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

Summary of Volume II

Feasibility Studies on Rehabilitation and Improvement of Hanoi – Ho Chi Minh Line

February, 1996

JAPAN RAILWAY TECHNICAL SERVICE
PACIFIC CONSULTANTS INTERNATIONAL
JAPAN TRANSPORTATION CONSULTANTS, INC.

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CONTENTS

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). 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.

The Scope of Work above directed JICA Study Team to draw up Master Plan targeted at 2010 for rehabilitation and improvement of Hanoi-Ho Chi Minh railway line, to carry out feasibility studies on high priority projects of the north-south trunk line based on the above mentioned Master Plan, to conduct feasibility studies on high priority projects selected from the northern railway lines based on the JICA's Master Plan Study on the Transport Development in the Northern Part of Viet Nam.

The Master Plan for rehabilitation and improvement of Hanoi-Ho Chi Minh railway line has been drawn up and are now being presented to Vietnamese Government as Vol. I.

The interim result of feasibility studies on Hanoi-Ho Chi Minh railway line targeted at 2000, and of feasibility studies targeted at 2000 on Lao Cai - Cai Lan railway lines which were selected from the northern lines based on mutual agreement between Vietnamese Government and JICA, were presented to and discussed with Vietnamese Government in August 1995 as Interim Report II. Interim Report II was accepted in principle by Vietnamese Government, however many useful comments were presented to JICA Study Team.

Feasibility studies on rehabilitation and improvement of Hanoi - Ho Chi Minh railway line targeted at 2000, Vol. II of Draft Final Report, which was prepared with appropriate response to the comments mentioned above, was presented to Vietnamese Government for review and discussion in January 1996. Based on the discussion and suitably responding to the comments on Draft Final Report, Final Report has been prepared.

1.2 Objectives of the Study

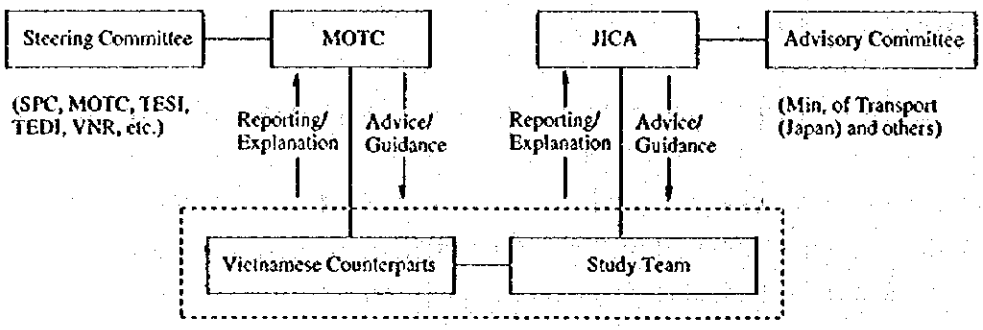
The Objectives of the Study are, in accordance with the Scope of Work agreed on July 12th, 1993 between the Government of Viet Nam, and JICA, to conduct feasibility studies on the high priority projects of the north-south trunk railway line based on the Master Plan Hanoi-Ho Chi Minh railway line targeted at 2010. During the Study, efforts has been made to transfer the relevant technologies/techniques to the Vietnamese side through the exchange of opinions and workshops, etc.

The subject of the F/S is in principle the Phase I of the Phased Improvement plan of Master Plan with a target year of 2000. In addition feasibility study has been carried out with due consideration on management analysis and improvement, and marketing. Further three priority sections were selected in the line where investment and services were intensified with a view to present a demonstration effect.

1.3 Organization for the Study

For the implementation of the Study, a Study Team consisting of Japanese railway experts was organized by JICA. Similarly, a team of counterparts consisting of senior staff members of the TEDI and VNR (responsible for Hanoi-Hochi Minh Railway Line) and VRDI (responsible for Lao Cai Cai Lan Railway Line) was organized by the Vietnamese side. The JICA Study Team is now conducting 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 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
Shoichi 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
Tsuneo 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

2. Roles of the Railway, Improvement Principles and Perspective

2.1 Role of Railway

Railway is expected to perform the roles below to the full extent, which of the VNR's has been fading away in the Vietnam because of the deteriorated railway infrastructure and the negative heritage of VNR's management status. Roles of railway are:

- To form a backbone of national transport network
- To form a part of multiple mode transport system on major national artery
- To perform a role of inter-regional transport mode
- To provide a transport mean for industrial products
- To be a more flexible and less expensive mode to meet the increasing demand of transport
- To assure a long-term advantage of the railway

Any backbone of national trunk lines should be free from traffic interruptions, and be guaranteed by a multiple mode transport system. This north-south penetrating railway line is the route deserves this treatment. In general the railway is advantageous to the users whose trips have a length less than 500 kilometers, while it is also advantageous for the bulk cargo transportation such as mining production. In these fields, an increase in transport demand is expected, and it provides the target areas for the service improvement by implementing the infrastructure rehabilitation.

Railway faces severe competition with the road transport. This situation is prevailing over the country since a vast investment had already experienced an influx into the road sector because of its high investment efficiency in general. However, railway has its peculiar advantages: (1) greater energy efficiency, (2) less air polluted impact, (3) fewer fatal accident ratio, and (4) greater contribution to the social equity.

2.2 Objectives of Railway Rehabilitation

To transform the railway in Vietnam contribute to the roles above, the Team sets the minimum objectives for the rehabilitation and improvement works. This is basically in line with the Rehabilitation Maser Plan. In addition, two new aspects are also incorporated in the objectives

at this feasibility study stage: first is management efficiency, and second is the rehabilitation plan designed to contribute to a sound financial performance. Objectives of rehabilitation works are defined as follows:

- To consolidate safety, and stable operation
- To make the railway competitive with road and other modes
- To transform the VNR into a more profit-seeking and a more self-sustainable company

At present, the railway in the Vietnam is challenged by other modes because the railway service is losing its original features, which should be restored by the rehabilitation projects. Those are:

- high safety
- non-interrupted operation
- punctuality
- high speed
- comfort

2.3 Principles in Formulating Projects up to the Year 2000

The actual rehabilitation works on the whole Hanoi-Ho Chi Minh line are divided into many sub-projects, which are formulated based on the following principles.

- To assure safety and stable operation all over the line
- To improve an overall capacity and ability of the railway industry as a total system
- To seek for a demonstration effect, and to expand an investment fund in involvement of increasing supporters
- To set priority sections for an intensive rehabilitation
- To formulate projects in a small scale of investment
- To contribute to financial improvement of the VNR
- To include in the project list the recommended study and projects

Railway services requires a wide range of knowledge and manufacturing activities, and rehabilitation works require to catch up with the new aspects of the knowledge. Vocational education, training and a provision of sufficient educational facilities can thus contribute to an level-up of total capability of railway management and maintenance works. The Team judges that this kind of fundamental functions is paid attention sufficiently.

Among many fields of railway rehabilitation, the Team judges that a top priority should set on the restoration of safety and stable operation of the train. Deteriorated bridges and track are the top subject for the rehabilitation. Other safety-related rehabilitation should be planned all over the line.

However, whole rehabilitation requires huge amount of fund in a short period which this country cannot afford. Most effective way of investment is judged to concentrate the initial investment on priority sections, where high level of service will be guaranteed. This is expected to attract the further investment on the other section with a supportive evidence on the performance of the priority section. Projects are formulated to generate this kind of demonstration effects.

In order to overcome a budgetary constrains, each project is designed in a small size of fund. This kinds of flexible and step-by-step treatment can contribute not to aggravate the financial situation of the VNR.

2.4 Roles and Rehabilitation Principles for Hanoi-Ho Chi Minh Line

Here are some roles this line has to play in a transport network.

- To form a north-south axis of national transport network, and induce an unity of the country
- To perform an inter-regional transport mode
- To share a burden to strengthen the transaction between the north and the south
- To provide a transport mean for industrial products

Here are some principles for the Hanoi - Ho Chi Minh line rehabilitation and improvement works.

- To consolidate safety, and stable operation all over the line
- To make the railway service competitive with road and other modes at the priority sections
- To adopt a step-by-step policy: demonstrating the investment efficiency of the railway for a priority section, and then expanding the fund with cooperation with new supporters
- To introduce and strengthen a capability of scientific inspection works for bridges, tunnel and so on

3. Socio-Economic Framework

3.1 GDP Scenario

This Study adopts an economic growth scenario suggested by the State Planning Committee and the Ministry of Transport. Figures reaches 10.7%, remarkably high for the period 1996 - 2000. A higher level is set for the period 2000 - 2010.

The setting of GDP growth rate in the future is aiming at achieving a national policy; "to double per capita GDP during the period 1990 - 2000," which original target was set at the Communist Party of Viet Nam 7th National Congress and was revised in 1994.

Table 3.1.1 Growth Scenarios

	Per Capita GDP (US$)	Targets of 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%
World Bank	-	-	8.0%	8.0%
This Study's Scenario	242	8.5%	10.7%	11.5%

However, it is noteworthy that the high growth scenario of the Viet Nam has a vulnerable foundation. Because:

- High growth performance in 1990 - 1994 is achieved by rather low investment rate as proved by a low incremental capital-output ratio (ICOR: investment rate divided by GDP growth rate; 2.3 in 1990, 2.4 in 1993). However, in pursuing the high growth scenario, a remarkable increase in investment rate is indispensable. The ICOR must rise to 3 or 4 in parallel with an increase of investment productivity. However, no clear vision is apparent on how to increase in saving rate far beyond the target of 23 - 30% set in 1991.

Projection of GDP by province is shown in Table 3.1.2.

