9$ probably occupied as largely as less than 1,500 sq. km. The towns of Tuan Giao, Quynh Nhai, prov. town of Lai Chau were within this limit. Many houses, constructions were heavily damaged. The low - quality houses were collapsed. All the building houses were damaged. Within the center area, landslides, subsidence, cracks of 10 - 15cm wide and 20km long happened. The area with $M_s = 7$ covered 13,000 sq. km including the Son La and Dien Bien prov. towns and Thuan Chau, Sin Ho, and Muong Te dist. towns.

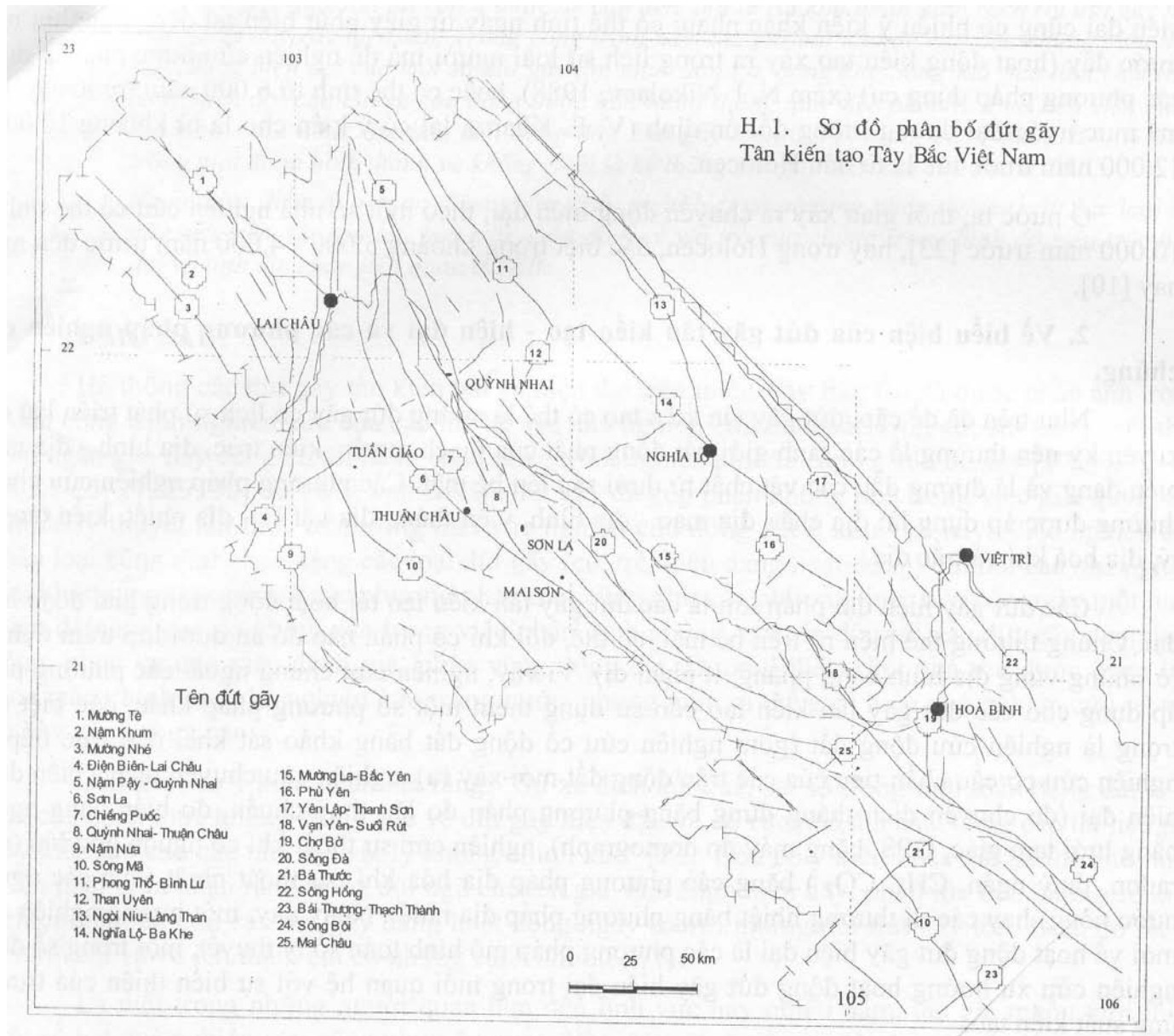
➤ The latest was on 22h 52m, 19 February 2001, with magnitude $M_s = 5.3$ in Richter scale, in Dien Bien city, About 200bln VND has been lost.

