

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF TRANSPORT AND COMMUNICATIONS
THE SOCIALIST REPUBLIC OF VIET NAM

**FINAL REPORT
OF
THE FEASIBILITY STUDIES
ON
THE REHABILITATION AND IMPROVEMENT
OF
THE RAILWAY IN VIET NAM**

Volume I

**Master Plan at 2010 for Rehabilitation and
Improvement of Hanoi - Hochi Minh Line**

February, 1996

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The composition of this report

The report of "The Feasibility Studies on the Rehabilitation and Improvement of the Railway in Viet Nam" is composed of 3 volumes.

Vol. I : "Master Plan on Hanoi - Ho Chi Minh Line up to 2010".

Vol. II : "Feasibility Studies on Rehabilitation and Improvement of Hanoi - Ho Chi Minh Line".

Vol. III : "Feasibility Studies on Rehabilitation and Improvement of Lao Cai - Cai Lan Line".

The summary is provided for each volume.

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PREFACE

In response to a request from the Government of the Socialist Republic of Viet Nam, the Government of Japan decided to conduct a Feasibility Study on the Rehabilitation and Improvement of the Railway in Viet Nam and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Viet Nam a study team headed by Mr. Sadaaki Kuroda, Japan Railway Technical Service (JARTS), 5 times between February 1994 and February 1996.

The team held discussions with the officials concerned of the Government of Viet Nam, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Socialist Republic of the Viet Nam for their close cooperation extended to the team.

February 1996



Kimio Fujita

President

Japan International Cooperation Agency

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CHAPTER 1 INTRODUCTION

1.1 Background

The Government of the Socialist Republic of Viet Nam (hereinafter referred to as Viet Nam) made an official request to the Government of Japan to conduct the Feasibility Study on the Rehabilitation and Improvement of the Railway in the Socialist Republic of Viet Nam (hereinafter referred to as the Study). In response to this request, the Government of Japan decided to conduct the said Study and commissioned the Japan International Cooperation Agency (hereinafter referred to as JICA), a government organization responsible for the implementation of technical cooperation, to implement the Study. JICA then sent the Preparatory Study Team to Viet Nam in June, 1993 with a view to discussing the scope of work for the Study with the Government of Viet Nam.

On July 12th, 1993, the Government of Viet Nam and the Preparatory Study Team agreed and signed the Scope of Work and JICA then organized the Study Team and also established the Study Advisory Committee for the implementation of the Study.

JICA Study Team commenced the study from February 1994, carried out the field survey, collected the relevant data/information and prepared the Progress Report, which included the outline of present situations and problems of Vietnamese Railway, fundamental ideas of alternatives of Master Plan at 2010 for rehabilitation and improvement of Hanoi – Hanoi – Ho Chi Minh Railway and basic concept of phased improvement plan. The Progress Report was submitted to Vietnamese Government in May, 1994 for mutual discussion. Based on the discussion on Progress Report, JICA Study Team prepared the Report on "Selection of Optimum Alternatives of Master Plan at 2010 for Hanoi – Ho Chi Minh Railway", which included the evaluation of alternatives of Master Plan, selection of optimum alternatives of Master Plan and outline of phased improvement plan.

The Report was submitted to Vietnamese Government in October 1994 for mutual discussion. Through discussion, Alternative I was selected as the optimum alternative for Master Plan and the outline of phased improvement plan was agreed in principle between Vietnamese Government and JICA Study Team. (Appendix 1.1) However, various useful comments on the Report were presented by the Vietnamese experts, and these comments were appropriately reflected in preparing the Interim Report I as far as practical.

Based on the above agreement, JICA Study Team prepared Interim Report I which includes the analysis of the current situation and problems of Vietnamese Railways, demand forecast

of railway traffic, selection of optimum alternative of Master Plan at 2010, details of optimum alternative of Master Plan (namely Alternative I), phased Improvement Plan for Master Plan, and selection of feasibility study projects.

Interim Report I was submitted to Vietnamese Government for mutual discussion in May 1995. Interim Report I was accepted by Vietnamese Government in principle. Various comments were presented by Vietnamese Government on Interim Report I. JICA Study Team revised Interim Report I though responding suitably to those comments and submitted the Volume I as Draft Final Report of Master Plan at 2010 for Hanoi-Hochi Minh Railway in January 1996. Based on the discussion and appropriately responding to the comments on Draft Final Report, Final Report has been prepared.

When Interim Report I, which includes the contents of the Master Plan (MP), was explained to and discussed with the Government of Vietnam in May 1995, there was a request to correct the frame on socio-economy. In accordance with the request, the socio-economic frame and demand forecast used in the preparation of the MP was corrected. However, regarding the socio-economic frame, demand forecast, cost and cost/benefit analysis used in relation to the comparison of Master Plan Alternatives I, II and III, it was decided not to correct the values originally used in IR 1, because it is considered that the relative superiority of the alternatives would not change in the event of revisions being made to these factors. Corrections were only carried out on the socio-economic frame, demand forecast, cost and cost/benefit used in relation to the selected optimum Master Plan.

1.2 Objectives and Area of the Study

The Objectives of the Study are, in accordance with the Scope for Work agreed on July 12th, 1993 between the Government of Viet Nam and JICA, to prepare a master plan for the rehabilitation and improvement of the north-south trunk railway line with the target year of 2010, to conduct a feasibility study on the high priority project of the north-south trunk railway line based on the above Master Plan (namely phase I of Master Plan) and also to conduct a feasibility study on high priority project selected from the Lao Cai – Cai Lan/Hai Phong Line and Hanoi – Lang Son line based on the JICA's Master Plan Study on the Transport Development in the Northern Part of Viet Nam (Lao Cai – Cai Lan line was selected). During the Study, efforts will be made to transfer the relevant technologies/techniques to the Vietnamese side through the exchange of opinions and workshops, etc.

The subject area of the Master Plan to be prepared will cover the railway section of 1,726km between Hanoi and Ho Chi Minh. In the case of the feasibility studies, the study area will be the area of a priority project identified by the above Master Plan and also a priority project

selected from the Lao Cai – Cai Lan/Hai Phong Line and Hanoi – Lang Son Line identified by the Master Plan Study on the Transport Development in the Northern Part in Viet Nam.

1.3 Process and Major Work Items of the Study

The Study was carried out partly in Viet Nam and partly in Japan. The process and major work items of the Study is as follows as given in Inception Report.

(1) 1st Work in Japan

- 1) Preparatory work in Japan
- 2) Preparation of Inception Report

(2) 1st Field Survey

- 3) Explanation of and discussions on Inception Report
- 4) Collection of data and field survey
- 5) Survey of socioeconomic framework
- 6) Understanding of current situation and identification of problems based on 4) and 5) above
- 7) Establishment of basic policies and alternatives for Master Plan for Rehabilitation and Improvement of the Railway in Viet Nam
- 8) Data collection and field investigation for the environmental survey
- 9) Establishment of basic principles for Phased Improvement Plan
- 10) Preparation of and discussions on progress Report
- 11) 1st Workshop

(3) 2nd Work in Japan

- 12) Forecast of total transportation demand and the railway's share
- 13) Establishment of basic railway rehabilitation and improvement policies
- 14) Preparation of Master Plan alternatives; implementation of Initial Environmental Evaluation (IEE)

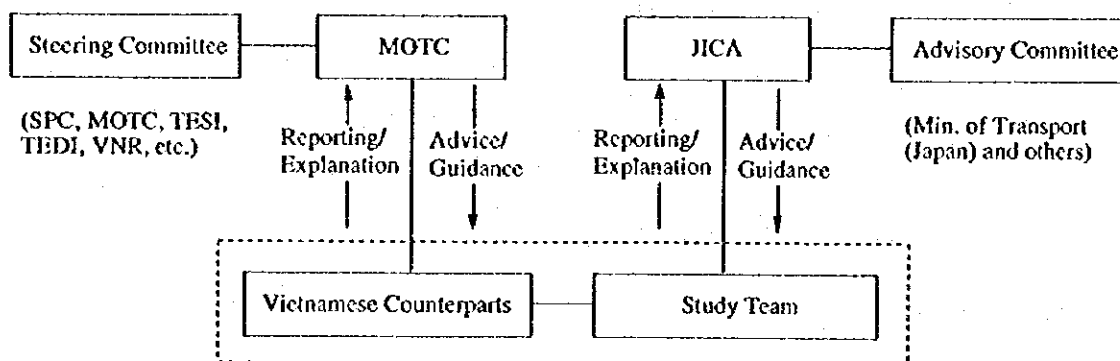
- 15) Calculation of investment cost and operation and maintenance cost
 - 16) Economic and financial evaluation of Master Plan alternatives
 - 17) Selection of optimal Master Plan; preparation of outline of Phased Improvement Plan
- (4) 2nd Field Survey
- 18) Explanation of and discussions on the Report on "Selection of Optimum Alternative of Master Plan at 2010 for Hanoi - Hochi Minh Railway".
- (5) 3rd Work in Japan
- 19) Finalisation of and further detailing of optimal Master Plan; establishment of Phased Improvement Plan for Master Plan
 - 20) Selection of feasibility study projects
 - 21) Completion of Interim Report (I) based on 18), 19) and 20) above
- (6) 4th Work in Japan
- 22) Preparation of the paper to clearly explain the approach to formulation of the master plan
 - 23) Preparation of the Inception Report for Feasibility Studies on Urgent Railway Improvement Projects
- (7) 3rd Field Survey
- 24) Explanation of and discussions on Inception Report for Feasibility Studies, Workshop
- (8) 4rd Field Survey
- 25) Explanation of and discussions on Interim Report (I), 2nd Workshop
 - 26) Final decision of feasibility study projects from among urgent (priority) projects identified by the Master Plan Study on the Transport Development in the Northern Part in Viet Nam (namely Lao Cai - Cai Lan Railway) and also by the Master Plan for the Rehabilitation and Improvement of the Railway in Viet Nam (namely phase 1 of Master Plan)

- 27) Supplementary surveys (on natural conditions and railway facilities, etc.) for feasibility studies
 - 28) Supplementary demand forecast for feasibility studies
 - 29) Environmental impacts assessment (EIA) and examination of Rehabilitation and Improvement Plan
 - 30) Preparation, explanation of and discussions on Interim Report (II)
 - 31) 3rd Workshop
- (9) 5th Work in Japan
- 32) Preparation of Rehabilitation and Improvement Plan
 - 33) Environmental impacts assessment (EIA)
 - 34) Preliminary design
- (10) 6th Work in Japan
- 35) Calculation of investment cost and operation and maintenance cost
 - 36) Preparation of implementation plan
 - 37) Economic and financial analyses
 - 38) Overall evaluation and recommendations
 - 39) Preparation of Draft Final Report
- (11) 5th Field Survey
- 40) Explanation of and discussions on Draft Final Report
 - 41) 4th Workshop
- (12) 7th Work in Japan
- 42) Comments by Government of Viet Nam on Draft Final Report
 - 43) Completion and submission of Final Report

1.4 Organization for the Study

For the implementation of the Study, a Study Team consisting of Japanese railway experts with rich expertise and experience in the subject issues was organized by JICA. Similarly, a team of counterparts consisting of senior staff members of the TEDI and VNR (responsible for the Feasibility Study on the Rehabilitation and Improvement of the Railway in Viet Nam: master plan and feasibility study) and VNR (responsible for the feasibility study chosen from the Master Plan Study on the Transport Development in the Northern Part in Viet Nam) was organized by the Vietnamese side. The JICA Study Team conducted the Study in close cooperation with the counterpart team.

JICA also established an Advisory Committee consisting of senior officials of the Ministry of Transport in Japan who have rich expertise and experience in the required supervisory work to guide the Study Team and to ensure the smooth implementation of the Study. On the Vietnamese side, a Steering Committee was established consisting of representatives of such organizations as the SPC, MOTC, TESI, TEDI and VNR, etc. to provide guidance, advice and recommendations for the smooth completion of the Study by the Study Team. The members of the Advisory Committee and the Study Team and the JICA coordinator for the Study are listed below.



(1) Advisory Committee

Name	Work Assignment	Current Position
Kazuo Notake	Chairman	Director, Technology Development Office, Technology Planning Division, Railway Bureau, Ministry of Transport
Toshio Ikari	Railway Facilities Planning	Chief, First Technology Section, Railway Division, Kinki Transportation Bureau, Ministry of Transport
Masayuki Tuji	Railway Planning	Chief, Oshiage Office, Construction Headquarters, Tokyo Rapid Transit Authority

(2) JICA

Name	Work Assignment	Current Position
Kazufumi Shiii	Study Supervision (1994. 2 - 1995. 9)	First Social Development Study Division, Social Development Study Department, JICA
Shouichi Tsugane	Study Supervision (1995. 10 - 1996. 2)	

(3) Study Team

Name	Work Assignment
Sadaaki Kuroda	Team Leader/General Management
Korehide Miyaguchi	Deputy Team Leader/Basic Planning (1995. 4 - 1996. 2)
Nobuo Osawa	Deputy Team Leader/Basic Planning (1994. 2 - 1995. 3)
Akira Tamura	Subsidiary Basic Planning (1995. 4 - 1996. 2)
Isamu Yoshitake	Transportation Planning
Toshiaki Saiko	Stations/Track/Disaster Prevention Planning
Tsuneco Hashimoto	Structure Planning (1995. 4 - 1996. 2)
Ikujiro Kikuta	Structure Planning (1994. 2 - 1995. 3)
Shigeru Doi	Structure Planning (1994. 2 - 1995. 3)
Koji Terado	Rolling Stock and Workshop Planning (I)
Misao Hasegawa	Rolling Stock and Workshop Planning (II)
Masahiko Yamamoto	Signaling and Communication Planning (1995. 4 - 1996. 2)
Tohru Igarashi	Signaling and Communication Planning (1994. 2 - 1995. 3)
Kunihisa Sugiyama	Marketing Planning (1995. 4 - 1996. 2)
Katsuo Hayashi	Financial Analysis
Kiminari Tachiyama	Management Analysis (1995. 4 - 1996. 2)
Akihisa Kojima	Developing Economy/Economic Analysis
Hideo Arikawa	Demand Forecast (I)
Junji Shibata	Demand Forecast (II) (1995. 4 - 1996. 2)
Shunji Sato	Structural Design and Construction
Teruo Otsuki	Station Design and Construction
Kazunori Ishikawa	Signal and Communication Design and Construction
Tomotaka Ichimura	Rolling Stock and Workshop Design (1995. 4 - 1996. 2)
Hiroshi Takagi	Rolling Stock and Workshop Design (1994. 2 - 1995. 3)
Shogo Shibata	Natural Conditions
Akinori Sato	Environmental Impacts Assessment (1995. 4 - 1996. 2)
Sanpei Nakanishi	Environmental Impacts Assessment (1994. 2 - 1995. 3)

(4) Vietnamese side Counterpart

Hanoi-Ho Chi Minh line

Name	Assignment	Office
Mr. Nguyen Van Luong	Leader	TEDI
Mr. Nguyen Tien Toi	Deputy leader	VNR
Mr. Ngo Ngoc Tran	Transport Economy	TEDI
Mr. Le Bao Vinh	Planning	TEDI
Mr. Nguyen Ngoc Long	Bridge, Tunnel	TEDI
Mr. Tang Van Thin	Bridge	TEDI
Mr. Vo Duy Hoa	Station	TEDI
Mr. Nguyen Minh Thang	Track	TEDI
Mr. Dang Vu Binh	Signalling, Communication	VNR
Ms. Do Thi Hoa	Signalling, Communication	TEDI
Mr. Doan Trong Dinh	Rolling Stock, Workshop	VNR
Mr. Nguyen Xuan Hung	Rolling Stock, Workshop	VNR
Mr. Dang Dinh Tieu	Economy	VNR
Mr. Pham The Khai	Cost Estimate	TEDI
Mr. Le Bao Vinh	Hydrology	TEDI
Mr. Nguyen Van Cuong	Technical Geology	TEDI
Mr. Do Ban	Hydrology	TEDI

Lao Cai-Cai Lan line

Name	Assignment	Office
Mr. Pham Manh Thuong	Leader	VRDI
Mr. Nguyen Thanh Tinh	Deputy leader	VRDI
Mr. Pham Van Lan	Bridge	VRDI
Mr. Nguyen Van Quynh	Bridge	VRDI
Mr. Tran Van Su	Track	VRDI
Ms. Ho Thi Dung	Track	VRDI
Ms. Bui Thi Minh Thu	Station	VRDI
Mr. Ha Trung Nghia	Station	VRDI
Ms. Nguyen Thi Xuan Phong	Communication	VRDI
Ms. Nguyen Thi Ngoc Chau	Signalling	VRDI
Mr. Doan Trong Dinh	Locomotive	VRDI
Mr. Pham Xuan Hung	Coach	VRDI
Mr. Nguyen Ba Nha	Geology	VRDI

1.5 Structure of Volume 1

The Volume 1 consists of 10 chapters, the contents of which are summarised below.

In Chapter 1, the background, objectives, scope, main work, work processed and organization of the Study and also outlines the structure and contents of the subsequent chapters are described. In Chapter 2, the current natural conditions in terms of the topography, geology and hydrology, etc. and the socioeconomic conditions relating to environmental protection, pollution, population and GDP, etc. are described. In Chapter 3, beginning with the Doi Moi policy, (i) the guidelines for national development policies as well as for the transportation sector, (ii) the socioeconomic framework determined by the population growth, GDP and likely investment in the transportation sector and (iii) the development framework for both national and regional development strategies are described. In Chapter 4, the current conditions and roles of various modes of transportation other than railways, i.e. road, air, coastal shipping and inland water transportation are introduced, and the current patterns of transportation and the current OD pater are described. In Chapter 5, the current conditions, roles and problems of each railway line, the future prospects for urban transport and international railway transportation are discussed. In Chapter 6, the expected roles and characteristics of each railway line in the year 2010 and the principles and development objectives for the formulation of a master plan are discussed. A demand forecast is made for each Master Plan alternative in this chapter to calculate the required investment size. The economic and financial analyses, environmental impact assessment and comprehensive evaluation of each alternative are also explained in this chapter, leading to the selection of the optimum Master Plan alternative. In Chapter 7, the operation plan, facility rehabilitation and improvement plan, environmental considerations and maintenance plan, etc. are described in detail for the selected optimum alternative and the economic and financial sensitivity analysis results are introduced. In Chapter 8, the process of formulating the phased improvement plan for the optimum, alternative are described and the underlying principles are explained. Chapter 9 describes the contents of the urgent projects subject to the Feasibility Study and argues why it is deemed appropriate to conducted Feasibility Study for such projects. And Chapter 10 provides conclusions and recommendations and also proposals on subject items for improvement after the year 2010.

The linkage between the above chapters shown in Fig. 1-5-1.

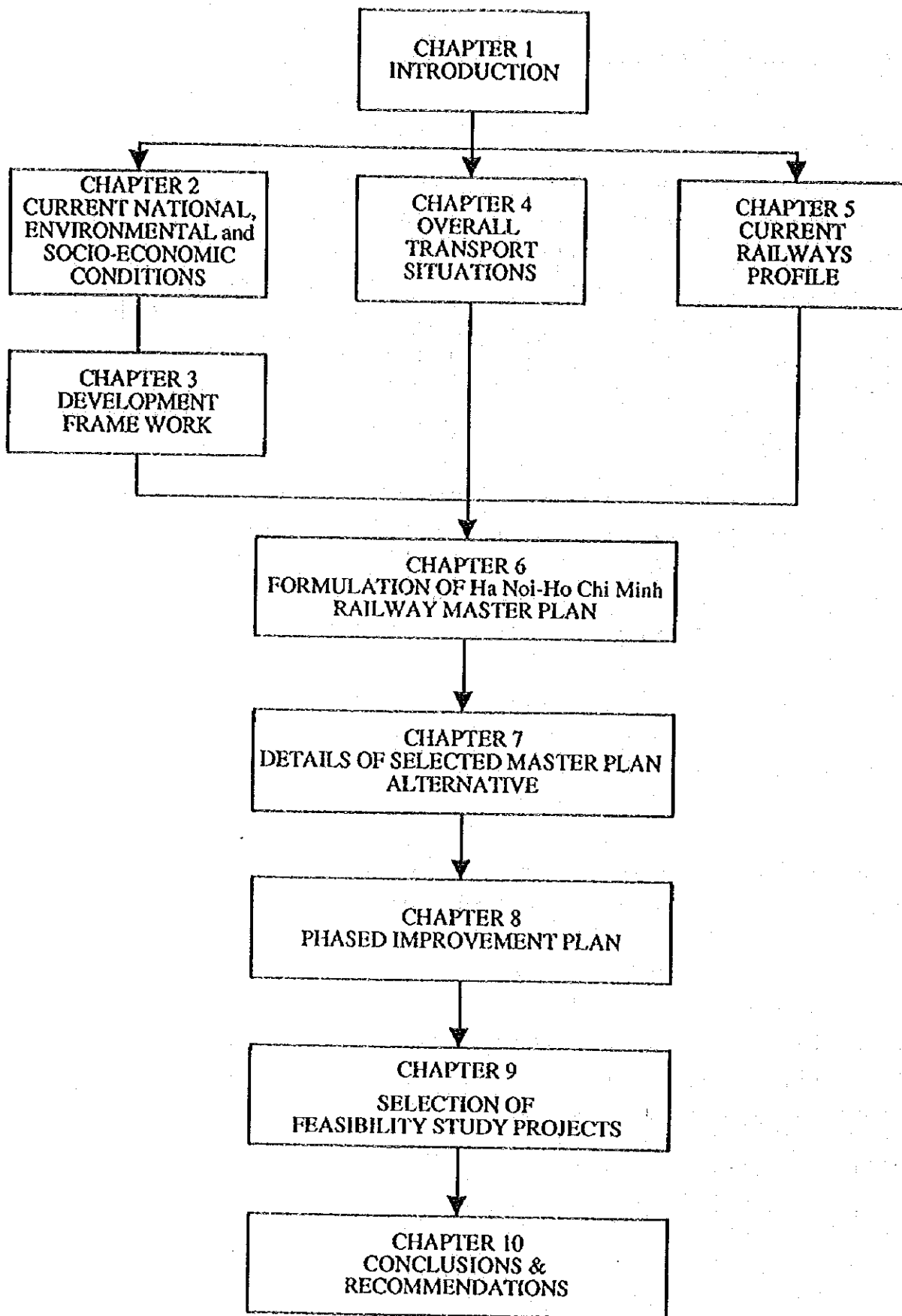


Figure 1.5-1 Report Organization

CHAPTER 2 CURRENT NATURAL, ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

2.1 Natural Conditions

This chapter describes the outlines of natural conditions such as topography, geology, meteorology, hydrology, and soil condition in Vietnam. The data were abstracted from "Geography of Vietnam", the GIOI, Foreign Language Publishing Houses, 1992.

