

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 III
Feasibility Studies on Rehabilitation and
Improvement of Lao Cai - Cai Lan Line**

February, 1996

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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.

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 Lao Cai - Cai Lan railway line targeted at 2000, Vol. III 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 study on high priority projects 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.

When considered in terms of a short timespan of, say, the year 2000, however, the development along the line and of Port Cai Lan and its surrounding areas will not have been completely conducted and the railway is expected to transport not so much traffic.

It is desirable to firstly formulate a conceptual improvement plan with the long timespan of upto 2010. A feasibility study for a short-term improvement plan for the Lao Cai - Cai Lan Line upto the year 2000 has been conducted based on this long term improvement plan. In formulating the long-term conceptual improvement plan, the possibility of introducing a short cut route has been examined together with examination of the preferable timing to change the standard gauge on the Hanoi - Cai Lan section to the meter gauge in accordance with the government policy. The necessary measures or management improvement (such as manpower reduction, marketing of passenger and freight services and an improved service level) have been carefully examined together with those for the improved operational safety and reliability of the Lao Cai - Cai Lan Line.

Through traffic between Lao Cai Line and Cai Lan Line is at present very few. Even at 2010, through traffic between two lines is few, thus two lines playing their respective roles independently.

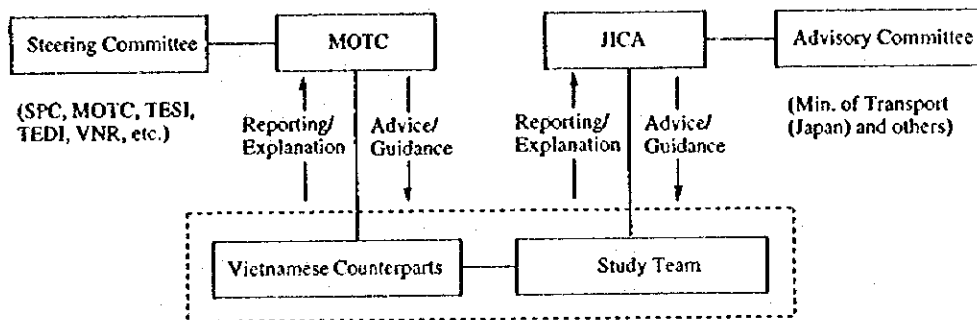
In this context, it is desirable to carry out its feasibility studies on two lines separately. JICA Study Team has carried out feasibility studies on Lao Cai line and Cai Lan line separately.

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 Lao Cai - Cai Lan Line as well as the Hanoi - Ho Chi Minh 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 an 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 Lao Cai - Cai Lan line are divided into many sub-projects, which are formulated based on the following principles.

- To improve an overall capacity and ability of the railway industry as a total system
- To assure safety and stable operation all over the line
- 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 Lao Cai - Cai Lan Line

(1) Hanoi - Lao Cai Line

The Team judges that the roles this line has to share are as follows:

- To strengthen an east-west axis of transport network
- To assure an access to a remote area with no other transport mode
- To transport the mining products, and to provide a foundation of fertilizer industry and agriculture
- To share the potential international freight transport in future

The followings are the principles when the Team works on the rehabilitation plan.

- To assure a safety and stable operation all over the line
- To try to induce a management rationalization
- To induce a modernization of maintenance works

(2) Hanoi - Cai Lan Line

The Team assumes that this railway line has to play a great role in this region, facing a drastic expansion of transport demand attributable to the Cai Lan Port. Those are:

- To form a transportation means responsible for an arterial traffic flow
- To share a role to induce the regional development progress along the line
- To induce a international transportation with China

Here are major principles the Team takes into consideration when preparing the rehabilitation and improvement projects of this line.

- To be advantageous and competitive as a transport means for freight
- To commence the railway service prior to an completion of the road grade-up works
- To prove the best timing of a meter gauge installation and a new short-cut line construction

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
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 3.1.2 Growth Projection by Province

PROVINCE	(at 1994 constant prices)					1 USD=11,000 VND
	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	66	93	131	213	346	
Cao Bang	71	74	99	152	253	
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	1,018	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	630	1,014	1,606	
Ha Tinh	174	184	249	395	622	
Quang Binh	108	111	150	231	365	
Quang Tri	73	75	101	157	254	
Th. Thien Hue	170	193	360	641	1,136	
ON. 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	663	
TP HCM	3,293	3,777	7,538	13,478	24,014	
Song Be	222	262	552	1,024	1,894	
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	9,980	
Long An	284	303	417	665	1,055	
Dong Thap	373	403	572	937	1,528	
An Giang	486	521	737	1,201	1,948	
Tien Giang	379	411	580	940	1,518	
Ben Tre	242	260	356	555	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	592	936	
Kien Giang	372	406	587	981	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 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.

