10.2 Expansion and Improvement of Railway School

(1) Project Title: Expansion and Improvement of Railway School

(2) Priority: A

(3) Location: Gia Lam(Hanoi)

The new training center is located at VNR's Gia Lam sports ground, which has land area of 37,250m^2(near Gia Lam Station next of Hanoi Station and the Gia Lam workshop).

(4) Cost:
The project cost is as follows:

(Unit: US$ million)

Investment Item	Foreign Currency	Local Currency	Total
Building		1.10	1.10
Equipment & Machines	3.90	0.20	4.10
Overseas Training	2.00		2.00
Consulting Services	3.00		3.00
Contingency	1.10		1.10
Total	10.00	1.30	11.30

(5) Objectives:

It is urgent to meet the requirement that the nation improve the management ability of not only VNR managers but also the management ability of rank-and-file employees of VNR. Consequently, reeducation for advanced knowledge and technology is essential.

VNR has a railway technical and vocational school in Hanoi that reformed its old with the cooperation of universities and colleges, and if now offers market-oriented training and foreign language studies in order to realize innovation in economic and financial management.

The school has played an important role in VNR's development and reformation. The current training school at Me Linh, Vinh Phuh Province(two hours from Hanoi via bad road), was constructed as a temporary facility during the Viet Nam War for an evacuation from Hanoi. Therefore, the facilities for education and training are very poor and insufficient.

The Government of Viet Nam has approved the establishment of a new and modern railway education and training center at Gia Lam(5 km from the center of Hanoi). Construction work commenced in 1993 with a total budget of 8 billion Dong(equivalent to US$ 0.8 million in August 1993). Because the price of construction materials has been rising, the initial budget is now insufficient to construct a modern training center. Moreover, VNR lacks the necessary knowledge and technology to establish a modern railway education and training center.

Therefore, VNR needs assistance from abroad to establish a modern railway education system and to provide modern training equipment.

Construction work began with the building of class rooms in 1993 and the budget for the new training center is sufficient for the construction of the remaining buildings. However, the budget is insufficient for providing modern teaching tools and equipment. Moreover, VNR needs know-how to realize a suitable training center.

VNR plans to establish the following modern curriculum.

1) Manager training

Reformation of management to cope with a free market economy is an urgent issue for VNR. There are many modern management technologies that managers of VNR need to be trained in; marketing, accounting and finance, costing, production control, human relation, leadership, etc.

This training will be executed using modern teaching methods: business games, case studies, etc. Approximately 2,000 managers of whole VNR will be trained in the near future in Hanoi.

2) College education course

Railway management, operation and technology experts who support VNR's management and technology need to be cultivated by VNR itself. Since railway management and technology lessons are not available elsewhere, it is necessary to have VNR teachers with much knowledge and experience provide appropriate training.

Students will be selected from employees with a high school education and who have worked over 3 years at VNR. They will be educated for 1-2.5 years at the training center.

Facilities, laboratory, measurement and testing equipment equivalent with a technical college are necessary to educate advanced technology for them.

3) Engineer and technician brush-up course

Foreman class technicians need to acquire new knowledge, technology, and know-how periodically. It is also necessary to introduce new operations and maintenance systems, modern technology, and new machines into VNR's system. These systems are supported by the foremen and technicians and they need to be familiar with them. Practice equipment and tools similar to those on site need to be installed at the training center by projects respectively.

4) Vocational Training

There are about 3,500 employees who have finished high school. They need railway vocational training. VNR will select qualified personnel from these employees and provide them with vocational training.
Some employees will change their jobs due to the rationalization policies of VNR.

5) Overseas Training

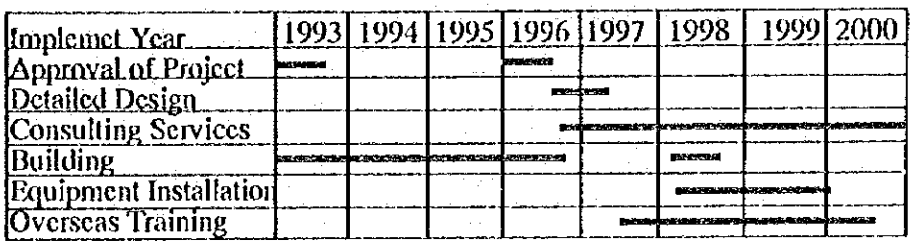
The training center has 20 highly qualified teachers, 7 qualified vocational instructors and 10 technical experts. They have the ability to prepare curriculum, to edit textbooks and to give lectures, if they can acquire new knowledge. It is essential to revamp VNR's management, technology, operations and maintenance with advanced technologies and know-how.
Overseas training is essential to obtain such advanced technologies and know-how by themselves.

6) Summary

The new training center will be the focus for education and training center by VNR.
VNR plans to educate the following number of employees:

Manager training:	2,000 in near future
College education course:	200 every year
Upgrading of engineer and technician brush-up course:	200 every year
Vocational training:	800 every year
Other courses:	200 every year

(6) Implementation Schedule:



(7) Components:

This project includes 17,675m^2 of training buildings, 4,200m^2 of dormitories, 6,412m^2 of staff housing and 5,200m^2 of workshops, warehouses and garages.

The necessary equipment and costs are shown in the following table:

Curriculum and field	Necessary facilities	Invest cost ('000 US$)
General equipment	Computers, word processors, printers, photocopier, OHPs, audio visual aids, videos & cameras.	200
Management	Teaching tools.	100
Language laboratories	English and Japanese languages.	100
Train operation (driver, conductor, signal operator)	Driver training operation cabin simulator(D18E, D12E, D4H). Circuit displays, models of signal control panels, dispatching equipment.	2,500 *(1)
Rolling stock (workshop, depot)	Structure model of DL components, electric training equipment, material testing & chemical analysis equipment, machines.	500
Basic mechanic	Training equipment & machines for mechanical work: lathes, drilling machines, milling machines. AC arc & gas welders. shaping machines, etc.	*(2)
Track maintenance	Tools & machines for track work, track measuring equipment, curve adjustment calculator (computer). Model track.	*(3) 200
Bridge and track structure	Inspection equipment for bridge and structures, measurement instrument: strain gauge & recorders, accelerators. Transit & level. Material examination machine:testing machine, compression testing machine. Soil testing machine: CBR testing, 3 ways compression, consolidation measuring instrument.	*(4) 100 *(5) 200

Curriculum and field	Necessary facilities	Invest cost ('000 US$)
Basic electric	Practice board for magnetic amplifier circuit, logical circuit, motor control circuit. Electric measurement device: osillo scope, digital memory, voltmeter, ammeter, tester. Model of electric circuit, transformer. Model of motor & generator.	300
Signaling	Model track & circuit board, model of signal equipment.	*(1)
Telecommunication	Model of telecommunication equipment, Telephone exchangers, measurement devices, radio communication devices	*(6)
Total		4,100

Refer:

*(1): Training equipment is to be installed by on other project(signal improvement)

*(2): Training machines are to be installed by on other project(Gia Lam Rolling Stock Workshop Improvement)

*(3): Training equipment is to be installed by on other project(Track Maintenance Improvement)

*(4): Training equipment is to be installed by on other project(Establishment of Bridge Technology Center)

*(5): Practices are held at the Bridge Technology center, when these machines are necessary for training.

*(6): Training equipment is to be installed by on other project (Telecommunication Improvement)

(8) Investment Efficiency

Education and training are an essential functions for VNR. reformation, modernization and rationalization will be implemented with staff educated with new knowledge.

(9) Relations with Other Projects:

(10) Others:

10.3 Establishment of a Bridge Technology Center

(1) Project Title: Establishment of a Bridge Technology Center

(2) Priority: A

(3) Location:

Hanoi.
The Center should be located outside residential zones, since the testing machines to be installed at the Center will generate vibration and noise.

(4) Cost:

(Unit: US$ million)

Investment Item	Foreign Currency	Local Currency	Total
Building		0.30	0.30
Inspection Equipment	0.10		0.10
Survey Instruments	0.10		0.10
Material Testing Machines	0.30		0.30
Soil Testing Machines	0.20		0.20
Computer System	0.30		0.30
Overseas Scholarships	0.70		0.70
Consulting Service	0.30		0.30
Contingency	0.20		0.20
Total	2.20	0.30	2.50

(5) Objectives

1) General

There are many bridges that need either to be replaced or repaired, resulting in the enforcement of speed restrictions on many of these structures. These speed restrictions present a large obstacle to the marketing of VNR.
Attention should be paid to the following issues for bridge rehabilitation projects:

(a) As bridge replacement, repair, and rehabilitation work will continue for the next several decades, the introduction of new technology and organizations for inspection and repair, the cultivation of young engineers, the upgrading of repair work capacity and training of bridge technicians are essential.

(b) The inspection and calculation of the existing strength of each bridge member should be carried at first. Then, a long term bridge maintenance will be established.

(c) It is urgent to introduce modern bridge technology. This will be achieved with assistance from advanced railways and by dispatching VNR engineers overseas for training.