2.1.1 Outline of Land and Natural Conditions

Viet Nam stretches in a S shape in the north-south direction along the eastern coast of Indochina and lies between 8°30'N and 23°22'N. The Changshan Mountains run along the western border with Laos while the eastern coast facing the South China Sea is as long as some 3,260 km. The total land area is approximately 331,000 km² and mountains and highlands account for three-quarters of the national land. Topographically, the country can be largely divided into the north, centre and south. In the north, the River Hong (Rouge), which originates in Yunnan Province in China and flows into the Gulf of Tongking, forms a fertile delta. The annual rice harvest in this delta area, however, is smaller than the harvest in the south due to frequent damage caused by typhoons and others. The delta is surrounded by many mountains which are mainly composed of limestone and have sawtooth ridge lines due to severe erosion by wind and rain. Many limestone islands are scattered in the Bay of Ha Long in the Hong Gai area, constituting an attractive tourist spot. The capital of Viet Nam, Hanoi, and Hai Phong are situated in the north.

The centre forms a narrow belt between Laos and the South China Sea and mainly consists of highlands with a narrow strip of plains along the coast. Many small bays provide good natural ports in places where the mountain range is near the coast. The centre is dotted with many picturesque spots, including beautiful beaches.

The narrowest part in the east-west direction is found in Thua Thien Province and is approximately 50 km. The Hai Van Pass between Hue, an old capital of Viet Nam, and Da Nang, the key city in the centre of the country, is the demarcation line between the north-centre and south-centre in terms of weather. Although Viet Nam is known to be frequently assaulted by typhoons, the south of the Hai Van Pass is little exposed to typhoons as the Pass acts as a shield.

Paddy rice cultivation is popular in lowland areas but is hampered by typhoons and alkaline soil. The felling of trees has adverse impacts on the environment and the Government of Viet Nam emphasises afforestation to sustain its forest resources. The south is bordered by Cambodia and includes a huge, fertile delta created by the Mekong River which originates in the Tibetan Highlands and empties into the South China Sea after running through Burma, Laos, Thailand, Cambodia and Viet Nam. A well developed irrigation system is employed in the delta and a large volume of rice is produced through double cropping and triple cropping in some areas.

The continental shelf along the southern coast provides excellent fishing grounds. Ho Chi Minh City (formerly Saigon) has historically developed as the area's key commercial city.

Based on the local climate, Viet Nam is classified into 3 zones, i.e. a cool climate in the northern mountain ranges, a wet, sub-tropical climate with four seasons in the area from the north to the centre and a tropical monsoon climate with an everlasting summer in the south. Viet Nam is hit by typhoons every year. Although their courses vary depending on the season, they cause extensive damage every year, including the flooding of railway track and farmland, etc.

2.1.2 Topographic Conditions

Topographic structure is diverse in Vietnam, with three constituent parts: mountains, plains and sea, resulting from cycles of tectonic activity and at the same time exposed to the effects of a humid tropical monsoon climate accounting for the differences among the three.

(1) Hill and mountains

Hill and mountains cover up to three-quarters of Vietnam's land area, the results of tectonic movements - high mountains were thrown up by intense pressures and hills by weaker ones. Around 85% of mountains are under 1,000 m in height, those above 2,000 m constituting only 1%. In reality, Vietnam has no high mountains, only valleys - showing the degree of parceling out of land due to humidity and heat following the organic process.

The mountain system in Vietnam appears as a continuation of the Van Quy plateau running in a southeasterly direction for 1,400 km from the Dong Van plateau to eastern Nam Bo and is divided into two inclines running in a straight

line along the Red River valley, including the mountain systems of the northeast, northwest and northern and southern Truong Son Range.

(2) The plains

If mountains and hills were formed through a process of lifting and erosion, the plains were mainly formed in the resulting depressions and built up from deposits of river and sea alluvium.

In Vietnam the plains system lies along the meridian and in a northwest - southeasterly direction; each plain borders mountains or hills to the west and the sea to the east. The plains are still forming as the result of a long process of sedimentation and natural enrichment, and of active human intervention. Vietnam has three plains systems - Bac Bo, the Trung Bo coast and Nam Bo.

(3) The sea

Vietnam's sea: approximately one million square kilometers, is three times larger than the mainland. It is the most important component part of the East Sea with a 3,260 km - long coast.

The islands and archipelagoes of the East Sea were formed by the extension of continental mountain ranges and from coral. Almost all the smaller islands are concentrated in the Gulf of Bac Bo and the Gulf of Thailand.

(4) The coast

The coast: Vietnam's coastline is S-shaped and 3,260 km long, with varying directions and characteristics determined by the mountain configurations, with many bays and capes.

The coastline changes according to the advance and retreat of the sea under the influence of various tectonic movements, including the movement of glaciers, which contributed to the straightening and leveling of the coast, through a process of consolidation, turning the eroded parts into areas covered with sand dunes and lagoons.

The coastline of Vietnam can therefore be divided into several sections that differ as to direction, characteristics and utilization.

2.1.3 Geological Conditions

The territory of Vietnam stands on the edge of the Euro-Asia continental which begins with the Himalayans - the highest mountain range in the world; it is also contiguous to the largest ocean - the Pacific - and not far from the deepest point of the globe - the Marianas. This is the meeting point of the two big tectonic and mineralogical belts - the Pacific and Mediterranean.

As far as geological structure is concerned, the territory of Vietnam, and of Southeast Asia stands at the pint where ancient continents met resulting in extremely complicated structures (Fromaget, 1941) Those structures have orientation lines that intersect - northwest - southeast and northeast - southwest.

The active geosynclines of Indochina were reborn from an ancient Euro - Asia foundation of the pre-Cambrian age. The tectonic activities of the Indochinese geological block ended in the Mesozoic era and left their mark in the form of the Truong Son Range.

The territory of Vietnam is also under the strong influence of the great Himalayan mountains - building movement, shown in the reappearance of large tectonic ruptures and the raising of Fansipan, in complementary depressions and the extensive basalt flows of Eastern Nam Bo, the Central Highlands, Quang Tri, Nghe Tinh and other areas during the Neozoic era. Then later, a process of erosion and covering of the area by alluvial sediments occurred on the continental shelf to the southeast.

The parts of the earth's crust belonging to Vietnam and other Southeast Asian countries continue to undergo constant change due to the activities of internal and external forces, particularly those related to the humidity and monsoons of the tropics.

2.1.4 Meteorological Conditions

Meteorology is described the characteristic regime of climate elements and climate zones in Vietnam as follows.

Owing to its location within the northern hemisphere subtropical zone and at the extreme southeastern end of the Euro - Asian continent - close to the Tropic of Cancer and not far from the equator and surrounded on the east by the Pacific

and adjoining the Indian Ocean to the southwest - Vietnam has a humid tropical climate heavily influenced by the monsoon regime prevailing in Southeast Asia.

(1) Characteristic regime of climate elements in Vietnam

This is shown in Figure 2.1-1.

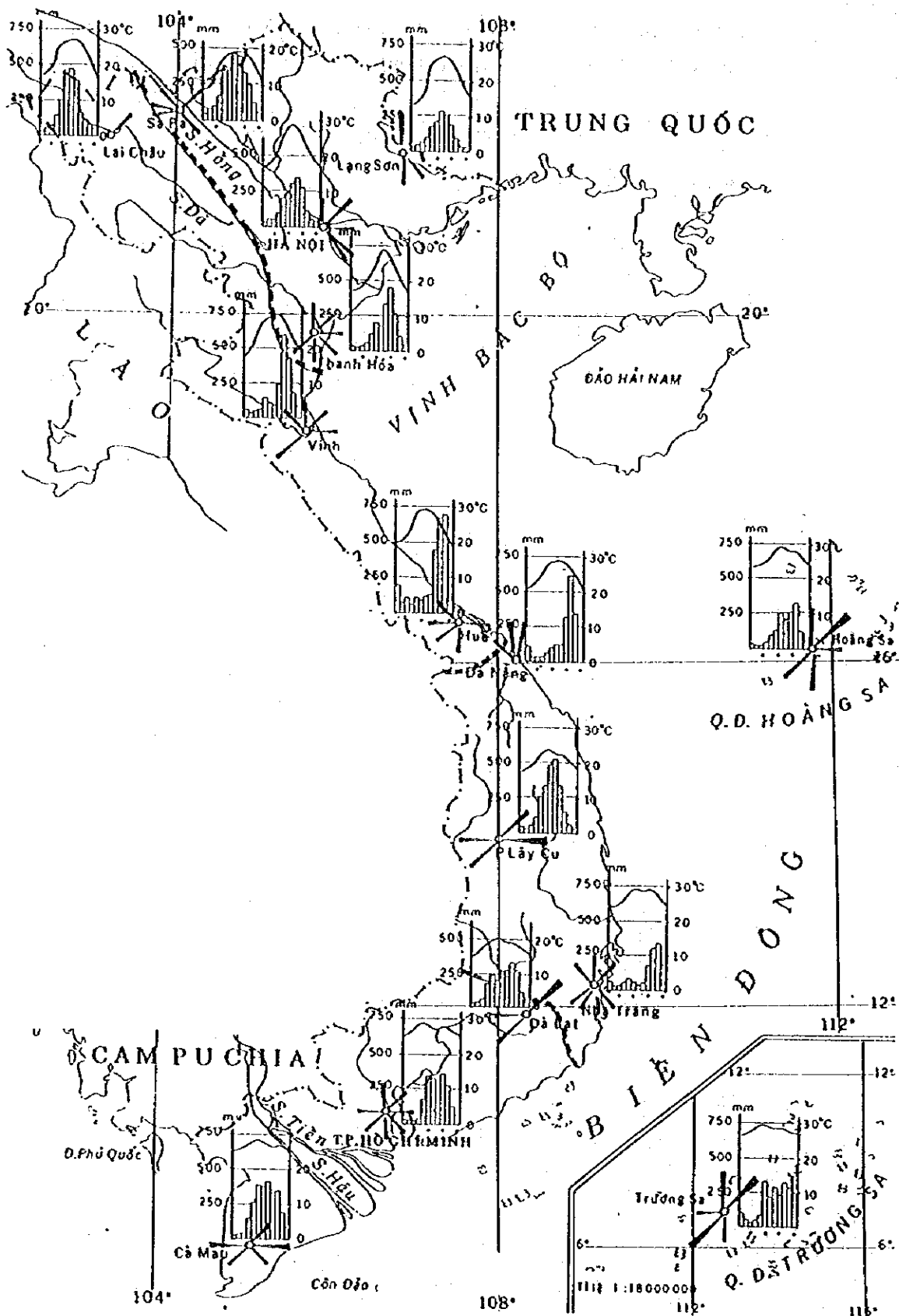


Figure 2.1-1 Climate Zone Map in Vietnam

1) Temperature.

Located entirely within the subtropical zone of the northern hemisphere, the tropical heat of the sun with its abundant radiation and reasonably even distribution is the main factor controlling temperature. However, besides this factor of astronomy, the winter monsoon brings a reduction in temperature not experienced by neighboring regions. Annual temperatures in Vietnam thus show wide variations, with low minimum temperatures in the northern part of the nation's territory while temperatures standard for the same latitude are experienced in the south.

In the south there is little variation in temperature between the two seasons, and clear differences exist only in the fact that one season is rainy and the other dry, while in the north one season is cold (while comparatively humid) and the other season is hot and humid. During the winter the degree of cold varies between mountainous regions and the northern part of Trung Bo, but in the hot season the temperature is high everywhere and the weather comparatively humid.

The average annual temperature in north and south ranges from 21°C upwards, with notable variations between winter and summer, between the mountains and the plains and between north and south.

2) Wind

Vietnam has two main seasons, each experiencing a particular wind direction - the southwestern monsoon in summer and the northeastern monsoon in winter. The wind speed ranges from 1 to 5 m/sec.

- Summer

A summer wind (southwesterly) blows from May to September. Characteristic here is the preponderance of wind from the Bay of Bengal and the South Pacific in the hot, rainy season (except in places where the effects of the Foehn are felt, especially in northern Trung Bo and the northwest). The end of the season coincides with a period of heavy rain and typhoons as the convergence over the tropic moves to its most northerly point.

- Winter

A winter wind (northeasterly) blows from October to April, with three stages - the transition of autumn to winter, winter to spring, and spring to summer. The weather hardly changes and can be generally regarded as stable (cold in Bac Bo, wet and humid in Trung Bo and hot and dry in Nam Bo).

3) Storms

The territory of Vietnam usually feels the direct impact of typhoons from the East Sea or from the Pacific (sometimes as a result of tropical low pressures gradually building up into typhoons).

According to statistics covering the past 100 years (1885 - 1987) more than 405 typhoons have struck Vietnam, with 196 between 1954 and 1984 (including 104 typhoons and 92 storms).

The storm season along Vietnam's coastline varies as follows:

Bac Bo	; June to September.
Northern Trung Bo	; July to October.
Southern Trung Bo	; October to December.
Nam Bo	; November to December (rare).

Wind velocity may reach 50 m/sec. Storms are usually accompanied by heavy rain, reaching 600 mm over a 24-hour period in places particularly the coastline of Trung Bo. For this reason, storms and floods combined hit some areas of Vietnam's territory as associated disasters.

4) Rainfall and humidity

Annual rainfall over the greater part of Vietnam's territory is around 1,600 mm, except in areas sheltered from the wind where rainfall is less than 1,000 mm per year, while in places where the mountain slopes are open to the winds, precipitation may exceed 2,500 - 3,600 mm and even reach 4,000 mm per year.

Rain is concentrated during the hot season due to monsoonal influences, but regional variations exist. The dry season lasts from November to

March, and accounts for 15% of annual rainfall whereas the remaining 85 % is concentrated during the period from April to October. In the area of the Truong Son Range in particular, the rainy season begins late and ends late, whereas Bac Bo is wetter due to the drizzle or "crachin", and in Nam Bo and the Central Highlands the dry season is of longer duration.

Compared with evaporation and relative humidity, rainfall is, generally speaking, high; in places where the extra amount is small rainfall may reach 500 mm, and even 1,000 - 1,500 mm per year. This explains why we have such a large network of rivers and streams, and why our national territory boasts such forest cover.

(2) Climatic zones in Vietnam

Owing to differences in climatic factors, Vietnam can be divided into two zones with one common element - tropical monsoon humidity - and separated by a buffer zone. The zone north of the 18th Parallel has two contrasting seasons - cold and hot - but with tropical humidity all the time. South of the 18th Parallel, the climate is hot all year round with two seasons - dry and humid. Depending on topography and altitude, each zone can be divided into many sub-zones.

2.1.5 Hydrological Conditions

Hydrology is described the network of rivers and streams, and lake and ponds as follows.

The hydrographic system in Vietnam comprises a network of rivers and streams lakes and ponds, underground water and the sea. This system is a clear reflection of the combined effects of rainfall, topography, geological structure, vegetation, and human intervention as well.

(1) The network of rivers and streams

Annual rainfall on Vietnam's land territory totals about 640 billion m³, generating a moving body of water approximately 310 billion m³ in volume. If the amount of waters coming from adjacent territory is also taken into account, this total can be trebled. Surface waters have resulted in the creation of 2,295 rivers and streams at least 10 km long, and along 3,260 km of coastline no less than 1,600 rivers large and small empty into the sea - or one estuary every 20 km on average.

Vietnam's network of rivers and streams has the following characteristics:

- Density of the network;
- Flow is mainly in a northwest - southeasterly direction and following a winding course;
- Several rivers converge in upland areas before descending to the plains;
- Rivers flow swiftly in mountainous regions then gradually more slowly before emptying into the sea;
- Two distinct seasons in river flows coincide with the wet and dry: during floods in the rainy season, the volume of water accounts for 70 - 80 % of the annual total whereas in the dry season it accounts only for 10 - 30 %. During the dry season, rivers narrow, velocity decreases, and the effects of tides and salinity are felt further upstream.
- Large volume of alluvium, about 250 - 300 million tons per year.

(2) Lakes and ponds

Vietnam has few major lakes, but many ponds. Because in the orogenic era few ruptures and depressions formed, and as the process of alluvial sedimentation by major rivers continues to this day, lakes were easily filled in. On the other hand, numerous ponds and marshes made their appearance in the plains and coastal regions. Most are the vestiges of ancient river beds and the remains of lagoons after the sea's gradual retreat, or of ponds dug during the process of human settlement. More recently artificial lakes have been created during the construction of hydroelectric or hydraulic installations.

Among the most famous natural lakes in Vietnam are the Ba Be and West Lakes.

2.1.6 Soil Conditions

The land territory of Vietnam has developed on an ancient geological foundation, composed of rock which metamorphosed between the primary and tertiary eras. Tectonic processes caused the appearance of many kinds of rock from different ages - limestone is widespread in the highlands of Bac Bo while basalt covers a large area of the southern Truong Son Range. Then, through a process of erosion and sedimentation the plains took shape. Through the action of climatic conditions - hot

tropical humidity - of topography, vegetation and animals, and of human intervention, various types of soil made their appearance in Vietnam.

According to recent research, Vietnam's territory contains no less than 64 categories of soil coming within 14 groups which can in turn be classified into four main species - alluvial soils, eroded and poor soils, red and yellow soils, and humus on the high mountains.

2.1.7 Other Conditions

(1) Classifications of seismic intensity

There is no earthquake recorded in Vietnam, during last fifty years.

(2) Freeboard of railway bridges

The highest river water level and the bottom level of the beam on railway bridges between Hanoi and Ho Chi Minh are given in Appendix 2.1-1. The recommended order of the priority for improvement was selected on the basis of the freeboard value. The emergency improvement is classified as the first priority, and the long term improvement is classified as the second priority. The bridges which do not have clear freeboard are recommended to review in order to assess the freeboard value. The selection criteria of recommended improvement are as follows.

Freeboard <0m	;	Emergency plan
$0 \leq \text{Freeboard} < 0.8\text{m}$;	Long term plan
Freeboard =not clear	;	Review of freeboard

(3) Records of inundation

The records of inundation on railway tracks between Hanoi and Ho Chi Minh during the period 1931 -1990 are given in Appendix 2.1-2. These records describe the location and the track length of inundation, spots which had been covered with water, and the location of the collapsed banks.

The total number of submerged track sections is sixty nine, which includes two hundred and seventy three thousand, one hundred meters of track length. The total number of spots covered with water is sixty three and the total number of collapsed banks along the tracks is one hundred fifteen.

The recommended priority category for improvement against the inundation should not be judged on the basis of the above inundation records, because the records do not contain some valuable information such as, the magnitude of inundation, the number of railway traffic suspended days and the restoration cost. Therefore the recommended order of priority for improvement were selected on the basis of the field investigations.

2.1.8 Field Investigation

In order to assess the existing conditions of the railway lines and bridges, between Hanoi and Ho Chi Minh, were carried out from 25 March to 5 April, 1994. The scheduled investigation spots were selected based on the preliminary data prepared by the VNR. The investigations were focused on the following items.

- Freeboard of railway bridges
- Erosion of ballast and banks
- Slope failure.

The locations where improvement are recommended to carry out, are selected based on the safety criteria. The recommended procedures include an emergency plan and a long term plan. The criteria of improvement plan is judged by the degree of danger to the railway traffic.

2.2 Environmental Conditions

2.2.1 Current Situations

It is judged that there are not so serious environmental problems concerning with the existing North-South Railway. However, the following matters call attentions.

(1) Legislation, Environmental Impact Assessment Systems and Environmental Standards

"Environmental Protection Law" was formulated in December 1993. This Law described that large-scaled railway projects including rehabilitation and improvement should be carried out in conformity with this Law, and any execution agency of the project should conduct environmental impact assessment and take suitable counter-measures if necessary.

"Guidelines on Environment Impact Assessment" established a systems for an environmental impact assessment (E.I.A.) in 1993. "Provisional Environmental Criteria" formulated a temporary standards in order to meet imperative demands on the state's environmental management.

These criteria cover the standards for the pollution items of air quality, water quality, micro-climate at workplace, noise, vibration and ionizing radiation.

However, the standard of train noise and vibration is not established, while the water quality of drainage water at workshops can be applied by these criteria. Sanitary conditions of passenger coaches as a public space is also not yet established in the criteria.

(2) Dwellings along Railway in Urban Areas

There are some dwelling houses, which locate extraordinarily close to the railway track in Hanoi City and some other densely populated areas. Inhabitants there face the risk of life especially where the entrance of the house faces the railway track.

(3) Sanitary Conditions

Passenger coaches do not facilitate any evacuation tank, and pollutants are dumped out to the track without treatment. These conditions apparently cause sanitary problems, especially in residential areas.

Furthermore, passenger coaches are under unsanitary conditions, and VNR have not carried out a periodical cleaning and/or medicine sprinkling of the facilities. These points are apparently dis-advantageous to attract passengers.

(4) Water Pollution around Workshops

Each workshop has facilities for overhauling, washing, gilding and molding of rolling stocks, and water treatment facility is facilitated. However, the facility have not been operated because of machine troubles, and thus drainage water are directly discharged from the workshop without any treatment.

Oil content and some other items were measured at Gia Lam Workshop by the JICA Study Team in April, 1994. The values of oil content and pH at the non-operation period were 0.03 to 0.335 mg/l and 6.7 to 7.5 respectively, which did not exceed the limit values established in "Provisional Environmental Criteria". However, continuous observation should be encouraged especially at operation time of workshops.

(5) Noise and Vibration

No official complaints from the residents were reported on train noise and vibration according to VNR. However it is apparent that in general this disturbs a social life of the people.