Table 3.2 Growth Projection by Province

(at 1994 constant prices) 1 USD=11,000 VND

PROVINCE	GDP 1994 (mil.USD)	GDP 1995 (mil.USD)	GDP 2000 (mil.USD)	GDP 2005 (mil.USD)	GDP 2010 (mil. USD)
Ha Giang	46	49	69	113	183
Tuyen Quang	86	93	131	213	346
Cao Bang	71	74	99	152	233
Lang Son	90	95	128	202	316
Lai Chau	84	91	133	226	381
Lao Cai	57	60	85	139	226
Yen Bai	93	101	142	232	378
Bac Thai	223	237	325	517	820
Son La	79	85	124	208	347
Hoa Binh	200	216	299	478	761
Vinh Phu	366	390	529	832	1,304
Ha Bac	345	365	489	758	1,168
Quang Ninh	268	328	623	1,170	2,190
Thu do Ha Noi	1,037	1,180	2,175	3,952	7,159
Hai Phong	483	548	1,016	1,862	3,397
Hai Hung	540	607	1,101	1,968	3,505
Ha Tay	352	372	498	772	1,192
Thai Binh	317	327	419	625	928
Nam Ha	475	504	661	1,003	1,514
Ninh Binh	123	127	166	250	376
Thanh Hoa	593	625	840	1,308	2,027
Nghe An	442	467	638	1,014	1,606
Ha Tinh	174	184	249	395	622
Quang Binh	103	111	150	234	365
Quang Tri	73	75	101	157	244
Th. Thien Hue	170	193	360	641	1,136
QN. D.Nang	381	434	814	1,454	2,588
Quang Ngai	142	161	303	545	978
Binh Dinh	268	282	386	613	968
Phu Yen	112	121	170	277	448
Khanh Hoa	287	307	435	709	1,148
Ninh Thuan	129	138	198	328	542
Binh Thuan	116	126	180	298	492
Gia Lai	101	117	176	305	524
Kon Tum	45	50	76	130	224
Dac Lac	210	244	395	718	1,298
Lam Dong	128	145	224	392	683
TP HCM	3,293	3,777	7,538	13,478	24,014
Song Be	222	262	552	1,024	1,854
Tay Ninh	159	172	240	381	603
Dong Nai	559	681	1,475	2,782	5,231
Ba Ria Vung Tau	1,319	1,512	3,044	5,524	9,990
Long An	284	303	417	665	1,055
Dong Thap	373	403	572	937	1,528
An Giang	486	524	737	1,201	1,948
Tien Giang	379	411	580	940	1,518
Ben Tre	242	260	356	565	890
Vinh Long	262	283	395	636	1,020
Tra Vinh	213	228	316	509	815
Can Tho	438	469	655	1,060	1,706
Soc Trang	241	258	360	582	936
Kien Giang	372	406	587	931	1,631
Minh Hai	756	829	1,202	2,018	3,373
TOTAL	18,437	20,410	33,930	58,473	100,770

3.2 Population

Three kinds of population projection are available. This study adopted Scenario 3, showing a moderate growth rate among three projection. This is the latest population figures by province released from the SPC in the publication.

Table 3.2.1 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)	70.0	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.

This projection assumes that the growth rate of population will be controlled to calm down to 1.4% at the year 2010. Population projection is thus totally dependent of a performance of population control policy; family planning. Compared with a natural growth rate (2.1%) in the period between two census years (1979 - 1989), it is said that each population projection sets a remarkable assumption on growth rate, ranging from 1.34% to 1.53% during a period 2000 - 2010.

3.3 Regional Integrity

This clarifies a regional concepts to formulate the rehabilitation plan of the Hanoi - Ho Chi Minh line.

Figure 3.3.1 shows a spatial structure derived through the regional clustering procedure. 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, northern part and southern part of Viet Nam are possibly considered separately, and

Region / Province	GDP (Mil. US $)	Population (Thousand)
TOTAL	72,717	95,000
I Northern Mountain	6,580	16,496
1 Ha Giang	154	674
2 Tuyen Quang	215	824
3 Cao Bang	202	830
4 Lang Son	285	889
5 Lai Chau	209	652
6 Lao Cai	207	689
7 Yen Bai	393	866
8 Bac Thai	733	1,571
9 Son La	338	1,015
10 Hoa Binh	361	956
11 Vinh Phu	1,097	2,067
12 Ha Bac	958	3,216
13 Quang Ninh	1,438	1,357
II Red River Delta	16,755	18,907
14 Ha Noi	5,450	3,128
15 Hai Phong	3,595	2,346
16 Hai Hung	2,150	3,574
17 Ha Tay	1,748	3,016
18 Thai Binh	1,031	2,311
19 Nam Ha	2,595	3,436
20 Ninh Binh	587	1,096
III North Coastal	5,866	12,887
21 Thanh Hoa	1,808	4,501
22 Nghe An	1,300	3,436
23 Ha Tinh	1,040	1,715
24 Quang Binh	410	1,028
25 Quang Tri	438	762
26 Thua Thien-Hue	870	1,445
IV South Coastal	10,670	10,534
27 Quang Nam-Da Nang	3,009	2,268
28 Quang Ngai	672	1,478
29 Binh Dinh	1,481	1,823
30 Phu Yen	763	936
31 Khanh Hoa	1,844	1,303
32 Ninh Thuan	936	1,593
33 Binh Thuan	1,065	1,172
V Western Highlands	3,657	4,866
34 Gia Lai	600	1,031
35 Kon Tum	502	371
36 Dac Lac	1,308	2,251
37 Lam Dong	1,247	1,213
VI Eastern Nam Bo	14,334	11,903
38 TP Ho Chi Minh	8,528	5,728
39 Song Be	589	1,680
40 Tay Ninh	753	962
41 Dong Nai	4,213	2,411
42 Ba Ria-Vung Tau	251	1,122
VII Mekong River Delta	14,851	19,367
43 Long An	1,189	1,425
44 Dong Thap	1,105	1,841
45 An Giang	2,178	2,354
46 Tien Giang	1,303	2,017
47 Ben Tre	703	1,561
48 Vinh Long	804	1,274
49 Tra Vinh	479	1,119
50 Can Tho	2,540	2,324
51 Soc Trang	1,072	1,449
52 Kien Giang	1,506	1,721
53 Minh Hai	1,885	2,229

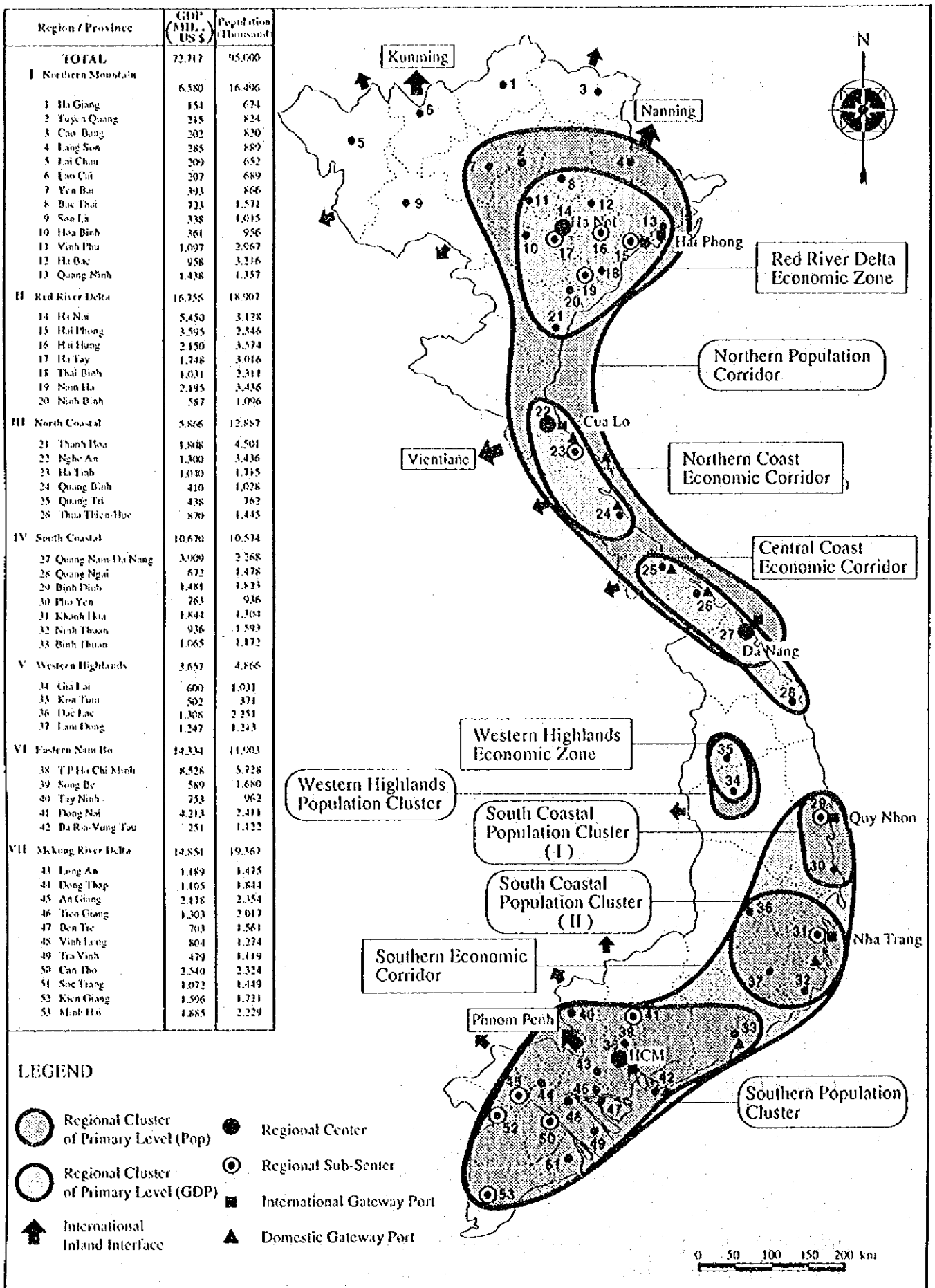


Figure 3.3.1 Overall Primary Regional Cluster

Da Nang would be regarded as a point of interface between them. In this context, the followings are suggested.

First, interconnections between cities within each cluster must be strengthen 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 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.

3.4 Priority Sections

The Team sets three priority sections. These sections are a subject of intensive and overall rehabilitation and improvement.

Criteria of selection and a selected section are as follows:

- one priority section for each union
- densely populated region and/or economic focal region
- area with high demand of railway
- appropriate distance to be competitive with other modes

Priority section selected is :

- **Hanoi - Than Hoa section**
- **Hue - Da Nang section**
- **Saigon - Muong Man section**

Those sections aim at coping with a high demand and at competing with the road transport service.

[Section outside Priority Sections]

Even outside the priority sections, there are important projects. Those are designed to guarantee the most fundamental features of railway i.e. the safety and stable operation.

4 Demand Forecast

4.1 Overview of Base Year Conditions

Passengers have a choice of traveling by rail, by road, or by air transportation. The most popular traffic modes by the travelers and commuters are bus and automobiles. The share of railway is about 5% as shown in Figure 4.1.1. Share of air traffic is very small.

Cargo load is transported mostly by trucks. The share of truck freight is about 67% in the year 1994, which is relatively low compared to the percentage of passengers, because railway, inland waterway and coastal shipping are also available for cargo freights. The share of each mode is shown in Figure 4.1.2. Total volume of cargo trips is 60.5 million tons.