(d) Modern bridge technology, including inspection and repair technology, will be transferred through bridge replacement projects. Inspection technology, and standards, inspection equipment, and bridge repair measures will be determined first.

A bridge design and inspection institute should be established in Hanoi in order to retain introduced technologies. All technology, experts, data, textbooks, research equipment and machines, and computer software should be concentrated at the institute.

The first priority in the bridge rehabilitation program is the introduction of bridge technology.

2) Organization and facilities

The Bridge Technology Center should be consist of the following departments:
(a) Railway steel structure department
(b) Railway concrete structure department
(c) Lower structure department
(d) Geological survey department
(e) Inspection of structure, supervision of construction works and completion inspection department

The Center needs to install the following equipment and machines:

- Inspection equipment for bridges and other structures(displacement measurement instruments, strain gauges and recorders, accelerometer, transit and level).
- Material testing machines(compression and shear force testing machines).
- Soil testing machines(CBR testing machines, 3-way compression testing machines, consolidation measurement instruments)

3) Overseas training

Overseas training for engineers should be included in the project.

(a) Advanced course
Advanced engineers will learn a foreign language for 6 months in Vietnam and 6 months abroad. Then will attend graduate school for 2 years. After graduation, they

will work and receive on-the-job-training(OJT) overseas at a bridge design institute or a consultant for a few years.

(b) Technician course

Technicians will learn a foreign a language for 6 months in Viet Nam and then go overseas to work a bridge institute, a consultant, or bridge manufacturer/construction company.

(6) Implementation schedule

Implemet Year	1996	1997	1998	1999	2000
Approval of Project					
Detailed Design					
Building					
Installation					
Overseas Training					

(7) Components

1)Engineering Services

Detailed design, drawing up tender documents, supervision

2) Building

Construction of facilities

3) Installation of equipment and machines

(a) Equipment and machines bridge inspection

Measurement instruments: strain gauges & recorders, accelerators. Transit & level.

(b) Material examination machines:

Testing machines, compression testing machines

(c) Soil testing machines:

CBR testing, 3-way compression and consolidation measurement machines.

4) Scholarships for overseas training

(a) 5 advanced engineers study abroad for 2 years.
(b) 10 engineers are trained abroad for 6 months.

(8) Investment Efficiency:

(9) Relations with other Projects:
-Overall Rehabilitation at Hanoi-Thanh Hoa Section
-Overall Rehabilitation at Hue-Da Nang Section
-Overall Rehabilitation at Saigon-Muong Man Section
-Bridge Replacement and Rehabilitation
-Bridge Structure Inspection

(10) Others:

10.4 Improvement of Freight Transport Capacity Study

(1) Project Title: Improvement of Freight Transport Capacity Study

(2) Priority:

(3) Location: All of VNR

(4) Cost: US$ 1.50 million

(Unit: US$ million)

Item	Foreign Currency	Local Currency	Total
Remuneration	1.20	0.10	1.30
Reimburse cost	0.10	0.10	0.20
Total	1.30	0.20	1.50

(5) Objectives:

1) Current status of freight transport

Freight transport totaled 1,077 million ton-kms in 1992, 978 million ton-kms in 1993. The commodity with the largest volume is coal(23%), followed by cement(16%), construction materials(17%), and apatite(11%).

Bulk freight comprises 67% of the total commodities transported. Union 1 transports about 82% of the total VNR freight in terms of tonnage and 54% in terms of ton-km. This is due to most bulk freight being produced in the northern part of Viet Nam.

Containers to and from Hai Phong Port, Ho Chi Minh City and other ports are not transported by rail due to a lack of loading and unloading facilities.
The present transport volume of each line which is 200 to 500 thousand tons per year, is commercially not feasible from a railway management and operation standpoint.

2) Necessity for freight transport reform

VNR is facing dramatic changes in adjusting to the ongoing transformation of the Vietnamese economy. Administrative and technical reforms are essential for VNR to meet the needs of an economy oriented to the free market.

It is probable that the railway cargo transport system will not survive under the intensifying competition from road transport, which can provide flexible door-to-door

services at very competitive rates. In addition, marine transport is also a very competitive mode of transport for bulk goods because of the geographical features of Viet Nam.

Therefore, the freight transport system of VNR needs to be modernized dramatically in order to survive in this free market economy.

3) Strategy for freight transport reform

Management's policy is to promote efficient operations and improve service. The marketing objective is to promote direct door-to-door freight service.
The difference in costs and efficiency will be significant and large savings realized by changing to direct origin-destination train operation.

Since bulk cargo is major and most profitable business, VNR needs to focus its marketing plans on bulk cargo operations. This requires cooperation with customers in reducing distribution costs such as loading and unloading cost, as well as transporting and storing freight in warehouses.

Freight operation stations handling only small lots of cargo should be closed. The remaining stations should be equipped with better loading and unloading facilities.

The following strategies to reform freight transport are recommended:
(a) Transportation of bulky cargo
Bulky cargo items such as coal, oil, cement and mineral resources should be transported by an exclusive direct origin-destination unit train.
Bulky cargo terminals should be constructed for coal, oil, and cement with appropriate unloading and storage systems.

(b) Integration of freight operation stations
Freight operation stations that have small lots of cargo should be closed. The remaining stations should receive investments to realize better loading and unloading facilities. A reduction in the number of freight operation stations will reduce demand a little, but such freight is inefficient and unprofitable.

(c) Containerization of rail cargo
Door-to-door service using containers is essential to survive the intensive competition with road transport. General cargo should be stuffed into containers appropriate for the size of the of railway. Development of rail containerization should be studied.

(e) Marine container transport

Marine container transport is a profitable business if it is operated appropriately. When inland container depots(ICD) are constructed at Yen Vien(Hanoi) and Song Than(Saigon), this will be a powerful incentive for container market development.

(f) Pallet system

A loading system using pallets is very efficient for stuffing and unstuffing cargo, and it is cost and time efficient. Pallets are also used for stuffing marine container cargo. It is recommended that VNR develops a pallet system.

4) Scope of the study

The following surveys are to be executed:

- A review of plans and reports executed in the past
-Collection of data and information
-Site investigations

The following studies are to be executed:

-Demand forecast of freight transport
-Formulation of freight transport improvement program
-Improvement of bulk cargo transport
-Integration of freight operation stations and installation of loading machines
-Promotion of rail containerization
-Marine container transport and construction of ICDs
-Pallet system

(6) Implementation Schedule:

Implemet Year	1996	1997	1998
Approval of Project	▬		
Field Survey		▬	
Report			▬

(7) Components:

-Field surveys
-Establishment of program
-Studies on improvement items
-Feasibility studies on improvement items
-Editing of reports

(8) Investment Efficiency:

Freight transport reform is essential if it is to survive in a free market economy.

(9) Relations with Other Project:

(a) Closing small lot of freight operation stations on Hanoi-Saigon, Lao Cai-Cai Lan lines and installing loading machines at main stations
(b) Cement transport plan on Cai Lan line
(c) Inland Container Depot Construction(Yen Vien)

(10) Others:

10.5 Bridge Structure Inspection

(1) Project Title: Bridge Structure Inspection

(2) Priority: A

(3) Location: All of VNR

(4) Cost:

(unit: US$ million)

Investment Item	Foreign currency	Local currency	Total
Remuneration	2.60	0.20	2.80
Reimbursement	1.40	0.20	1.60
Contingency	0.40		0.40
	4.40	0.40	4.80

(5) Objectives:

The current status of railway bridges in Viet Nam is not particularly good. Many are corroded and have other serious problems. These problems are caused by natural aging, salt damage in coastal sections, relatively high humidity, destruction and damage from war, flooding, temporary girders and piers, and poor maintenance. Measures, taken consist of minor repairs and reducing train speed. Speed restrictions on many bridges are presenting a serious obstacle to the marketing of VNR.

A detailed report on the inspection and repair of bridges is essential for an economical evaluation of investment, to decide on implementation program.

If modern theories, standards, and manuals for bridge inspection and repair are applied in VNR, they will greatly assists in the bridge rehabilitation of VNR.
Modern inspection and maintenance procedures developed by advanced railways would be very useful in establishing a rehabilitation program in VNR.

The defects of bridges will be classified and numerically rated so the necessity and priority of each rehabilitation item can be easily grasped.

Long Bien Bridge in Hanoi is one of the largest civil engineering structures in Viet Nam. It was bombed and restored with temporary beams and piers. Replacement of the bridge is one of the most urgent projects. However, there are many issues to be resolved before a replacement plan can be settled on.

The following technical and social issues must be studied prior to the commencement of detailed design:

- Whether or not existing caisson piers can be used
- Loading scheme and construction gauge
- Soundness of temporary repairs for Long Bien Bridge until the replacement
- Double tracking
- Method of bridge replacement
- Raising of bridge level(additional clearance height of 3m)
- Environmental issues(aesthetics and noise)

(6) Implementation Schedule:

Bridge inspections will be completed within 3 years as a first phase for high-priority bridges for urgent repair until 2000 as follows.