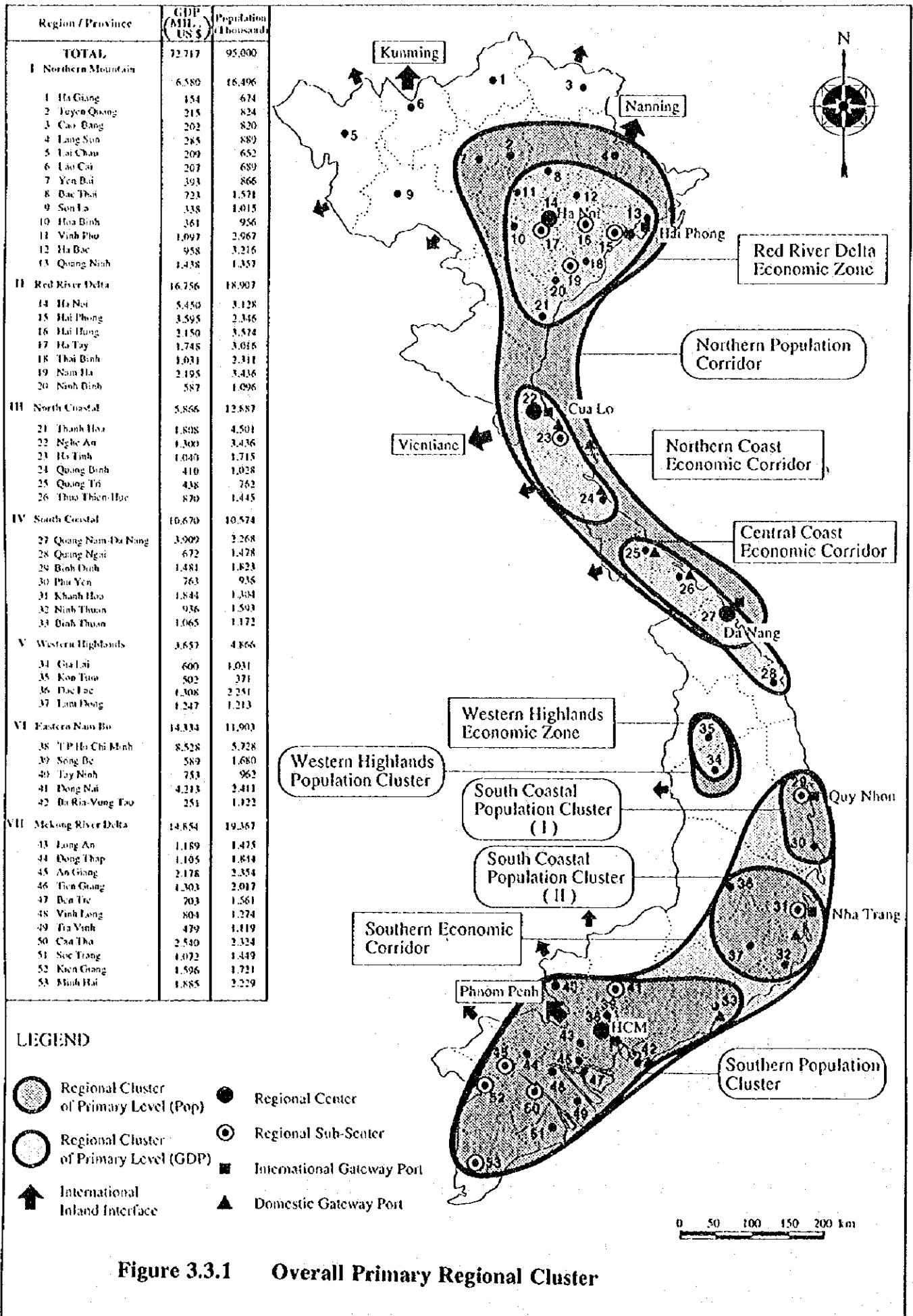
This projection assumes that the growth rate of population will be controlled to calm down to 1.4% at the year 2010. Population projection is thus totally dependent of a performance of population control policy; family planning. Compared with a natural growth rate (2.1%) in the period between two census 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.

Figures by province is shown in Table 3.2.1.

3.3 Regional Integrity

This clarifies a regional concepts to formulate the rehabilitation plan of the Hanoi - Lao Cai line and the Hanoi - Cai Lan line.

Figure 3.3.1 shows a spatial structure derived through the regional clustering procedure.



Since all the primary regional clusters are on railway lines, each regional cluster is 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 within the northern region, there is a strong integrity within "Growth Triangle" composed of Hanoi, Hai Phong and Cai Lan. Furthermore, the followings 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 200 km), 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.

3.4 Priority Section

The Team sets one priority section. This section is a subject of intensive and overall rehabilitation and improvement.

Criteria of selection and a selected section are as follows:

- Densely populated region and/or new economic center
- Area with high demand of railway
- Appropriate section to compete with other modes
- A task of new short-cut line is at issue.
- To minimize the cost of temporary rehabilitation for the existing line

The Team sets the section below as a priority rehabilitation section.

- Yen Vien - Cai Lan section

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.

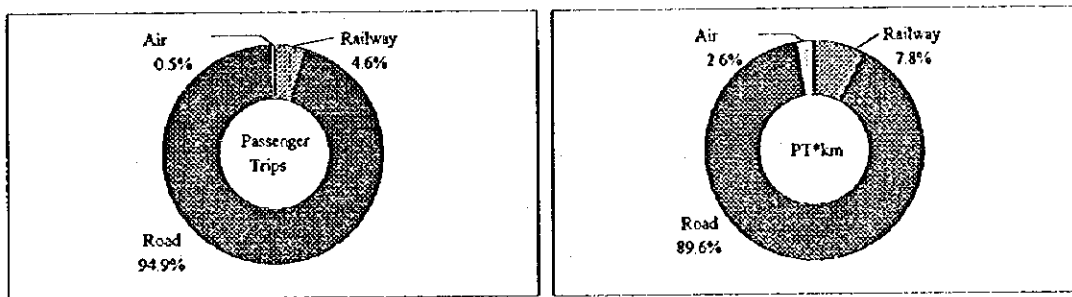
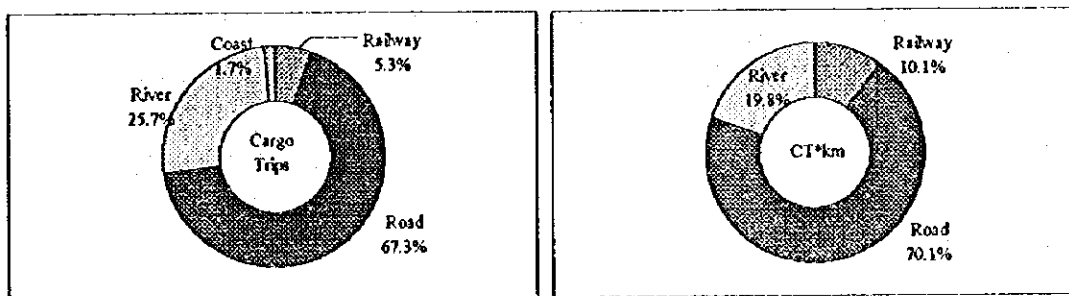


Figure 4.1.1 Passengers Analysis by Transportation (1994)



*) 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 Mckong 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