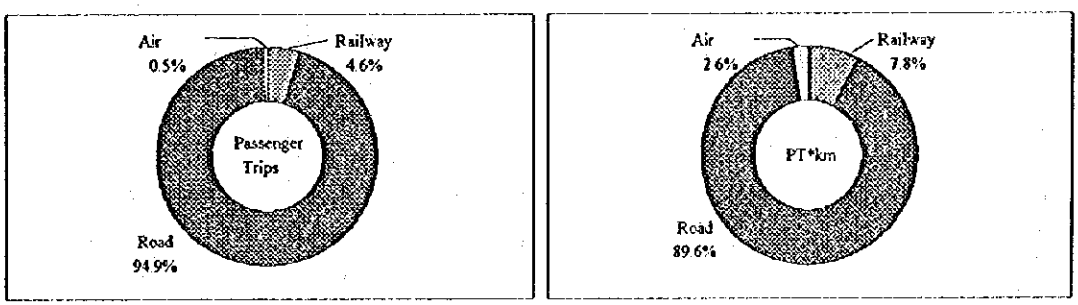
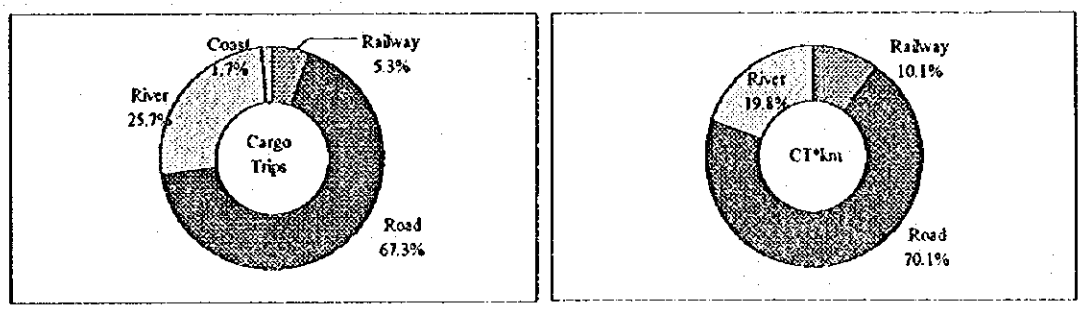


Figure 4.1.1 Passengers Analysis by Transportation (1994)



*) The volume of CT*km by coastal shipping is unknown.

Figure 4.1.2 Cargo Analysis by Transportation (1994)

Railway Demand

The number of passenger trips using railway stations is 8.8 million. The largest number is generated in the Hanoi zone, reaching approximately 1.6 million trips in the year 1994. The second largest number is marked in the Ho Chi Minh zone. Hanoi - Ho Chi Minh line transported 5 million trips, which is 57% of the railway passenger trips in Vietnam. The number of passenger along the Lao Cai line was 2.2 million, including connecting trips to/from other lines. The number at stations in the Quang Ninh zone and Ha Bac was 0.6 million trips.

Total volume of cargoes handled by railway was 3.2 million tons in the year 1994. The volume is almost the same as in the year 1993, but it has been growing up since the year 1990. The share of Hanoi - Ho Chi Minh line is 60% including cargo that go to/from other lines.

4.2 Overview of Future Demand

(1) Passenger Traffic

Tables 4.2.1 and 4.2.2 show the total amount of passenger traffic. The total amount of passenger traffic is estimated to be 384 million trips in the year 2000 and 1,094 million trips in the year 2010. The annual growth rates are 12% for the period 1994-2000, 11% for the period 2000-2010. The larger growth in the earlier stage is caused by the rapid Increase in population until the year 2000. These also show that the trips are centered around Ho Chi Minh City, Hanoi, and Da Nang. These figures trace only inter-provincial traffic, and not include intra-provincial traffic.

The traffic mode diversities are shown in Tables 4.2.3 (with-project) and 4.2.4 (without-project). Table 4.2.3 shows the growth in the case of the railway rehabilitation done, showing increase in passengers from 8.8 million trips in 1994 to 12.4 million trips in the year 2000, and 23.1 million trips in 2010. Table 4.2.4 shows the growth in the case that the reformation is not performed. There will be a slight increase because the total number of person trips will increase as the population increases, but the share of railway travelers will go down significantly. The rehabilitation and improvement of railway infrastructure and operation will prevent the railway share from going down rapidly.

Railway passenger trips in 1994 accounts for 4.6% of total trip. But in 2010, this will turn to be 2.1% because an advancement in air traffic and road conditions will result in higher growth rates of these modes, leaving the railway a subtle 2.1% in the year 2010.

Table 4.2.1 Forecast of Passenger Trips in the Year 2000

(unit: 000 persons)	1	2	3	4	5	6	7	Total
1 Northern Upland	8,840	27,260	638	147	34	135	6	37,060
2 Red River Delta	27,478	61,111	5,984	1,833	374	1,338	252	98,369
3 North Central	654	5,922	6,646	3,997	280	1,347	93	18,939
4 Central Coast	138	1,778	3,939	10,476	2,515	7,735	784	27,364
5 Central Highlands	32	374	273	2,508	115	2,596	151	6,048
6 Southeast	123	1,278	1,303	7,726	2,563	91,238	34,190	138,422
7 Mekong River Delta	5	234	89	769	150	34,241	22,943	58,431
Total	37,271	97,958	18,871	27,455	6,031	138,630	58,419	384,634

Table 4.2.2 Forecast of Passenger Trips in the Year 2010

(unit: 000 tons)	1	2	3	4	5	6	7	Total
1 Northern Upland	24,620	69,619	2,493	491	148	310	10	97,690
2 Red River Delta	69,684	143,201	18,531	4,712	1,451	2,720	604	240,904
3 North Central	2,530	18,335	21,498	12,567	1,297	3,340	312	59,880
4 Central Coast	460	4,640	12,418	27,532	10,417	20,008	2,461	77,936
5 Central Highlands	137	1,470	1,273	10,354	809	9,597	606	24,246
6 Southeast	281	2,630	3,354	19,961	9,459	293,254	89,270	418,209
7 Mekong River Delta	9	568	300	2,403	600	89,554	81,839	175,272
Total	97,722	240,462	59,866	78,021	24,181	418,782	175,102	1,094,137

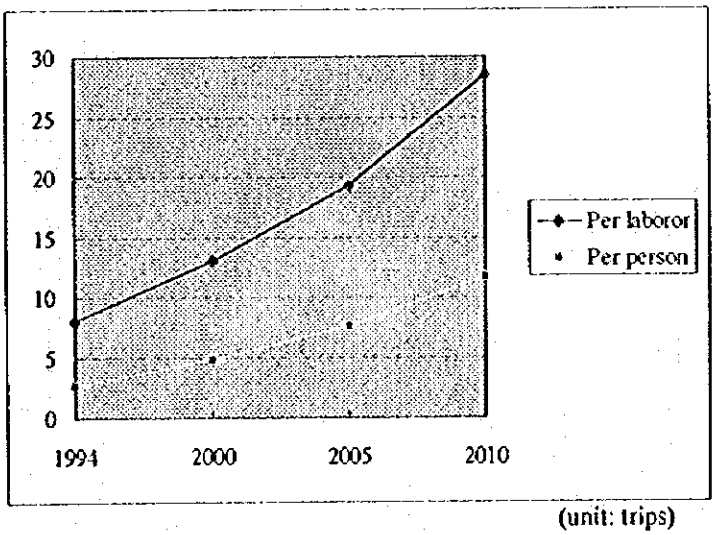


Figure 4.2.1 Passenger Trips per Person

But these numbers are based on the current preference of transportation model. If railways can prove that they are much more comfortable and convenient than using airplanes or buses, there is a possibility that the preference model itself may change. The quality of service is another key factor in increasing railway demand, in addition to time savings and cost saving factors that we have previously observed.

Table 4.2.4 (without-project) shows that demand for air travel will increase to 11 million trips. However the Vietnam Aviation Bureau only plans for expansion to 7 million trips, which means that demand overflows the supply. The excess passengers will convert to road traffic, according to our estimates.

Table 4.2.3 Mode Share of Passenger Traffic (With Project)

		Year 1994	Year 2000	Year 2005	Year 2010
Passenger Trips	Total	191,247,726	384,634,395	659,719,208	1,094,136,576
	Railway	8,807,434	12,416,816	17,040,539	23,119,926
	Road	181,527,512	370,381,435	639,307,353	1,063,572,945
	Air	912,780	1,836,144	3,371,317	7,443,706
Ratio (%)	Total	100.0	100.0	100.0	100.0
	Railway	4.6	3.2	2.6	2.1
	Road	94.9	96.3	96.9	97.2
	Air	0.5	0.5	0.5	0.7

Table 4.2.4 Mode Share of Passenger Traffic (Without Project)

		Year 1994	Year 2000	Year 2005	Year 2010
Passenger Trips	Total	191,247,726	384,634,395	659,719,208	1,094,136,576
	Railway	8,807,434	9,894,442	11,064,520	11,222,673
	Road	181,527,512	372,839,234	644,780,172	1,072,297,377
	Air	912,780	1,900,719	3,874,517	10,616,527
Ratio	Total	100.0	100.0	100.0	100.0
	Railway	4.6	2.6	1.7	1.0
	Road	94.9	96.9	97.7	98.0
	Air	0.5	0.5	0.6	1.0

(2) Cargo Transportation

The total amount of cargo transportation is 58 million tons for 1994, and estimates that it will reach 96.8 million tons in the year 2000, and 209.4 million tons in the year 2010. The growth rates behind these numbers are 8.7% from 1994 to 2000 and, 8.0% from 2000 to 2010. The larger growth rate in the earlier section reflects that the current traffic demands have not yet grown to the size appropriate for the economic activities of this country, and model shows a rapid growth achieved. Tables 4.2.5 and 4.2.6 do not include intra province trips. In comparison with passenger traffic data which showed a large amount of movement inside the large zones, cargo freight traffic shows large transactions between neighboring large zones. Cargo traffic also centers around Ho Chi Minh City, Hanoi and Da Nang.

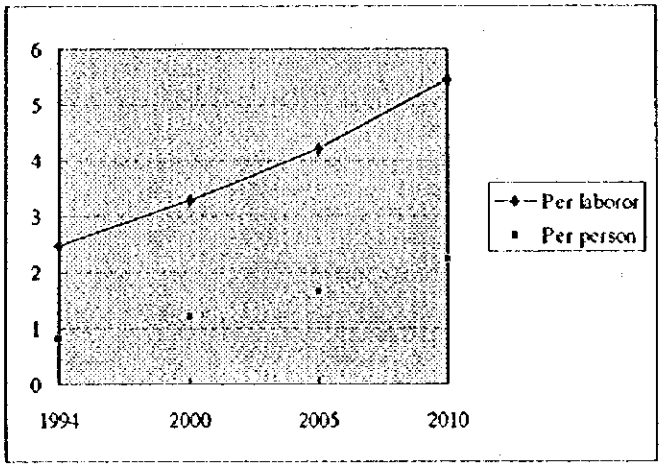
The number of cargo trips per person was 0.8 tons in the year 1994 and will be 1.2 tons in the year 2000 and 2.2 tons in the year 2010. The growth ratio is forecast to be sharp. As shown in Figure 4.2.2, the ratio after the year 2000 is higher than that before the year 2000. Observing the data from another angle, the number is about 2 tons - 3 tons per GDP (US$1,000). The per GDP ratio will decrease slightly, because the growth ratio of GDP is very sharp.