Implemet Year	1996	1997	1998
Approval of Project			
Pre-Survey			
Inspection Manuals			
Field Inspection			
Analysis of Data			
Overseas Training			
Design for repair			
Study on Long Bien Bridge			
Preparation of Next Phase			

(7) Components:

The soundness of a steel bridge is judged from its bearing capacity, durability, and usability and not merely from the degree of deterioration.

Judgments of on the superstructure and substructure of bridges is executed using the following items:
- Existing bearing capacity
- Damage and defects of the superstructure and substructure
- Remaining service life
- Train operation safety

(a) Calculating existing bearing capacity

In the case of railway bridges, the bearing capacity of an existing structure is evaluated as a stress ratio or bearing capacity. The evaluation formula is shown in (i) below.

Stress Ratio(SR)=Sm/Sx100%-------(i)

S_m: Maintenance limit stress intensity.

S: Maximum stress intensity acting on a member when a train is coming in at the allowable maximum speed.

The maintenance limit stress intensity is obtained by increasing the allowable stress intensity.

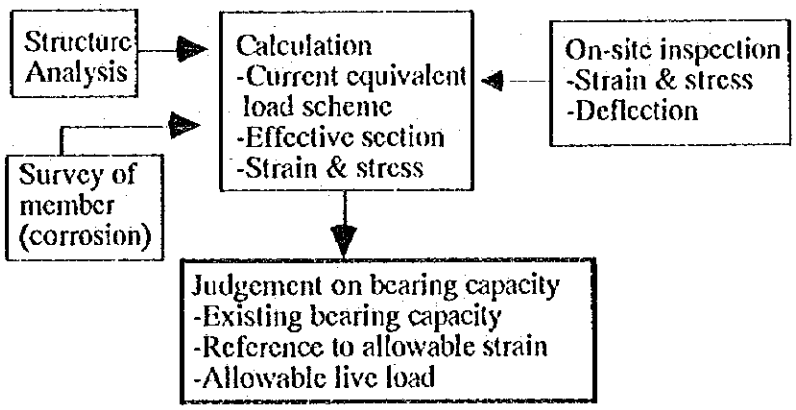


Fig 10.5.1 Calculation Flow of Bearing Capacity Calculation

(b) Classification of evaluation for bearing capacity

The calculated bearing capacity is evaluated as a stress ratio and classified by a measure of soundness as shown in Table 10.5.1.

Table 9.3.1 Classification of Bearing Capacity

Stress ratio(SR%)	Class	Countermeasures
SR≤100	AA	Damaging safety
100<SR≤120	A	Needs repairs
120<SR≤150	B	Observations needed
SR>150	C or S	Sound structure

The results obtained are as follows:

- Judgment on safety given current train load
- Estimation of allowable train load
- Train operation safety given speed and load
- Estimation of speed restrictions if necessary

(c) Estimation of remaining service life

Corrosion and fatigue mainly determine the physical service life as durability of a steel bridge in use.

The analysis flow is shown in Fig. 10.5.2 and the obtained results are as follows:

- Forecast of remaining service life
- Calculation of deterioration curve
- Forecast of fatigue defects

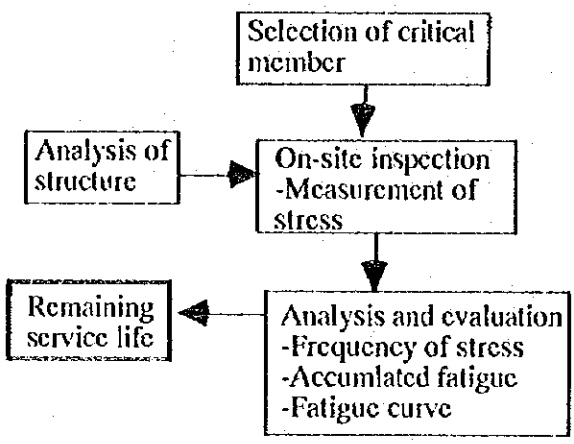


Fig 10.5.2 Flow for Establishing Remaining Service Life

(d) Train operation safety

The following will be reported as results by evaluating of existing bearing capacity, remaining service life and defects.

- Safety function for an assumed train speed
- Allowable deflection due to speed
- Estimation of allowable maximum speed
- Decision to impose speed restrictions

(c) Evaluation of defects

An analysis on the origin of defects will be investigated with the following methods:

- Calculation of the stress and strain of each member
- Spectral analysis on structure vibration
- Calculation of the degree of defects
- Calculation of the parameter for welding defect

Visual Inspection is executed as shown in Fig.10.5.3

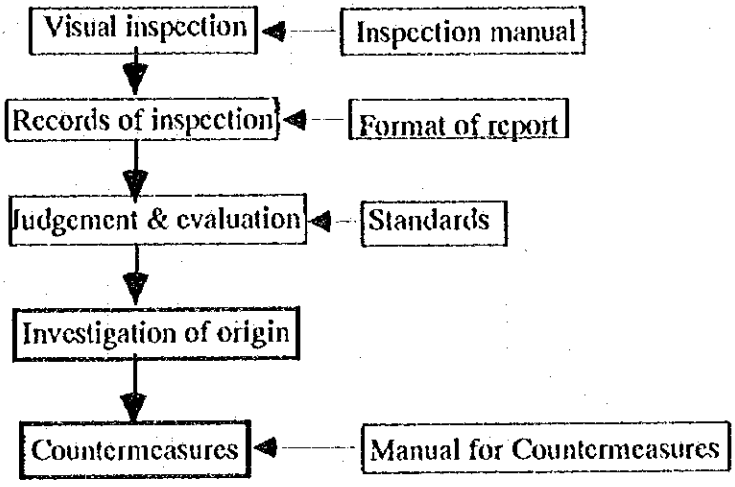


Fig. 10.5.3 Flow of Visual Inspection

(f) Survey and study of Long Bien Bridge

The Long Bien Bridge project will be divided into 2 phases.
Surveys, technology transfers, studies and discussion are implemented in the first phase and completed by 2000, and detailed design and construction are executed in the second phase after 2000.

(g) The contents of the consulting services are as follows:

Expatriate Engineers	117 Man-Months
Local Engineers	181 Man-Months
Local Staff	156 Man-Months
Computer Fee	
Reports and Documents	
Overseas Training	46 Man-Month
Office Fee	36 Months
Others	

(8) Investment efficiency

Bridge rehabilitation is too much of a burden for VNR budget. In addition, there are many projects that have a higher priority than bridge rehabilitation.

A detailed report on the inspection and repair of bridges, or an economical evaluation, is essential for making a decision on the project and for obtaining foreign loans.

If a bridge rehabilitation project is evaluated with numerical technical and scientific data, it will be easy to explain the level of safety to the authorities concerned with planning and finance in the Government.

(9) Relations with Other Projects

-Overall Rehabilitation at Hanoi-Thanh Hoa Section
-Overall Rehabilitation at Hue-Da Nang Section
-Overall Rehabilitation at Saigon-Muong Man Section
-Bridge Replacement and Rehabilitation
-Establishment of Bridge Technology Center

(10) Others

10.6 Tunnel Structure Inspection

(1) Project Title: Tunnel Structure Inspection

(2) Priority: A

(3) Location: A total of 27 tunnels on North-South Line.
An aggregate length of 8,405 m

(4) Cost : USS 1.2 Million

(Unit: US milS)

Investment Item	Foreign Currency	Local Currency	Total
Remuneration	0.48	0.12	0.6
Reimburse Cost	0.48	0.12	0.6
Total	0.96	0.24	1.2

(5) Objectives :

In planning for improvement, repairs and strengthening of tunnels, it is required to check the soundness of all tunnels that includes inspection of the deformation of the lining, etc. By pursuing the inspection, each tunnel will have a ranking for the soundness which will help to planning an overall tunnel improvement.

There are many tunnels in which the train speed is restricted for reasons being that the construction gauge is impeded. However, there is not enough data as to the extent of an impediment. In order to obtain a numerical data of clearance between the construction gauge and the lining of tunnel on full section, configuration of inside surface of tunnel has to be measured. It is desirable to work out repair plan based on those data.

(6) Implementation Schedule:

Item	Month									
	1	2	3	4	5	6	7	8	9	10
The Sight Inspection	----	----	----	----	----					
Analysis of Inspection						----	----	----	----	----

(7) Components:

An overall inspection of tunnels, inspection of deformation of lining and measurement of sections at every 10 meters.

(8) Investment Efficiency:

A ledger of all tunnels between Hanoi and Ho Chi Minh City will be made available.

(9) Relation with Other Projects:

Since the repairing and strengthening work will be planned based on the inspections conducted, priority for inspections will be given to those tunnels to be repaired/strengthened.