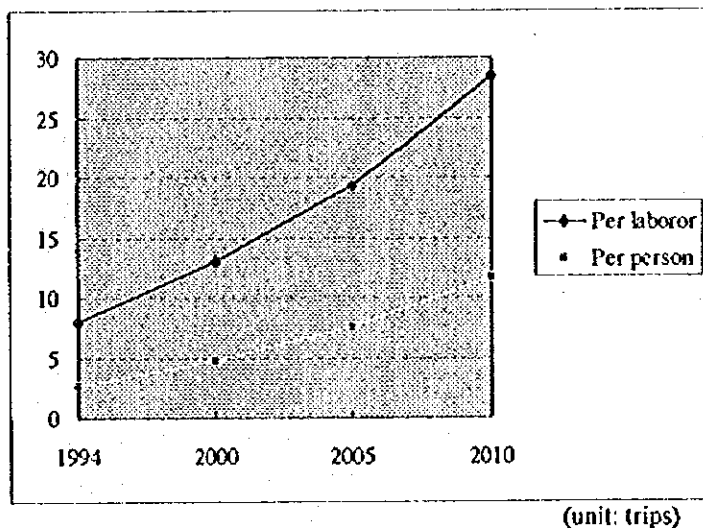


Figure 4.2.1 Passenger Trips per Person

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

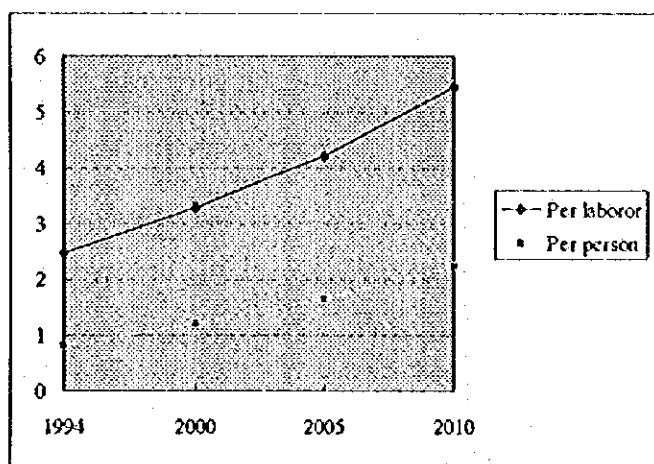


Figure 4.2.2 Cargo Trips per Person
(unit: ton)

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 Lao Cai - Cai Lan Line

(1) Passenger Traffic

Passenger transportation by railways along the Lao Cai line is expected to grow at an annual growth rate of 5% up to the year 2000, and increase to 7% after the year 2000. Road network is not well established in this area, and trains play an important role of transportation. This condition is not likely to change in the future, but developments in bus transportation might affect the share of railway transportation.

Passenger transportation by railway along the Cai Lan line is expected to grow at an annual growth rate of 10%. This rate is totally in proportion with the total growth rate of all traffic demands in this area, and the numbers show that there is a possibility that railways can maintain their share if the railway rehabilitation will be implemented to improve their services adequately.

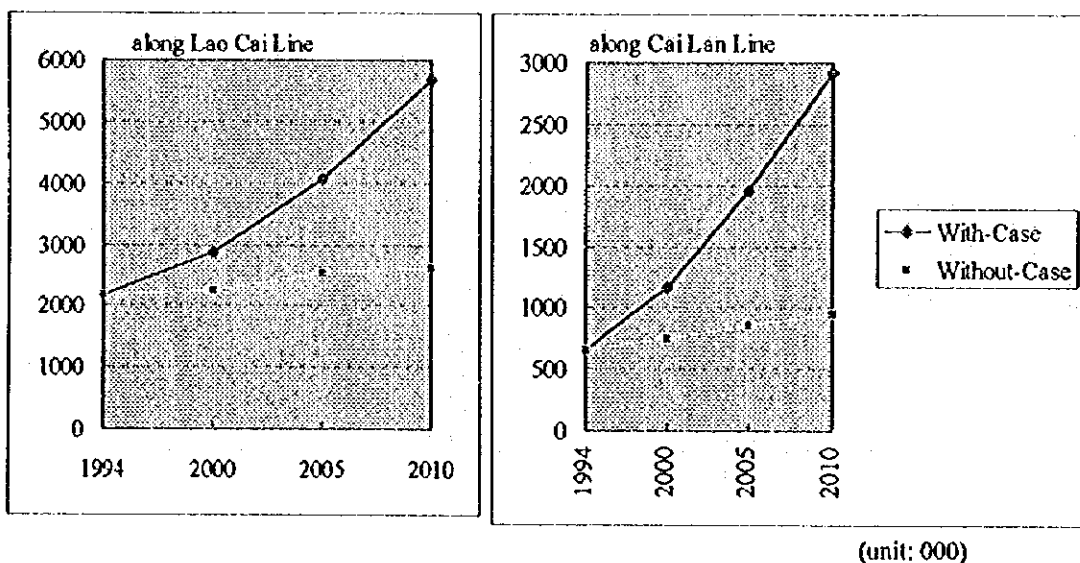


Figure 4.3.1 Person trips by railway along Lao Cai-Cai Lan Line

(2) Cargo Transportation

Rail cargo transportation along the Lao Cai line is estimated to grow at an annual growth rate of 3%, owing to the fact that cargo demand for this route is lower than the other routes. However, railway accounts for 8% to 10% of the total cargo transportation demand. Short distance freights meet competition with inland waterways (up to Viet Tri), but for long distance freight, railways still can play an important role.

Cargo transportation along the Cai Lan line is expected to grow rapidly in amount, although the share by railway is only 3% in the future. There will be only a 2% annual growth rate up to the year 2000, but a rapid economic growth in the area will accelerate the annual growth rate to a 10% order. If railway services will not be improved by expanding necessary facilities, they will lose freight under the heavy competition with inland waterways and trucks. Further demand can be generated at the Cai Lan port.