Table 4.2.5 Forecast of Cargo Trips in the Year 2000

(unit: 000 persons)	1	2	3	4	5	6	7	Total
1 Northern Upland	6,066	15,773	1,496	320	22	191	3	23,871
2 Red River Delta	9,881	4,910	1,695	444	0	138	31	17,099
3 North Central	1,402	2,591	2,332	1,180	54	244	15	7,818
4 Central Coast	436	573	1,107	2,784	882	1,476	178	7,436
5 Central Highlands	28	0	59	903	2	450	98	1,541
6 Southeast	227	804	280	1,504	475	6,490	11,052	20,833
7 Mekong River Delta	5	49	15	179	100	12,005	5,892	18,244
Total	18,046	24,700	6,984	7,314	1,535	20,994	17,271	96,843

Table 4.2.6 Forecast of Cargo Trips in the Year 2010

	(unit: 000 tons)	1	2	3	4	5	6	7	Total
1	Northern Upland	10,795	28,313	2,711	438	58	354	7	42,676
2	Red River Delta	19,781	10,257	3,526	679	0	314	46	34,604
3	North Central	3,130	5,542	5,086	2,092	141	595	27	16,612
4	Central Coast	941	1,205	2,276	4,690	1,779	3,531	298	14,720
5	Central Highlands	100	1	171	1,815	7	1,414	219	3,726
6	Southeast	582	2,254	790	3,381	1,420	21,141	27,530	57,098
7	Mekong River Delta	15	100	22	277	223	28,278	11,019	39,934
	Total	35,343	47,673	14,582	13,372	3,628	55,626	39,145	209,370



(unit: ton)

Figure 4.2.2 Cargo Trips per Person

The demand forecast of cargo trips by each traffic mode gets the results as shown in Table 4.2.7 (with-project) in the case that the railways are rehabilitated according the plan in this study. Table 4.2.8 (without-project) represents modal share of cargoes in the case of without plan.

Total volume of cargo trips by railway will grow up to 4.7 million tons and 14.8 million tons in the years 2000 and 2010 respectively from 3 million tons in the base year 1994. And the share will also increase in the case of improvements. However without improvements of railway, the cargo volume will grow at a stagnating rate because the growth ratio of cargo demand is totally high but the share of railway cargo will gradually decrease.

Table 4.2.7 Mode Share of Cargo Trips (With Project)

		Year 1994	Year 2000	Year 2005	Year 2010
Cargo Trips	Total	58,575,307	96,843,098	143,394,707	209,369,882
	Railway	3,182,951	4,654,907	8,644,116	14,831,757
	Road	40,085,187	68,772,556	105,516,391	160,131,563
	River	15,307,170	23,415,635	29,234,200	34,406,562
Ratio (%)	Total	100.0	100.0	100.0	100.0
	Railway	5.4	4.8	6.0	7.1
	Road	68.4	71.0	73.6	76.5
	River	26.1	24.2	20.4	16.4

Table 4.2.8 Mode Share of Cargo Trips (Without Project)

		Year 1994	Year 2000	Year 2005	Year 2010
Cargo Trips	Total	58,575,307	96,843,098	143,394,707	209,369,882
	Railway	3,182,951	3,525,095	6,491,746	8,406,388
	Road	40,085,187	70,110,882	108,080,702	167,422,468
	River	15,307,170	23,207,121	28,822,259	33,541,026
Ratio (%)	Total	100.0	100.0	100.0	100.0
	Railway	5.4	3.6	4.5	4.0
	Road	68.4	72.4	75.4	80.0
	River	26.1	24.0	20.1	16.0

4.3 Railway Demand of Hanoi - Ho Chi Minh Line

(1) Passenger Traffic

Annual growth ratio of passenger traffic along the Ha Noi - Ho Chi Minh line will be 6 % in this study if the railway rehabilitation will be implemented, while the number of railway passengers will decrease gradually if the railway is not rehabilitated. The numbers of passengers at the Ha Noi and Saigon stations mark the largest figures, and these are followed by Da Nang and Dong Hoi.

(2) Cargo Traffic

Traffic forecast indicates that the railway demand of cargoes increases at an annual average rate of 8.7% up to the year 2000 and at 13.5% after that under the condition that the rehabilitation plan will be implemented. If not, the growth will continue according to the expansion of cargo transportation demand in the area to some extent, but will soon hit a ceiling where it cannot grow anymore. The zones that generate the highest railway cargo demand are Hanoi and Thanh Hoa. These are followed by Saigon.

(3) Frequent Service

Survey on the main transportation mode used from the departure point to the nearest railway station in this route, conducted in June 1995, shows that busses are most frequently used, accounting for 26%, followed by motor cycles of 25%. The average time required by bus is 67 minutes. More potential passengers could be gained by increasing the frequency of train service to a shorter interval than this average value, and by providing higher services to satisfy the demand of motor-cycles, people who come on foot (9%), by bicycles (6%), and taxi (1%).

Considering the effects in other regions, especially where the potential demand is high, an increase in operation frequency will directly result in the increase of passengers, and the rate of passenger increase will be in proportion with the rate of increase in service. However, the increase stops at the point where all the passengers are satisfied with the frequency of service. The survey points out that 15% of the people are feeling that there is not enough trains operated in this route. Judging from this results, we can conclude that there would be a 15% increase in passengers in this region if frequent services can fully satisfy their demands towards frequency.

4.4 Revised Demand Forecast

As for the transportation of cement, coal, stone and wood, it is estimated that 10% of long-distance cargo to be shifted into shipping. Long distance freights of fertilizers and foodstuff (75%-80%) are predicted to shift to coastal shipping. For other products, it is forecast that all trips exceeding 600 kilometers will shift to coastal shipping.

Summing up these factors, we forecast that 30% of railway cargo will shift to coastal shipping. However, the economic growth rate suggests that it will take more than 10 years for all the ports and ships to be prepared, and for shipping to be competent with the land opponents. It is decided not to modify our estimate for the year 2000, but judged that there will be a shift of railway cargo, reaching 30% of total cargo demand at the year 2010.

5. Management Improvement

5.1 Management

(1) Managerial Form and Organization

Since January 1, 1995, the infrastructure was separated from railway transportation block of the VNR and has belonged to national assets. The new managerial system of the VNR can meet the advantageous requirements as an organization such as reduction of cost for infrastructure including construction and strengthening of competitiveness with other modes. One alternative for the more improving management is to open the track to the private companies which is called "Open Access System" introduced by Sweden National Railway. The other major problems are the establishment of criteria on rental fee setting of track on the basis of cost, the innovation of organization for supporting industries and Head Quarter, and pursuit of optimum management unit/scale.

(2) Improvement of Productivity and Rationalization

It is desirable to set a target of raising up the extremely low level of labor productivity. In order to achieve this target, reduction of surplus personnel through introduction of the system of fixing the number of staff, improvement of skill level of staff and higher intensification of works with aim of increasing transport distance per head are keenly required.

(3) Modernization of Financial and Accounting System

There can be found some inconsistencies in the present accounting system. Then its modernization on the basis of international standards is urgently needed.

(4) Strategic Fare Policy

By aiming at low level of fares on the basis of reduction of transportation cost by rationalization, it is necessary to establish the strategic and elastic fare system to be able to compete with other modes by separation of passenger basic fare from service charges, and the cargo fare system on the basis of cost or weight.

(5) Policy for Increasing Revenue

For passengers, it is required to generate the potential traffic demand by speeding up, frequency service, leveling up comfort by improvement of accommodation of passenger coach, smoothing feeder service and so on. For freights, it is indispensable to save handling cost and introduce the container transportation system by construction of inland container depots.

(6) Policy for Reducing Expenditures

Reduction of staff, restraint or suspension of new employment, encouragement of retirement or reallocation of staff to other blocks as related business are considered to be urgent policies. To reduce costs of suppliers, reduction of cost for repairs by rationalization aiming at maintenance free and saving cost of fuels are also needed.

(7) Management Diversification

Management diversification should be more promoted by maximum utilization of the managerial resources such as railway lines and stations by referring to the experience by foreign countries. The VNR is needed to participate into general tourism service business integrating constructing railways and hotels, coordinating trips by railway, bus and ferry, hotel reservation and so on.

(8) Policy to Cope with Abolishment of Non- Lines

Three unprofitable lines are now listed up . The rational criteria for abolishment must be set up by referring to the experience of foreign countries and the abolishment problems should be carefully studied not only from view point of profitability of transport side but from wider view point of social welfare for users in the region.

(9) Management Information System (MIS)

Review and restructure of management organization, institute and regulation are now urgently required and then management information system (MIS) will be established mainly for accounting system, seat reservation system, materials management etc.

(10) Fostering Capable Staff and Development of Capability

The development of capability of human resources of the VNR is the most important and urgent tasks realized by training and educating the executives to understand market economy and modern management, and strengthening the section of management staff and constructing the new school or training center.

5.2 Management Analysis

Management analysis is conducted on the basis of the income statement and the balance sheet of the VNR during the period from 1992 to 1994.

(1) Growth Analysis

For the purpose of balanced expansion of management scale, transportation of passenger and parcels must increase more corresponding to increase of total capital. At present, only subsidiary business is contributing to the growth of management. The profit from the freight transportation is increasing proportionally to the total capital or more rapidly that the freight transportation, while the profit attributable to passenger transportation shows negative relations with the growth rate of total capital. The main business of VNR is now in very critical situation.

The substantial growth of management is realized not for the main business but only for subsidiary business. Therefore, the main business of the VNR is now in very critical situation.

(2) Profitability Analysis

Judging from ROA (Rate on Assets), the whole Transport Division and three Unions have been unprofitable except subsidiary business. On the contrary, other divisions are profitable.

(3) Break Even Analysis

Break even analysis is a measure for judgment of sufficiency of operation revenue with operation cost and a supporting measure of profitability. The rates of break even points (RBEP) of the whole Transport Division and three Unions have been worsened as more than 100%. The reasons for this high RBEP are considered to be the increase of fixed cost and the decrease of marginal deficit or increase of the ratio of variable cost on operating revenue. These figures suggest that inefficient investment or surplus staff belonging to fixed cost must be reduced and materials, fuels and maintenance cost belonging to variable cost must also be saved and the operating revenue or traffic volume is needed to increase to make a BEP and RBEP lower.