10.7 Anti-Submerged Measure Study

(1) Project title : Anti-Submerged Measure Study

(2) Priority : A

(3) Location

1) Yen Xuan — Minh Le (330.0 km - 481.8 km, Extension 51.8 km)

2) Nong Son — Tra Kieu (813.6km - 824.8km ,Extension 11.2km)

3) Vinh Hoa — Muong Man (1,453.7 - 1551.2km, Extension 97.5 km)

4) Song Than — Binh Trieu (1710.6km - 1718.3 km, Extension 7.7 km)

(4) Cost

Table 10.7.1 Improvement Cost

(Unit: Million US$)

Item	Foreign Currency	Local Currency	Total	Remarks
Study	1.02	0.19	1.21	

(5) Objectives

Countermeasure for safe and stable train operation of on time operation daily

(6) Impremention schedule

1996 - 1997

(7) Components

1) Yen Xuan — Minh Le, 2) Nong Son — Tra Kieu

The section had suffered submergence of railway facilities (tracks and stations). But the relation between rainfall , geographical features and flood volume in Vet Nam is not definite theoretically. So this submerged railway section will be determined real causes of submergence and flood, analyzed by hydrographic survey and study, and selected appropriate countermeasures.

When countermeasure of flood will be rerouting, new line will be studied. When it will be track raising, design and construction method will be studies. When it will be track-crossing widing and construction, design and construction method will be studies.

3) Vinh Hoa — Muong Man

2 sections between 1,463.2 km and 1,491.1 km will be the same as the above-mentioned. But because 1,527.2 km — 1,533.8 km section is low area, side drain of the countermeasure may be designed by the studies.

4) Song Than — Binh Trieu

Because this section is cut section, side drain may be designed by the studies.

(8) Investment efficiency

When countermeasure of submerged section will be desided, their constructions will be inplementaed and the railway will be able to do safe and stable train operation of on time operation daily.

(9) Relations with other projects

This project relate with Bridge Replacement and Rehabilitation.

10.8 Route Selection of the New Hai Van Tunnel

(1) Project Title: Route Selection of the New Hai Van Tunnel

(2) Priority: A

(3) Location: (Hue) Lang Co-Kim Lin (Da Nang)

(4) Cost:

Cost for study (Unit: US$ million)

	Local Currency	Foreign Currency	Total
Geological Survey	0.21	0.22	0.43
Drawing of Topographical Map	0.40	0.90	1.30
Remuneration	0.02	0.45	0.47
Reimbursement	0.01	0.10	0.11
Total	0.64	1.67	2.31

(5) Objectives:

Hai Van pass between Lang Co and Kim Lin is the most severe bottle neck on Hanoi-Saigon Line, because there are steep gradient of 1.7% and small curves of radius of 100m. The equivalent gradient for steep gradient and a curve of radius 100m is 2.25%. So, these poor track conditions and train operation result in slow speeding and limited traffic capacity. Helper locomotives are used for freight trains in order to increase transport capacity. VNR uses D18E(CoCo) locomotives recently, it will accelerate rail wear.

Traffic capacity of this section is 22 trains in both directions per day. Traffic capacity will be obtained for a while with a construction of a signal station between Hai Van Bac and Hai Van Nam by 2000 and by using double locomotive traction.

On the other hand, there are operational loss in longer traveling time, small lot of traction capacity, low speed train operation, excess track maintenance cost and frequent rail replacement.

It is necessary to calculate economical loss due to steep gradient and detour track, and profit by construction of a new short-cut route, and to find turning point of feasibility.

(6) Implementation Schedule:

Implemetation Year	1996	1997	1998	1999
Approval of Project				
Field Survey				
Route Selection				
Drawing Topographical Map				
Geological Survey				
Data Collection				
Feasibility Study				
Reports				

(7) Component:

(a) Field survey

Field survey will be executed at first by a working group being consisted of tunnel engineering experts. The following matters will be investigated by experts and reported: Topographic features and nature of soil along alternative routes, fault, land slide, construction method, location of tunnel mouths, space for rock waste, depot for construction work and approach road.

(b) Route selection

Alternative routes will be selected by the working group in order to focus further detailed topographical and geological survey.

(c) Drawing of topographical map

Topographical map with a scale of 1/2,500 and 1/500 will be drawn according to the necessity of construction work. Area and scale of maps to be drawn will be clarified by the working group.

(d) Study on construction timing and feasibility

The following site survey will be executed:

- A review of plans and reports executed in the past
-Collection of data and information
-Site investigations

The following studies are to be executed:

-Forecast demand
-Excess Expenditure due to Hai Van Pass
-Economic and financial evaluation

-Environmental impact Assessment
-Land acquisition and compensation
-Development plan for Hai Van pass and Lang Co seaside area

(c) Report
Reports will include a new tunnel route selection, geographical and geological investigation, a proposal for construction method, machines, and layout of work sites, appropriate construction timing and a feasibility study.

(8) Investment Efficiency:

(9) relation with Other Projects:

(10) Others:

10.9 Emergent Solution to Level Crossing Issues in Hanoi City

(1) Project Title: Emergent Solution to Level Crossing Issues in Hanoi City

(2) Priority: A

(3) Location: Hanoi

(4) Cost:

(Unit: US$ million)

	Foreign Currency	Local Currency	Total
Installation of Signals	2.08	0.21	2.29
Track and Fence		0.29	0.29
Land Acquisition		6.83	6.83
Total	2.08	7.33	9.41

(5) Objectives:

As the level crossing alarm systems are not modern, a level crossing is closed for over 3 minutes before a train arrives. This disrupts traffic in Hanoi. Therefore, some solution is necessary to mitigate the restriction of train operation.

A grade separation of the railway track will be studied as a long-term solution, while installing alarm devices at level crossings should be carried out as a short-term solution.

There are 25 level crossings registered between Long Bien Bridge and Giap Bat. The number of improved crossings in Hanoi is 19. Other level crossings and unregistered crossings should be closed. The interval between crossings that are equipped with alarm devices should be over 300 m due to technical reasons.

Small traffic paths should be closed. Side roads will be constructed in return for closing crossings in order to detour to safe level crossings.
A rigid fence will be constructed in order to prevent disorderly crossing of the railway track and to ensure the safety of high-speed train operation.
It is also recommended that the width for double tracking be secured in this project.
Land acquisition and compensation are included in the project.

(6) Implementation Schedule:

Implemet Year	1996	1997	1998	1999
Approval of Project				
Detailed Design				
Land Acquisition				
Manufacturing Devices				
Installation of Devices				

(7) Components:

- Installation of level crossing alarm systems 19 sets
- Ballast replacement 7km
- Installation of fencing 4,800 m
- Construction of side path 4,400 m
- Land acquisition 31,000 m^2
- Building compensation 34,000 m^2

(8) Investment Efficiency

Train operation restrictions implemented from January 1996 present serious obstacles to the development of the transportation network in Hanoi urban and suburban areas. When this project is implemented, it is expected that the restrictions on commuter and middle-distance train operation will be alleviated. The railways should play an important role in commuter transport in Hanoi.

(9) Relation with Other Projects:

-Overall rehabilitation between Hanoi and Thanh Hoa
-Hanoi urban development study by JICA

(10) Others:

10.10 Emergency Solution to Level Crossing Issues in Ho Chi Minh City

(1) Project Title: Solution to Level Crossing Issues in Ho Chi Minh City

(2) Priority: A

(3) Location: Ho Chi Minh City

(4) Cost:

(Unit: US$ million)

	Foreign Currency	Local Currency	Total
Installation of Signal	1.14	0.18	1.32
Track and Fence		0.44	0.44
Land Acquisition		15.61	15.61
Total	1.14	17.19	17.37

(5) Objectives:

As the level crossing alarm systems are not modern, a level crossing is closed for over 3 minutes before a train arrives. This disrupts traffic in Ho Chi Minh City. Therefore, some solution is necessary to mitigate the restriction of train operation.

A grade separation of the railway track will be studied as a long-term solution, while installing alarm devices at level crossings should be carried out as a short-term solution.

There are 12 level crossings registered between the Bien Trieu-Saigon stations. The number of improved crossings in Ho Chi Minh City is 10. Other level crossings and unregistered crossings should be closed. The interval between crossings that are equipped with alarm devices should be over 300 m due to technical reasons.

Small traffic paths should be closed. Side roads will be constructed in return for closing crossings in order to detour to safe level crossings.
A rigid fence will be constructed in order to prevent disorderly crossing of the railway track and to ensure the safety of high-speed train operation.
It is also recommended that the width for double tracking be secured in this project.
Land acquisition and compensation are included in the project.

(6) Implementation Schedule:

Implemet Year	1996	1997	1998	1999
Approval of Project				
Detailed Design				
Land Acuisition				
Manufacturing Devices				
Installation of Devices				

(7) Components:

- Installation of level crossing alarm system 10 sets
- Ballast replacement 7km
- Installation of fence 8,300 m
- Construction of side path 8,300 m
- Land acquisition 66,000 m^2
- Building compensation 79,000 m^2

(8) Investment Efficiency

Train operation restrictions implemented from January 1996 present serious obstacles to the development of the transportation network in Ho Chi Minh City urban and suburban areas. When this project is implemented, it is expected that the restrictions on commuter and middle-distance train operation will be alleviated. The railways should play an important role in commuter transport in Ho Chi Minh.