Train noise was measured in Hanoi City, Ninhbinh, Phuly and Thuongtin by the JICA Study Team in April, 1994. The measured noise levels were 71 to 92 dB(A) at 25 meter and 51 to 70 dB(A) at 100 meter from the nearest rail. The values at 25 meter are a little higher than those attributable to the electric trains in urban areas of Japan. Because of present low frequency of train operation, these results can not be not so serious problems at present. This stands true for hospitals and schools even though there are some such kinds of public buildings along the railway line.

2.2.2 Legislation, Environmental Impact Assessment System and Standards

(1) Legislation

The major environmental laws and their items are summarized in Table 2.2-1. As for international laws, Vietnam ratified five (5) kinds of international

agreements, and shows a positive involvement in the international movement in an environmental protection and reservation.

Table 2.2-1 Summary List of Major Laws concerning Environment

International Laws		
Name	Condition of Affiliation #1	Major Items of Law
Convention on Wetlands of International Importance Especially as Waterfowl Habitat	CP	Reservation and appropriate utilization of wetlands and their ecosystems which are internationally important.
Convention concerning the Protection of the World Cultural and Natural Heritage	CP	Reservation of valuable cultural assets and the natural environment.
Convention on International Trade in Endangered Species of Wild Fauna and Flora	S	Control for international trade of the endangered flora and fauna.
United Nations Convention on the law of the Sea	S	Control for legal systems of the Sea.
Framework Convention of Climate Change	S	International control for the greenhouse effect gas.
Domestic Laws		
Name	Major Items	
Law on Mineral Resources	Control for appropriate exploitation and reservation of mineral resources.	
Regulation on Fishery Sources preservation and Development	Control for appropriate development and reservation of fishery sources.	
Law on Forest Reservation and Development	Control for appropriate development and reservation of forest.	
Environmental Protection Law	Control for overall environmental reservation including natural resources.	

Note: "CP" means that Vietnam has completed the procedures on ratification, and "S" means that Vietnam signed the convention.

"Environmental Protection Law" was established in National Assembly in December 1993, and was proclaimed in February 1994. It was the first law in Vietnam to control overall environmental reservation.

"Environmental Protection Law" has the following advantages and disadvantages.

Advantage:

- The Law can control the issues on overall environmental reservation.

- Environmental impact assessment (E.I.A.), which is a obligation of any development project, has large effects to control the development not to depress the environment. Monitoring system on environmental reservation is a device to guarantee this system.
- The Law stipulates the obligation the development entity to adhere the environmental standards.

Disadvantage:

- The Law lacks the descriptions concerning topics on a global environmental reservation regarding such phenomena as global warming, the ozone layer depletion, marine pollution and decrease in wildlife species.

VNR's regulations on railway land and resettlement describes the followings:

- When VNR widens the railway line, VNR can resettle the inhabitants living in the VNR's land to other lands.
- If VNR acquires the private land when VNR widens the railway line, the State should compensate their properties and resettle the inhabitants to new lands.
- In case that there locate squatters within the land that VNR acquires, the State should partly compensate and resettle them to new lands.
- The amount of compensation should conform to the annual price regulation established by Ministry of Construction.

(2) Environmental Impact Assessment System

The concept of Environmental Impact Assessment (E.I.A.) was introduced to Vietnam in 1984 with the organization of an E.I.A. Introductory Course organized by the National Resources and Environment Research Programme (N.R.E.R.P.). E.I.A. training courses were organized with the assistance of United Nations Environment Programme(U.N.E.P.) or Asian Development Bank (A.D.B.). The Initial Environmental Examination (I.E.E.) was executed in practice for the first time for Tri An Water Reservoir Project in 1984 by NRERP. In 1990 to 1993, E.I.A. studies were executed in some projects.

As for the legislation on E.I.A., "Guidelines on Environment Impact Assessment" was proclaimed by the Ministry of Science and Technology on

Environment in September 1993. The basic system of this guideline is shown in Figure 2.2-1.

The major contents of these guidelines are described as follows.

- E.I.A. should be executed for any socio-economic project funded by foreign or domestic investors.
- Two (2) types of reports (Preliminary Report and Detail Report) on E.I.A. for above projects should be submitted to the inspection offices of the Ministry of Science and Technology and Environment.
- Detail Report should be inspected by the Inspection Council.

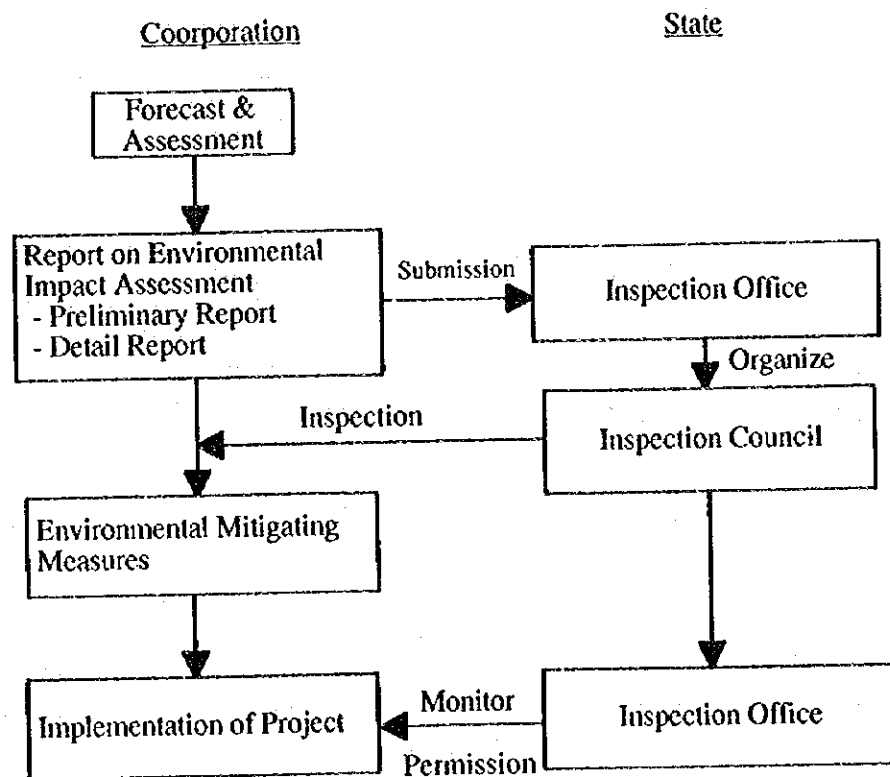


Figure 2.2-1 Basic System of Environmental Impact Assessment

- The inspection office can inspect the environmental reservation conditions at project sites and can monitor the mitigating measures for environmental reservation.

This guideline lacks the description such as public hearing and inhabitant participation.

(3) Environmental Standards

There had been separately established a number of environmental criteria by ministries or departments. The Ministry of Science and Technology on environment published "Provisional Environmental Criteria" by gathering, adjusting and systematizing above available criteria relating to environmental protection to introduce environmental standards for controlling environmental issues, especially, pollution.

Environmental items of this Law such as water quality, micro climate (temperature, light and dust) at workplace, noise and vibration are applicable to the rehabilitation and improvement of railway project. However, it is necessary that the standards on train noise and vibration be clearly established.

Totally, "Provisional Environmental Criteria" seems to have the following problems.

- As for noise and vibration, the characteristics of sources (traffic noise such as train, car, airplane, construction machinery and factory) and the surrounding landuse, should be taken into consideration in the Criteria.
- As for air quality, noise and vibration, the concept on time such as long-term or short-term exposure should be taken into consideration in the Criteria.

2.2.3 Social Environment

(1) Dwellings along Railway in Urban Areas and Resettlement

There are some houses extraordinarily close to the railway track in Hanoi city and some other areas. There are no equipment installed to guarantee a safety of train operation and inhabitants' lives.

According to VNR, the accidents in Hanoi-Ho Chi Minh Railway Line forms approximately 80 to 90 % of the whole railway lines in Vietnam in 1989 to 1993. The accidents at level crossings form approximately 30 % of the total accidents. This suggests a necessity to adopt some a counter-measures.

(2) Public Health

Sanitary conditions of coaches itself is poor. Passenger coaches do not facilitate any evacuation tank, and pollutants are dumped into the track without

any treatment. periodical cleaning and/or medicine sprinkling of the facilities have not been carried out by VNR.

And public facilities, especially toilet in the station are also in poor sanitary conditions. There is a record that Cholera spread from the South to the North in 1992 to 1993 by means of the railway passengers

The dumped pollutant from the train causes sanitary troubles for inhabitants near the railway line.

(3) Waste

The disposal system on construction dump, which is ordinarily generated in railway project, is not completely established in the present legal system.

2.2.4 Natural Environment

(1) Flora and Fauna

The flora and fauna of Vietnam is rich, diverse and endemic in species of flora and fauna. About 7000 plant species have been identified. Many of the floral species occur in the narrow vegetation province and at low individual densities. Several of most valuable timber species have already been endangered or are being extinct. The fauna, on the other hand, include 273 mammals, 780 birds, 180 reptiles, 80 amphibious species, hundreds of fishes and many thousands of invertebrate species. Numerous species which are valuable, rare and of great interest to conservation are included among these species.

By 1986 total of 87 reserved areas had been designated. The distribution of these areas are shown in Figure 2.2-2. Two more reserved areas were recognized by the JICA Study Team in April 1994. They were the Tram Chim Reserve in the Mekong Delta reserved for the endangered Eastern Sarus Crane and the Xuan Thuy Reserve in the Red River estuary for migratory birds.

Hanoi-Ho Chi Minh Railway Line almost passes the cultivated areas of lowlands or residential areas and partly passes the artificial woods. However, it does not pass the designated reserved areas. The Railway passes closest near Bac Ma Hai Van Reserved Area for endemic and rare species situated in Hue Province. However, the distance is several kilometers from the existing railway. Therefore, the existing railway operation has no environmental impact on this item.

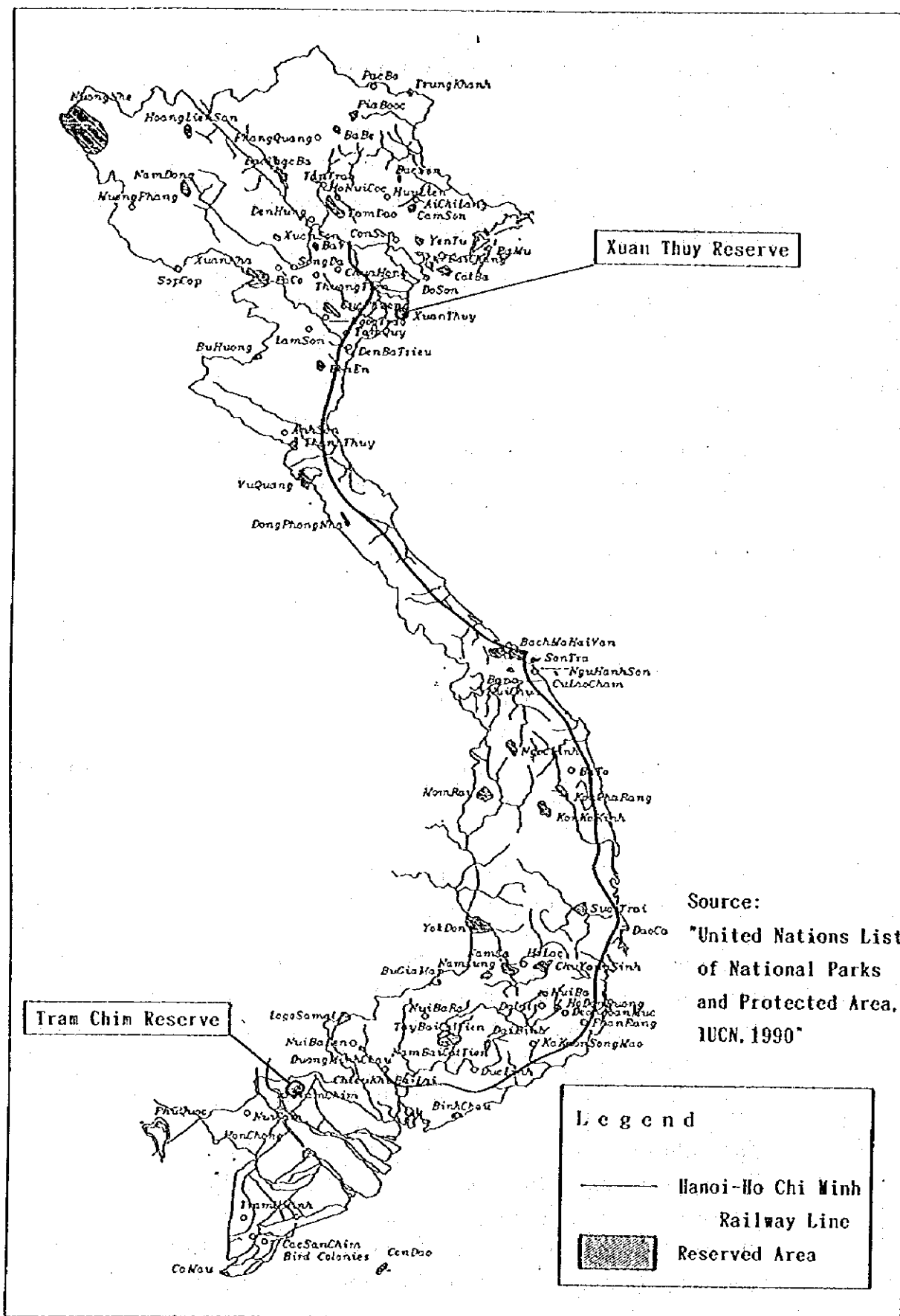


Figure 2.2-2 Distribution Map of Reserved Area in Vietnam

Table 2.2-2 Summary List of Reserved Areas
(Above 50 km²)

Name	Area(km ²)	Name	Area(km ²)
(National Park)		Sop Cop	50
Ba Be	50	Suoi Trai	190
Bach Ma Hai Van	400	Tay Bai Cat Tien	100
Cat Ba	277	Thanh Thuy	70
Con Dao	60	Thuong Da Nhim	70
Cuc Phuong	250	Vu Quang	160
Nam Bai Cat Tien	365	Xuan Nha	600
		Yoc Don	575
(Nature Reserves)		(Scenic Sites)	
Bana-Nui Chua	52	Dea Ca Hon Ron	100
Ben En	120	Dong Phuong Nha	50
Binh Chau Phuoc Buu	55	Duong Minh Chau	50
Bu Gia Map	160	Ho Lac	100
Bu Huong	50	Nui Tam Dao	190
Chu Yang Sinh	200		
Dao Phu Quoc	50	(Non-classification)	
Kon Kai Kinh	280	Ho Nui Coc	60
Kong Cha Rang	160	Khu Dao Thac Ba	50
Lo Go Sa Mat	100		
Mom Ray	450	-----	-----
Muong Cha		Sub Total	8,204
Nam Dun	180	Others	2,741
Nam Lung	200	-----	-----
Ngoc Linh	200	Total	10,945
Nui Ba	60		
Nui Dai Binh	50		
Nui Hoang Lien	50		
Nui Pia Hoac	100		
Nui Yen Tu	50		

Source : United Nations list of National Parks and Protected Areas, IUCN, 1990

2.2.5 Pollution

(1) Air pollution

Air pollution has been getting worse in large urban cities due to the an insufficient facilities of removing the pollutants of the drained gas from the factories. Motorbikes and cars are recognized as major moving source of air pollution in the cities.

Railway facilities are not the polluted source of air. However, air pollution attributable to dust are reported at quarry sites of North-South Railway Line.

(2) Water Pollution

Some workshops of Hanoi-Ho Chi Minh Railway Line have the facilities such as washing, grinding and molding rolling stocks and water treatment facilities. In Gia Lam Workshop, their facilities are not completely operated. Especially, the waste water from the workshop is not completely treated by the water

treatment facility due to its damage. Drainage water from the workshop is directly discharged without treatment.

Therefore, the water treatment facilities such as oil separator or pH regulator should be required.

(3) Noise

According to VNR, no official complaints from the residents were reported on train noise and vibration.

Train noise was measured in Hanoi City, Ninhbinh, Phuly and Thuongtin by the JICA Study Team in April, 1994. The measured noise levels were 71 to 92 dB(A) at 25 m and 51 to 70 dB(A) at 100 m from the nearest rail. The values at 25 meter seem to be a little larger than those of the present Japanese electric trains. Because of low operation frequency of train, these results are not so serious problems at present. This is also true for hospitals and schools.

2.3 SOCIO-ECONOMIC CONDITION

2.3.1 Population

Population Census was conducted in 1989, and provides the most reliable population data. Total population is 64.4 million, and its growth rate 2.1% per year between 1979-1989, recording rather high growth rate.

Spatial distribution is shown in Table 2.3.1-1. The population of Vietnam is concentrated mainly in two large river deltas, the red River delta in the northern part of the country and the Mekong River delta in the southern part. These regions comprise only 17 % of the country total land area, however they contain almost half (44%) of the total population.

Table 2.3.1-1 Spatial Distribution of Population

Region	Land	Population	
	Land	1979	1989
Whole country	100.0	100.0	100.0
Northern Uplands	16.4	15.3	15.9
Red River Delta	8.6	21.7	21.4
North Central	11.3	13.8	13.5
Central Coast	9.4	11.0	10.5
Central Highlands	13.9	2.9	3.9
Southeast	10.8	11.9	12.3
Mekong River Delta	29.6	23.4	22.4

Source: Vietnam Population Census 1989, The Population of Vietnam, Statistical Publishing House 1992.

Population of base year, 1994 is estimated by expanding the figures of 1989 at the rate of population growth rate between 1979-1989, and then adjusted proportionally according to the 72.0 million (official figure of the General Statistics Department). Figure 2.3.2-1 shows spatial distribution of population in 1994.

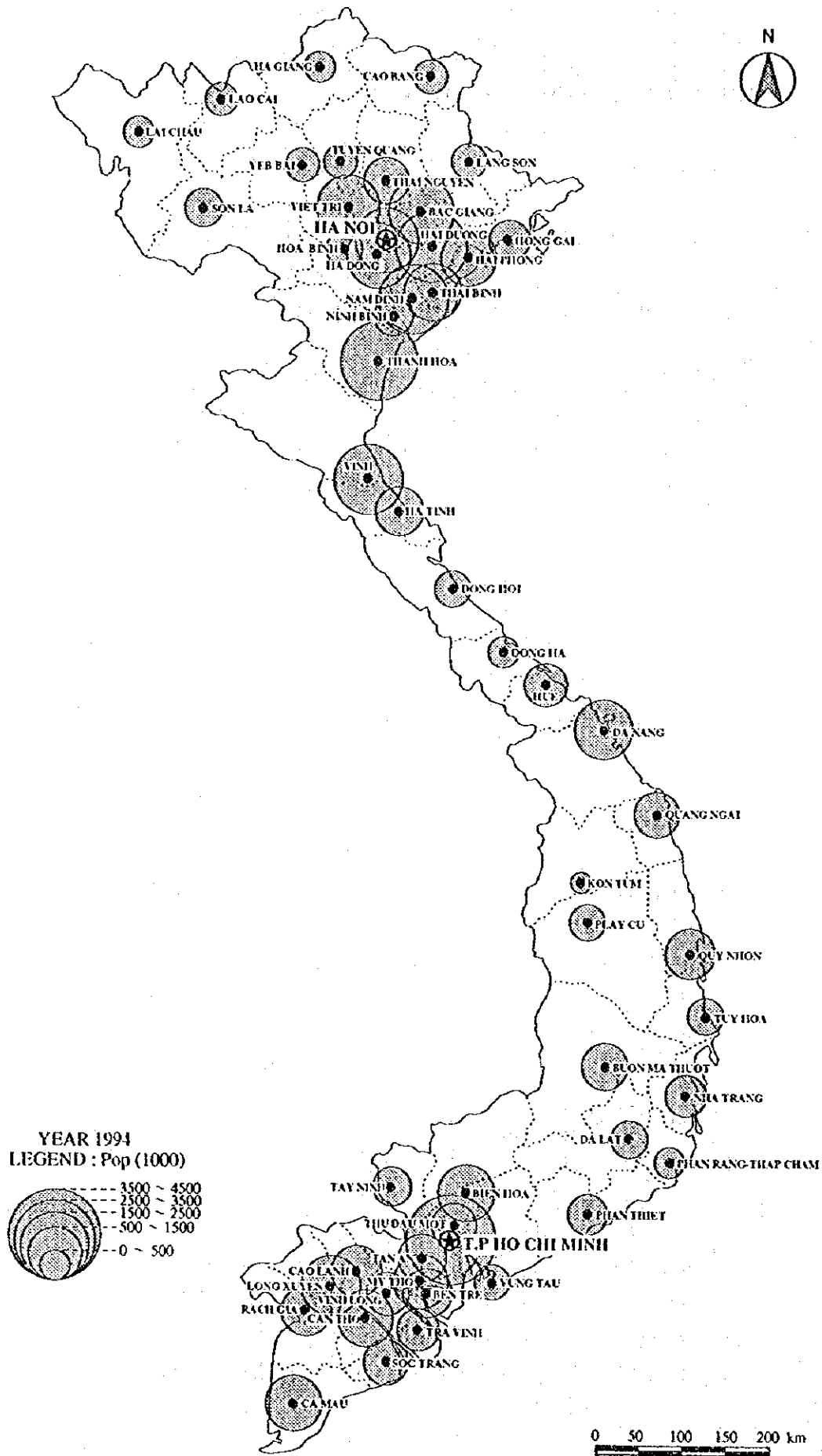


Figure 2.3.1-1 Spatial Distribution of Population, 1994

2.3.2 Gross Domestic Products

Figure 2.3.2-1 shows spatial distribution of gross domestic products (GDP).

GDP of the whole state in the past are summarized in Table 2.3.2-1. However, its formal breakdown by province are not yet published by the government. Here the Study Team shows to estimate the GDP by province.