(4) Productivity Analysis

Judging from investment efficiency of total capital (IETC), productivity of the whole Transport Division has been decreased. But value and labor productivity and the degree of capital intensification show increases. For other division, IETC, value productivity and the degree of capital intensification are mostly lower than Transport Division.

From this fact, the policies to increase IETC of Transport Division is to decrease of growth rate of total capital or to increase growth rate of value added. Then it can be concluded that performance of value added and control for total capital is very important factor for

improvement of IETC. Policies to increase value added per staff are considered to be reduction of the number of staff and/or other component of value added, especially current profit.

(5) Safety Analysis

1) Judging from the ratio of equity to total capital and the ratio of depending to loans liability, the situation of raising funds of the Transport Division of the VNR is very high degree of soundness and suitability comparing with other divisions.

2) Judging from the ratio of fixed assets to net worth and the ratio of sales to fixed assets turnover, the funds of Transport Division had not been effectively activated its fund in these three years comparing with other divisions.

3) Judging from three kinds of ratios such as current ratio, quick ration and ratio of managing funds, the capacity of paying debts by short term funds of Transport Division has been weakened year by year comparing with other divisions mainly because current liabilities has more rapidly increased than current assets, quick assets and operating revenue.

4) Forecast of Income Statement

The financial impact of the project can be known by the difference between projected income statements of "With-the-Project" and "Without-the-Project".

The working ratio of the whole Transport Division, which is deprived from a formula, (operating cost)/(operating revenue) x 100, for "Without-the-Project" will increase for 112.3% in 1994 to 159.5% in 2020. Profitability will be worsened year by year. On the contrary, the working ratio of "With-the-Project", will increase slightly from 112.3% in 1994 to 112.6% in 2020. But comparing with "Without-the Project", considerable improvement of profitability can be observed.

6 Project Profile

(1) Current conditions and issues

VNR has following obstacles in reformation toward the market oriented management and modernization of technology and infrastructure.
Program 2000 intends to resolve such issues. It is necessary to clarify such issues in order to formulate countermeasures for obstacles.

(a) Management
The productivity of VNR is extremely low level due to inefficient management system, surplus employees, superannuated facilities and low level skill of staff. It is necessary to reform management, marketing and operation systems for the free market economy. Improvement of productivity, revitalization of marketing and developments of technology are essential to survive in the free market economy.

(b) Technology development
In spite of sufficient excellent engineers and skilled technicians, VNR lacks modernized research facilities for technology development and machines, equipment and tools for the efficient work performance. Various works for maintenance are executed by labor intensive method.
Therefore it is necessary to raise technology level by introducing new technology and systems

(c) Passenger and freight marketing
Frequent train operation, comfortable passenger cars, shorter traveling time and feeder service to and from stations are essential functions of passenger transport, but that of VNR is not sufficient now.
There are no loading machines at stations. Moreover, almost stations operate cargo handling in spite of small lot of cargo.
Improvement of services for passenger and freight is urgent measures in order to correspond the needs of market and survive in the new economic system.

(d) Train operation
Between 20-28 trains both way are operated on the line, however the line is single track meter gauge through out the average distance between stations relatively long at 11 km. There are several bottlenecks in traffic capacity that are necessary to be improved by 2000.

(e) Track

Track structure of the line is composed with 43kg/m rail and 2-block concrete and iron sleepers excluding 30kg/m rail section of 277km in length. Track maintenance work is executed by labor intensive work with poor equipment.

Current track structure except sections that have 30kg/m rail has potential to run with the speed of 80-100km/h. When track maintenance is executed with scientific and modernized method, and machines, it is possible to realize raising speed up more.

(f) Bridge

Many bridges on the line are deteriorated and suffered serious damage by the war. Many bridges were recovered by temporary beams during and after the war. Some structures were designed and constructed with small locomotive load. Moreover, bridges are maintained with poor budget and tools, and efforts of skilled engineers.

(g) Tunnel

There are 27 tunnels in the line. 9 tunnels out of them have speed restrictions due to deterioration of lining and other reasons. Some tunnels have already urgent steel supports to prevent falling of rock.

(h) Submerged sections

Some 180km sections subject to flooding, and train operation service cancellations continue for several days on those sections almost every year.

(i) Signaling

Installation program of tokenless block system has been under installation in the whole line with VNR's project by 2000. Color light signals and power sources have been equipping by VNR. However some stations have no perspectives to be installed by color light signals and power sources.

(j) Telecommunication

Almost telecommunication lines, transmission facilities, exchange facilities and power source facilities are superannuated. Current facilities are out of date and lack spare parts for maintenance because manufacturers stop production of spare parts. Capacity of communications is insufficient for current demand and it will be obstacles for modernization of management, marketing and operation that are essential improvement for VNR.

Therefore, it is necessary to install new facilities intentionally and spare parts will be borne from replaced facilities.

(k) Rolling stock and maintenance

Currently, VNR has lot of reserved locomotives and passenger cars. Locomotives that have small power are surplus but that of bigger power are insufficient for increasing demand.

Though, passenger cars are the most important tools for marketing, almost passenger cars are deteriorated. Freight wagons are surplus now, but VNR will lack suitable freight wagons for new demand of rail transport.

Maintenance of rolling stock has been conducted in accordance with the inspection cycle determined by types at workshops and depots. There are no facilities for overhaul of DEIs and maintenance of DLs is executed in limited components.

(l) Level crossings

There are no modern approaching signal systems for level crossings in VNR. Train accident at level crossing is majority in whole accident. 87 people died at level crossing of whole VNR , and other fatalities were 12 in 1994. Therefore, safety measures for level crossings will become be important soon.

(2) Principle of improvement

Program 2000 is formulated based on the following principle:

(a) Priority sections for overall rehabilitation

Priority rehabilitation sections are formulated for comprehensive improvement, demonstration effects, model for improvement, passenger and freight transport service improvement, maintenance improvement, rehabilitation of fixed facilities, reduction of operation cost, upgrading of productivity, reducing employees

(b)Train operation safety and stability

Safety and stable train operation are the essential functions of railways. Priority among the rehabilitation work should be taken for safety and stability improvement. Related rehabilitation is planned all over the line including the priority sections.

They are rehabilitation of bridges, tracks, tunnels, telecommunication and signaling.

(c) Improvement of overall capacity of railways

Railways need to play an important role in transport of passenger and cargo. Service level of the railways needs to be improved in order to play such role. The demand for railways is forecast to be increased, therefore, transport capacity needs to be increased according the increasing of demand. It is necessary to consider not only quantity but also quality of transportation services. Rolling stock that is the most important

marketing tools will be added, and bottleneck in some sections need to be improved in order to increase train operation.

(d)Improvement of management

The VNR needs to perform duty to use railways facilities efficiently and generate more profit by the investment. The rehabilitation plan should increase the demand for railways, streamline the management of VNR and improve productivity of railways. It is also necessary to make all staff to receive an appropriate education and training in order to catch up modern management and knowledge on technology.

(e)Technology development

Technical matters will share most part of investment cost. Rehabilitation plan should be implemented using appropriate level of technology. Domestic products should be used as much as possible, therefore, Program 2000 should include machines and facilities for domestic production. Almost projects should contribute for upgrading of technology level in Viet Nam through their implementation.

Projects to install new technology and facilities should include a development of training for engineers and technicians, installation of training facilities and preparation of user's manuals in Vietnamese version. If necessary, they should execute overseas training.

(3) Project list, costs and components

Project costs of each project in Program 2000 are shown in Table 6.1.

Each project formulated in Program 2000 has multi-purposes, because the railway is an integrated industry composed with many fields. Table 6.2 shows the relations with improvement principles and targets.

Improvement components will be implemented in priority section projects and other projects for other sections(Thanh Hoa-Hue, Da Nang-Muong Man). Table 6.3 shows components included in priority section at Union 1, 2 and 3 projects, and other sections. Some projects will cover the whole section between Hanoi-Ho Chi Minh.

Table 6.1 Cost of Program 2000(unit: US$ million)

Projects for cost-benefit analysis in feasibility studies	Total Cost	Local Currency	Foreign Currency
Modernization and Efficiency of VNR Management	7.12	0.18	6.94
Overall Rehabilitation at Hanoi-Thanh Hoa Section	45.83	14.64	31.19
Overall Rehabilitation at Hue-Da Nang Section	41.52	12.10	29.42
Overall Rehabilitation at Muong Man-Saigon Section	59.01	18.67	40.34
Bridge Replacement and Rehabilitation	82.37	12.80	69.57
Tunnel Rehabilitation	7.26	1.27	5.99
Track-crossing Drain and Side Drain Widening and Construction	1.36	1.19	0.17
Track and Other Structure Rehabilitation and Improvement	42.59	10.82	31.77
Station Improvement	0.84	0.77	0.07
Signal Rehabilitation and Improvement	13.06	2.20	10.86
Telecommunication Rehabilitation and Improvement	4.48	0.76	3.72
Rolling Stock Plan	107.80	29.00	78.80
Gia Lam Rolling Stock Workshop Improvement	30.04	6.46	23.58
High Speed Train for Hanoi-Saigon Section	28.00	6.50	21.50
Hai Van Pass Transport Capacity Improvement	9.62	8.33	1.29
Total Cost	480.90	125.69	355.21

Cost of Program 2000(unit: US$ million)

Other recommendation projects	Total Cost	Local Currency	Foreign Currency
Expansion and Improvement of Railway School	11.30	1.30	10.00
Establishment of Bridge Technology Center	2.50	0.30	2.20
Improvement of Freight Transport Capacity Study	1.50	0.20	1.30
Bridge Structure Inspection	4.80	0.40	4.40
Tunnel Structure Inspection	1.20	0.24	0.96
Anti-submerged Measure Study	1.21	0.19	1.02
Route Selection of the New Hai Van tunnel	2.31	0.64	1.67
Emergency Solution to Level Crossing Issues In Hanoi City	9.41	7.33	2.08
Emergency Solution to Level Crossing Issues in Ho Chi Minh City	17.37	16.23	1.14
Total cost	51.60	26.83	24.77

Table 6.2 The relation between projects, principles and targets

Projects for cost benefit analysis in feasibility studies	Safety and Stability	To implove Services	Transport Capacity	Management Improvement	Technology Develop
Modernization of Management				*	
Rehabilitation at Hanoi-Thanh Hoa	*	*	*	*	*
Rehabilitation at Hue Da Nang	*	*	*	*	*
Rehabilitation at Muong Man-Saigon	*	*	*	*	*
Bridge Rehabilitation	*				
Tunnel Rehabilitation	*				
Drain Widening	*				
Track Rehabilitation	*			*	
Station Improvement			*		
Signal Improvement	*				
Telecommunication Improvement	*	*		*	
Rolling Stock Plan		*	*	*	
Gia Lam Workshop Improvement	*			*	
High Speed Train		*	*	*	
Hai Van Pass Improvement			*		