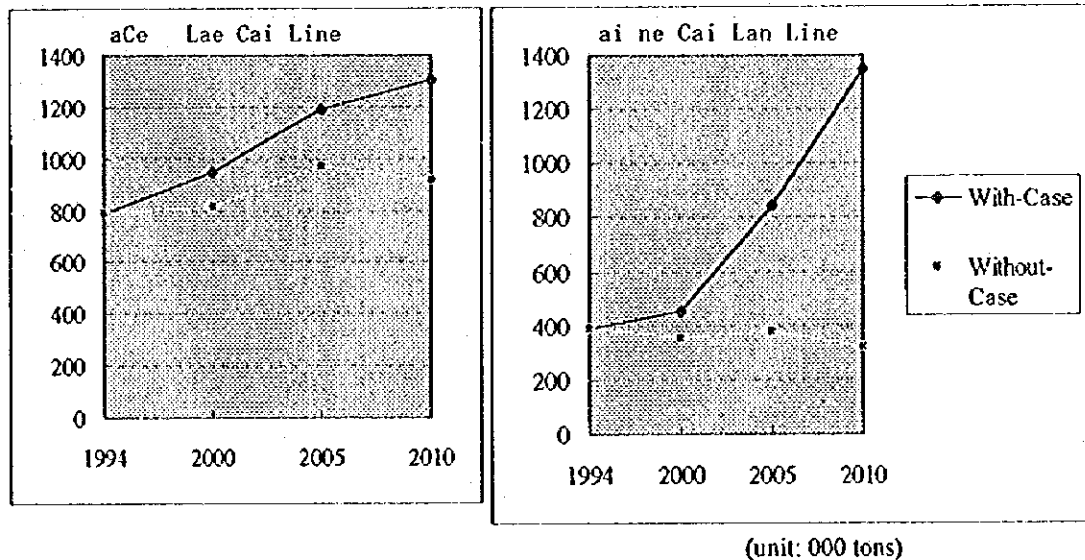


Figure 4.3.2 Cargo Trips by Railway along Lao Cai-Cai Lan Line

(3) Cai Lan Port

The completion of all the Cai Lan port facilities is planned for the year 2000. Therefore there will be small amounts of cargo until 2000. If the railway freight tracks will be extended to a new Cai Lan port by the year 2000, and the quality of railway service will improved, it is possible for railways to maintain its current share in cargo transportation in this area. This service extension will result in an additional 600 thousand tons of railway cargo.

(4) Tourism

In 1994, the number of tourists to Quang Ninh totaled approximately 400 thousand visitors, of which 130 thousand were from overseas. Quang Ning now has 1,400 rooms of hotels available for these tourists, and 3,700 rooms are expected to be necessary in the future. However, foreign visitors have not used railway transportation, and railway demand for sightseeing purposes consists of only local Vietnamese travelers.

There are hotel construction plans taking place in the Cai Lan area, and visitors to this zone are expected to increase. To emphasize railway services as transportation of tourists in this area, it is necessary to shorten the time-to-destination and also introduce air-conditioned cars to compete with buses.

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.

5.2 Management Analysis

(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 than 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 IBTC. 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, $(\text{operating cost})/(\text{operating revenue}) \times 100$, 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 of Lao Cai-Cai Lan Line

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 current obstacles.

(a) 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 Lao Cai-Cai Lan Line is not sufficient now.

There are no loading machines at stations. Moreover, almost stations operate cargo even though it is small lot of cargo.

Improvement of services for passenger and freight is essential in order to correspond the needs of market.

(b) Train operation

The Lao Cai line is single track meter gauge through out the average distance between stations relatively long at 7 km. Cai Lan Line is single track of standard gauge. There are 11 intermediate stations between Kep-Ha Long, but interchange facilities of several stations are not used.

(c) Track

Track structure of the Lao Cai Line is composed with 43kg/m rail and 2-block concrete sleepers and iron sleepers. Track structure of the Cai Lan Line is composed with 43kg/m rail and PC sleepers.

Track maintenance work is executed by labor intensive work with poor equipment. Current track structure has potential to run with the speed of 80-100km/h. When track maintenance is executed with scientific and modernized method, it is possible to realize raising speed up more.

Rail joints are the most weak point in the track structure, so 2 pieces of rails will be welded in a rail of 25m in length in order to delete these weak points. Maximum speed of train will be raised after installation of track maintenance machines and equipment, and rail welding.

(d) Bridge

Some bridges on the line are deteriorated and suffered damage by the war. Some bridges were recovered by temporary beams during and after the war. Bridges are maintained with poor budget and machines, and efforts of skilled engineers.

There are some speed restrictions due to deteriorated structures but they are not serious obstacles for train operation in Lao Cai-Cai Lan Line.

Inspection of soundness of bridges should be executed in order to establish suitable rehabilitation program and to use limited budget efficiently.

Special attention should be paid for Long Bien bridge.

(e) Signaling

Token block system and semaphore signals are used in the line

Installation program of tokenless block system, color light signals and power sources should be considered in order to increase traffic capacity and shorten traveling time.

(f) 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. It is necessary to install new facilities intentionally. Spare parts will be borne from replaced facilities.

(g) 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. Standard gauge rolling stock is used in Cai Lan Line.

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 in the near future.