First, whole Vietnamese economy has experienced a steady growth at higher rates compared with the surrounding Asian countries, ranging 6.1% in 1991 to 7.5% in 1993 (at the 1989 prices). In the nearest future, it is expected to reach at 8% in 1994 and 9.0% in 1995. It is really climbing at an accelerated rate. This phenomenon is boosted by the industrial sector, which marked the growth rates ranging from 10.4% TO 15.3%. Significance in industry sector is apparent when compared with the agricultural sector that experienced rather stagnating rate of growth from 2.9% to 4.2%, except extraordinary expansion in 1992. It is also noteworthy that output of industrial sector overwhelmed that of agricultural sector in 1993.

Table 2.3.2-1 GDP Performance

	1991	1992	1993	1994 (planned)	1995 (planned)
GDP (bil. dong in 1989 prices)	28,651	30,988	33,310	36,000	39,250
GDP Growth Rate (%)	6.1%	8.1% (8.6%)*	7.5% (8.1%)*	8.0%	9.0%
Industrial Output Value (in 1989 prices)	15,471	17,834	19,706	21,874	24,500
Industrial Output Growth Rate (%)	10.4%	15.3%	10.5%	11.0%	12.0%
Agricultural Output Value (in 1989 prices)	16,775	18,053	18,595	19,340	20,150
Agricultural Output Growth Rate (%)	2.9%	7.6%	3.0%	4.0%	4.2%

Source: Vietnam in 1993 and Socio-Economic Prospects for 1994-1995. The GIOI Publisher, 1993.

(*) indicates the different figures released by General Statistical Office

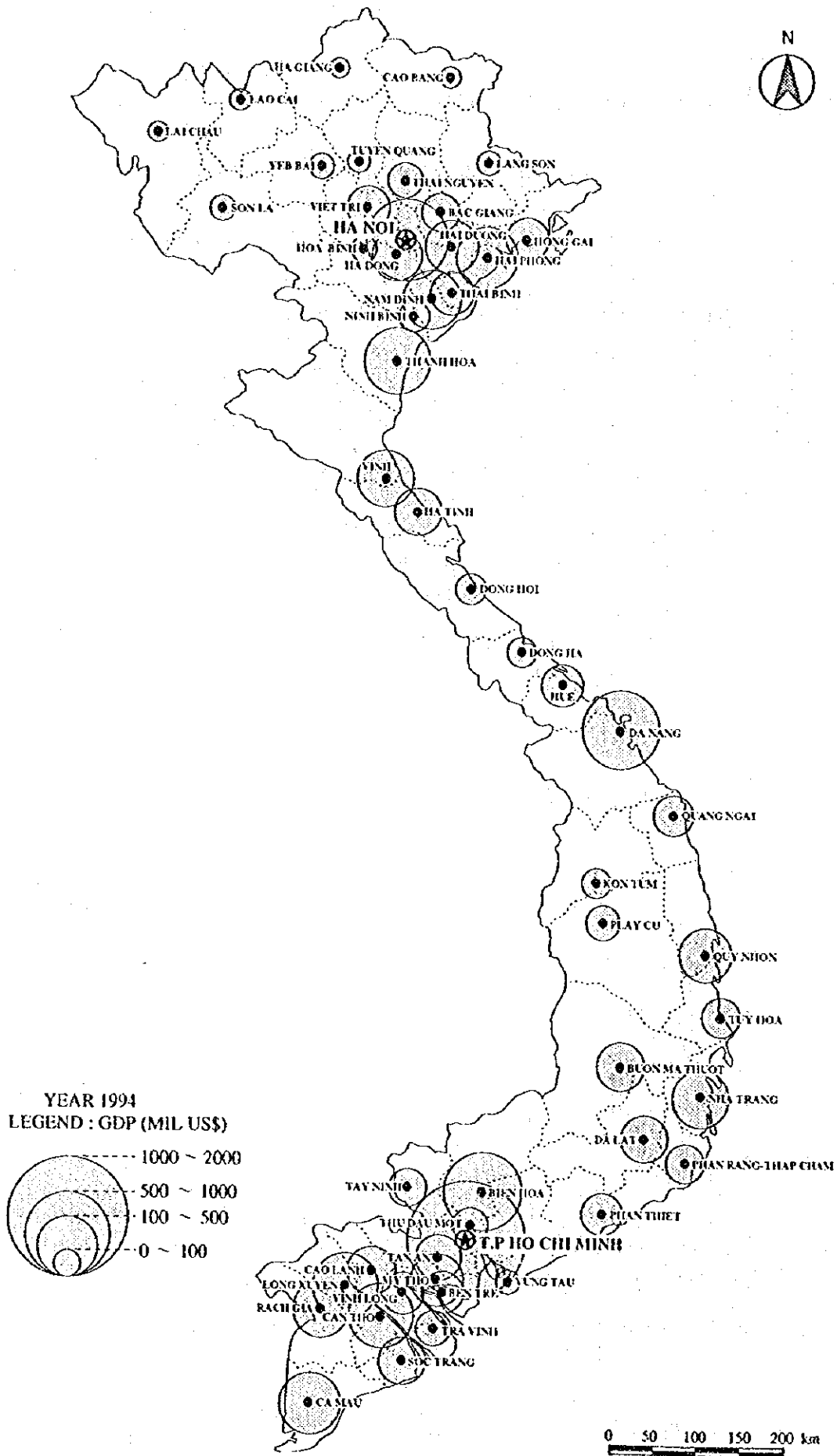


Figure 2.3.2-1 Spatial Distribution of GDP, 1994

Secondly, it is confirm the state targets of whole economy, industrial sector and agricultural sector. These are the control total in setting economic indicators of the individual provinces. GDP growth in 1993-2000 is targeted at 8% per annum, and is set 10% in the period 2001-2010. However, according to the recent high performance, target figures in 1996-2000 should be lifted upwards with due consideration of potential inflation pressure.

Thirdly, growth rates of industrial and agricultural sector by region and province are synthesized with a control total. Table 2.3.2-2 shows the growth rates of industry and agriculture by region in 1990-1993. Remarkable expansion of the industry in Northeast of Southland is expected to continue in the future.

In this process, a list of the planned industrial estate and export processing zones are fully taken into considerations. Almost all the planned industrial zones are located in three population agglomerated areas; (1) Hanoi-Hai Phong-Cai Lan area, (2) Ad Nang area and (3) South Triangle area (Ho Chi Minh-Vung Tau). One independent export processing zone is planned in Can Tho, south-west of Ho Chi Minh City.

Table 2.3.2-2 Economic Performance by Region

Region	Annual Growth Rate (190-1992)			Share (%)	
	Agri-culture	Industry	Total	1990	1992
North Mountain and Midland	3.1%	10.6%	6.1%	11.4%	10.7%
Red River Delta	6.1%	2.4%	4.4%	18.1%	16.3%
Central Coast and Northland	4.4%	9.1%	5.9%		6.7%
Central Coast and Southland	5.0%	4.6%	4.8%	8.5%	7.7%
Central Highland	10.7%	9.7%	10.5%	2.5%	2.6%
North East of Southland	7.4%	22.6%	19.9%	25.3%	30.1%
Mekong River Delta	7.2%	9.5%	7.9%	25.9%	25.9%

Source; same as Table 2.3.2-1.

Lastly, some policy measures are assumed to eradicate the further widening of income distribution between the North and the South. This suggests priority allocation of industrial allocation in the North.

2.3.3 Budgetary Condition

Table 2.3.3-1 shows the trend of the state budget since 1990. Budget balance and the components of revenue and expenditure are clarified in the table.

Table 2.3.3-1 State Budget

Item	1990	1991	1992	1993 (estimated)	1994 (planned)
Budget Revenue	8,109	10,613	18,970	29,895	38,660
Budget Expenditures	9,285	12,081	22,815	36,590	46,510
Balance	-1,176	-1,468	-3,845	-6,695	-7,850
Share of Budget Deficit against GDP (%)	3.1%	2.1%	3.8%	5.4%	5.2%
Revenue Items					
Taxes and Fees	6,249	10,083	18,400	26,740	35,200
Loans and Amortization	1,860	530	570	3,155	3,340
Expenditure Items					
Regular Expenditure	6,257	8,728	15,005	23,860	30,600
Development Investment	2,123	2,135	n.a.	9,540	10,300
- Industry	736	420	n.a.	5,692	2,226
- Transport & Communication	399	508	n.a.	979	2,428
- Agriculture & Forestry	334	367	n.a.	267	503
- Construction	63	71	n.a.	338	278
- Education & Vocational	83	128	n.a.	261	408
- Health & Social Aid	-	-	n.a.	400	408
- Science, culture & Sports	141	200	n.a.	108	257
- Others	367	441	n.a.	1,495	3,792
Payment of Debts and Loan	905	1,218	2,100	1,610	3,110

Note: Items of the state budget revenue have been revised into new formation since 1994. Figures in this table are compiled based on the data of the Ministry of Finance.

(n.a.) stands for "not available."

Most apparent features are a rapid expansion both in revenue and expenditure since 1992. Proportionally budget deficit had also sharply increased up to 1994.

As shown in Table 2.3.3-1, the state revenue in 1992 increased 1.8 times as much as that in 1991. And 1.6 times in 1993 compared with the previous year, and 1.3 times in 1994. Tax collection contributes significantly to this unusual expansion of state revenue.

Expenditure is also expanded so sharply in 1992, recording 1.9 times as much as that in 1991. 1.6 times in 1993, and 1.3 times in 1994 compared with the previous year.

As for the deficit, it reaches 3.8% of the GDP in 1992, 5.4% in 1993 and 5.2% in 1994. Rapid increase in expenditure in 1993 open up a deficit that the government had difficulty funding. The deficit was equivalent to about US\$800 million. The net flow of concessional loans was quite small, creating a serious financing problems for the government. To its credit, the government borrowed the equivalent of US\$400 million from domestic sources, and US\$200 million from international commercial institute. Its high cost arrangement will impose a heavy burden to pay back a substantial amount of interest costs.

Among each transport sector, a share of railway had been declining up to 9.9% in 1993, averaging at 11.4% in a period 1990-1993.

Table 2.3.3-2 Budget Distribution among Each Transport Sector

Sector	1990	1991	1992	1993
Railway	7.9%	15.7%	12.2%	9.9%
Road	83.3%	66.4%	74.8%	76.8%
Inland Waterway	1.5%	2.9%	0%	1.2%
Sea Port	3.4%	8.8%	3.8%	3.2%
Aviation	4.0%	6.2%	9.2%	8.9%

Source; (1) Vietnam; Economy and Finance of Vietnam, 1986-1992, and
(2) Economic and Development Resource Center, Asian Development Bank, 1993.

CHAPTER 3 DEVELOPMENT FRAMEWORK

3.1 Development Policy

3.1.1 "Doi Moi" Policy and Recent Trends

The Vietnamese government commenced its "Doi Moi" policy in 1987, which means "Changes for Building a New Country". Its four main policy are:

(1) Socialist Policy

- The conventional radical socialist policy has been denied.
- A long period should be devoted to a conversion into socialism.
- Great efforts will be spent to convert into a socialist policy in the future.

(2) Modifications in Industrial Policy

- The conventional policy that gives a high priority to heavy industry is replaced with a policy centered on agriculture.

(3) Introduction of Market Economy

- A market economy is introduced to induce an economic reform.
- Capitalistic management is regarded to be rationale in the national and public management.
- Basically, the conventional centralized, planned economy is discarded.

(4) Participation in International Cooperation

- Vietnam will aggressively participate in international division of labor and international cooperation.
- Efforts will be made to contribute to a peace in Indochina, and to establish peace throughout the world.

The Vietnamese government has prepared the middle and long term plans for development, and established development goals. Fifth five year plan for the period 1991 to 1995 has a role to give a framework of the development policies. To supplement the five year plan, "Social and Development Strategy for the Economy and Society by the Year 2000" was released. The main goals of the strategy are:

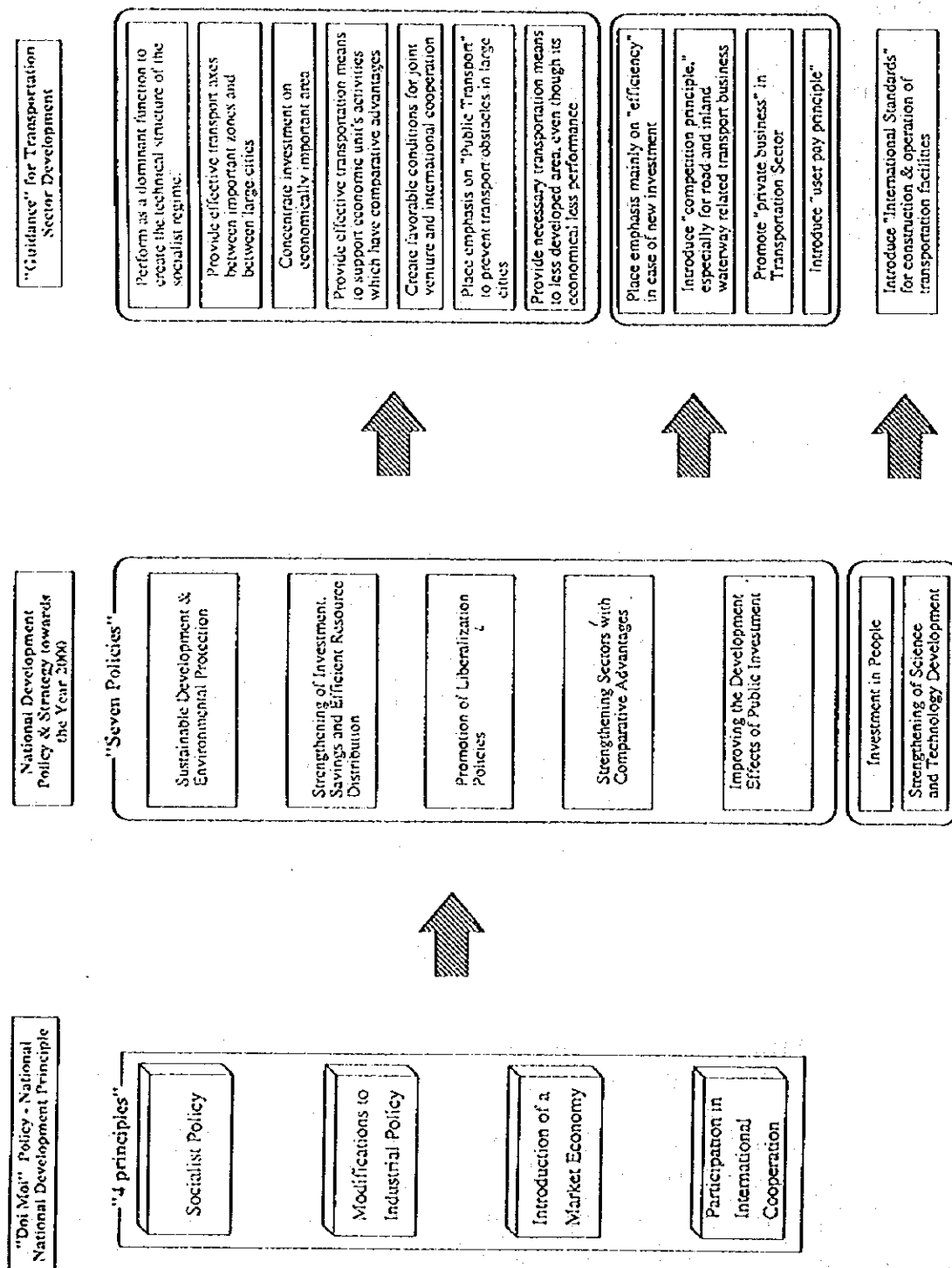


Figure 3.1-1 Relationship of Relevant Policies

- Population: 80 million (Efforts will be made to keep the population growth rate at a low rate of 1.8 percent or less.)
- Working population: 45 million
- Food production: 30 million tons (Fifty percent greater than in 1990.)
- Marine product production: 1.5 million tons (Production in 1990 was one million tons.)
- Coal production: Three times as much as the level of 1990.
- Per capita income: 500 dollars (About twice as much as that in 1990.)
- Inflation rate: To be kept at 10% or less per annum.
- Construction of oil refinery plants and petrochemical plants.
- Promotion of the improvement of transportation, communications and other infrastructure.

The average annual growth rate of the Vietnamese economy between 1987 and 1989 was about 6%. However, the economy was not stable. In 1988, the construction sector registered about 3% negative growth, and in 1989 production in the industrial sector declined by 4%. Also, the drought during 1988 and 1989 made it clear that sustainable growth in agricultural production was indispensable.

Under these circumstances, the government introduced further economic reform in 1988. The main reforms were:

- abolition of the dual price system,
- introduction of market pricing system,
- termination of subsidies of subsidized products, and
- elimination of differences in two markets; a controlled market and a free market.

This price reform had a significant effect on the social and economic lives of Vietnamese people. The market pricing system promoted the production and adjusted the imbalance of supply and demand. Furthermore, since the double price system was abolished, the government was no longer burdened to pay subsidies, which accounted for 20 percent of its total budget. In conjunction

with the price reforms, a control of the official exchange rate had been faded out gradually so that it reached the same level as the market rate.

Economic management by the government using the Doi Moi Policy has marked the following successes:

- An annual growth rate of 6 to 8% a year has been achieved.
- High inflation has been calmed.
- Opening the economy to foreigners has been promoted, so that both trade and foreign investment have increased.

It can be said that the Doi Moi Policy has been successful under the poor circumstance such as lack of funds, poor infrastructure, incomplete laws, organizations, financial systems, tax structure and other problems.

Politically, Vietnam has become an observer in ASEAN, and is making efforts to create a closer relations with its neighboring countries. In addition, with the lifting of economic sanctions by the United States in February 1994, the conditions have been set for economic cooperation with the western countries and for a further foreign investment.

3.1.2 National Development Policy and Strategy towards the Year 2000

3.1.2.1 Development Policy and Strategy

The basic framework of the development policy and the strategy of the Vietnamese government is clarified in "Stability and Development Strategy for the Economy and Society by the Year 2000." The Vietnamese government intends to learn some lessons from the development experiences of other developing countries, and formulates its own "catch-up" development plan. The development strategy emphasizes the seven policies described below.

In executing the Vietnamese development strategy, there is a need to flexibly cope with fluctuations in the world economy and other surrounding factors. In addition, it will be necessary to learn from failures and meet the new demand of society.

(1) Sustainable Development and Environmental Protection

The government has established the National Plan for the Environment and Sustainable Development (NPESD), and a framework for actions. It has put an emphasis on the creation of efficient organizations, laws and policies for the plan. In addition, the government calls for the environment issues in a execution process of individual government policies, and for a need of appropriate environment laws, environment information system, environmental impact assessment procedures, an environmental monitoring system, etc.

(2) Strengthening of Investment, Savings and Efficient Resource Distribution

The strategy for achieving this goal is based on stabilizing the macro-economy, a progress of transition into a market economy, and a increase of foreign investment. In stabilizing the macro economy, a calm of inflation was achieved by means of careful adjustment of the financial deficit and money supply. In order to promote transition further to a market economy, there are some indispensable factors that are a reform of the tax system and the banking system, legislation improvement, reforms of state-owned companies, and the execution of administrative. A direct foreign investment stimulates the economy by a means of job creation and technology transfer. Improvement of the investment environment such as infrastructure improvement is required in order to realize regionally balanced investment,

(3) Promotion of Liberalization Policies

In a process of transition into a market economy, a number of changes have occurred in foreign trade. The most significant are an introduction of free trade and market exchange rates, and the fact that the main trading partners have changed into capitalist countries. In order to cope with these changes and to strengthen exports, various improvements are necessary such as (a) strengthen the trading system, (b) establishment of a law system and an export credit system, (c) the infrastructure improvement for exporting activities, (d) elimination of import restriction, and (e) promotion of linkage with the international trade and the economic cooperation mechanism.

(4) Strengthening Sectors with Comparative Advantages

The government has positioned agriculture, fisheries light industry tourism and energy as sectors with comparative advantages, and provides various measures to strengthen those activities. Since development of these sectors require a

huge amount of investment, the government is making efforts to attract foreign investment.

(5) Improving the Development Effects of Public Investment

The fifth development strategy is to maximize the efficiency of public investment. The State Planning Committee (SPC) is responsible for a preparation of public investment plans. They are closely related with the middle and long range budget plans that combine together the government development policy, strategy and investment fund, and make sure that they will be implemented. And it contributes to attract an aid from abroad, and to effectively combine a domestic fund with foreign funds.

(6) Investment in People

The government will build a system in which the people can decide their own future themselves. The government will put an emphasis on investment in education, vocational training, health and hygiene, and family planning.

(7) Straightening of Science and Technology Development

Science and technology are keys to the dynamic economic development, and the government has recognized that these were the weak point of this country. In order to develop these fields, the following action plans have been formulated:

- strengthening of education and research,
- protecting intellectual rights
- implementing applied technology,
- free competition and quality control, and
- strengthening of information services and standardization.

3.1.3 "Guidance" for Transportation Sector Development

This guidance for the transportation sector development is a break-down of the previous national development policy and strategy towards the year 2000, and provides more concrete principles specific to the transport sector. These contains 12 items and some of them are self evident.

- (1) Perform as a dominant function to create the technical structure of the socialist regime.

This relates spatial structure of the countries, connecting the towns and forming the transport networks in order to make the commodity flows smooth in the context of the socialistic hierarchy.

- (2) Provide effective transport axes between important zones and between large cities.

This also relates with the transport networks organized well to make the commodity flow smooth and effective. This is especially important to connect the material production zones and manufacturing zones. For example, connections between free trade zones, between industrial zones and transport nodes such as sea/river port, airport, and so on are indispensable. Axes in the Red River Delta and Mekong Delta have a high priority.

- (3) Concentrate investment on economically important area

Well organized transportation network induces a high movement of commodities. Especially industrial agglomerated areas with effective transport network can generate an accumulative effect to boost the production activities, and generate an external economy. This is based on the effective allocation of the investment fund to a high return project.

- (4) Provide effective transportation means to support economic unit's activities which have comparative advantages.

Comparative advantage falls on agriculture, fisheries, light industries, tourism and energy sectors. To facilitate a transport network to the agricultural and fishery products mean to provide an access to the market. Transport network in the rural agricultural areas are given a priority.