Occurring probability of earthquakes in NW Viet Nam

(According to Cao Dinh Trieu, Dang Thanh Hai, 2003)

Earthquake zone	Magnitude (Ms in Richter scale)	Occurring probability after (years)				
		10	20	30	40	50
Red River	5.0	0.596	0.826	0.920	0.962	0.982
	5.5	No conformable data				
	6.0	No conformable data				
Da & Ma Rivers	5.0	0.534	0.873	0.952	0.981	0.992
	5.5	0.359	0.618	0.775	0.866	0.919
	6.0	0.102	0.244	0.394	0.529	0.637
Muong Te & Dien Bien	5.0	0.608	0.831	0.927	0.966	0.984
	5.5	0.434	0.676	0.808	0.884	0.930
	6.0	0.246	0.432	0.573	0.678	0.758

Neo tectonics in NW of Viet Nam





Lanslides in NW of Viet Nam

- NW Viet Nam is a potential region of landslide with various scales and intensities. There have been thousands of plots investigated, studied and mapped with scales from very large to average. According to statistics of some most recent works on landslides in NW Viet Nam the followings could be given: $1,000\text{m}^3 < \text{mass} < 10,000\text{m}^3$: 153 localities; $\text{mass} = 10,000 - 100,000\text{m}^3$: 134 localities; and $\text{mass} > 100,000\text{m}^3$: 16 localities (Dao Van Thinh, 2004). Landslides frequently take place in rainy season damaging lots of lives and properties, ruining lots of housing, trafficking, and sewage... works.

3 great landslides in NW of Viet Nam

- Plot 1, in Mong Sen II bridge coordinate center: 22°24'48"N; 103°53'46"E; happened in: 1990, 1994, 1996, 1998, Oct 2000; Oct 2001; Jun 2002; Mass: about 207,300m³ (very great); damage: 1998 - 2 peoples died, 2002 - 1 people died, before years: 4 - peoples died; spend 10 bln VND for processing in 2000.
- Plot 2, South of Huoi Leng, on road No12; coordinate center: 21°52'48"N; 103°07'18"E; happened in: 1994, 1996, 1998, Aug 2000; Mass: about 28,300m³, (great); damage: destroyed 200m of road; trafficking was stopping in several days.
- Plot 3, in Lai Chau Pro town, coordinate center: 22°03'06"N; 103°09'26"E; happened in: Jul 2000; Mass: about 19,625m³ (great).

Some landslide images in NW of Viet Nam







Rockfalls



Torrential and flash floods in NW of Viet Nam

- The Northwest of Viet Nam is evaluated to have a highest potential of flash and torrential floods in Viet Nam due to the topographical, geomorphologic, pedologic, and climate features in consonance with traditional farming practices such as slope fielding on the basins, upstream deforestation. The recent statistical data show that occurring frequency of the flash floods is increasing and concentrating on the areas of Sin Ho (1990), Dien Bien (1994, 1995, 1996), Tua Chua (1995, 1996), Tuan Giao (1994, 1995, 1996), Lai Chau province town (1990, 1991, 1992, 1996), Son La province town (1990, 1991), Mai Chau and Hoa Binh.

Torrential and flash flood images in NW of Viet Nam







2 10:45AM

Conclusion

- Earthquake is the most dangerous geohazard in the Northwest of Viet Nam with the very high threat. During a period from April 1903 to 31st July 2003 there have been 340 shaking events of various grades.
- The two strongest earthquakes in the Northwest of Viet Nam and strongest in Viet Nam as well happened in 1935 with $M_s = 6.75$ in Richter scale at SE Dien Bien city and in 1993 with $M_s = 6.7$ in Richter scale in the Northeast of Tuan Giao town.
- Landslide is the secondly dangerous geohazard in the Northwest of Viet Nam occurring numerous landslides. Landslides frequently occur along the national roads, in Lai Chau - Muong Lay, southern Hoang Lien Son Mt. range, Tuan Giao - Tua Chua... At some places, landslides have been continuously occurring in many years such as Muong Sen bridge, Muong Lay...
- Torrential and flash floods are the thirdly dangerous geohazards after earthquakes and landslides. Northwest is an area of the most torrential and flash floods within Viet Nam territory. From 1958 to 2002 there had been 97 statistical flash and 5 torrential floods.

- *Great thank to Geological Survey of Japan (GSJ), AIST,*
- *Great thank to Asia-Pacific Economic Cooperation (APEC),*
- *Thank you very much for your attentions.*