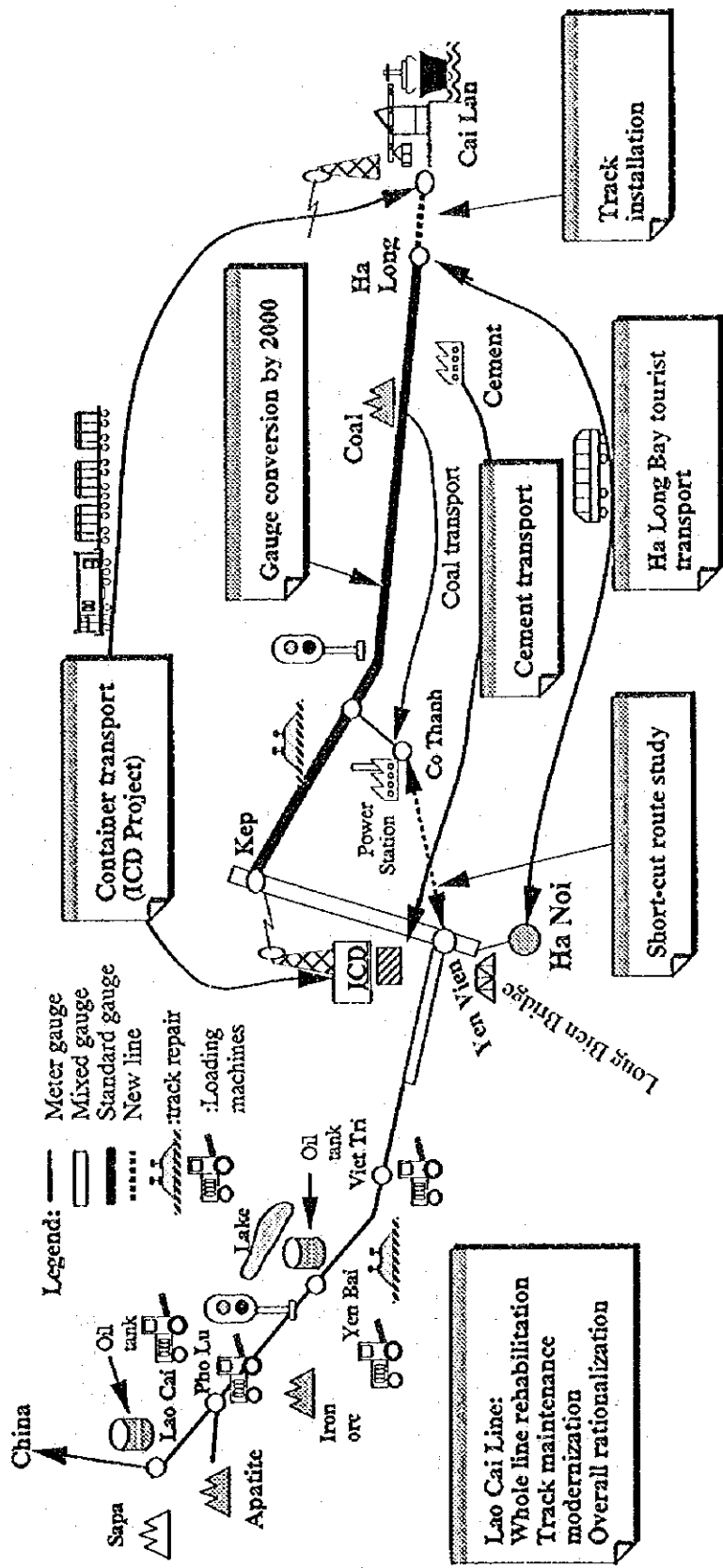
Innovation and purchasing of locomotives and passenger cars will be necessary by 2000.

(2) Principle of improvement on Hanoi-Lao Cai Line

Safety and stable train operation are the essential functions of railways. Priority among the rehabilitation work should be taken for safety and stability improvement.

This line is not expected to increase the revenue so much, that reduction of cost is necessary. Since, the line is an essential infrastructure for the life of resident along the line, the VNR needs to perform duty to use railways facilities efficiently.

Program 2000 in Lao Cai-Cai Lan Line



The rehabilitation plan should streamline the management of VNR and improve productivity of railways.

It is also necessary to make all staff to obtain an appropriate education and training in order to catch up modern management and technology.

Rehabilitation plan should implement modernization of maintenance works.

Long Bien bridge will be surveyed and studied prior to plan of replacement by 2000 with **Bridge structure inspection project**.

(3) Project Cost on Lao Cai Line

Project costs in the Lao Cai Line are as follows:

(Unit: US\$ million)

Projects for cost benefit analysis in feasibility studies	Total Cost	Local Currency	Foreign Currency
Whole Line Rehabilitation	27.34	7.82	19.52
Track Maintenance Modernization	1.59	0.12	1.47
Overall Rationalization	1.24	0.71	0.53
Total cost	30.17	8.65	21.52

(4) Outline of projects of Lao Cai Line

(a) Whole line rehabilitation

2 pieces of rail will be welded at 15,600 spots. Small radius curves will be re-aligned and measuring pegs for maintenance of alignment will be installed.

Tokenless block system, color light signals and power source will be installed at 33 stations.

Telecommunication cable and wireless telephone installation will be implemented between Yen Vien-Viet Tri.

16 D12Es and 14 passenger cars will be procured by 2000.

Rain and wind velocity gauge will be equipped at 4 stations in order to prevent accident by disaster.

(b) Track maintenance modernization

Track maintenance machines and equipment for 10 depots will be installed. Crushed stone machines and ballast hopper wagons will be installed for ballast adding.

As a result of modernization of track maintenance, employees will be reduced by productivity improvement

(c) Overall rationalization

Station facilities at Viet Tri, Yen Bai, Pho Lau and Lao Cai will be innovated. Seat reservation systems and loading machines are also installed at 4 main stations. Oil terminal facilities are necessary to be constructed at Yen Bai and Lao Cai stations.

(5) Principle of improvement on Hanoi-Cai Lan Line

Safety and stable train operation are the essential functions of railways. Priority among the rehabilitation work should be taken for safety and stability improvement.

This line is not expected to increase the revenue so much, that reduction of cost is necessary, but there is potential demand for rail transport in the near future.

The VNR needs to perform duty to use railways facilities efficiently.

The rehabilitation plan should streamline the management of VNR and improve productivity of railways.

It is also necessary to make all staff to obtain an appropriate education and training in order to catch up modern management and technology.

Rehabilitation plan should implement modernization of maintenance works.

The Cai Lan Port is planned to commence transport by 2000. The existing road 18 will be improved by 2000. The railway will face severe competition with road traffic. Cai Lan Line needs to be rehabilitated in order to compete with roads. As there is some demand of port cargo for rail transport, it is necessary to prepare port cargo transport. There is a policy to convert gauge from standard to meter, therefore, projects are formulated in line of the policy.

(6) Projects list and cost on Cai Lan Line

(Gauge conversion is executed by meter gauge by 2000)(Unit: US\$ million)

Projects for cost benefit analysis in feasibility studies	Total Cost	Local Currency	Foreign Currency
Ha Long-Cai Lan Section Track Installation	3.37	2.30	1.07
Ha Long Bay Tourist Transport Improvement	6.94	2.01	4.93
Rehabilitation of Kep-Ha Long Line	4.28	1.29	2.99
Gauge Conversion (MG)	23.10	10.73	12.37
Total	37.69	16.33	21.36

Projects for other recommendation	Total Cost	Local Currency	Foreign Currency
Inland Container Depot Construction	6.25	1.56	4.69
Cement Transport Improvement	3.20	0.40	2.80
Total	9.45	1.96	7.49

(7) Outline of projects

(a) Ha Long-Cai Lan section track installation

Track between Ha Long Station-Cai Lan Port(4.3km) will be constructed with meter gauge by 2000.