- (5) Create favorable conditions for joint venture and international cooperation

At present, the cheap labor costs attract the foreign investment but a further influx of foreign capital is constrained by the poor transport network. Since a role of the foreign investment is a key to boost the Vietnamese economy,

sufficient transport infrastructure is a fundamental and pre-requisite conditions for a prosperity of Vietnamese economy.

- (6) Place emphasis on "Public Transport" to prevent transport obstacles in large cities

Many large cities such as Hanoi and Ho Chi Minh have developed well and there remains few space to expand the existing roads. And the roads are congested with fleet of motorcycles and bicycles. The only countermeasure is an introduction of public transport such as bus and new transport system. This is also contribute to shorten a travel time of commuters.

- (7) Provide necessary transportation means to less developed area, even though its economical performance is less active.

This is to guarantee the social interaction between communities. Even a small communities can not live without transaction with other communities. In this case, economic efficiency can be out of the consideration.

- (8) Place emphasis mainly on "efficiency" in case of new investment

This efficiency of the investment is measured by the economic internal rate of return of the investment and/or financial one. Projects should be implemented in order according to the priority given by those evaluation indicator. Balancing with this item and item 7 above is a sensitive works.

- (9) Introduce "competition principle," especially for road and inland waterway-related transport business

Roads and inland waterways are often running in parallel with each other. Each can minimize the transportation cost and induce to attract the commodities that uses the competing mode. Otherwise resources are wasted in a low productivity services.

- (10) Promote "private business" in transport sector

This can apply to the long distance bus operations and buses in the urban areas. With a limited government fund, it is impossible to meet a whole demand of buses.

(11) Introduce "user pay principle"

This principle is widely adopted in the neighboring countries and the developed countries. Saving in travel time and operation cost can be an economic benefit that the user can receive by using the new roads, bridges, and so on. This can be charged and provide a fund for other construction of transport infrastructure.

(12) Introduce "International Standards" for construction and operation of transportation facilities.

This aims to connect the Vietnamese transport network with that of neighboring countries. And it also aims at encouraging the engineers to pioneer the new technologies and keeps themselves at the front line of the new technologies.

3.2 Future Socio-economic Framework

3.2.1 Population

There are three kinds of population projection available as shown in Table 3.2.1-1, and in this study the population scenario 3 are employed as a socio-economic framework. This is because the growth rate of population is set most moderately compared with that of 2.1% in the period 1979-1989.

Growth rate of population in a period 1990-1993 is set 2.28% per annum, higher than the average growth rate between two census years, 1979 and 1989. This figure suggests that the annual growth rate of 1.80~1.84% in the period 1995-2000 is far below the suitable target.

Population at the target year is set as equal as the projection 1 which is employed together with the forecast of GDP growth in the future. This treatment is the best to keep a consistency with the national goal of the various socio-economic framework.

Spatial distribution of population is shown in Figure 3.2.1-1.

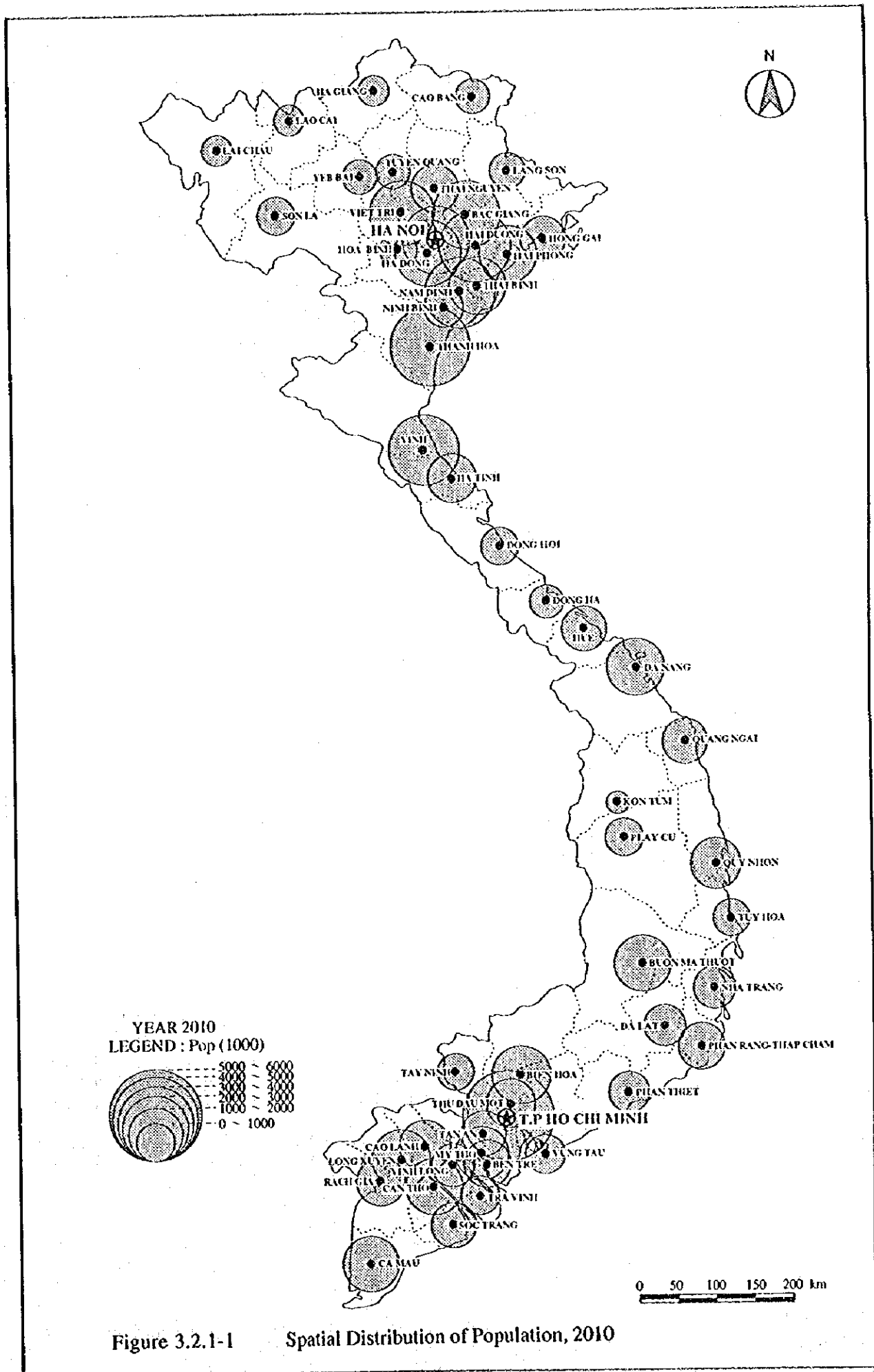
Table 3.2.1-1 Population Forecast

	Population (unit; million persons)				Growth Rate (% per annum)	
	1993	1995	2000	2010	1995 - 2000	2001 - 2010
Projection 1	72.0	75.0	82.0	95.0	1.80%	1.48%
Projection 2	70.2	73.2	80.2	91.6	1.84%	1.34%
Projection 3 (The Study Team) (1992)	69.8	73.0	80.3	93.5	1.92%	1.53%

Note; Scenario 1 is compiled by the General Statistics Department. These figures are tabulated together with GDP scenarios.

Scenario 2 is quoted from "Vietnam Population Census - 1989, The Population of Vietnam," Statistical Publishing House, 1992. Figures are forecast at 1994, 1999, 2004, and 2009. Those were adjusted into the each target year by interpolated.

"Projection 3; 69.8 million in 1992" is quoted from "Vietnam; Economy and finance of Vietnam, 1986-1992." This figure is equivalent to 71.3 million in 1993.



3.2.2 Gross Domestic Products

Interim Report I, there was a discrepancy in the growth setting in the future between this Study Team's setting and the State Planning Committee's revised version of growth scenario. This study employed the Study Team's growth setting for a temporary use in the Interim Report (1) since a change in framework would result in the demand forecast and a scale and number of necessary rehabilitation facilities and there was a time constraint to modify a whole framework. However, the Team has amended a growth-related framework in the Draft Final stages to fit the SPC's one.

This difference is attributable to date of scenario setting. The Study Team set growth scenario May 1994, while the SPC revised its growth perspective upwards to reflect the recent dynamic economic activities and were informed to the Study Team at the end of 1994.

Table 3.2.2-1 Growth Scenarios

	Per Capita GDP (US\$)	Growth Rate		
	1993	1994-95	1996-2000	2001-2010
SPC Scenario 1 (Low Growth)	263	8.6%	9.8%	10.0%
SPC Scenario 2 (High Growth)	263	9.0%	10.7%	11.5%
Northern VN M/P Scenario	240	7.0%	7.0%	10.0%
This Study's Scenario	263	9.0%	10.7%	11.5%

Note; SPC revised its growth forecast in May 1994, and previous figure of GDP per capita of US\$220 (at least) in 1992 (refered in "Vietnam: A Development Perspective," prepared for the Donor Conference, September 1993) to US\$263 in 1993.

Major difference is the GDP growth in the period 1996-2000 as shown in Table 3.2.2-1. This Team was requested to follow the GDP growth rates of 10.7% between 1996-2000, while the SPC sets as a national growth target and 11.5% (higher growth scenario) for a period 2001-2010.

With a due consideration to a industrial development plans, infrastructure development plans, and tourism plan, the future growth rates by province were forecast. The anticipated spatial distribution in economic activities in the future is translated into Figure 3.2.2-1.

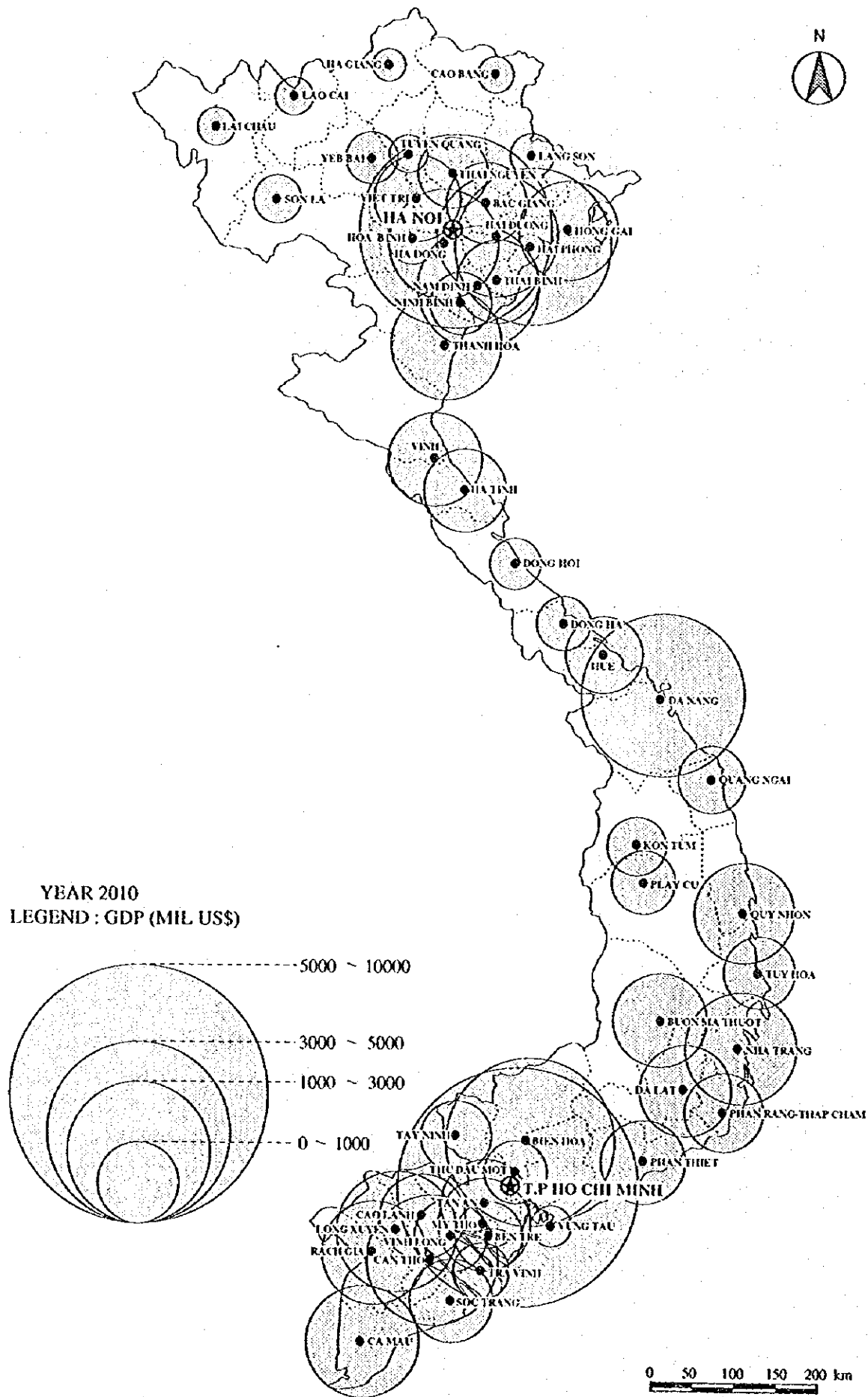


Figure 3.2.2-1 Spatial Distribution of GDP, 2010

economic growth rate in the late 1990s is lower than the formal setting. This is diagrammatically shown in Figure 3.2.3-1.

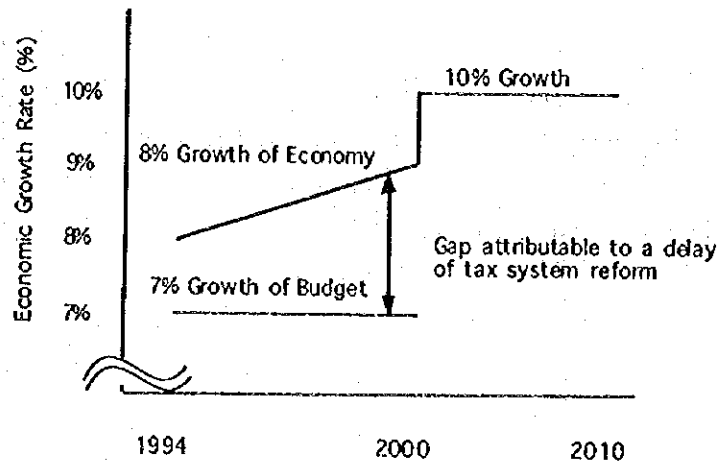


Figure 3.2.3-1 Difference of Assumption on GDP Growth Rate

(2) Policy to Increase Budget Revenue

Tax reform, now under the planning, is set as a pre-requisite of this analysis. Structural features of budget revenue at present lies on a large share (45%) of state's owned company. tax reform intends to increase tax revenue attributable to tax income, improvement of tax collection ratio, introduction new tax. Swedish specialist is giving assistance to formulate new tax system. Actual size of budget revenue may be dependent of implementation degree.

(3) Distribution Ratio to Transportation Sector

This analysis assumes that share of transportation investment will be enlarged up to 3% of GDP in 2010. This 3% is set as a target driven from Japanese experience.

Furthermore, analysis assumes that 15% of incremental portion of construction investment will be allocated to transport sector. This is;

- 1) In order to solve the bottleneck to progress the development, transportation infrastructure are indispensable and requires a investment.

- 2) Key factor to invite a foreign investment is an improvement of transport infrastructure, and priority investment to transport sector is indispensable.

3.2.3.2 Investment share of Railway Sector

Investment share to railway is set at 10% of total investment to transport sector and is kept constant up to 2010.

Principle in estimating the investment fund to railway sector is to limit the fund sources to the state budget and no loan provision was consumed as a pre-condition in this analysis. Share of railway sector in the past is shown in Figure 3.2.3-2.

3.2.3.3 Conclusion

This analysis concluded that the total amount of 1,876 million US dollar can be funded at the maximum by the state government from its own expense. This fund will be invested to the railway sector over the whole nation.

Vietnam government has given a priority allocation of budget to transportation. However this policy may be further accelerated or decelerated in the future, which depends on the growth performance. Table 3.2.3-1 indicates target

Table 3.2.3-1 Estimated Fund for Railway Investment

Items	(unit: million US\$)			
	1994-2000	2001-2005	2006-2010	1994-2010
3 % of GDP	186 (26.6)	483 (96.6)	1,008 (201.6)	1,632 (96.0)
3% of GDP and Priority Allocation of 15% of Increment in Construction Investment	365 (52.1)	463 (92.6)	1,047 (209.4)	1,876 (110.4)

Note: () indicates annual figures.

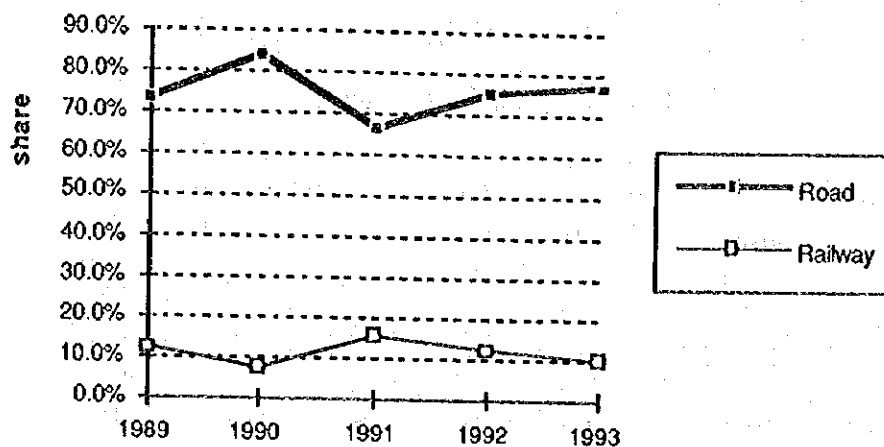


Figure 3.2.3-2 Share of Railway and Road Investment Budget

In compared with the investment amounts of each implementation stage, a shortage in investment cost during initial period can be paid back by the surplus of budget of railway sector in the period 2005-2010. This is also diagrammatically shown in Figure 3.2.3-3.

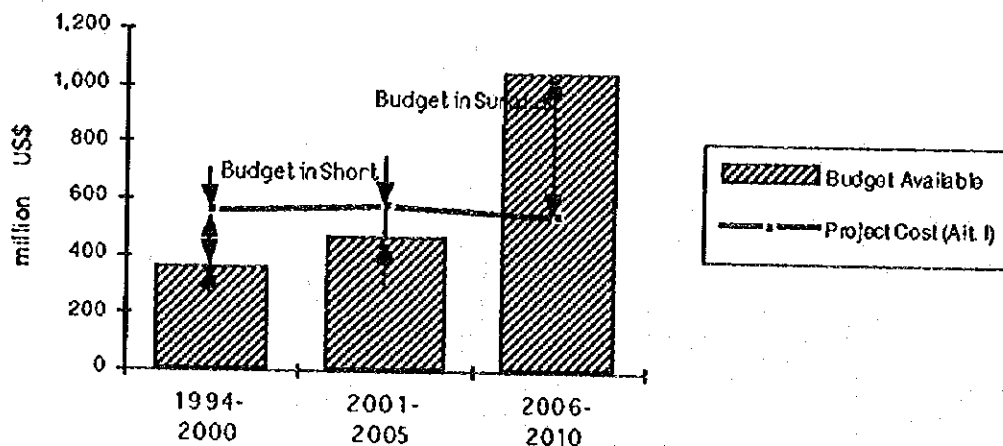


Figure 3.2.3-3 Actual Investment Cost and Budget Available

3.3 Spatial Development Plan

3.3.1 Industrial Development Plan

There is a various industrial development plans. Some are valid, and others at the stage of conceptual plan. Here the existing and planned 39 industrial estates and export processing zones are listed in Table 3.3-1 and shown in Figure 3.3-1. All are located in the three areas: North triangle area (centered in Hanoi), Central area (centered in Da Nang), and South area (centered in Ho Chi Min City). This suggests that the development potential in the future are large in these cores. Those are incorporated in reckoning regional development potentials.

An establishment of industrial estates generates a traffic flow of input and output materials. However, many of the industrial estate plan are at the stage of conceptual planning and there are many unknown factors on (1) whether they are really established, (2) whether a planned field of industry will be advanced or not, and (3) whether a planned volume will be produced or not.

Furthermore, industrial development plan includes many export processing zones that has smaller effect on the regional economy compared with the ordinal industrial estate.

Therefore, magnitude of the industrial development plan in the vietnam has a pressure to push the provincial GDP upward a bit, no tso much.

3.3.2 Infrastructure Development Plan

(1) Road Development Plan

National road 1 (Lang Son - Hanoi - Da Nang - HCMC - Can Tho) runs parallel to the North-South Railway Line. And its improvement plan has covered almost 1,422 kilometers, more than 80% of the section between Hanoi and Ho Chi Min City by 1997.