Projects for other recommendation	Safety and Stability	To improve services	Transport Capacity	Management Improvement	Technology Development
Improvement of Railway School				*	*
Bridge Technology Center	*				*
Freight Transport Study		*	*	*	
Bridge Structure Inspection	*				
Tunnel Structure Inspection	*				
Anti-submerged Study	*				
New Hai Van tunnel Study	*	*	*		
Level Crossing In Hanoi	*				
Level Crossing in HCM City	*				

*: related

Table 6.3 Components of rehabilitation projects

Rehabilitation, improvement,modernization, rationalization, items	Unit	Priority Union 1	Priority Union 2	Priority Union 3	Other section
Frequent train operation		*	*	*	-
Seat reservation system	station	3	3	4	-
Station facility innovation	station	4	2	3	-
Loading machines	station	8	2	1	-
To promote unmanned station		*	*	*	-
Track structure improvement		*	*	*	*
Track maintenance modernization	depot	7	3	7	-
Bridge inspection		bridges in whole section			
Bridge rehabilitation	m	370	842	324	3,104
Tunnel inspection		Whole tunnel			
Tunnel rehabilitation	place	-	2	-	4
Submergence survey	km	Whole section			
To expand water drain culvert	section			7.7km	149km
To install interchange station	station		2		1
To install tokenless block system		under way by VNR projects			
Color light signal installation	station	13	5	7	65
Power source installation	station	13	2	7	63
Level crossing alarm signal Hanoi and Ho Chi Minh cities	Place	15 19	4	9 10	32
Optical fiber cable laying	km	175	0	175	0
Installation of exchange		4	2	4	0
Operation of push-pull train		1 round operation(5 p-p train sets)			
Procurement of rolling stock		33 D18E, 16 D12E,32 PC,661 FC, 10 D11H, 20 PC remodeling			

*: implemented

(4) Project profile of Program 2000

1) Priority sections for overall rehabilitation

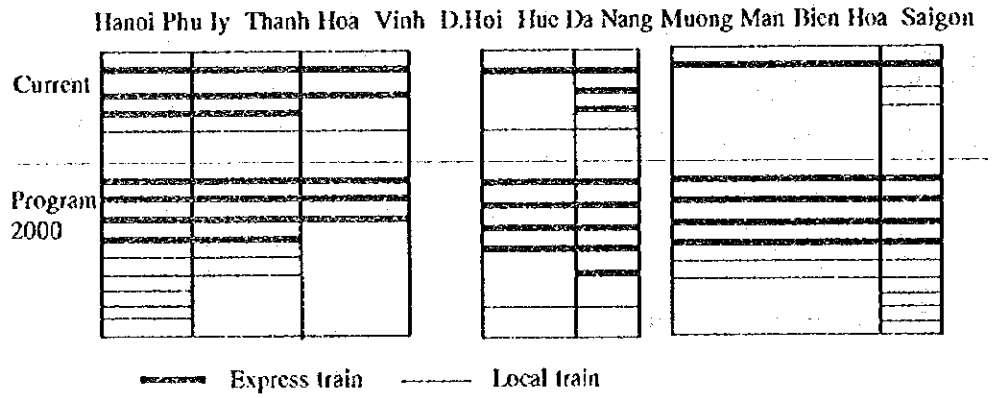
Priority rehabilitation sections are formulated for comprehensive management improvement, demonstration effects and model for improvement.

Project name related:
Overall rehabilitation at Hanoi-Thanh Hoa
Overall Rehabilitation at Hue-Da Nang
Overall rehabilitation at Muong Man-Saigon

Components of these projects are as follows:

- Promotion of unmanned stations and installation of track maintenance machines will reduce the number of staff by improving productivity. Management of these section will be improved by reduction of operation cost
- Passenger services will be improved by implementation of frequent train operation service, innovation of 7 main station facilities, installation of seat reservation systems at 10 main station and procurement of comfortable passenger cars
- Freight service will be improved by installation of loading machines at 11 main station. On the other hand, stations that have small lot of cargo should be closed.

- Track improvement will be executed by means of replacement of track materials and rail welding at 53,100 spots. Track maintenance work will be modernized by installation of maintenance machines, equipment and tools of 17 sets, as a result, employees will be reduced by productivity improvement
- Bridge rehabilitation will be implemented for 19 bridges that have speed restriction of under 30km/h.
- Train approaching alarm signal systems will be installed at 28 manned level crossings that have heavy road traffic and pavement of them will be repaired.
- Color light signals and power source will be installed at 25 and 22 stations respectively.
- Optical fiber cable installation will be installed between Hanoi-Thanh Hoa and Muong Man-Saigon. Transmission facilities and exchange facilities will be replaced.
- Rainfall and wind velocity gauge will be installed as an anti-disaster measures



Train operation plan by Program 2000
(excluding Hanoi-Saigon express trains)

2) Projects for train operation safety and stability

The following projects are formulated for safety and stable train operation. Components of these projects are replacement and rehabilitation of railway track, deteriorated bridge and tunnel, other civil engineering structure, signal and telecommunication and procurement of necessary rolling stock:

List of projects related is as follows:

Bridge replacement and rehabilitation
Bridge structure inspection
Tunnel rehabilitation
Tunnel structure inspection
Track-crossing drain and side drain widening and construction
Anti-submerged measure study
Track and other structure rehabilitation and improvement
Station improvement
Signal rehabilitation and improvement
Telecommunication rehabilitation and improvement

Gia Lam rolling stock improvement
Emergency solution to level crossing issues in Hanoi City
Emergency solution to level crossing issues in Ho Chi Minh City

Descriptions of each project are as follows:

(a) Bridge replacement and rehabilitation and Bridge structure inspection

16 bridges that have speed restriction of under 15km/h and being outside priority sections will be rehabilitated. Inspection of bridge soundness will be implemented for other bridges in order to establish rehabilitation plan.

(b) Tunnel rehabilitation and Tunnel structure inspection

4 tunnels that the train speed restriction is under 15km/h and being outside priority sections will be rehabilitated. However, Inspection of tunnels on the line will be implemented prior to the rehabilitation.

(c) Track and other structure rehabilitation and improvement

Track and other structures outside priority sections will be rehabilitated by means of replacement of track materials.

(d)Track-crossing drain and side drain widening and construction, and Anti-submerged measure study

Track crossing drain that the cross section of water passing is not sufficient will be widened. On the other hand, another heavy flooding section will be surveyed geographically.

(e) Signal rehabilitation and improvement

Color light signal at 65 stations and power sources at 63 stations and train approaching signals for 32 manned level crossings will be installed.

(f) Telecommunication rehabilitation and improvement

Optical fiber cable will be laid and transmission facilities will be installed between Thanh Hoa-Vinh(144km).

(g) Gia Lam rolling stock workshop improvement

Full overhaul capacity for DELs will be installed. Additional machines and equipment for overhaul and manufacture of PC and FC will be installed.

(h) Emergency solution to level crossing issues in Hanoi City
Emergency solution to level crossing issues in Ho Chi Minh City

Grade separations in Hanoi and Ho Chi Minh cities are studied in the report and projects recommended to install approaching signals for level crossings in both cities are formulated. Grade separations should be studied relating with urban development plan and as long term projects. Installation of alarm signal systems should be implemented as a urgent short term projects.

3) Improvement of overall capacity of railways

There are several projects for the improvement of overall transport capacity for management and transport. The following projects are related for increasing transport capacity and quality:

(a) Hai Van Pass transport capacity improvement

A new signal station will be constructed between Hai Van Bac -Hai Van Nam. Traffic capacity will be increased from current 22 trains to 44 trains,

(b) Feasibility study on new Hai Van tunnel

A feasibility study on a new Hai Van tunnel will be studied as soon as possible in order to solve current severe train operation condition and excess operation and maintenance cost. An optimum route will be selected and then geological investigation and geographical survey will be implemented. Suitable timing for construction will also be studied.

(c) Rolling stock plan and High speed train for Hanoi-Saigon section

Necessary rolling stock by 2000 will be procured corresponding to increasing demand. They are 5 train sets of push-pull train, 33 D18Es, 16 D12Es, 32 air-conditioned passenger cars, 661 freight wagons, 10 D11H and remodeling of 20 passenger cars.

(d) Station improvement

Installation of interchange signal station at location of 415km and installing storage track at Vinh, Donh Hoi and Dieu Tri.

4)Improvement of management

Purposes and target of projects related to management are reformation toward the free market economy, human resources development, financial resources improvement, improvement of organization and system, overseas training to obtain up-to-date knowledge and technology.

The following projects are formulated for above-mentioned purposes:

(a) Modernization and efficiency improvement of VNR management

Organization, rule, standards, accounting, fare and sale, personnel administration systems of VNR will be reviewed prior to establish of a management information system. Management target and strategy for modern management will be studied in the project.

A management information system will be constructed using computers when new management system is formulated.

(b) Expansion and improvement of railway school

Human resources development is one of the most important management function of VNR. The project includes establishment of a new railway school, implementation of education and training

It is important to spread new management strategies and targets for the staff of VNR at the new school. Overseas training for lecturers to catch up new knowledge will be implemented.

(c) Improvement of freight transport capacity study

Freight transport shares a half of transport volume in VNR. Modernization of freight transport is essential to play an important role in transportation and to survive in competition with other transport modes. The study will reform the current freight transport into competitive and market oriented system.