(9) Relation with Other Projects:

-Overall rehabilitation between Muong Man and Saigon

(10) Others:

Chapter 11 Economic and Financial Evaluation

11.1 Economic Evaluation

11.1.1 Method of Economic Evaluation

(1) Purpose of Economic Evaluation

This study aims at evaluating the rehabilitation projects for the Hanoi - Ho Chi Minh Line. Three rehabilitation projects of priority sections and overall rehabilitation of the Hanoi - Ho Chi Minh line are evaluated.

Economic evaluation is defined as an evaluation of project investment efficiency in terms of national economy. And this evaluation clarifies how efficiently the national resources are allocated by means of the project, and indicates how superior (or inferior) the project is in comparison with other competing projects.

Analytical frame of economic evaluation shows a sharp contrast from that of financial analysis since the latter is an analysis in terms of one investment entity such as a company or entrepreneur. In financial analysis, there is no relation with any project's impact on national economy.

Economic analysis is utilized by the policy makers in selecting the best policy among many competing alternatives. In formulating the national policy, numerous projects will be given a priority by the policy makers. Economic analysis aims at providing one of the best information in screening the projects.

Economic analysis adopts economic prices and economic benefit instead of nominal price and return. Economic cost is set equivalent to real productivity of the inputs and excludes non-productive monetary transfers such as tax, subsidy. Economic benefit is any preferable effect to the whole national economy and is measured as a improvement in productivity.

(2) Method

Evaluation itself is carried out by comparing economic benefit with economic cost. Economic benefit is calculated as a net benefit between "without project case" and "with project case." In this analysis, direct tangible effects are quantified, and indirect and non-tangible effects are not involved in the benefit calculation.

Economic internal rate of return (EIRR) is adopted in this analysis as a evaluation indicator. This is defined as a rate at which the present value of net benefit becomes zero, and its position suggests in comparison with opportunity cost of capital in Vietnam how efficient the project is.

11.1.2 Economic Cost

(1) Total Economic Cost

Table 11.1.1 summarizes total economic cost of the project by alternative. Nominal financial cost is converted into economic cost by utilizing the shadow prices about working compensation and all the domestic materials. The former relates with the actual productivity of labor forces, while the latter relates with the tax structure in Vietnam. In this Study, we set the shadow prices by reducing turn-over tax from prices of all domestic material.

(2) Calculation of Economic Cost (= Shadow Pricing)

1) Working Compensation of Domestic Work Forces

Income tax is not incorporated in this analysis. This is because income tax is a subject of high income classes with more than 650,000 Dong per month as of September 1994. Table 11.1.2 shows the structure of income tax ratios by income class. Average level of working compensation (from one source) is estimated far less than 500,000 Dong, and thus the majority of people is exempted from the income tax.

Table 11.1.1 Total Economic Cost

Line	Financial Cost	Economic Cost		
		Local Portion	Foreign Portion	Total
Whole Line Rehabilitation	481.10	114.91	338.97	453.88
Priority Section 1	66.53	8.34	45.47	63.81
Priority Section 2	43.79	11.25	29.51	40.76
Priority Section 3	68.41	18.71	46.44	65.15

Table 11.1.2 Structure of Income Tax

Average Monthly Income	Tax Ratio
less than 650,000	0%
650,000 - 1,300,00	10%
1,300,000 - 1,900,000	20%
1,900,000 - 2,900,000	30%

Table 11.1.3 Structure of Turn-Over Tax

Sector	Tax Ratio
Manufacturing Sector	1 - 10%
Construction Sector	3 - 5%
Transportation Sector	1 - 4%
Commercial Sector	1 - 16%

Table 11.1.4 Life of Project Property

Kind of Property	Tax Ratio
Bridge	more than 50 years
Tunnel	more than 50 years
Rail	35 years
Ballast and Concrete Sleeper	more than 50 years
Communication Equipment	20 years
Signaling Equipment	20 years
New Rolling Stock	25 years
Rehabilitated Rolling Stock	25 years
Workshop Depot	20 years

However, productivity of work forces is adjusted because enormous number of un-employment and under-employment apparently exist in Vietnam. "Un-employment ratio is estimated 20% of total population of work forces and this reaches 27-28% if under-employment is included" explained the Party's Secretary Mr. Do Muoi. In this analysis, real average productivity of labor forces is set 80% of nominal wage.

2) All Domestic Materials

All the domestic materials are subject of shadow pricing. However, the structure of subsidies and tax are so complicated and difficult to seize its actual magnitude in price structure. This is partly attributable to a lack of clear record of subsidies and a perplexing system of a pricing procedure. In this system, the most clear tax item (= turn-over tax) is adopted in reckoning the shadow prices. And it should be noted that this is a preliminary result and there is a large room to improve in the shadow price calculation.

State government imposes a turn-over tax in Vietnam and all the transactions of manufacturing sector, construction sector, transport sector, commercial and other service sectors are subject of this turn-over tax. Table 11.1.3 shows a structure of turn-over tax.

Nominal financial prices of construction materials are converted into economic prices by reducing this turn-over tax ratio. Its ratio is set 3%, and 97% of nominal price is set as a economic price.

3) All the Foreign Materials

All the prices of the foreign materials are used as economic prices. This is because foreign exchange rate is decided in the free market, and because a few items are subject of import tax concerning the materials of railway projects as a public infrastructure project.

Shadow price of foreign exchange ratio is not calculated in this analysis. This is because (a) there is no direct control of the foreign exchange market by the government, and (b) sufficient data is not available concerning volume and value of traded commodities.

Vietnamese government replaced a fixed foreign exchange system with a floating exchange system in 1989, and established a foreign exchange market in Hanoi and Ho Chi Minh City in 1991. No durable exchange ratio is prevailing in Vietnam. It is judged that foreign exchange ratio is completely dependent on the market mechanism.

Furthermore, price distortion attributable to import and export taxes on the materials for the pubic infrastructure project, especially for railway project, is negligibly small. Import tariff

table ("Export and Import Tariff for Commercial Goods" in effective in 1993) shows that there is few taxable items in the materials of the railway project.

4) Replacement Cost

Construction materials and operation equipment are all replaced with a new property when property life is over. Property life is set according to VNR standard, and is shown in Table 11.1.4.

Replacement cost is set as same as the original one. It is assumed that the rehabilitated rolling stocks can be operated for a full life period of new rolling stock.

5) Residual Value

Residual value of property was incorporated in the analysis. Every properties are depreciated year by year, and there remains some value of property when the project life is over before its depreciation period is expired. This residual value is listed as a negative cost of each investment item at the very last year of the project life.

However, residual value is incorporated only when property concerned can be utilized for other project. This study limits a scope of residual value to four items: rail, signal and communication equipment, rolling stocks, and equipment in workshop and depots.

6) Operation and Management Cost

This cost is converted by adjusting working compensation from financial cost concerned.

11.1.3 Economic Benefit

(1) Total Economic Benefit

This project expects eight (8) items of tangible economic benefit to generate and contribute to national economy. Of these economic items, five (5) items are measured in this project. Figure 11.1.1 shows eight items of economic benefits and an actually measured five items are listed in Table 11.1.5.

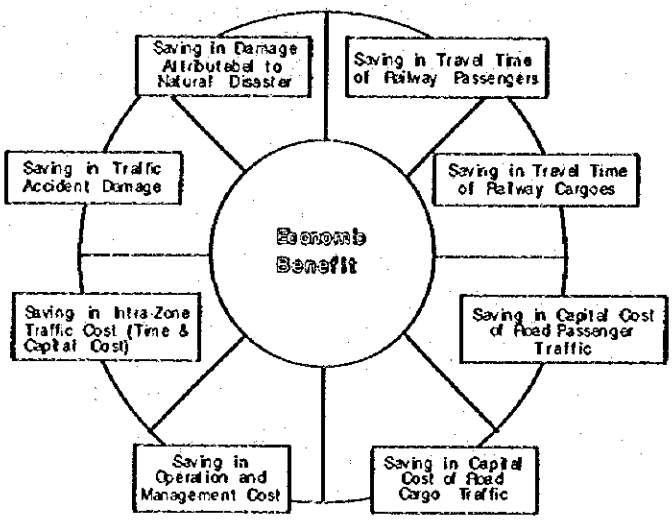


Figure 11.1.1 Eight Items of Economic Benefits

Table 11.1.5 Summary of Economic Benefit

(unit; million US$)