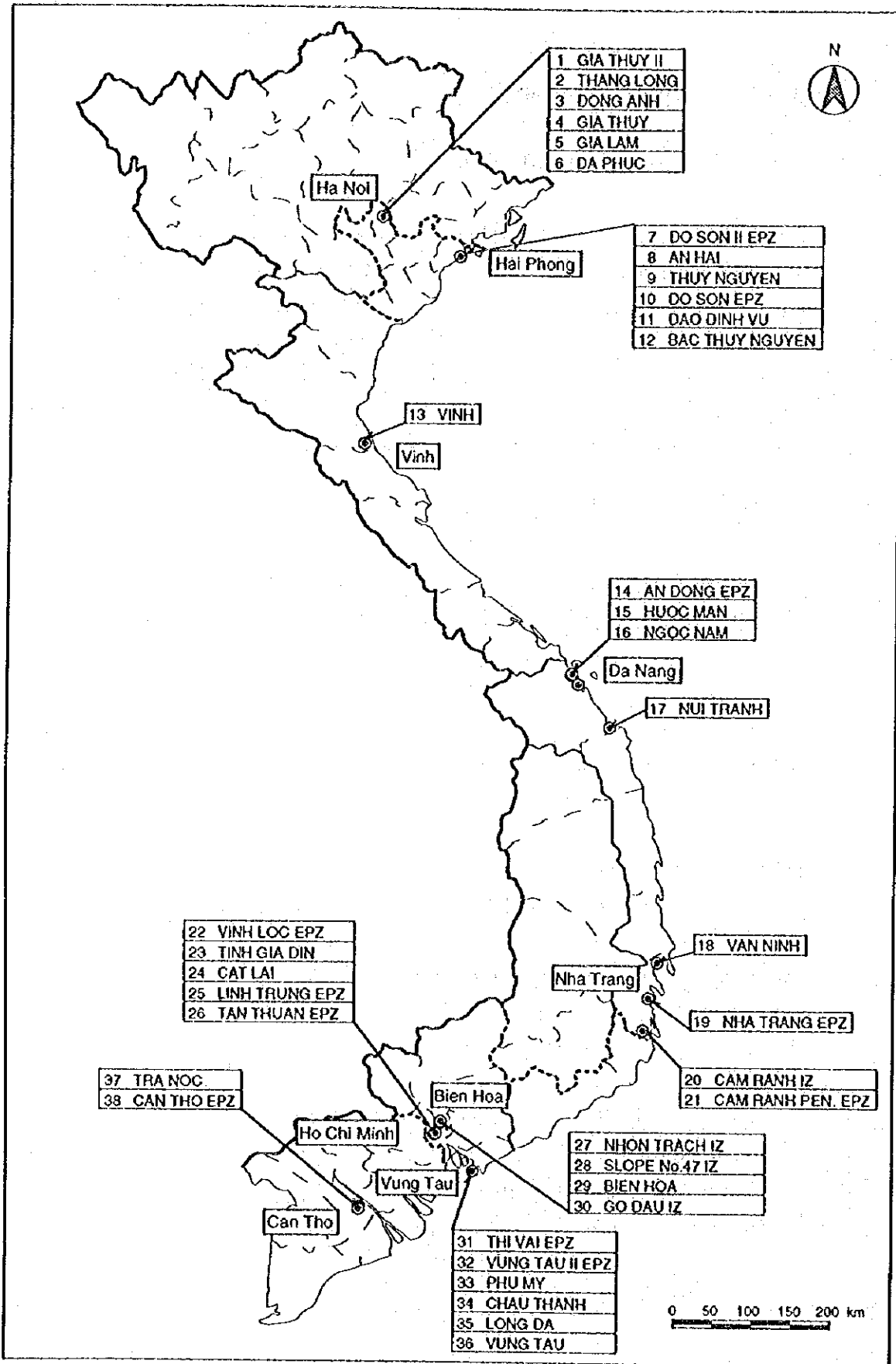


Figure 3.3-1 Location of Existing and Planned Industrial Estate and Export Processing zones in Vietnam

Table 3.3-1 List of Industrial Estates and Export Processing Zones

Region	City	No.	Name of Industrial Estate	Basic Materials Type	Machining Type	Local Resources Type	Urban Type	Heavy Industry Type	Light Industry Type	Attached to Port Type	Attached to Airport Type	Roads and Railways	Development Area (ha)	Remarks (★: Proposed, ◇: New, ▽: Started)
North Triangle Region	Ha Noi	1	Gia Thuy II		⊙		⊙		⊙		⊙	⊙	350	★
		2	Thang Long		⊙		⊙		⊙		⊙	⊙	350	★
		3	Dong Anh		⊙		⊙		⊙		⊙	⊙	350	★
		4	Gia Thuy		⊙		⊙		⊙		⊙	⊙	150	◇ (Taiwan JV)
		5	Gia Lam		⊙		⊙		⊙		⊙	⊙	80	▽ (S.Korea JV)
		6	Da Phuc		⊙		⊙		⊙		⊙	⊙	150	◇ (Malaysia)
	Hai Phong	7	Do Son II EPZ	⊙	⊙			⊙		⊙		⊙	240	★
		8	An Hai	⊙	⊙			⊙		⊙		⊙	150	★
		9	Thuy Nguyen		⊙	⊙		⊙		⊙		⊙	150	★
		10	Do Son EPZ		⊙		⊙		⊙		⊙	⊙	980	▽ (H.K. & S.Africa JV)
		11	Dao Dinh Vu		⊙		⊙		⊙		⊙	⊙	1,200	◇ (USA JV)
		12	Bac Thuy Nguyen	⊙		⊙		⊙		⊙		⊙	600	◇ (Vietnam)
	Vinh	13	Vinh	⊙	⊙			⊙		⊙		⊙	300	★
Central Develop't Region	Da Nang	14	An Dong EPZ	⊙	⊙			⊙		⊙		⊙	120	◇ (Malaysia JV)
		15	Huoc Man		⊙		⊙		⊙		⊙	⊙	150	◇ (Vietnam)
		16	Ngoc Nam		⊙		⊙		⊙		⊙	⊙	2,000	◇ (Vietnam)
	Nui Trang	17	Nui Tranh	⊙		⊙		⊙		⊙		⊙	200	★
	Van Ninh	18	Van Ninh	⊙		⊙		⊙		⊙		⊙	200	★
	Nha Trang	19	Nha Trang EPZ	⊙		⊙		⊙		⊙		⊙	150	★
	Cam Ranh	20	Cam Ranh	⊙		⊙		⊙		⊙		⊙	200	★
21		Cam Ranh P. EPZ	⊙		⊙		⊙		⊙		⊙	500	★	
South Triangle Region	Ho Chi Minh	22	Vinh Loc EPZ		⊙		⊙		⊙		⊙	⊙	500	★
		23	Tinh Gia Din		⊙		⊙		⊙		⊙	⊙	360	★
		24	Cat Lai		⊙		⊙		⊙		⊙	⊙	300	★
		25	Linh Trung EPZ		⊙		⊙		⊙		⊙	⊙	60	▽ (Singapore JV)
		26	Tan Thuan EPZ		⊙		⊙		⊙		⊙	⊙	300	▽ (Taiwan JV)
		Binh Hoa	27	Nhon Trach	⊙		⊙		⊙		⊙		⊙	2,000
	28		Slope No.47		⊙		⊙		⊙		⊙	⊙	1,000	◇ (Vietnam)
	29		Bien Hoa		⊙		⊙		⊙		⊙	⊙	700	◇ (Vietnam)
	30		Go Dau		⊙		⊙		⊙		⊙	⊙	400	▽ (Taiwan JV)
	Vung Tau	31	Thi Vai EPZ	⊙	⊙			⊙		⊙		⊙	360	★
32		Vung Tau EPZ	⊙	⊙			⊙		⊙		⊙	100	★	
33		Phu My		⊙		⊙		⊙		⊙	⊙	500	◇ (Vietnam)	
34		Chau Thanh	⊙		⊙		⊙		⊙		⊙	300	◇ (Vietnam)	
35		Long Da		⊙		⊙		⊙		⊙	⊙	300	◇ (Vietnam)	
36		Vung Tau		⊙		⊙		⊙		⊙	⊙	200	▽ (Malaysia JV)	
Mekong D Region	Can Tho	37	Tra Noc		⊙	⊙		⊙		⊙	⊙	⊙	150	▽ (Vietnam)
		38	Can Tho EPZ		⊙	⊙		⊙		⊙	⊙	⊙	300	★▽ (Vietnam)
Total of ⊙ Marks				7	17	8	5	13	24	19	3	15	16,400	

(Proposed 7,060)

Note: ⊙ : Best Function, ○ : Good Function

Table 3.3-2 Improvement Plan of National Road 1

	Section	Kilometer	No. of Lane	Completion Date	Fund
Section of D/D completed					
1.	Hanoi - Vinh	184 - 463	2	End of 1997	IBRD loan
2.	HCMC - Can tho	1915 - 2055	2	End of 1997	IBRD loan
3.	Nha Trang - HCMC	1451 - 1900	2	End of 1997	ADB loan
Section of F/S offered					
4.	Dong Ha - Nha Trang	757 - 1451	2	n.a.	ADB loan
5.	Lang Son - Hanoi	0 - 184	2	n.a.	ADB loan

- Note:
- Two (2) lanes with 7.5 meter in width.
 - Bicycle lanes attached on both sides.
 - n.a. indicates "information not available."
 - Design speed = 80 km/h.

(2) Port and Airport Development Plan

Figure 3.3-2 indicates the location of ports and airports with aviation routes. And Improvement plan of each sector are summarized in Tables 3.3-3 and 3.3-3.

As for ports, the basic direction according to the economic development are:

- Combination of an improvement of Hai Phong port (current capacity 4.6 million tons/year) and constructing Cai Lan port.
- Combination of an improvement of Saigon port (current capacity 4.6 million tons/year) and constructing the new Ti Bai/Vung Tau port.
- Improving port in the central region.

In regards to airport and airlines, rapid internationalization and the importance of these facilities as a domestic means of transportation for the viewpoint of tourism and business activities has brought about the realization that improving airports, and nurturing and strengthening the air transport industry is an urgent and important matter. The basic direction is to modernize the three international airport, introduce new aircraft for international flights, and strengthen the functions related to domestic flights.

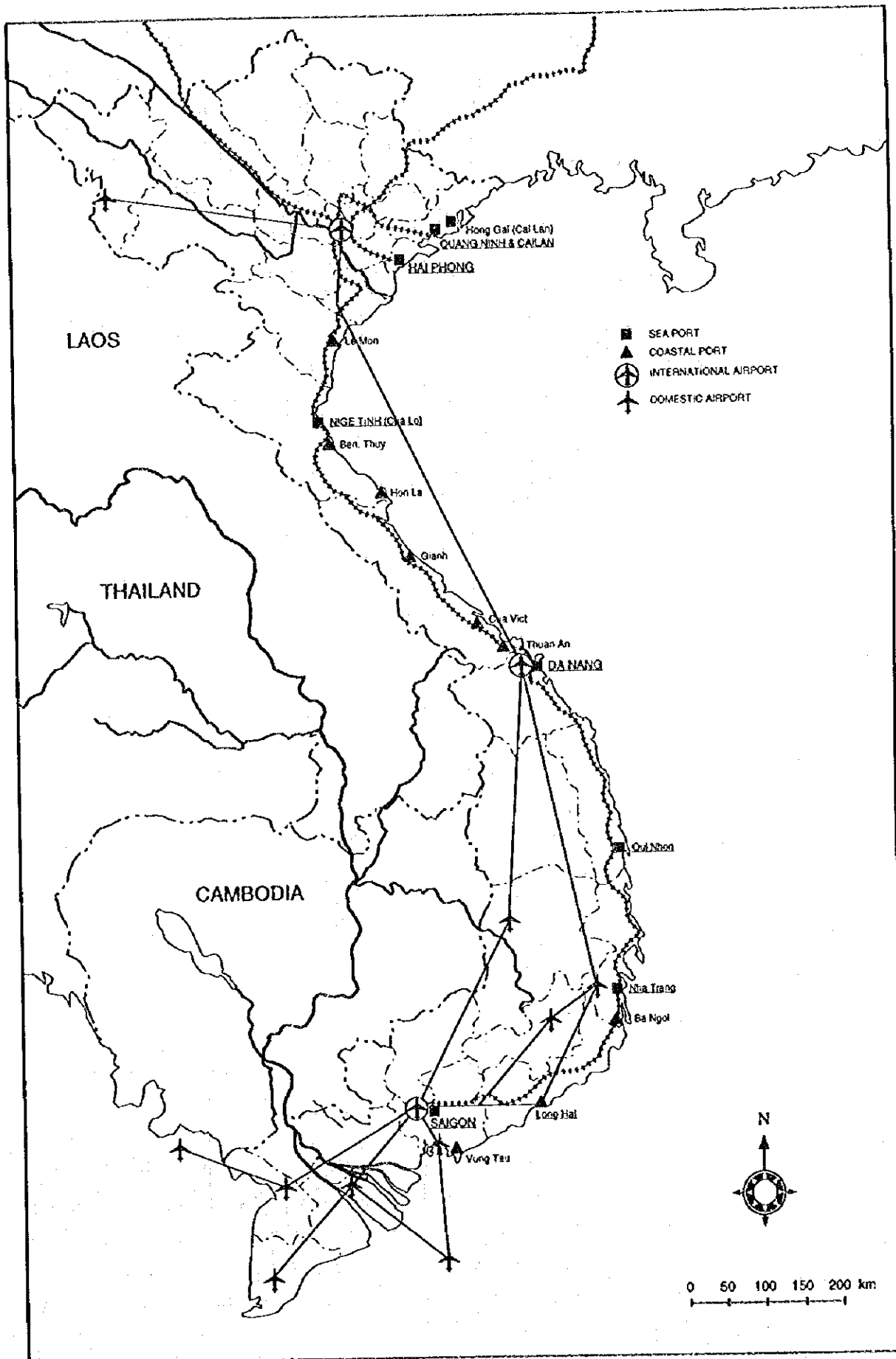


Figure 3.3-2 Location of Existing and Planned Port and Airport in Vietnam

Table 3.3-3 Port and Marine Shipping Project Situation

1	Improvement of Hai Phong Port equipment	(1994-97, US \$40 million)
2	Construction of Cai Lan Port	(1994-, self-procure) (1993-94, study in progress)
3	<ul style="list-style-type: none"> - Improvement of Saigon Port - Improvement of navigation support system - Improvement of current equipment, container terminal, etc. - Construction of a new berth at Khanh Hoi - Improvement of facilities in the Than Thuan area 	<ul style="list-style-type: none"> (1992-) (1991-, self-procure) (1991-, self-procure)
4	Improvement of Quy Nhon port Construction of a 170 m x 30 m pier (for a 1,000 DWT ship)	(1994-93, self-procure)

Table 3.3-4 Airport and Airline Projects Situation

1	Improving the capability of the operation, communications, electrical and mechanical general systems at major airports.	
2	Improving the capability of the airline training center	
3	Subsector master plan	
4	Improvement of airline weather service for international and domestic flights	(1990-92, US\$0.7 mill. UNDP)
5	Organizing repair work business	(1990-91, US\$1.2 million, Soviet Union)

(3) Tourism Development Plan

Tourism is one of the focused section to be boosted, and this has a significant effect to generate a trip. Some are expected to use the railway.

Those areas are Ha Long Bay, Da Nang, Nha Trang and so on. All have some tourism facilities and further investment are expected. But at present, a planned scale and transportation routes are not so well developed for the frequent and massive influx of tourists. Railway can play a role in providing a convenient access modes to those tourism resources. This possibility is also incorporated in the spatial planning in Vietnam.

3.4 Regional Setting

3.4.1 Strategic Area

Six strategic areas are indicated as integrated transportation development units in the " Guidance to Consolidate and Develop the Communications and Transportation Sector from Today until the Year 2000 " which was published by the Ministry of Communications and Transportation in 1993. The guidance provides potential / required transportation development projects by each strategic area with an integrated manner as well as an overview of each area's socio-economic characteristics and development potentials. The six areas are named as follows;

- I. Capital of Ha Noi
- II. Northern Corridor of the Northern Region
- III. The Northern Mountainous Region
- IV. The Central Viet Nam Economic Zone
- V. Ho Chi Minh City - Dong Nai - Vung Tau Region, and
- VI. The Southwestern Delta

In the following section, (1) Development Objectives in Transportation Sector, and (2) Potential and/or Required Railway Sector's Development will be summarized by the each strategic area. Descriptions are obtained from the above mentioned guidance. It should be noted that the recommended projects would not necessarily same as the JICA team's recommendation. However, the team will fully take them into consideration during a Master Plan formulation process.

- I. Capital of Ha Noi

(1) Development Objectives

In order to reach the level of other developing countries' capital cities in terms of transportation infrastructure, reconstruction and further development of

transportation network system should be given priority. In this context, the development objectives for the coming decade are realization of the main road axes of the capital's transportation network system and development of the organization and restoration of the city's public transportation system.

(2) Railway Sector's Development

Meet the demand with an integrated manner

Railway systems in Ha Noi are to be redesigned in order to satisfy cargo and passenger transport demand and to introduce compatible development rules common to other big cities.

Gia Lam - Long Bien - Giap Bat Axis

Any plan should be designed with sparing sufficient land space for the construction of the ground railway from Gia Lam to Long Bien Bridge to Giap Bat, which creates a principal axis of the capital. This line is expected to be a part of public transportation networks of the capital.

Interconnection between Ha Noi and its satellite cities

The above mentioned ground railway axis should be connected to other railway axes. It is expected to create effective transportation means between the capital of Ha Noi and its satellite cities like Phu Ly, Nam Dinh, Viet Tri, Phu Tho, Da Phuc, Thai Nguyen, Bac Ninh, Bac Giang, Pha Lai, Quang Ninh, Hai Dong, Hai Phong etc.. Simultaneously, these axes are expected to be of help to realize the strategic intent to spread the population, and to interconnect the capital with industrial corridor. The recommended projects being based upon the existing railway facilities, priority concern should be given to those projects and sooner investment is desirable.

Dong Anh - Thang Long Bridge - Viet Hung

This line is recognized as a peripheral railroad at present. However, improvement of this line is necessary because it will be a first transportation means of the cargo as well as a part of the passenger on the West - South axis. A priority section is to be the line from Bo Ho to So Ha Dong crossroads. Besides, land should also be reserved for the expected parallel tracks.

II. Northern Corridor of the Northern Region

(1) Development Objectives

The center of this corridor is a triangle formed by Ha Noi, Hai Phong and Quang Ninh, which is regarded as the main gate of the entire northern region and have some extended influence up to the southern part of China and northern part of Laos.

In this context, infrastructure development in this region should be sufficient and coherent to the expansion of its economic activities.

(2) Railway Sector's Development

Yen Vien(or Bac Ninh) - Pha Lai

This line will provide a short cut against the Cai Lan - Lao Cai line.

Ha Noi - Hai Phong

Improvement of this line is necessary.

If these two projects are correctly and coherently completed, transportation capacity of the two lines could possibly reach 6.5 million ton per year by the year 2000.

III. The Northern Mountainous Region

(1) Development Objectives

This region is formed by the large uppermost area of Vietnam. Due to this special topographic nature, transportation development of the region has been concentrated onto road transportation. The objective for the next 10 years would be to improve maintenance of the existing structure of the road network.

(2) Railway Sector's Development

No project would be recommended for the railway sector.

IV. The Central Viet Nam Economic Zone

(1) Development Objectives

This economic zone is formed by a large area spreading from Thanh Hoa to Binh Thuan, within which two important region, namely, Tay Nguyen and Quang Nam are included. In order to develop and integrate this corridor effectively, three transport facilities, those are the sea ports locating along the coast, the Thong Nhat railways, and National 1A road, are necessary to be coordinated. As Da Nang is a important traffic node at which the Tien Sa Harbor, the Da Nang International Airport, the Thong Nhat Railways and the National 1A, 14 are crossing, it will become a center of the zone.

(2) Railway Sector's Development

- A study to renovate the railway from Thap Cham to Da Lat is necessary.
- In the case that the bauxite exploitation program is started, a specialized port for export and a special utility railway up to Bao Loc, Lam Dong would be necessary.

V. Ho Chi Minh City - Dong Nai - Vung Tau Region

(1) Development Objectives

HCM, Bien Hoa and Vung Tau Triangle

This development region is the most vital economic zone of the country, within which an industrially concentrated triangle area is formed by HCM, Bien Hoa and Vung Tau. Among the three cities, the HCM city is to become a big financial, economic center and a tourist destination of South East Asia. Therefore, any works related to infrastructure development in the region must be consolidated and coherent in order to satisfy the needs of not only the 5 million people of the city but also millions of people from outside of the city including tourist and business people from abroad.

First, in order to overcome the current urban transport problems in the city, a reasonable classification of transport mode and traffic management are necessary. For example, as all types of vehicle are allowed to use every road of the city at present, cargo transport vehicles (heavy vehicles) create the cause of chaos.

(2) Railway Sector's Development

Railway transportation is very important to sustain especially such the big city's life of Ho Chi Minh. Two major projects are addressed in the region. First, a high speed passenger transport means between the city and the neighbouring towns is necessary. A high speed passenger railway transport from the Bien Hoa industrial area to the center of the city, using the existing ground railway, is to be a principal railway axis of the region. Second, creating principal intersections for the peripheral axes is expected.

VI. The Southwestern Delta

(1) Development Objectives

This area comprises the Long An - Dong Thap and Long Xuyen square region, the west of Hau Giang River. Due to its natural endowment, the region will become one of the richest agricultural and industrial areas of the country.

The transportation and communication infrastructure of the region is required not only to meet the regional needs but also contribute to making the most of the region's natural and topographical advantages. Practically, to exploit and develop fluvial network of the rivers and the canals is essential.

(2) Railway Sector's Development

No railway project is addressed.

3.4.2 Ha Noi - Ho Chi Minh Railway and Regional Clusters

As far as recognizing that transportation is a service system which supports socio-economic activities between different places, to recognize spatial structure of linkage between the places is essential for an advanced transportation plan - making process.

Person and Cargo OD matrices directly indicate amount of movement between traffic analysis zones. Inter - regional input - output table indicates strongness of linkage between regions in terms of amount of commodity transaction. Thus, such the information in the form of matrix provides valuable information to

transportation planners in identifying important links to be connected / improved / strengthened.

In addition to such the information, to recognize distribution pattern and scale of regional cluster is important because a regional cluster is an unit within which transportation facilities should be formulated with an integrated manner in order to support intra-regional socio-economic activities effectively and efficiently. Besides, distribution pattern of regional center suggests trunk lines which consist of some high standard transportation means between regional centers in order to support inter-regional socio-economic activities.

In this context, a brief explanation on "regional cluster" will be given in the following section, then, some regional clusters identified in 2010 will be presented.

(1) Basic idea for identifying "Regional Cluster"

An ideal spatial transportation formulation process would be distinguished as the following steps.

1) Scattered Cities

At the beginning stage of the transportation formulation process, a lot of small / medium scale cities are scattered over a country. Hinterlands of the cities are still spatially limited, inter-linkage between the cities is not strong. Production activities are rather self-support, in other words, the cities have not specialize yet in specific productions which have relative advantages.

2) Penetrating Link

Some of the small cities having relative advantage in some production and/or rather large market, penetrating links are developed from a gateway such as a port to such the cities.