(b) Ha Long Bay tourist transport improvement

Locomotives and passenger cars will be procured and Ha Long Station will be innovated. A seat reservation system is installed at Ha Long Station.

(c) Rehabilitation of Kep-Ha Long Line

2 pieces of rail will be welded at 8,400 spots. Track maintenance machines and equipment will be installed at 7 depots. Crushed stone machines and ballast hopper wagons will be installed for ballast adding.

As a result of modernization of track maintenance, employees will be reduced by productivity improvement

Tokenless block system, color light signals and power source will be installed at 12 stations.

Rain and wind velocity gauge will be equipped at Kep and Ha Long stations.

(d) Gauge conversion

Optimal timing of gauge conversion into meter gauge was studied and based on overall evaluation is recommended to convert gauge to meter gauge by 2000 with a method of stopping train operation. Rolling stock that needs to replace standard gauge rolling stock will be procured until gauge conversion.

(e) Inland container depot

Since cargo to and from Cai Lan Port is not so much until 2010, a temporary ICD at Yen Vien is better to be constructed. Loading machines for containers is necessary to be installed at ICD.

A freight information system and digital micro wave radio system between Yen Vien and Cai Lan Port will be installed for container transport.

Container wagons of 30 will be purchased for container transport.

A further study for a full scale ICD is necessary to acquire wide land near Yen Vien and to develop industry development plans in greater Hanoi.

(f) Cement transport improvement

Cement transport is one of the profitable business, but installation a cement terminal facility at Yen Vien Station is essential to expand transport share by rail. Cement tank wagons that are idle now are modified with air-unloading system.

(g) Short-cut route construction(study)

Construction of a new line between Yen Vien and Pha Lai was studied, but it is better to postpone the construction after 2010 according to the economical evaluation by the JICA team.

7. Economic and Financial Evaluation

7.1 Economic Evaluation

Economic evaluation covers the rehabilitation project on the whole Hanoi - Lao Cai line aiming at rationalization and the Hanoi - Cai Lan line aiming at improvement of Cai Lan port-related cargo transportation. Other projects are not evaluated because it is difficult to identify which measure contributes to generate the economic benefit and how much it is. In addition, plan of gauge change on the Hanoi - Cai Lan line and plan of new short cut line construction are evaluated in terms of investment efficiency. 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

Figure 7.1.1 shows all the cases of the Lao Cai - Cai Lan Line, including the analysis on a timing of short-cut line construction and a change into meter gauge. And Table 7.1.1 shows the investment efficiency of the Hanoi - Lao Cai line and those of the Hanoi - Cai Lan line, which include the results of sensitivity analysis.

With the level of the growth rate as set by the SPC, the feasibility of all the rehabilitation projects can be valid.

It is well worth calling attention of all the policy planners to observe the actual economic growth path in the future. Sensitivity analysis shows if benefit will decrease by 20%, the EIRR will fall into a range 3.8% to 7.3% i.e. lower than marginal level to approve the feasibility of the Projects. This can be realistic if the Vietnamese economy follows lower growth scenario of 8% ~ 9% in the future up to the year 2010.

(5) Conclusion

Rehabilitation projects on the Hanoi - Lao Cai Line shows that this project is feasible and can be recommended to implement.

Construction project of short-cut line cannot turn to be feasible up to the year 2010.

Conversion of gauge into meter one with other rehabilitation works is at the marginal level to justify the implementation. And it is very dependent on the growth rate of the economy. However, EIRR reaches 10.1% if the gauge will be changed by the year 2000. In case that benefit will decrease by 20 %, the results turns into non-feasible. It is recommended that the policy planners be careful on the economic growth scenario in the future.