Benefit Items	2000	2010
Whole Line ; Hanoi - Ho Chi Minh Line		
1. Saving in Travels Time, Passenger	2.97	49.25
2. Saving in Travel Time, Cargo	-0.20	85.33
3. Saving in Road Transport Vehicle; Passenger	23.80	7.30
4. Saving in Road Transport Vehicle; Cargo	19.90	51.20
5. Saving in O & M	15.40	12.30
Total	61.90	205.4
Priority Section 1; Hanoi - Thang Hoa		
1. Saving in Travel Time, Passenger	0.71	4.53
2. Saving in Travel Time, Cargo	0.27	11.84
3. Saving in Road Transport Vehicle; Passenger	2.61	0.73
4. Saving in Road Transport Vehicle; Cargo	3.71	6.88
5. Saving in Cargo	1.54	1.23
Total	8.84	25.21
Priority Section 2; Hue - Da Nang		
1. Saving in Travel Time, Passenger	0.50	4.45
2. Saving in Travel Time, Cargo	0.07	2.39
3. Saving in Road Transport Vehicle; Passenger	1.65	0.51
4. Saving in Road Transport Vehicle; Cargo	1.20	2.77
5. Saving in Cargo	0.92	0.82
Total	4.34	10.94
Priority Section 3; Muong Man - Saigon		
1. Saving in Travel Time, Passenger	1.02	5.57
2. Saving in Travel Time, Cargo	0.12	7.58
3. Saving in Road Transport Vehicle; Passenger	2.42	0.77
4. Saving in Road Transport Vehicle; Cargo	1.28	5.87
5. Saving in Cargo	1.54	1.23
Total	6.38	21.02

There is actually one more benefit items that is attributable to flood mitigation measures. This is included in each benefit item since flood-free operation of railway can guarantee each benefit generated in a full scale. A full scale of economic benefit attributable to flood mitigation measures are incorporated in this study since average duration of railway inundation is not clear. Even with the improvement plan in this study, there remains about 100 km (out of 150 km) of flood prone railway section. To be accurate, this negative benefit should be reduced from the result of this section.

(2) Calculation of Economic Benefit

In calculating the economic benefit, a safety operation of the train at the designed speed would be assured after the rehabilitation works.

1) Saving in Travel Time of Railway Passengers

Each alternative guarantees the operation of passenger coaches at higher speed and results in saving in travel time. Railway passenger can enjoy this benefit, and a part of bus passengers also prefers this shorter travel time and diverts their transport mode from a long distance bus to the railway. It is assumed that the saving time will be assigned for additional production activities and contribute to the total GDP by means of increase of productivity. Scale of this contribution is quantified into saving in travel time of railway passengers.

Table 11.1.6 shows a calculation process of this benefit. Time value is estimated by dividing GDP by total number of labor forces.

2) Saving in Travel Time of Railway Cargo

Higher speed of freight cars can contribute to save the total transport time of cargo. This also affect the demand of railway cargo, and diverts a part of cargo transportation from truck to railway. It is assumed that saving in cargo transport time can make it possible to collect bills of cargoes and save a total amount of interest payment according to a difference of duration.

Table 11.1.7 shows whole process of calculation of this benefit. Saving in interest is calculated by (1) dividing present interest rate by total hours per year, and (2) multiplying it with average value of cargo.

Table 11.1.6 Saving in Travel Time ; Passengers

	Traffic Volume by Railway (mil. person-km/year)			Average Speed of Travel (km/h)			Saving of Travel Time (million hours)			Time Value	Saving of Time Value (million US$/year)		
	Railway Volume (with)	Railway Volume (without)	Traffic Converted from Road	Bus	Railway (with)	Railway (without)	Traffic Converted from Road	Residual	Total	Unit (US$/hr)	Traffic Converted from Road	Residual	Total
Year 2000													
Hanoi - HCM Line	3,455	2,751	704	38.44	52.00	48.00	4.78	4.41	9.18	0.3232	1.54	1.42	2.97
PRIORITY 1	370	253	117	38.44	64.70	51.80	1.24	0.97	2.21	0.3232	0.40	0.31	0.71
PRIORITY 2	257	162	95	28.00	41.90	37.90	1.13	0.41	1.53	0.3232	0.36	0.13	0.50
PRIORITY 3	360	235	125	38.44	68.90	45.80	1.44	1.72	3.16	0.3232	0.46	0.56	1.02
Year 2010													
Hanoi - HCM Line	6,054	2,644	3,410	38.44	72.00	48.00	41.35	18.36	59.71	0.8249	34.11	15.15	49.25
PRIORITY 1	613	253	360	38.44	70.00	51.80	4.22	1.27	5.49	0.8249	3.48	1.05	4.53
PRIORITY 2	429	162	267	28.00	51.00	37.90	4.30	1.10	5.40	0.8249	3.55	0.91	4.45
PRIORITY 3	628	235	393	38.44	73.00	45.80	4.84	1.91	6.75	0.8249	3.99	1.58	5.57

Note; bus = 45 hours (Hanoi-HCMC) = 38.44 km/h
train = 24 hours (Hanoi-HCMC) = 72.00 km/h
train = 31 hours (Hanoi-HCMC) = 55.80 km/h
train = 36 hours (Hanoi-HCMC) = 48.06 km/h

Table 11.1.7 Saving in Travel Time ; Cargo

	Cargo Volume by Railway (mil. ton-km/year)			Average Speed of Cargo Travel (km/h)			Saving of Travel Time (million hours/Year)			Cargo Value	Time Value	Saving of Time Value (million US$/year)		
	Total Traffic Cargo (with)	Total Traffic Cargo (without)	Traffic Converted from Road	Road	Railway		Traffic Converted from Road	Residual	Total	(US$/ton)	Unit (US$/hr)	Traffic Converted from Road	Residual	Total
					with	without								
Year 2000														
Hanoi - HCM Line	2,135	1,378	757	41.19	32.60	30.60	-4.84	2.76	-2.08	33.5	0.00288	-0.47	0.27	-0.20
PRIORITY 1	333	212	121	41.19	55.20	36.40	0.75	1.98	2.73	33.9	0.00288	0.07	0.19	0.27
PRIORITY 2	126	69	57	30.00	33.00	26.90	0.17	0.47	0.65	39.4	0.00288	0.02	0.05	0.07
PRIORITY 3	140	73	67	41.19	54.70	38.00	0.40	0.59	0.99	41.4	0.00288	0.05	0.07	0.12
										21.6				
Year 2010														
Hanoi - HCM Line	3,282	2,802	480	41.19	42.20	30.60	0.28	25.17	25.45	1,164.2	0.00288	0.9	84.4	85.33
PRIORITY 1	431	274	157	41.19	55.20	36.40	0.97	2.56	3.53	1,164.2	0.00288	3.2	8.6	11.84
PRIORITY 2	173	95	78	30.00	33.00	26.90	0.24	0.65	0.89	933.0	0.00288	0.6	1.8	2.39
PRIORITY 3	366	191	175	41.19	54.70	38.00	1.05	1.53	2.58	1,018.3	0.00288	3.1	4.5	7.58

Note:
truck = 42 hours (Hanoi-HCMC) = 41.19 km/h
train = 41 hours (Hanoi-HCMC) = 42.20 km/h
train = 54 hours (Hanoi-HCMC) = 32.04 km/h

time value = 25.2%/(365*24) = 0.00288%
cargo value = freight revenue x 20

Time value of cargo is set constant between the period 2000-2010.

3) Saving in Capital Cost of Road Passenger Traffic

A diversion of passengers from bus traffic to railway will result in reduction in number of bus fleet and will lessen capital cost of buses. This saving of bus capital is estimated by multiplying capital cost of bus by total saving in passenger volume.

Value of bus is calculated at a base of vehicle-kilometer. Basic data are the imported price of bus and the average travel distance during its life. Table 11.1.8 shows a whole calculation flows.

4) Saving in Capital Cost of Road Cargo Traffic

Concept of this benefit is quite similar to "Saving in Capital Cost of Bus." A diversion of cargo transport mode form truck to railway will results in reduction in number of truck fleet and contribute to save capital cost of truck. Unit value of capital cost is derived by taking the same procedure as the capital cost of bus.

Table 11.1.8 shows this calculation procedure together with that of bus.

5) Saving in Operation and Management of Railway

This saving is attributable to increase in productivity of management and operation sector. Financial figures were converted into economic cost by adjusting working compensation.