These links provide expansion of economy both for the cities and of the gateway, then the cities begin to play a role of center for relatively small cities around them.

Next, feeder links between the cities and the small cities around them are formulated, expanding the hinterland of the cities in terms of transaction area.

3) Interconnection

Some feeder links would reach other center cities. Such the feeder links might play a role of interconnection between the center cities, which cities form a region. Establishment of the interconnections would make the cities within the region specialize in each city's relatively advantageous production and cause competition among cities in expanding each market. Some of the cities would enjoy economies of agglomeration, becoming principal regional centers. At this stage regional clusters as well as regional centers would be identified.

4) Trunk Line (high priority linkage between regional clusters)

Regional center cities require higher level of transport service between the regional centers as their scale of economy expand. Some interconnecting and penetrating links are expected to carry more heavy traffic. These lines would form trunk lines between regional clusters.

(2) Regional Clustering at the year 2010

The Ha Noi - Ho Chi Minh Railway is expected to play the role of the above mentioned "interconnection" and "trunk line".

Ha Noi and Ho Chi Minh are recognized as the two principal regional centers of the northern and southern part of Vietnamese economy at present. Da Nang is expected to be the third regional center of central part of Viet Nam in the future. In the following section, summarizing a method of regional clustering, likely regional clusters derived from population and GDP are presented.

1) Clustering Procedure

As discussed above, a regional cluster is formed by cities being interconnected each other. Future interconnections are guided by expected intra- and inter-transactions of people and commodities. The magnitude of transactions, being considered that it is proportional to scale of socio-economy of the cities and in inverse proportion to distances between them, it could be estimated by using an analogy of a gravity model.

A level of expected transaction between two places is explained as a gravity model of the form:

$$T_{ij} = G_i * G_j / d_{ij}^2$$

where T_{ij} : transaction between zone i and zone j,

G_i : Gross Domestic Product or Population of zone i,

d_{ij} : Disance between zone i and zone j.

note : zoning system here is same as the traffic zone system utilized in chapter 4 and chapter 6(Demand Forecast)

Converting the average value of T_{ij} to 1, transaction level is classified into the following range.

In the case of using GDP for G_i ;

Primary Level: $1 < T_{ij}$ (greater than the average)

Secondary Level: $0.3710 < T_{ij} < 1$

Ha Noi - Da Nang transactions has a minimum value in the secondary level. Ho Chi Minh - Da Nang transaction value is in the secondary level.

Tertialy Level: $0.2315 < T_{ij} < 0.3710$

Ha Noi - Ho Chi Minh transaction has a minimum value in the thertialy level.

Forth Level: $T_{ij} < 0.2315$

In the case of using population size for G_i

Primary Level: $1 < T_{ij}$ (greater than the average)

Secondary Level: $0.081 < T_{ij} < 1$

Ha Noi - Da Nang transactions has a minimum value in the secondary level. Ho Chi Minh - Da Nang transaction value is in the secondary level.

Tertiary Level: $0.059 < T_{ij} < 0.081$

Ha Noi - Ho Chi Minh transaction has a minimum value in the tertiary level.

Fourth Level: $T_{ij} < 0.059$

Since zonal pairs at the primary level of transaction have strong expected inter-transactions (greater than the average), they form a primary regional cluster. At the same time, the city which has the biggest GDP or population is recognized as a regional center. A regional cluster identified at the secondary level of transaction, which is defined less than the average but not less than Ha Noi - Da Nang transaction, covers some primary regional clusters. Within this regional cluster of secondary level or more, trunk lines development is required between the regional centers.

2) Identified Regional Cluster

GDP-based Regional Clusters

As illustrated in Fig. 3-4-1, following five primary clusters are identified in the year 2010.

I) Red River Delta Economic Zone

The regional center of this zone is the capital of Ha Noi. Hai Phong is a sub-center of the zone with an international gateway. Hai Duong, Ha Tay, and Nam Dinh are the other sub-centers of this zone. These cities are necessary to be connected effectively and efficiently with the first priority.

II) Northern Coast Economic Corridor

This economic corridor is formed by the three provinces: Nghe An, Ha Tinh, and Quang Binh. Vinh in the Nghe An province is the regional center of this zone even though it is located at the northern end of the region.

III) Central Coast Economic Corridor

This economic corridor is formed by the four coastal provinces; Quang Tri, Thua Thien Hue, Quang Nam Da Nang, and Quang Ngai. Da nang is the regional center, which has an airport and a seaport as important international gateways.

IV) Western Highlands Economic Zone

This economic zone is rather small in comparison to other regional clusters and the only landlocked zone. It, however, has an inland international interface to Cambodia.

V) Southern Economic Corridor

This economic corridor is the largest regional cluster spreading Minh Hai to Binh Dinh. Ho Chi Minh is the regional center with an airport and a seaport as international interfaces. Some regional sub-centers are identified around HCM, those are Bien Hoa, Long Xuyen, Can Tho. The other sub-centers are Quy Nhon and Nha Trang. This region is possibly divided into smaller subregions, however, it could be recognized as a large economic unit because of its scale of economy.

Region / Province	GDP (MILL. US \$)
TOTAL	22.717
I Northern Mountain	6.580
1 Ha Giang	154
2 Tuyen Quang	215
3 Cao Bang	202
4 Lang Son	285
5 Lai Chau	209
6 Lao Cai	207
7 Yen Bai	393
8 Bac Thai	723
9 Son La	338
10 Hoa Binh	361
11 Vinh Phu	1.097
12 Ha Bac	958
13 Quang Ninh	1.438
II Red River Delta	16.756
14 Ha Noi	5.450
15 Hai Phong	3.595
16 Hai Hung	2.150
17 Ha Tay	1.748
18 Thai Binh	1.031
19 Nam Ha	2.195
20 Ninh Binh	587
III North Coastal	5.666
21 Thanh Hoa	1.808
22 Nghe An	1.300
23 Ha Tinh	1.040
24 Quang Binh	410
25 Quang Tri	438
26 Thua Thien-Hue	870
IV South Coastal	10.670
27 Quang Nam-Da Nang	3.909
28 Quang Ngai	672
29 Binh Dinh	1.481
30 Phu Yen	763
31 Khanh Hoa	1.844
32 Ninh Thuan	936
33 Binh Thuan	1.065
V Western Highlands	3.657
34 Gia Lai	600
35 Kon Tum	502
36 Duc Lac	1.308
37 Lam Dong	1.247
VI Eastern Nam Bo	14.334
38 TP Ho Chi Minh	8.528
39 Song Be	589
40 Tay Ninh	753
41 Dong Nai	4.213
42 Ba Ria-Vung Tau	251
VII Mekong River Delta	14.854
43 Long An	1.189
44 Dong Thap	1.105
45 An Giang	2.178
46 Tien Giang	1.303
47 Ben Tre	703
48 Vinh Long	804
49 Tra Vinh	479
50 Can Tho	2.540
51 Soc Trang	1.072
52 Kien Giang	1.596
53 Minh Hai	1.885

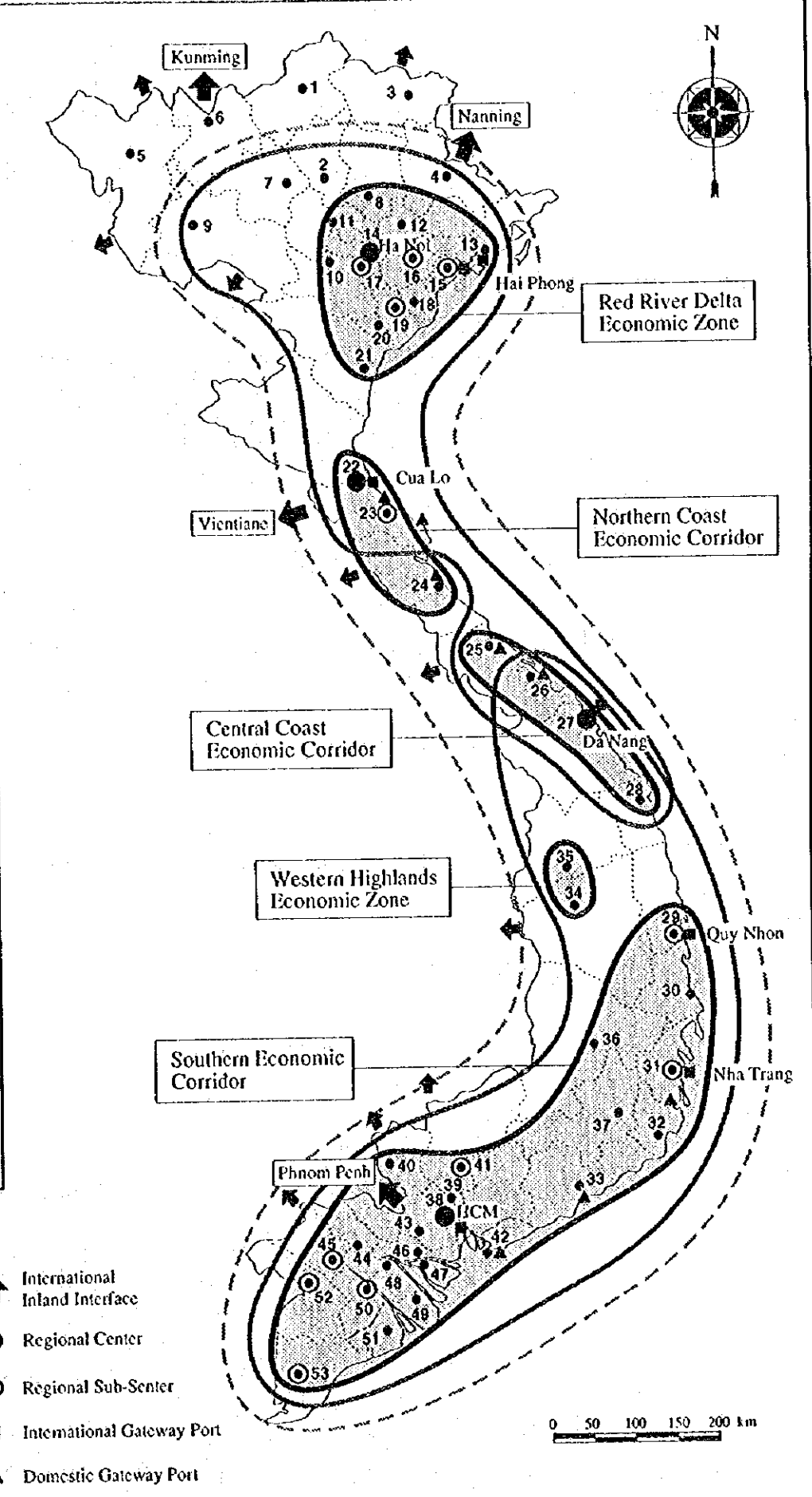


Figure 3 - 4 - 1 Regional Clustering by GDP

Population-based Regional Clusters

As illustrated in Fig. 3-4-2, following five primary population clusters are identified in the year 2010.

I) Northern Population Corridor

A long population corridor is formed along the northern coast. The northern end of this corridor is the Red River Delta which is relatively densely inhabited. This population corridor covers three GDP-based regional clusters: Red River Delta Economic Zone, Northern Coast Economic Corridor and Central Coast Economic Corridor.

II) South Coastal Population Cluster(I)

Binh Dinh and Phu Yen provinces form a small population cluster. According to the population size, Quy Nhon is regarded as a regional center.

III) South Coastal Population Cluster(II)

This population cluster is formed by the four provinces : Khanh Hoa, Ninh Thuan, Dac Lac, Lam Dong. It is located at the northern edge of the Southern Economic Corridor.

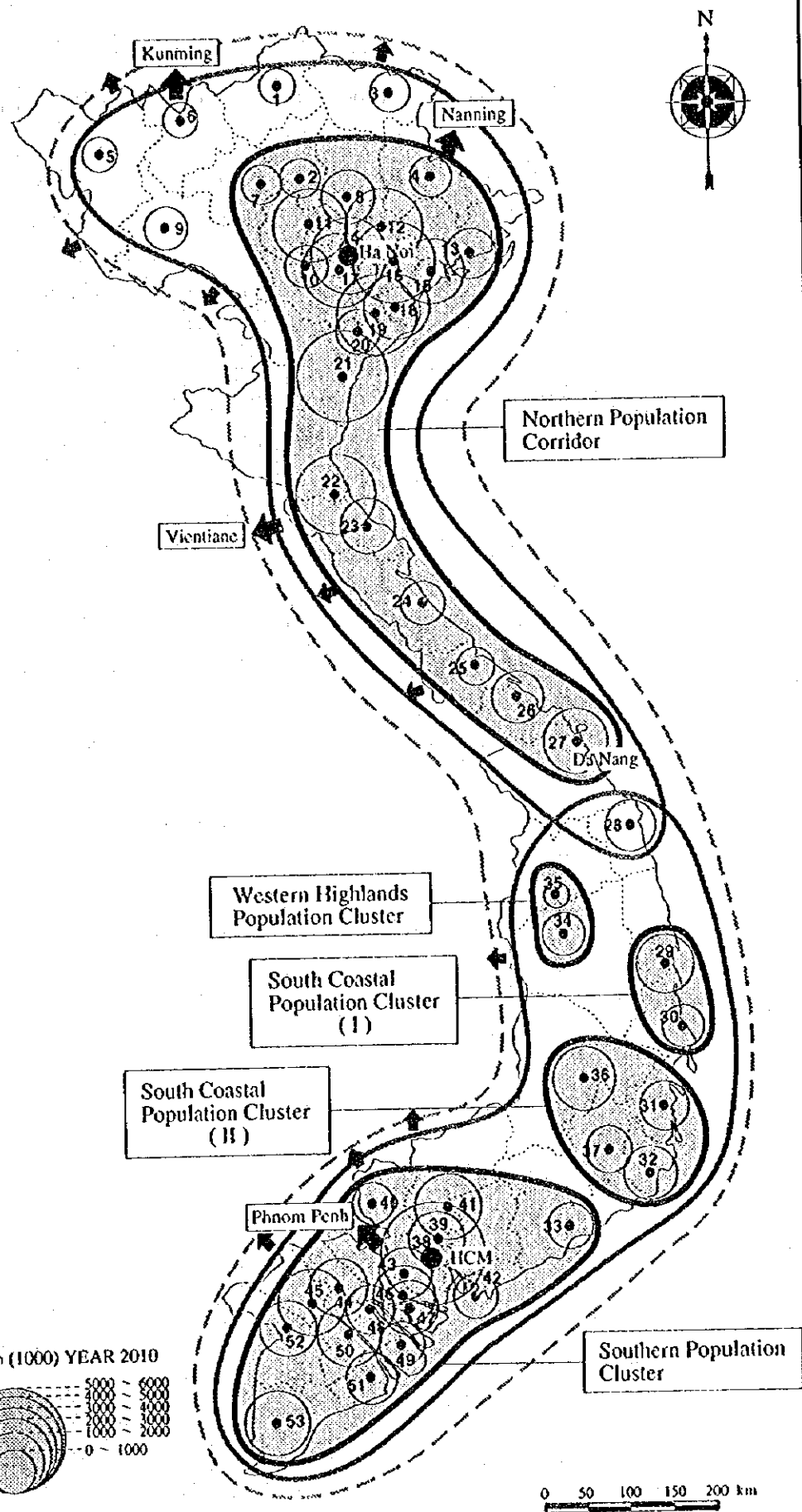
IV) Western Highlands Population Cluster

This cluster is as same as the GDP-based cluster presented above.

V) Southern Population Cluster

This cluster is formed in the Mekong Delta with relatively high population density.

Region / Province	Population (Thousand)
TOTAL	95,000
I Northern Mountain	16,496
1 Ha Giang	674
2 Tuyen Quang	824
3 Cao Bang	820
4 Lang Son	189
5 Lai Chau	652
6 Lao Cai	689
7 Yen Bai	866
8 Bac Thai	1,571
9 Son La	1,015
10 Hoa Binh	956
11 Vinh Phu	2,967
12 Ha Bac	3,216
13 Quang Ninh	1,357
II Red River Delta	18,907
14 Ha Noi	3,128
15 Hai Phong	2,346
16 Hai Hung	3,574
17 Ha Tay	3,016
18 Thai Binh	2,311
19 Nam Ha	3,436
20 Ninh Binh	1,096
III North Coastal	12,887
21 Thanh Hoa	4,501
22 Nghe An	3,436
23 Ha Tinh	1,715
24 Quang Binh	1,028
25 Quang Tri	762
26 Thua Thien-Hue	1,445
IV South Coastal	10,574
27 Quang Nam-Da Nang	2,268
28 Quang Ngai	1,478
29 Binh Dinh	1,823
30 Phu Yen	936
31 Khanh Hoa	1,304
32 Ninh Thuan	1,593
33 Binh Thuan	1,172
V Western Highlands	4,866
34 Gia Lai	1,031
35 Kon Tum	371
36 Dak Lac	2,251
37 Lam Dong	1,213
VI Eastern Nam Bo	11,903
38 TP Ho Chi Minh	5,728
39 Song Do	1,680
40 Tay Ninh	962
41 Dong Nai	2,411
42 Ba Ria-Vung Tau	1,122
VII Mekong River Delta	19,367
43 Long An	1,475
44 Dong Thap	1,841
45 An Giang	2,354
46 Tien Giang	2,017
47 Ben Tre	1,561
48 Vinh Long	1,274
49 Tra Vinh	1,119
50 Can Tho	2,324
51 Soc Trang	1,449
52 Kien Giang	1,721
53 Minh Hai	2,229



LEGEND

- Regional Cluster of Primary Level
- Regional Cluster of Secondary Level
- Regional Cluster of Tertiary Level
- International Inland Interface

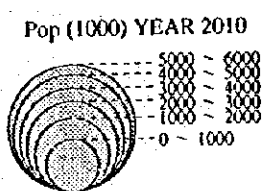


Figure 3 - 4 - 2 Regional Clustering by Population Size

(3) Recommended Concepts to Formulation of a N-S Railway Master Plan

As illustrated in Figure 3-4-3, a spatial structure derived through the regional clustering procedure is rather simple due to its geographic form called "S-shape". Since all the primary regional clusters are on a line, each regional cluster should be connected to the next cluster like a train by effective and efficient transportation means at the last stage. However, the overlaid primary regional clusters presented in Figure 3-4-3 suggests that northern part and southern part of Viet Nam are possibly considered separately, and Da Nang would be regarded as a point of interface between them. In this context, the following considerations to reaching the final status are suggested.

First, interconnections between cities within each cluster must be strengthened in order to encourage regional economy sufficiently enough for reaching the level that requires trunk line development between the regional clusters. The population-based clusters in the southern part and the GDP-based clusters in the northern part are rather small (radius is less than 200km), a major interconnection means would not be a railway system. On the contrary, as the "Northern Population Corridor" and the "Southern Economic Corridor" are spreading over 800 km, a railway system is likely to be required as one of important transportation facilities to support interconnecting activities within each regional cluster.

Second, the above mentioned two interconnection lines would be connected at Da Nang, forming a trunk line and an integrated railway system passing through whole Viet Nam.

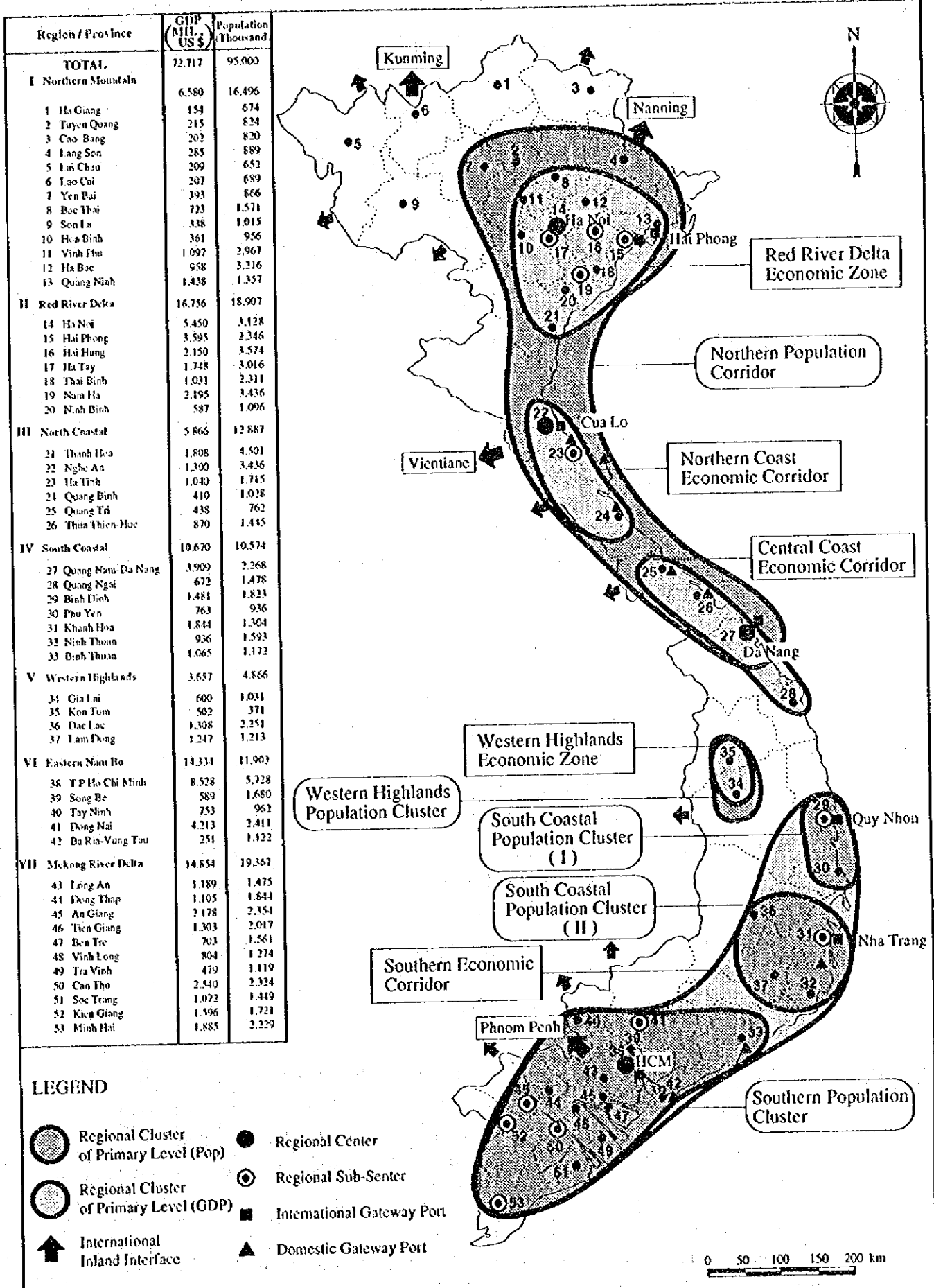


Figure 3 - 4 - 3 Overlaid Primary Regional Clusters

3.5 Review of Relevant Study Reports

In conducting the present Study, every effort was made to examine the following four earlier study reports which are closely related to the issues of the present Study and to incorporate the findings of these reports where they are relevant and useful for the present Study. In particular, the socioeconomic framework used for JICA's Master Plan Study on Transport Development in the Northern Part of Vietnam was also adopted for the present Study.