5)Technology development

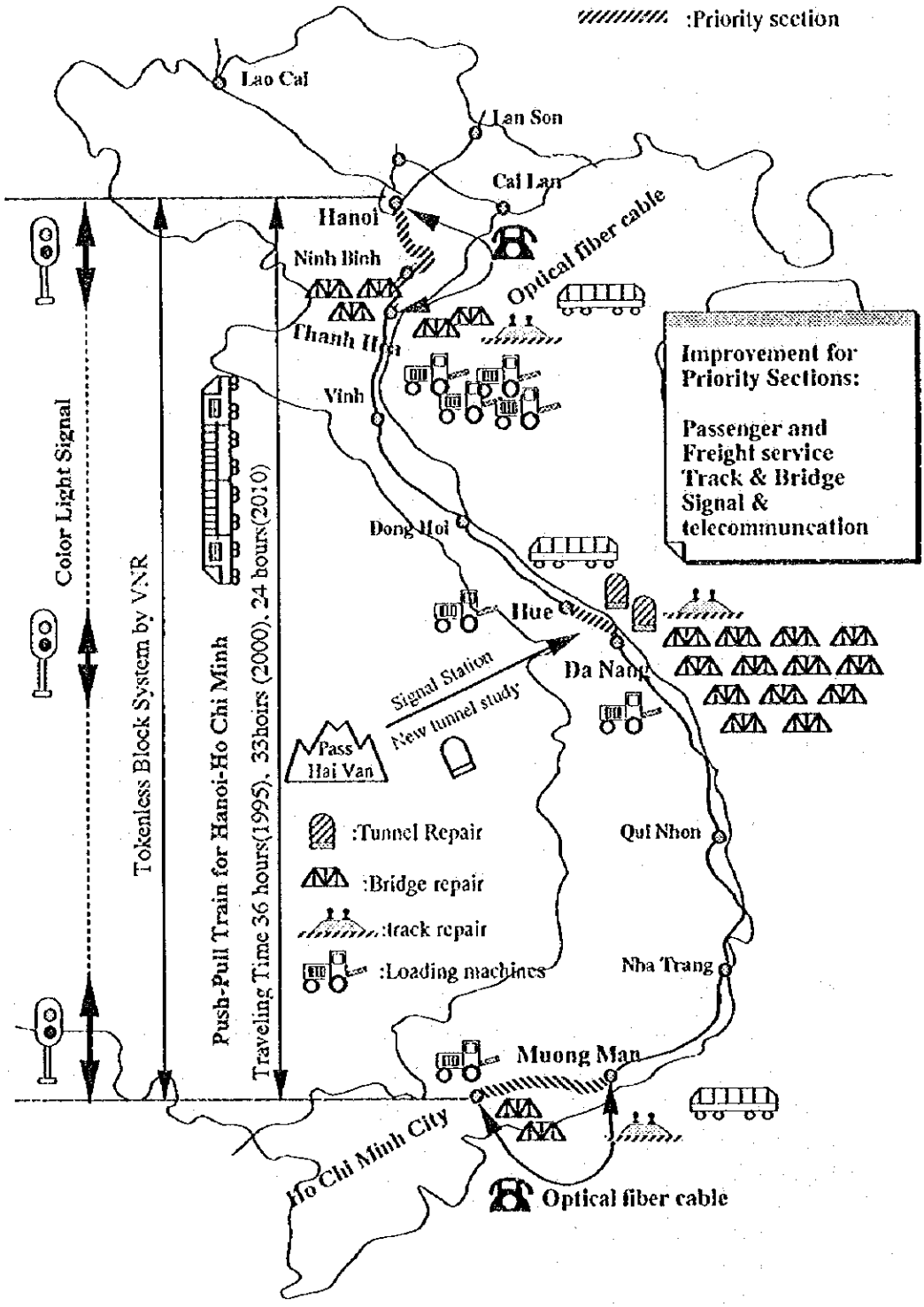
Purposes and target of technology development are introduction of advanced technology, introducing bridge inspection technology, installation of testing machines and equipment and overseas training of engineers.

Projects related to technology development are as follows:

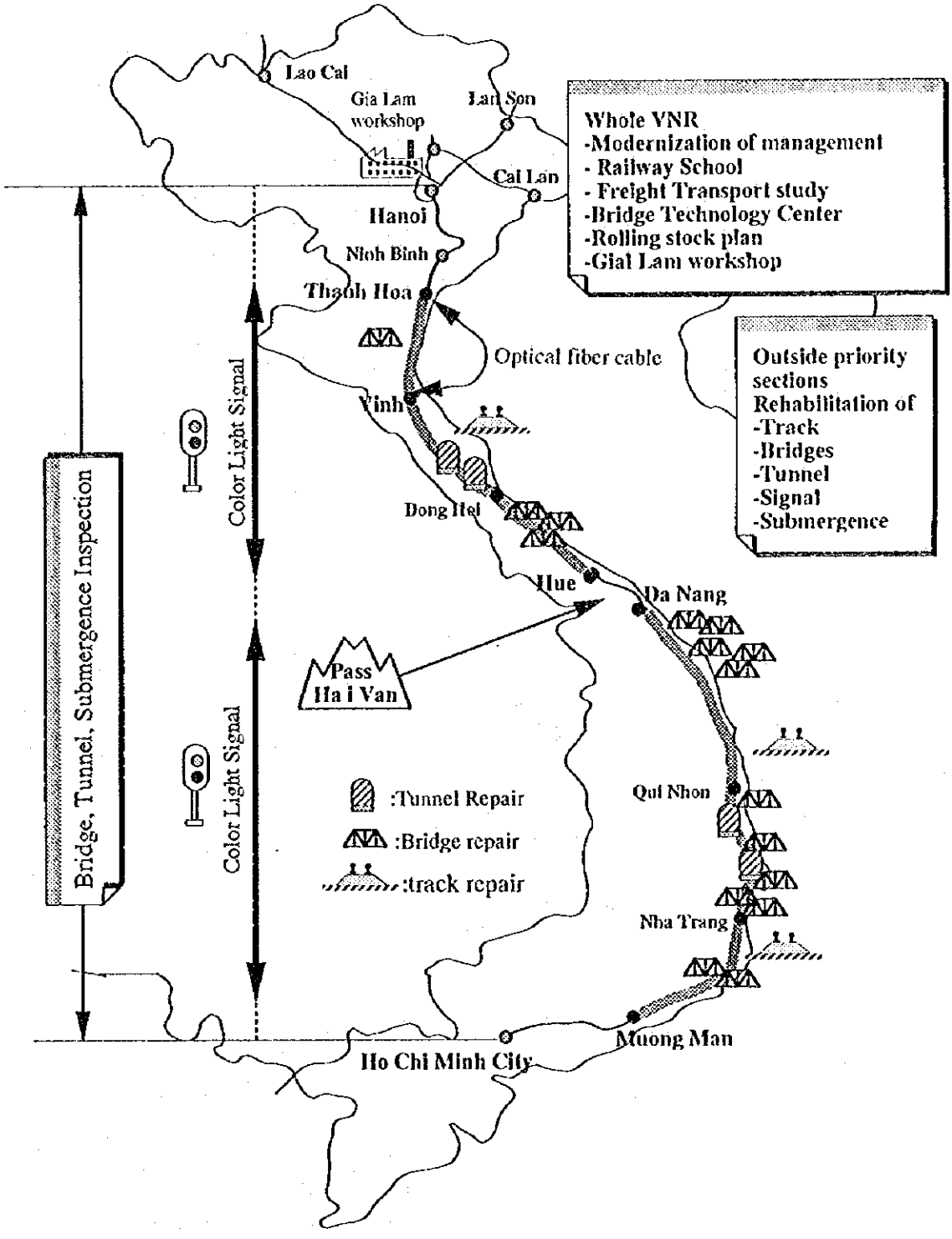
(a) Establishment of bridge technology center

Bridge technology obtained by projects will be concentrated in this center. Examination machines and equipment for bridge structure and soil examination will be installed by this project. Overseas training for engineer will be executed.

Program 2000 in Hanoi-Ho Chi Minh Line
Priority Section Projects



Program 2000 in Hanoi-Ho Chi Minh Line
Other Sections Projects



7. Economic and Financial Evaluation

7.1 Economic Evaluation

Economic evaluation covers the rehabilitation project on the whole Hanoi - Ho Chi Minh line and three priority sections. Other projects are not evaluated because it is difficult to identify which measure contributes to generate the economic benefit and how much it is. Feasibility is much dependent on the growth rate in the future, so the sensitivity analysis was conducted carefully .

(1) Economic Benefits

Five (5) kinds of economic benefits are incorporated in this study. Those are:

- Saving in travel time of railway passengers
- Saving in travel time of railway cargo
- Saving in capital cost of road passenger traffic
- Saving in capital cost of road cargo traffic
- Saving in operation and management of railway

Other items of economic benefits are saving in accident damage and in saving in infrastructure damage attributable to natural disaster. However these are not integrated in benefit calculation . This is because these are reckoned negligibly small compared with the total cost of the rehabilitation cost.

(2) Economic Cost

Cost at the market prices are calculated by distinguishing domestic portion and foreign portion. All prices of the foreign portion are assumed equivalent to the competitive international prices.

Of the domestic prices, the labor cost alone is transformed into economic price. Its conversion rate is 0.8 since the disguised employment ratio is estimated 20% in the government document. Prices of other materials are kept same as the market prices.

(3) Assumptions

Investment period; 1996-2000

Evaluation period; 1995-2030 a period which covers a construction period and the benefit flow of 30 years

Opportunity cost of capital ; 8.4% This is equivalent to a interest rate of "Capital Formation Loan" offered by Industrial and Commerce Bank of Vietnam.

(4) EIRR

Table 7.1.1 EIRR and Results of Sensitivity Analysis

Cost / Benefit	+20%	+10%	Normal	-10%	-20%
Whole Line					
-20%	7.9%		10.0%		
-10%		10.3%	11.5%		
Normal	10.5%	11.6%	12.7%	14.1%	15.6%
+10%			13.9%		
+20%			15.1%		
Hanoi - Than Hoa					
-20%	8.0%		10.3%		
-10%		10.6%	11.8%		
Normal	10.8%	11.9%	13.1%	14.1%	15.9%
+10%			14.3%		
+20%			15.4%		
Hue - Da Nang					
-20%	4.2%		6.4%		
-10%		6.7%	7.9%		
Normal	6.9%	8.0%	9.2%	10.5%	11.9%
+10%			10.3%		
+20%			11.4%		
Muong Mau - Saigon					
-20%	4.4%		6.7%		
-10%		6.9%	8.1%		
Normal	7.2%	8.2%	9.4%	10.7%	12.2%
+10%			10.6%		
+20%			11.7%		

Sensitivity analysis shows if benefit will decrease by 20 %, the EIRRs of Priority Sections 2 and 3 will fall into a bit lower than the opportunity cost of capital, ranging 6.4% to 6.7%. This can be realistic if the Vietnamese economy follows lower growth scenario of 8-9 % in the future up to 2010. And it calls attention of the policy makers to be keen on the growth scenario in the future.

(5) Conclusion

All the projects for the Hanoi-Ho Chi Minh line can be judged feasible on the assumption that all the pre-conditions are set constant. Highest priority can be given to the Hanoi - Than Hoa section with EIRR 13.1%, and the second priority is given to both the Muong Man - Saigon section and the Hue - Da Nang section, which show EIRRs of 9.4% and 9.2% respectively.