Table 11.1.9 Saving in Operation and Management Cost

	Hanoi-HCM Line	Hanoi-Lao Cai Line	Hanoi-Cai Lan Line
(million VN Dong)			
1994	183,000	35,200	14,157
2000	169,377	25,734	13,370
2005	141,866	20,077	14,493
2010	135,455	15,017	13,261
(Million US$)			
1994	16.64	3.20	1.29
2000	15.40	2.34	1.22
2005	12.90	1.83	1.32
2010	12.31	1.37	1.21

Source; JICA Study Team

Table 11.1.8 Saving in Capital Cost of Road Traffic (Hanoi - Ho Chi Minh Line)

	Items	mil.veh-km with	mil.veh-km without	mil.veh-km w-w/o	mil. pcu-km	Saving in Passenger Vehicle
2000	Passenger Vehicle Related;					
	Hanoi - HCM Line	26,579	27,228	-649	0.0367	23.82
	Priority 1	2,926	2,997	-71	0.0367	2.61
	Priority 2	1,868	1,913	-45	0.0367	1.65
	Priority 3	2,705	2,771	-66	0.0367	2.42
	Cargo Vehilce Related;					
	Hanoi - HCM Line	9,131	9,890	-759	0.0262	19.85
	Priority 1	1,714	1,856	-142	0.0262	3.71
	Priority 2	559	605	-46	0.0262	1.20
	Priority 3	588	637	-49	0.0262	1.28
2010	Passenger Vehicle Related;					
	Hanoi - HCM Line	70,075	70,273	-198	0.0367	7.27
	Priority 1	7,275	7,295	-20	0.0367	0.73
	Priority 2	5,087	5,101	-14	0.0367	0.51
	Priority 3	7,451	7,472	-21	0.0367	0.77
	Cargo Vehilce Related;					
	Hanoi - HCM Line	19,287	21,246	-1,959	0.0262	51.24
	Priority 1	2,596	2,859	-263	0.0262	6.88
	Priority 2	1,042	1,148	-106	0.0262	2.77
	Priority 3	2,204	2,428	-224	0.0262	5.86

11.1.4 Economic Evaluation

(1) Assumptions

1) Investment period ; 1996 - 2010

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

3) 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. In addition, a general standard of World Bank for developing countries (12%) is also taken into consideration.

4) Benefit generation during construction period;

First year of benefit generated is set at 2001. Scale of benefit is reduced according into the share of investment amount up to the year concerned against a total project cost.

(2) Evaluation Indicators

EIRRs for all cases are summarized in Table 11.1.10 together and the results of the sensitivity analysis.

(3) Conclusion

[Whole Hanoi - Ho Chi Minh line]

Rehabilitation project of the whole part of Hanoi - Ho chi Minh line is judged that it is feasible, showing 12.7% of EIRR, higher than the opportunity cost of capital in Viet Nam. This is attributable to the principles of sub-project formulation i.e. (1) principle that all the sub-projects are formed in a small scale of fund, (2) principle that all the sub-projects are designed to contribute to the financial condition of the VNR. All these are reflected in the setting of priority sections. And the SPC's high growth scenario of Vietnamese economy are also contributing to this conclusion.

[Three Priority Sections]

Among three priority sections of rehabilitation, the projects at the Hanoi - Than Hoa section marks the highest EIRR, 13.1%, sufficiently high level to justify the rehabilitation projects. This is followed by the Muong Man - Saigon section (EIRR=9.4%) with lower level of EIRR than that of the Hanoi - Than Hoa section by 3.7%. The lowest EIRR is marked at the Hue -

Da Nang section (EIRR=9.2%), which is attributable to the relatively large investment for the side station at the Hai Van Pass.

However, in cases that benefit will fall by 20% compared with the normal condition, only the Hanoi - Than Hoa section guarantee the validity of the project, but other two sections show lower EIRR figures than the opportunity cost of capital (=8.4%). This calls attention on the growth scenario of the Vietnamese economy when the implementation will be finally approved by the government.

It is note worthy that the judgment on feasibility of the project is much dependent on the growth performance during a period 1996 - 2010. It is recommended that the policy planners be careful on the economic growth in the future. Especially if the growth scenario follows the low growth scenario of the SPC, a validity of project investment should be reviewed again.

Table 11.1.11 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 Man - 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%		

11.2 Financial Evaluation

11.2.1 Methodology

(1) Situation in general

The VNR organization improvement plan indicated in the Prime Minister's Conclusion of March 1994 entered the implementation stage from January 1995. The details of the "New Accounting Mechanism" have yet to be publicly announced, however, from interviews conducted with the counterpart, the main items directly relating to the financial analysis are as follows.

(a) VNR shall exclusively specialize in the business operation of the railway.

The maintenance and repair costs for infrastructure, excluding rolling stock and rolling stock-related workshop facilities, shall all be transferred to the government account.

(b) Each block except for the Transport Division shall be placed under the control of VNR in organizational terms, however, they shall operate as independent accounting units.

(c) VNR shall, with regard to government-owned infrastructure, pay 10% of its annual revenue as rental.

(d) In addition to the above rental, VNR shall pay 4% of passenger income and 2% of freight income as revenue tax. Moreover, income tax shall be 20%.

The institutional changes are currently in the transition phase, and there are many unclear points in the detailed items and also contradictions between the current situation and the policy directions. Because the Business Plan for fiscal 1995, the year when the new system goes into effect, could not be obtained, the only available materials were the Result of Business and the List of Properties from the previous year. These materials were supplemented with information gained from the counterpart, and the analysis work had to be advanced through a process of experience-based progression.

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

(a) In line with the aforementioned 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) With regard to rehabilitation, in addition to the fact that conventional book values are added to the repair costs of non-operating rolling stock, which is unclear and varied, it is unclear as to how long the service life of the rehabilitated rolling tsock will be. For this reason, the post-rehabilitation service life cannot be determined, and it is thus not necessarily appropriate to count the subject rolling stock as new assets. However, 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.

(*) Strictly speaking, rolling stock is also a national asset and its rental charge is prescribed as 3.6% p.a. of the depreciation value. However, because the rolling stock operation costs, including depreciation cost, are all borne by VNR, it is reasonable to view the rolling stock as VNR assets. The aforementioned rental should be scrapped sooner or later and will be excluded from the analysis.

(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.

In view of the above, it is considered to be inappropriate to include the new cost of investment into Gia Lam Workshop in the exclusive repair facilities costs of the United Line.

11.2.2 Items Composing Cash Flow Statement

Fundamentally as in the case of the Master Plan, the revenue from train fares shall be estimated based on the fares revenue in the reference year (1994) as stated in VNR's (Result of Business of Transport Division in 1994.

The transportation volumes in each target year shall be based on the VNR-announced values for 1994 and calculated using the rates of increase, which are based on the demand forecast.

Revenue from Train Fares in 1994

Passenger revenue:	272,900 mil. Dong	Transportation volume Average rate	1,796 mil. P-km 152.0 Dong*
Freight revenue:	328,300 mil. Dong	Transportation volume Average rate	1,419 mil. T-km 231.3 Dong
(Other):	5,900 mil. Dong		
Total revenue:	607,100 mil. Dong		

Hand luggage revenue is included in freight revenue.

Revenue from Train Fares on the North-south Line

Passenger revenue:	219,000 mil. Dong	Transportation volume Average rate	1.423.5 P-km 153.8 Dong
Freight revenue:	258,400 mil. Dong	Transportation volume Average rate	1,135 mil. T-km 227.7 Dong
	477,400 mil. Dong		

The difference in the average rate between the two is minimal, and so the following rates shall be assumed as the standards for the calculation of revenue:

Passenger: 152 Dong
Freight: 231 Dong

*: In the Master Plan, the average rates were assessed as follows based on he actual performance in 1993: Passenger: 146.6 Dong; Freight: 228.7 Dong

(2) Increase in passenger fares - a recommendation

As one condition in determining the policy of business improvement, it is necessary to examine the possibility of increasing fares. However, with regard to the issue of across-the-board fare increases, it must not be forgotten that the national railway is for the public benefit, and there is also a risk that competitiveness may be adversely affected with respect to long-distance buses, etc. The utmost effort shall, therefore, be made to keep the basic fare as it is, and the appropriate measure is to use the facilities improvements as an opportunity to carry out a major revision of the service charges on upper class trains, which are used by people in high income brackets.

In the current situation, passenger fares on the United Line are set by class according to speed of particular trains and calculated by combining the basic fare, the express charge, the soft seating charge and the sleeping car charge, etc.

These fare elements were analyzed based on the actual table of fares, and the following results were subsequently obtained.

For this case, the S 5/6 train, which operates between Hanoi and Saigon in a time of 45.5 hours, shall be taken as the standard, and the basic fare shall be assumed to be the hard seating car seat charge.

Basic fare: 132.10 Dong per km

Soft seat charge: + 11.01 Dong

Sleeper charge: + 86.90 Dong

Total: 230.01 Dong per km (Soft sleeper S 5/6 between Hanoi and Saigon)

The basic fare rate is not necessarily the same throughout the whole country, however, because this is calculated as 131.37 Dong per kilometer on the Hai Phon Line which has no express services, it should be all right to view the S 5/6 level (132.0 Dong) as the average basic fare rate.

Extra charges apart from the basic fare shall rise in line with rolling stock accommodation. In particular, the soft seating charge and sleeper charge for upper-class trains shall be raised to around 1.5 times greater than the hard seating car charge. In the case of deluxe cars, the fare shall be made twice as much.

Moreover, as there is little difference between the special charges on upper-class trains, it is rational to set express charges that visibly reflect the traveling times.

Table 11.2.1 gives an example of a moderate fares revision alternative. Such fare increases are considered to be the absolute minimum required to improve the immediate business situation. The income and expenditure calculation in the financial analysis shall also assume this level of fares increases.