- (1) Master Plan Study on Transport Development in the Northern Part of Vietnam (Northern Transport M/P)
- (2) National Transportation Sector Review (UNDP)
- (3) Urgent Rehabilitation Project for Railway Bridges Between Hanoi and Ho Chi Minh (OECF) (SAPROF)
- (4) Feasibility Study Report on Cai Lan Port Construction Project (JICA) (Port Cai Lan F/S)

Report (1) relates to the formulation of the Master Plan for an integrated transport system in northern Vietnam with a target year of 2010, covering railway, road and river transportation and port development, and was conducted between June, 1993 and June, 1994. In regard to railway improvement, the Master Plan describes the estimated demand for each line in 2000 and 2010, the characteristics of each line and necessary improvement projects.

Report (2) was conducted between May, 1990 and April, 1992 by BECOM, a French consultancy firm, with UNDP funding. It reviews all available modes of transport in Vietnam (railway, road, air, river, ports and coastal shipping) and makes recommendations in regard to the institutional and investment planning aspects. These recommendations include an outline of the necessary improvement measures to be implemented by the year 2000 and conceptual measures to be implemented by the year 2010 for each sub-sector.

Report (3) describes the findings of the study of the SAPROF which was conducted in 1993. The study examined 18 major bridges between Hanoi and Ho Chi Minh, each of which requires urgent rehabilitation, in detail and decided the priority order for rehabilitation. The report puts forward a rehabilitation programme for 9 bridges requiring urgent rehabilitation with an OECF loan.

Report (4) compiles the findings of a feasibility study on the extension plan for Port Cai Lan which was conducted between December, 1993 and December, 1994. The study team firstly

established by the roles to be played by Port Cai Lan and Port Haiphong, put forward three alternative development plans for Port Cai Lan based on the long-term development concepts of Port Cai Lan, selected the optimum plan to prepare a short-term development plan upto the year 2000 and finally conducted a feasibility study on the short-term plan.

CHAPTER 4 OVERALL TRANSPORT SITUATIONS

4.1 Transport Network

The trunk transport network of Vietnam is shown on the map (Fig. 4.1-1). Major modes are represented by roads, railways, aviation, maritime, inland waterways. Passenger transportation volume and share of each mode are shown in Table 4.1-1. Cargo transportation volume and share of each mode are shown in Table 4.1-2. The characteristics and roles of each mode excluding railways are described in this section.

4.1.1 Roads

In Viet Nam, there is a well-developed road network of approximately 105,000km, of which 10 percent is paved. However the greater part of it needs repairs due to the lack of past investment.

The ratio of poor roads in the northern part of Vietnam is higher than that in the southern part. Roads have been playing a big role in the field of transportation by land.

It is estimated that according to the advance of economy, the volume of road traffic will increase rapidly. But existing roads will not be able to sufficiently deal with this traffic. Furthermore, a characteristic in Viet Nam is that bicycles and motorbikes run in disorder, which makes the problem more difficult.

If the traffic volume further increases near Hanoi and Ho Chi Minh, the capacities of main roads will become short.

The main tasks concerning roads are as follows:

- Improvement of total length of national road No. 1 including all big bridges. Development of cross-roads such as road No. 12, national roads Nos. 8, 9, 19 to link sea ports in the central part with Laos and Thailand.
- Improvement of road No. 14 in central Viet Nam.
- Improvement of national roads in the northern part of Viet Nam especially roads Nos. 5, 10, 18 in the essential areas. Construction of an expressway along road No. 18 to link Cai Lan deep sea port and Quang Ninh industrial area with Hanoi capital and Noi Bai International Airport. Improvement of road routes from Hanoi to different areas such as roads Nos. 2, 3, 6 and belt-roads surrounding Hanoi. Improvement of provincial roads in the mountainous provinces along the national border.

- **Improvement of national roads and development of roads in the southern part of Viet Nam leading deeply to Long Xuyen, Ca Mau Peninsula.**

First of all, improvement of national road No. 51 (Bien Hoa-Vung Tau). Rehabilitation and improvement of intra-urban roads and belt-roads of Ho Chi Minh City.

- **Promotion of traffic safety by the installation of traffic signals, etc.**

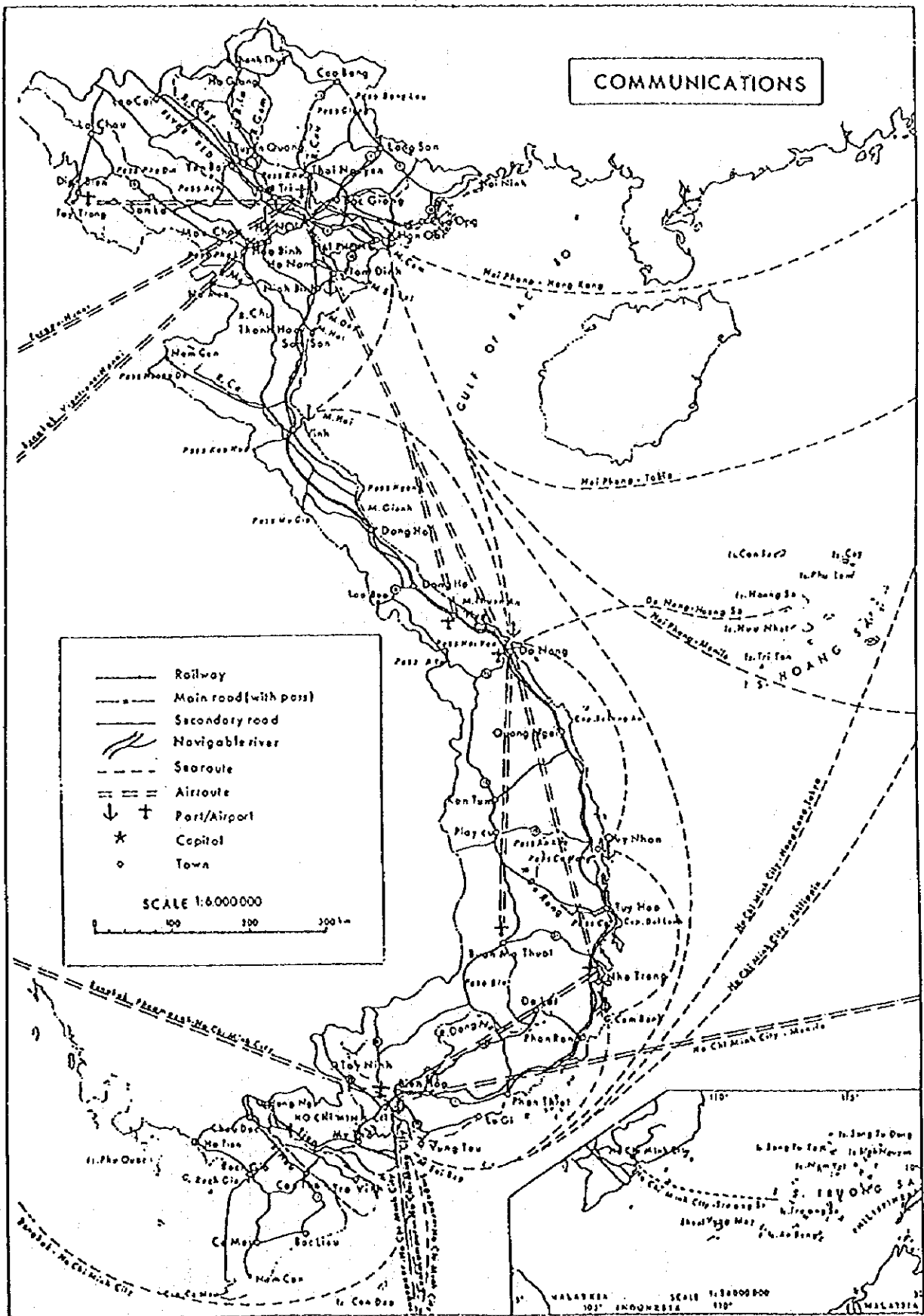


Fig. 4.1-1 Transport Networks in Viet Nam

Table 4.1-1 Passenger Transportation Volume

	1980			1986			1988			1989			1990			1991		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Railway	33.8 (7.6)	4487.7 (32.5)	133	21.1 (5.5)	4196.0 (27.9)	199	17.8 (4.3)	3505.5 (23.6)	197	11.7 (3.4)	2098.2 (18.5)	179	10.5 (2.0)	1913.0 (13.3)	182	9.5 (1.9)	1767.0 (13.1)	186
Road	370.7 (82.8)	8459.5 (61.3)	22	327.4 (84.3)	9743.9 (64.7)	29	360.6 (86.1)	10239.5 (68.8)	28	300.8 (86.2)	8208.3 (72.2)	27	414.2 (75.7)	10554.8 (73.2)	25	373.7 (74.1)	9955.4 (74.1)	27
Inland Water (River)	43.2 (9.6)	786.4 (5.7)	18	39.7 (10.2)	1053.0 (7.0)	26	40.3 (9.6)	1051.4 (7.1)	26	36.2 (10.3)	1013.7 (8.9)	28	121.8 (22.3)	1886.3 (13.1)	15	120.2 (23.8)	1677.4 (12.5)	14
Maritime	0.0 (0.0)	61.4 (0.5)	-	0.1 (0.0)	64.6 (0.4)	-	0.1 (0.0)	80.3 (0.5)	-	0.3 (0.1)	49.5 (0.4)	-	0.4 (0.0)	56.7 (0.4)	-	0.7 (0.2)	36.9 (0.3)	-
Total	447.7 (100.0)	13795.0 (100.0)	51	388.3 (100.0)	15057.5 (100.0)	38	418.8 (100.0)	14876.7 (100.0)	36	349.0 (100.0)	11369.7 (100.0)	33	547.2 (100.0)	14410.8 (100.0)	26	504.6 (100.0)	13436.7 (100.0)	27

A : Passengers (Unit: one million passengers)
 B : Passenger-kms (Unit: one million passenger-kms)
 C : Average Travelling Distance: (Unit: km)

Notes

- 1) Figures in brackets are percentage figures.
- 2) Past records are quoted from Statistical data of the Socialist Republic of Viet Nam 1992, General statistical office.

Table 4.1-2 Cargo Transportation Volume

	1980			1986			1988			1989			1990			1991		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Railway	3.5 (8.3)	757.5 (7.7)	216	4.1 (7.6)	960.6 (7.9)	234	3.9 (7.2)	1015.0 (7.8)	260	2.4 (4.4)	743.4 (5.7)	309	2.3 (3.9)	847.0 (6.6)	368	2.6 (4.1)	1103.3 (6.2)	424
Road	25.9 (61.3)	1307.8 (13.3)	50	31.1 (57.3)	1497.2 (12.3)	48	30.7 (56.7)	1725.6 (13.3)	56	35.2 (64.1)	1796.2 (13.6)	59	36.1 (61.7)	1749.7 (13.8)	48	39.6 (62.4)	2592.5 (14.6)	65
Inland Water (River)	11.6 (27.5)	1578.3 (16.1)	136	16.4 (30.2)	2255.9 (18.6)	137	15.5 (28.7)	2320.2 (17.8)	150	13.2 (24.0)	1832.4 (13.9)	139	16.0 (27.4)	1829.4 (14.4)	114	16.4 (25.8)	1284.4 (7.3)	78
Maritime	1.3 (2.9)	6179.7 (62.9)	4753	2.6 (4.9)	7425.3 (61.2)	2856	4.0 (7.4)	7959.1 (61.1)	1989	4.1 (7.5)	8786.2 (66.8)	2143	4.1 (7.0)	8284.8 (65.2)	2021	4.9 (7.7)	12744.7 (71.9)	2601
Total	42.3 (100.0)	9823.3 (100.0)	232	54.2 (100.0)	12139.0 (100.0)	224	54.1 (100.0)	13019.9 (100.0)	241	54.9 (100.0)	13158.2 (100.0)	294	58.5 (100.0)	12710.9 (100.0)	217	63.5 (100.0)	17725.9 (100.0)	279

A : Tonnage (Unit: one million tons)
 B : Ton-Kms (Unit: one million ton-kms)
 C : Average Transport Distance (Unit: km)

Notes

- 1) Figures in brackets are percentage figures.
- 2) Past records are quoted from Statistical data of the Socialist Republic of Viet Nam 1992, General statistical office.

4.1.2 Aviation

In Vietnam there are 16 airports except military airports. (Fig. 4.1-2)

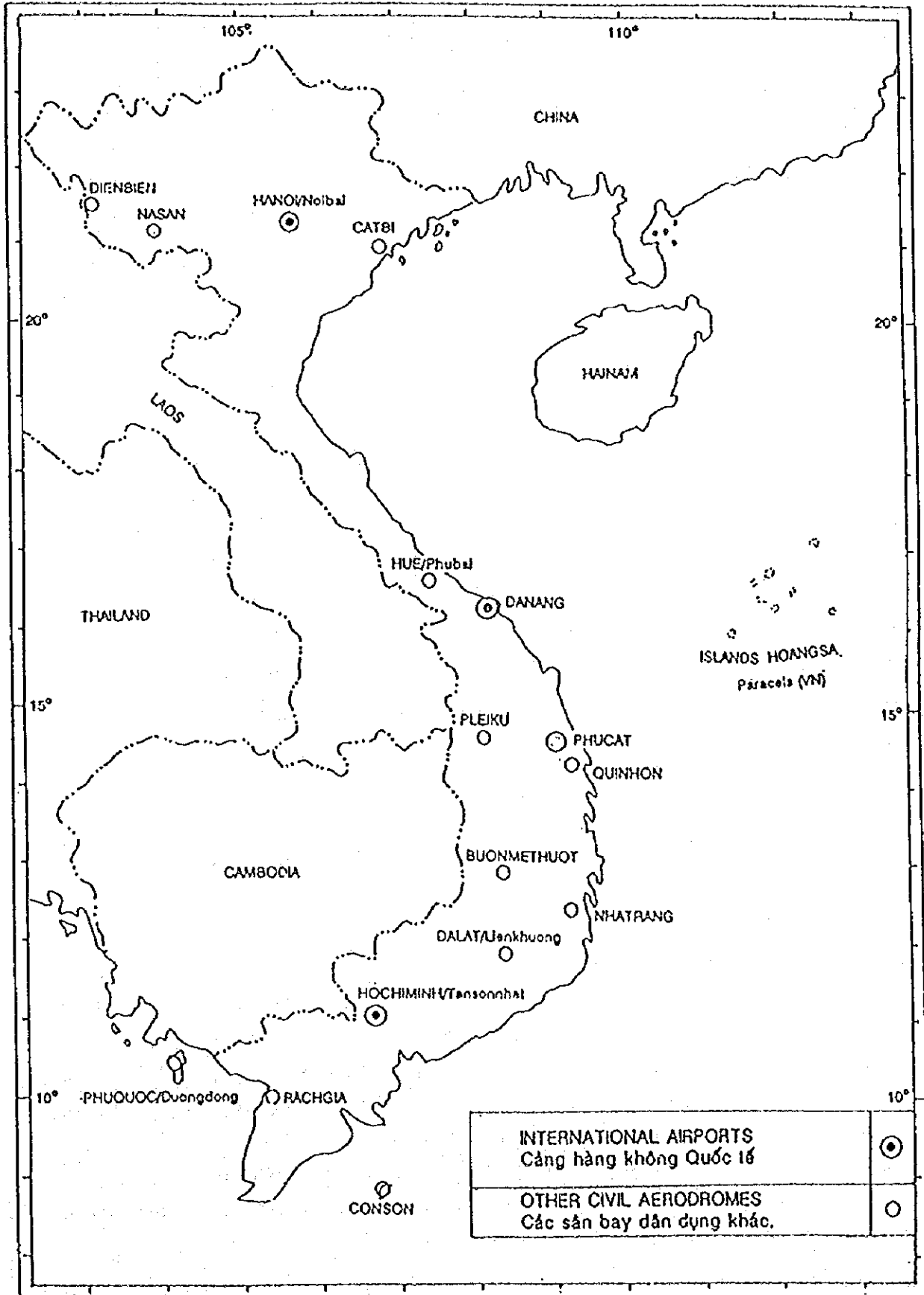
Three of them are international airports-Hanoi International Airport (Noi Bai), Da Nang International Airport and Ho Chi Minh International Airport (Tan Son Nhat). The current situation of each airport is as follows:

Regarding Noi Bai Airport, improvement of the terminal and catering house is necessary.

Da Nang Airport has been modernized more than other airports although the transport demand is relatively small.

Tan Son Nhat Airport has steadily been improved, but further upgrading of the parking area and other facilities is needed.

The capacities of these international airports have to be further enlarged to meet the demand of 10 million passengers per year in future, and the supply of new airplanes has to be secured. At the same time, satellite airport which are situated in different districts such as Cat Bi, Phu Bai, Nha Trang and Lien Khuong have to be improved for more convenient movement of tourists and other passengers. It is also necessary to replace old airplanes with new ones in accordance with expansion of demand.



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Fig. 4.1-2

VINAIRTRAS

4.1.3 Maritime

The Government of Viet Nam controls the following 7 central sea ports through the Viet Nam National Maritime Group (Vinamarine).

- (1) Port Hai Phong
- (2) Port Saigon
- (3) Port Da Nang
- (4) Port Nghe Tinh
- (5) Port Qui Nhon
- (6) Port Nha Trang
- (7) Port Quang Ninh

In addition to these central sea ports, there are approximately 20 local sea ports. The key ports are Port Hai Phong, Port Da Nang and Port Saigon in the northern, central and southern parts of the country respectively. It is highly likely that the following ports will be developed as international ports together with the above 7 central sea ports.

- Port Cai Lan in the north where the construction of 20 new berths is planned
- Port Cua Lo near Vinh which has the prospect of cross-border trade with Laos
- Port Dong Ha which has the prospect of cross-border trade with Laos
- Port Vung Tau in the south in connection with vigorous oil prospecting and production activities

The characteristics of the 7 central sea ports are described below. Table 4.1-3.

(1) Port Hai Phong

Port Hai Phong is located some 100 km east of Hanoi on the right bank of the Cua Cam River and is approximately 2 and a half hours from Hanoi via Highway 5. There is a total of 18 berths with an aggregate length of 2,736m which are accessible by vessels with a dead weight of 7,000 tons. In 1993, Port Hai Phong handled some 2.7 million tons of cargo. Periodic dredging is required to maintain the necessary water depth. In anticipation of the area's increased cargo handling demand in the future, Port Cai Lan is under construction as a port to mainly handle cement, coal, miscellaneous goods and containers. Upgrading of Highway 18A and the Hanoi - Cai Lan railway line is also planned to improve access to Port Cai Lan.

(2) Port Saigon

Port Saigon is located 90 km upstream of the mouth of the Saigon River and is on the right bank. It has 17 berths with a total length of 2,055m and is accessible by vessels with a dead weight of 15,000 tons. It plays a central role in commercial activities in southern Viet Nam, handling approximately 5.5 million tons in 1993. In anticipation of the area's increased cargo handling demand in the future, the expansion of Port Vung Tau located some 120 km south of Ho Chi Minh City via Highway 51 is planned.

(3) Port Da Nang

Port Da Nang is located in the Bay of Da Nang and has 5 berths with a total length of 1,114m. It is accessible by vessels with a dead weight of 15,000 tons.

(4) Port Nghe Tinh

Port Nghe Tinh is located at the mouth of the Ngan Pho River in the Vinh District and has 4 berths with a total length of 411m. It is accessible by vessels with a dead weight of 3,000 tons.

(5) Port Qui Nhon

Port Qui Nhon is located on sandbanks in the southwestern part of the Bay of Qui Nhon and has 2 berths with a total length of 340m. It is accessible by vessels with a dead weight of 7,000 tons.

(6) Port Nha Trang

Port Nha Trang is located in a leading resort area in Viet Nam and has 2 berths with a total length of 248m. It is accessible by vessels with a dead weight of 10,000 tons.

(7) Port Quang Ninh

Port Quang Ninh is located some 50 km northeast of Port Hai Phong and faces the Bay of Ha Long. It has only one berth for the shipment of locally produced coal. In addition, it has 2 berths for commercial purposes. The port is accessible by vessels with a dead weight of 20,000 tons.

Table 4.1-3 Freight through Central Sea Ports

1,000 ton

Port Name	1986	1987	1988	1989	1990	1991	1992	1993	(%)
Hai Phong	2,605	2,575	2,982	2,725	2,516	2,433	2,378	2,706	(26.9)
Sai Gon	2,292	2,477	3,075	4,048	4,437	4,160	5,004	5,509	(54.9)
Da Nang	644	628	585	567	430	261	313	372	(3.7)
Nghê Tinh	175	192	170	123	80	126	133	182	(1.8)
Qui Nhon	204	219	265	270	300	300	335	412	(4.1)
Nha Trang	245	211	263	239	221	148	155	181	(1.8)
Quang Ninh	239	206	204	215	298	425	719	683	(6.8)
Total	6,404	6,508	7,544	8,187	8,282	7,853	9,037	10,045	