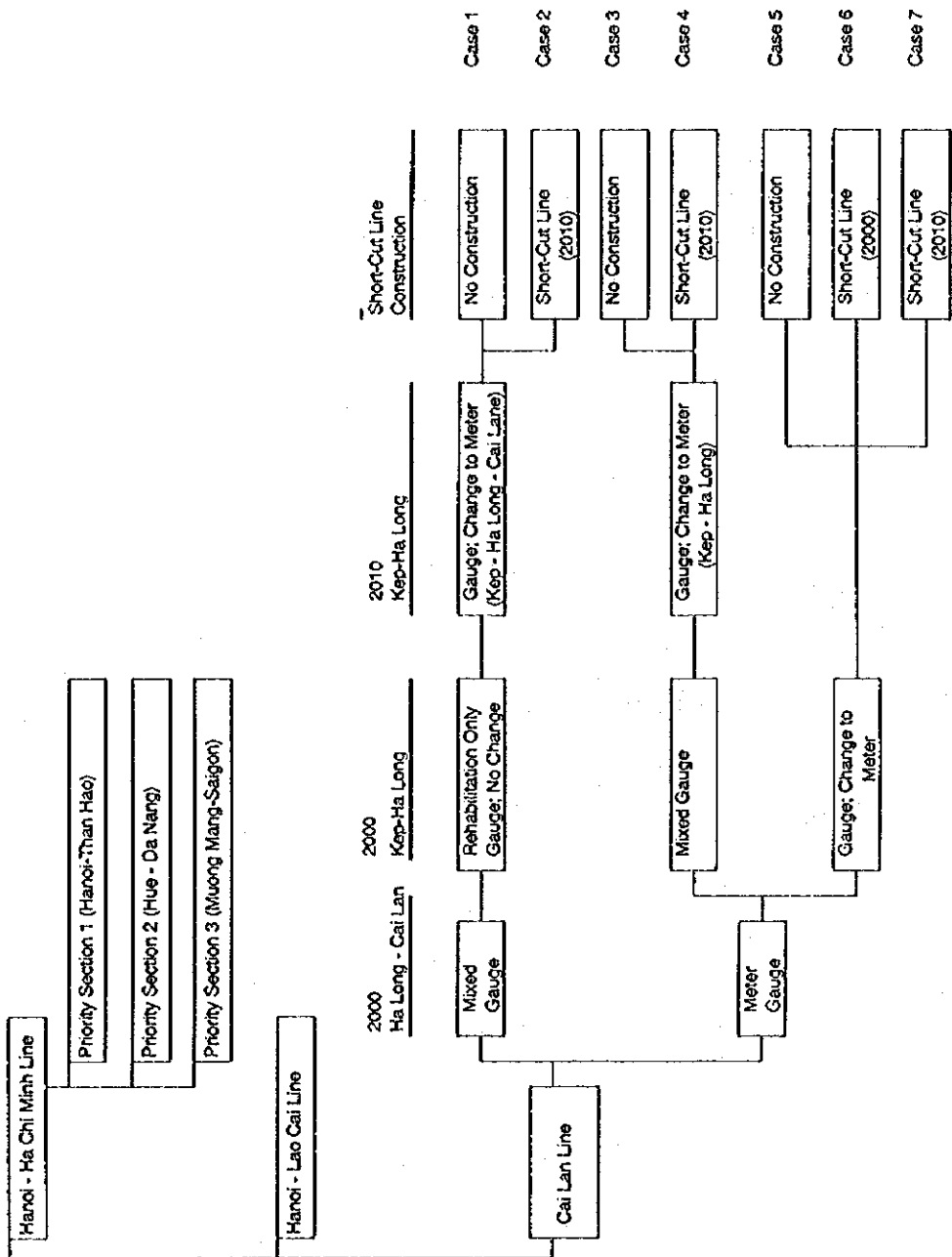


Figure 7.1.1 All the Cases for Analysis of the Lao Cai - Cai Lan Line

Table 7.1.1 EIRR and Results of Sensitivity Analysis

Case	EIRR										NPV (mil.U\$) (disc. rate=8.4%)	B/C	
	Benefit = + 0%		+ 0%		+ 0%		+ 10%		+ 20%				
	- 20%	- 10%	+ 10%	+ 20%	+ 0%	+ 0%	+ 0%	+ 10%	+ 20%	- 10%			- 20%
Hanoi - Lao Cai Line													
	15.8	13.3	9.4	7.8	11.3	7	9.2	13.1	14.9	7.5	3.8	27	1.16
Hanoi - Cai Lan Line													
Case 1	14.9	12.1	8.0	6.4	9.8	5.7	7.8	11.9	13.9	6.1	2.7	8	1.08
Case 2	12.3	9.8	6.1	4.7	7.8	4.1	6.0	9.6	11.4	4.4	1.5	-4	0.97
Case 3	13.2	11.4	8.4	7.1	9.8	6.5	8.2	11.3	12.6	6.8	3.7	11	1.1
Case 4	11.1	9.2	6.1	4.8	7.5	4.3	6.0	9.0	10.4	4.6	1.7	-7	0.95
Case 5	13.6	11.8	8.6	7.3	10.1	6.7	8.5	11.6	13.0	7.0	3.9	13	1.12
Case 6	8.1	6.8	4.7	3.8	5.7	3.4	4.6	6.7	7.6	3.6	1.4	-35	0.77
Case 7	11.3	9.4	6.4	5.1	7.8	4.5	6.2	9.3	10.7	4.8	2.0	-5	0.96

7.2 Financial Evaluation

7.2.1 Lao Cai Line

(1) Preconditions

- (a) Regarding the transportation volume, based on the 1994 Result of Business of Union No. 1, future increase rates were applied using the demand forecast to perform the calculation.
- (b) Income shall be calculated by assessing the rates for both passenger-kilometers and freight-kilometers. In this case, regarding the passenger fare, partial fare increases shall be included as a necessary condition for business management improvement.
- (c) With regard to expenditure, because there are no materials, it is not possible to divide costs into objective-separate management and operation costs and subsequently investigate each unit. As an alternative method, costs shall first be roughly divided into personnel cost and non-personnel cost, and with regard to non-personnel cost, the cost rates per passenger-kilometer and freight-kilometer shall be assessed, and with regard to personnel cost, this shall be calculated separately by setting a target with the emphasis placed on improving labor productivity through carrying out improvement investment.
- (d) With regard to investment cost, the only element to be included in the calculation shall be the investment cost for rolling stock to be newly purchased for the business improvement of the Hanoi - Lao Cai Line. Because the cost of maintenance of infrastructure, except for rolling stock, is to be shifted to the government account in line with the reorganization of VNR, the only maintenance cost to be counted for such infrastructure will be the rental charge consisting of 10% of annual revenue.

(2) Results of cash flow analysis and evaluation

Cash Flow and FIRR

From the Start of Investment	FIRR
15 Years	0.23 %
25 Years	▲ 0.01 %
35 Years	0.94 %

as per Appendix 16.2.1 Cash Flow Chart.

The extreme low value of FIRR above mentioned is chiefly due to the imbalance between the projected amount of investment on Rolling Stock and the financial standings of the railway line on which they operate. Though weak as it is, we may say the Lao Cai line will have a bright prospect to be a profitable business unit, even if only well managed with all its might, as it seems outward conditions are relatively favorable. Because no other developed means of transport to compete with that railway line, its importance as a regional means of transport is extremely high.

However, a care should be used to the fact that the demand for local transportation will not necessarily rise in line with Vietnam's rapid economic development. If one looks at the experience of other countries, it can be often seen that large-scale depopulation occurs in areas around large urban centers during the period of rapid economic growth.

Consequently, the advancement of positive regional development along the line can determine the future outcome of the railway. It is considered that the following two points hold the key to solving this problem.

1. The development of small and medium manufacturing sector enterprises in a way that utilizes local features in the cities along the line.
2. The promotion of tourism (in particular, in Lao Cai and Sapa).

In view of the low value of FIRR, the sensibility analysis is left out.

7.2.2 Cai Lan Line

(1) Preconditions

To carry out a realistic financial analysis on all of the potential cases would not be possible. It has thus been decided to arrange all the problem points and design the scenario for the following two cases.

The First Case involves the rehabilitation and continued use of the existing line (Hanoi - Ha Long). The main contents of the rehabilitation in this case are renewal of gauge between Kep and Ha Long and the laying of a line extension up to Cai Lan. In this case, the increase in the amount of rolling stock in line with the changed conditions is the main point of interest in the financial analysis. However, as the transportation volume on the existing line is, as will be described later, extremely small, it cannot be imagined that any immediate and dramatic changes in passenger movement patterns will arise as a result of these rehabilitation works. (The situation would, however, differ greatly if commercial usage of the line was to rapidly increase following 2000). Even if a high rate of growth were to be assumed, the relevance of past performance cannot be ignored.