7.2 Financial Evaluation

(1) Preconditions for analysis: relationship between Hanoi - Ho Chi Minh railway's revenue and expenditure and its investment burden

(a) In line with the reorganization of VNR, the new investment cost based on the North-south Line Improvement Plan shall, except for investment into rolling stock and rolling stock workshops, be included in the government's infrastructure account. The government will bear the cost of works and, upon works completion and hand over of resultant facilities to VNR, VNR will operate them and only have to pay a beneficiary charge in the form of rental (10% of operating income). Moreover, as a rule, VNR shall not bear the costs of maintenance and repair of the received facilities.

(b) Rolling stock are the proper assets of VNR, and the costs of procurement, remodeling and rehabilitation of rolling stock shall be borne by VNR.

As the analysis will only consider the new rolling stock to be introduced on the United Line, the required quantity shall be purchased for use by VNR (Transport Division) from external or internal sources (Industrial Division which is a different accounting unit). As with the economic analysis, import tariffs shall not be taken into account, and the estimated cost in foreign currency shall be regarded as market prices.

(c) In this analysis, the rehabilitated rolling stock shall be counted as new rolling stock and shall be assumed to have an equivalent service life of 25 years. With regard to the cost of rehabilitation, however, this shall be counted as 70% of the cost of new rolling stock purchase.

(d) Investment into workshops is investment into the Industrial Division, which is a separate accounting unit within the VNR group. The fruits of this investment are translated into new rolling stock production, and it is fair to say that the goods and service charges paid by the Transport Division to the Industrial Division include the workshop investment cost.

Gia Lam Workshop, which is the main workshop of the Industrial Division, will be initially responsible for the maintenance and repair of all VNR rolling stock, and there is a further vision to convert it into an independent comprehensive railway workshop in the future.

(2) Results of Cash Flow Analysis

Cash Flow and FIRR

From the Start of Investment	FIRR
15 Years	5.44 %
25 Years	8.71 %
35 Years	11.63 %

as per Appendix 11.2.1. Cash Flow Chart

The above FIRR values are a little higher than those of the Master Plan which did not exceed 10 % for the 35 years evaluation.

If taken simply at surface value, another way to hike FIRR value is by hastening the shift of maintenance staff to the Government account and thus reducing the proper personnel cost of VNR. However, it is more desirable is to attain a higher labor productivity through the improvement of staff performance through education and training.

(3) Evaluation

(a) As state above, only one base case is selected for Financial Analysis. However, whereas there are many uncertain factors in financial calculations in the present transitional state, before entering into formal sensitivity analysis it is necessary to examine some possible cases which could produce positive or serious negative results according to the situations,.

i. In the case where the number of VNR staff would be reduced to 24,000 in 2000 as an effect of positive management reorganization.

FIRR for 35 Years Evaluation..... 17.36%

ii. In the case where the proposed increase of extra service charges for passengers is not realised.

FIRR for 35 Years Evaluation.....4.25%

(b) As for regular sensitivity analysis, four different variations are selected, representing ±10% changes of revenue and operation cost of the base case, the results of which are shown below:

Table 11.2.5 Sensitivity Analysis (for 35 Years Evaluation)

Benefit \ Cost	0	+10%	-10%
0	11.63%	7.71%	16.80%
-10%	6.83%	2.87%	
+10%	17.46%		

In Conclusion, the present Financial Analysis is not attended with a better results in comparison with the evaluation of the Master Plan. The burden of expense is felt heavier than before. Chiefly on account of the increase of salary standard of staff and 2% higher setting of infrastructure rental than preestimated. Hence we recommend a series of proper measure should be promptly taken for management improvement.

8. Environmental Impact Assessment

8.1 Targets of EIA Study

The following sub-projects will be selected for environmental impact study:

- Overall rehabilitation project

Hanoi - Thanh Hoa	175km
Hue - Da Nang	103km
Muong Man - Saigon	175km

- Gia Lam Workshop improvement project

8.2 Environmental Impact Evaluation

8.2.1 Overall Rehabilitation Project

(1) Construction Phase

Positive impact

Improvement of railway line, passenger facilities, bridges and tunnels requires construction workers. Therefore, employment opportunity will increase.

Negative impact

Major negative impact may be obstruction of road traffic. Construction activities influence to the existing traffic conditions. The following activities will bring about obstruction of road traffic.

- improvement of railway
- construction of level crossing alarm
- construction and improvement of bridges

Especially improvement of bridges that is used for trains and vehicles will cause hindering traveling vehicles, hence Road No. 1A is arterial road in Viet Nam. If the existing traffic conditions will be obstructed by construction activities, it is recommended that the contractor should manage traffic, and provide information on construction schedule and detours.

Closing small scale freight stations will produce elimination of staff members. Although some staff members can transfer to other section, closing of freight stations may give rise to lots of unemployment.

(2) Operation and Maintenance Phase

Positive impact

It is expected that passenger service facilities, passenger cars and bridges will be beautified by the implementation of the project. Major positive impact may be to contribute national and regional economy by frequent service and speed-up of trains.

Negative impact

Frequent service is equal to increasing number of trains and speed-up of trains. Therefore, it is possible that frequent service will bring about increasing load of emission gas and noise level, and obstruction of traveling trains. There are lots of traffic accidents concerning railway in Viet Nam at the present. From view point of Viet Nam railway situations, traffic accidents of trains may increase by frequent service.

9 Conclusion and Recommendation

(1) Economical analysis of the four projects, namely
   (a) rehabilitation and improvement the whole line
       (Hanoi-Hochi Minh)
   (b) priority section 1 (Hanoi -Than Hoa)
   (c) priority section 2 (Hue- Da Nang)
   (d) priority section 3 (Muong Man- Saigon)
   shows that investment to each of these four projects can be justified from the national economic point of view. If the priority must be given to these four projects above, project (a), (b), (d) should be given higher priority than project (c) not only from the view point of economic return, but also from overall significance of the section.

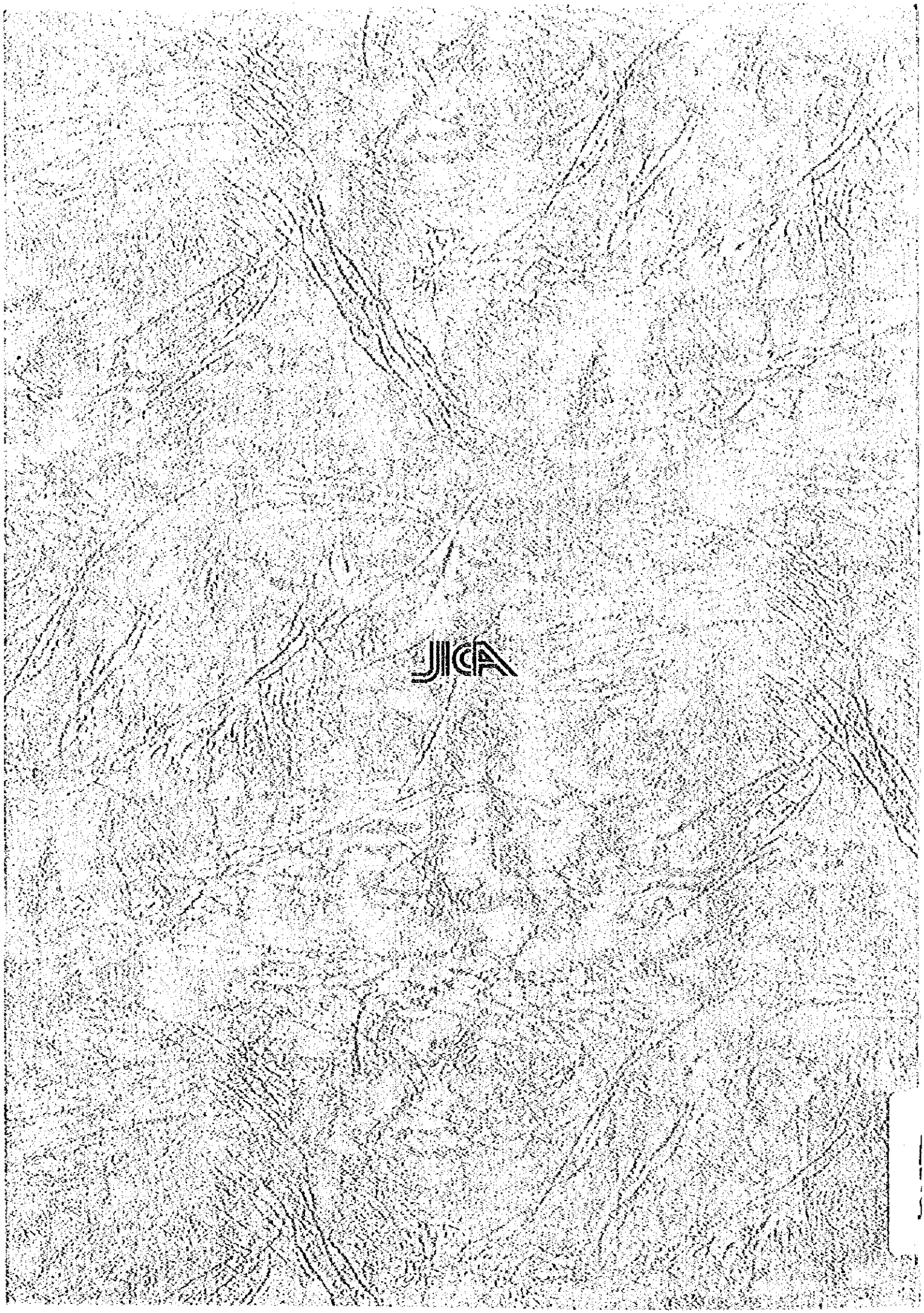
(2) Environmental evaluation on these four projects shows that there will be no significantproblems for these projects, if appropriate countermeasures as indicated in this Report are taken, because the projects are improvement and rehabilitation of the existing line.

(3) Financial analysis shows that all these four projects are financially viable for VNR if the Government supports the financing of the investment on infrastructure portion of the Projects.

(4) In addition to the projects considered for the cost benefit analysis, 9 other significant projects (as indicated in the section 10.2 - 10.10) have been recommended. These will all contribute to the effective improvement and development of the Vietnam Railways.

(5) Total amount of investment recommended for rehabilitation and improvement of Hanoi-Ho chi Minh railway line amounts to about US$ 535 million. This means that the Vietnamese government should allocate up to 2000 about 20% of investment to transport sector to railway sector. In this regard it should be recalled that about 28% of investment of transport sector was allocated to railway sector in Japan in the period 1945 - 1960, in order to make the railway play its role to support socio-economic development of the country.

(6) Concludingly, it is strongly recommended that rehabilitation and improvement of Hanoi-Hochi Minh line should be implemented with the full financial support of the Government, in order to make Hanoi-Hochi Minh railway line play fully its role to support socio-economic development of the country.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