The Second Case involves the new laying of short cut line and rehabilitation of a consistent meter gauge line between Ha Noi and Ha Long and then on to Cai Lan. In this case, a new means of transportation that would directly link Ha Noi to Quang Ninh Province within 2 and half hours would appear, and a form of demand attraction that would differ totally from that in the First Case would be a possibility. In this case the past demand performance on the conventional line could be ignored, and it would be possible to directly estimate the benefit and costs for the new line from the transportation demand forecast for between 2000 and 2010.

Regarding any other possibilities except for the above two base cases, they shall only be considered as variations or alternatives on the base cases.

Despite the presentation stated above, the Second Case will be left out of this financial analysis, as the construction of the short cut line could not be taken up before 2010 and come not within the scope of the present feasibility study, following the conclusion of the Economic Analysis thereof.

(2) Results of cash flow analysis and evaluation

Cash Flow and FIRR

– Meter Gauge line through existing route via Kep –

From the Start of Investment	FIRR
15 Years	▲ 4.77%
25 Years	▲ 1.41%
35 Years	3.19%

The Existence of the railway line, with an unique standard gauge of 106 km between Kep and Ha Long, has been a heavy burden for the VNR's management and sometimes considered to be scrapped, as it carried very little traffic. It could not be left alive until now, unless the Cai Lan Port Project has been on the rise.

We expect the railway will awake to new life, along with the development of the Cai Lan port after 2000, through the new rail link between Ha Long and the port. But, for these years, its profitability totally depends on the promotion of tourism, as it has no established relations with the local people, except for some peddlers, as an usual means of transportation.

We may say the project will not be financially feasible for the time being, so long as the rise of actual demand of railway traffic is not yet confirmed.

8. Environmental Impact Assessment

8.1 Targets of EIA Study

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

- Ha Long - Cai Lan section rail installation
- Installation of tower for microwave communication

8.2 Environmental Impact Evaluation

8.2.1 Ha Long - Cai Lan Section Rail Installation

(1) Construction Phase

Positive Impact

Construction new line requires lots of worker so that positive impact in construction phase may be increasing employment opportunity.

Negative Impact

Project site for installation of rail has been occupied. However, two houses are on project site. Small house where is located on proposed line is illegal so that this house can be resettled easy. However, a house is located in proposed marshaling yard may be legal resident. VNR should carry out resettlement of this resident by appropriate method.

Construction activities such as mobilization of heavy equipment and construction materials, and operation of heavy equipment will generate air pollutants, noise, vibration and traffic congestion section. It is expected that its impact will not be serious from view of land use and construction period.

Excavation of hilly area for construction of Cai Lan Station, a part of hilly area will disappear. and as a result, ecosystem will be deteriorated.

(2) Operation and Maintenance Phase

Positive Impact

It is predictable that amount of freight will be increase due to extension of railway from Ha Long Station. Extension of Ha Long: - Cai Lan section may contribute to national and regional economy.

Negative Impact

There is not railway line at the present. Therefore, noise level will be increase due to traveling train, and traveling vehicles on Road No. 18 will be obstructed at level crossings during passing train. Furthermore, it is possible that traffic accident by trains may increase after construction.

Construction of Cai Lan Station may cause changing semi-natural landscape.

8.2.2 Gia Lam Workshop Improvement Project

(1) Construction Phase

Positive impact

It is expected that there will be slight impact such as increasing employment of worker for construction.

Negative impact

The existing structures will be demolished. Old machines and equipment also will be disposed. Therefore, it is major impact that construction waste will be generated.

(2) Operation and Maintenance Phase

Positive impact

Major positive impacts are to improve water quality of waste water due to installation of water treatment facility. Although it is not positive impact on outside of the workshop, buildings will be beautified.

Negative impact

It is expected that there will not be negative, ative impact after construction.

9. Conclusions and Recommendations

(1) Economic analysis of Lao Cai line shows that investment to rehabilitation and improvement of Lao Cai line can be justified from the national economic point of view, under the condition of GDP forecast as the SPC sets.

(2) In carrying out a feasibility study on Cai Lan line, it has been preconditioned that extension of track between Ha Long and Cai Lan is to be made by 2000 in Meter gauge or Dual gauge.

Given this condition, many measures to convert the gauge to the meter gauge on the Kep - Ha Long Section were compared and the overall evaluation including economic analysis suggests that a plan to convert into meter gauge by 2000 is the optimum measure.

However, this conclusion is dependent on the Cai Lan Port development and the GDP growth rates as the SPC sets.

In addition to the projects considered for cost benefit analysis, two other recommendations as indicated in 15.3 and 15.4 are significant for effective improvement of Cai Lan line.

(3) Construction of optimum short cut line connecting Yien Vien and Pha Lai can be judged to be implemented after 2010 from the national economic point of view.

(4) Environmental evaluation of rehabilitation and improvement of Lao Cai and Cai Lan lines indicates that there will be no significant problems if the appropriate countermeasures as recommended in the Report are implemented, because the projects are rehabilitation and improvement of the existing lines.

(5) If the priority should be given on Lao Cai and Cai Lan lines, Cai Lan line should be given more priority with due consideration on the fact that development of Cai Lan Port, one of the most significant national project, is closely related with development of Cai Lan line. Priority on other recommendations as indicated in the Clause 15.3 and Clause 15.4 is given in Project 2000 in Chapter 2.

(6) Total cost for rehabilitation and improvement of Lao Cai and Cai Lan lines amounts to US\$ 77 million. Total cost for rehabilitation and improvement of Hanoi - Ho Chi Minh line and Lao Cai - Cai Lan line sums up to US\$ 610 million. This means that Viet Nam government should allocate 22% of investment to transport sector to railway sector by 2000.

(7) The rehabilitation and improvement of Lao Cai line and Cai Lan line should be implemented with adequate financial support of the government, so that the railway can play fully its role in supporting socio-economic development of the country.

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