Table 11.2.1 Moderate Fares System (a recommendation)

				Hanoi - Saigon	1,726 km
Hard seating car charge		a	D. 132.00		D. 228,000
Soft seating car charge		$b = a + \alpha$	D. 198.00	(132 + 66)	342,000
Special soft seating car charge		$c = a + 2\alpha$	D. 264.00	(132 + 132)	456,000
Hard seating car sleeper charge		$d = a + \beta$	D. 212.00	(132 + 80)	366,000
Soft seating car sleeper charge		$e = b + 1.5\beta$	D. 318.00	(198 + 120)	549,000
Special soft seating car sleeper charge		$f = c + 2\beta$	D. 424.00	(264 + 160)	732,000
Express charge					
S. 1/2	Soft seating car	D. 5 × 9.5 h	D. 47.50		82,000
	Hard seating car	D. 2.5 × 9.5 h	D. 23.75		41,000
S 3/4	Soft seating car	D. 5 × 4.5 h	D. 22.50		39,000
	Hard seating car	D. 2.5 × 4.5 h	D. 11.25		19,500
S 5/6		0			0

If the following fares system is put into effect, the average passenger fares revenue rates will increase in the manner shown below.

Basic fare:	132 Dong per km	
Extra charge:	85 Dong	
Total:	217 Dong	(This shall be the basic unit for passenger fares revenue)
Existing fare:	152 Dong	
Increase:	65 Dong	

Comparison with Existing S 1/2 Fares on the North-south Line

	Existing Fare	Revised Fare	Increase
Hard seating	269,000	269,000	± 0
Soft seating	292,000	424,000	± 132,000
Hard seating sleeper (mid-bunk)	375,000	407,000	± 32,000
Soft seating sleeper	483,000	631,000	± 148,000
Special sleeper	508,000	814,000	± 306,000

The fare for foreigners in the case of S 1/2 trains, as compared to the normal rate, is 2.41 times greater for soft seating and 2.64 times greater for soft seating sleepers. The fare for foreigners should, in the long term, be scrapped, however, it is considered reasonable to leave it as it is until 2000 and gradually decrease it to 2 times the normal fare or less depending on how well the income balance develops after 2000.

Incidentally, in the case of VNR, the system of diminishing basic passenger fare over distance is considered to be not in application, judging from analysis of the existing tariffs.

With regard to the freight charge, as in the case of the Master Plan, there is no room to consider any special rate increases.

According to the freight charge table set in June 1993, the charges for the five main items of freight on VNR (coal, apatite, chemical fertilizer, cement and grain) belong to categories 1 or 3, and judging from the average transportation distance for each, the applied rate ranges between 200 and 245 Dong per kilometer.

Also, in the case where loads are calculated according to the product separate transportation volumes for 1994 (demand forecast values), the average applied rate comes to around 218 Dong per kilometer.

The aforementioned average freight charge of 231 Dong includes the hand luggage charge, however, if the pure freight charges alone are looked at, the average rate works out at approximately 220 Dong per kilometer.

301,330 mil. Dong ÷ 1,370 mil. T-km ≠ 220 Dong per T-km

This average unit rate of charge is too low to cope with the unit cost of freight being touched upon later. As it seems difficult to review the tariff for the list of commodities, the only measure which can be taken to relieve this station is to cut the operational cost through the rationalization of business management.

(3) Unit costs of operation

(a) As the detailed contents of the personnel costs and materials costs cannot be confirmed from the VNR financial statements and provided materials, etc., it is not possible to break down each cost item by objective (management cost, maintenance cost, operation cost, transportation cost, etc.) and thus obtain the basic unit of cost for each.

However, it is possible to divide each cost item into passenger-related costs or freight-related costs by using specific indicators, and thus make a calculation of passenger-kilometer and ton-kilometer transportation costs.

These costs shall be utilized as overall units of cost in the estimation work.

The transportation units of cost for passenger and freight transportation, calculated based on actual performance figures for 1994, are given in the following table.

Attached Table 11.2.2 Cost Analysis of VNR Transport Division (1994)

Mil. Dong

Indicator		Passenger		Freight		Total	
Personnel	Revenue	(45.0%)	119,548	(55.0%)	146,115	(100)	265,663
Material	Train-km	(63.2%)	99,340	(36.8%)	57,843	(100)	157,183
Fuel	Ton-km	(46.8%)	33,376	(53.2%)	37,940	(100)	71,316
Electricity	Train-km	(63.2%)	3,970	(36.8%)	2,311	(100)	6,281
Others	(Average)	(51.2%)	47,691	(48.8%)	45,456	(100)	93,147
Total Operating Cost			303,925		289,665		593,590
Total Cost of Supplies			184,377		143,550		327,927
Depreciation	Car-km	(48.1%)	60,943	(51.9%)	65,757	(100)	126,700
Sales Tax	Rate/Rev.	(66.5%)	11,898	(33.4%)	5,994	(100)	17,892
Operating Expense			376,766		361,416		738,182
Non-Personnel Expense			257,218		215,301		472,519
Capital Tax	Train-km	(63.2%)	12,002	(36.8%)	6,988	(100)	18,990
Total Expense			388,768		368,404		757,172
Transport Volume		1,796.0 mil P-km		1,418.8 mil T-km			
Unit cost:		D/1 P-km		D/1 T-km			
Operating Cost Base		209.79		254.74			
Non-Personnel Base		143.2		151.75			
Total Cost Base		216.47		259.66			

(b) Regarding the operating costs of the Hanoi - Ho Chi Minh Line (United Line), because the itemized breakdown of costs on the line under the control of Union 1 (Hanoi - Dong Hoi section) are not open for review, as with the above example, it is not possible to calculate the unique unit costs for the line section.

Consequently, the following method shall be used to obtain the total non-personnel expense for the United Line, and the average unit cost per passenger-kilometer and ton-kilometer shall be compared with the level that exists throughout VNR.

	Non-Personnel Expense (Include. Sales Tax)
Union No. 1	233,045 mil. Dong
Same as above, between Hanoi and Dong Hoi	133,600*
Union No. 2	109,323
Union No. 3	130,153
All VNR	472,521
United Lines	373,076

472,521 mil. Dong (non-personnel expense per PT-km for all VNR) ÷ 3,214,730 PT-km = 146.99 Dong .....a

373,076 mil. Dong (non-personnel expense per PT-km for United Line) ÷ 2,558,500 PT-km = 145.82 Dong .....b

b/a = 0.992%

As can be gathered from the above, there is hardly any difference between the two. Therefore, the non-personnel expense unit costs for the United Line shall be assessed as follows:

Passenger: 142.0 Dong per passenger-kilometer

Freight: 150.5 Dong per ton-kilometer

* Expenses Between Hanoi and Dong Hoi (Union 1)

Personnel expense: 70,400 mil. Dong.....21,000 × 46% = 9,660 @ 7.290 mil. Dong

Non-personnel expense: 133,600

Total: 204,000

(4) Personnel expense and productivity

(a) The personnel expense here is the total of the salaries and social insurance costs, which are counted as expenses of the Transport Division. Each of the other blocks apart from the Transport Division raise proper personnel expenses in their respective tables.

Therefore, as the number of staff to be targeted for payment, it is appropriate to adopt the average number of staff in the Transport Division in the target year.

Table 11.2.3 Number of Staff and Average Personnel Expense of VNR

		Personnel Expense	Number of Staff	Average Expense per Head/Year
1992	Transport Division	139,313 mil D.	34,165	4,078 Thou. D.
1993	"	160,150	34,660	4,621
1994	"	265,663	34,800*①	7,634
1994	Union No. 1	153,085	21,000	7,290
	Union No. 2	52,226	6,800	7,680
	Union No. 3	60,353	6,600	9,144
1994	United Line	183,000*②	23,460	7,800

*① As the actual number of staff in 1994 is not known in detail, the staff number of the previous year plus a slight increase was assumed.
*② In Union 1, the number of staff working on the Hanoi Dong Hoi section of the United Line accounts for 46% of all staff. Consequently, the personnel expense rate was made the same.

All the staff of Union 2 and Union 3 are assumed to belong to the United Line. The Head Office staff of 400 are added to the United Line staff total.

Between 1993 and 1994, there was a striking increase in the personnel expense. According to the counterpart, large-scale salary adjustments were carried out in line with the reorganization, and the basic rate was increased by more than 20% to compensate for increased work loads.

However, rather than sliding in line with general prices, these wage increases are considered to largely reflect adjustment of the actual wage. This must be understood on the premise of the abnormal economic environment, which can be gathered from the large difference that exists between the official per head GDP (more than $ 200) and the actual consumption level ($ 1,000 or more).

(b) Labor Productivity: The railway transportation volume borne by each staff member in a specific year is treated as an indicator of labor productivity, and is expressed in person and ton-kilometers.

Labor Productivity in 1994:

$$\frac{\text{mil.P}-\text{km}}{1{,}796}+\frac{\text{mil.T}-\text{km}}{1{,}419}+\frac{\text{mil.PT}-\text{km}}{3{,}215}+\frac{\text{No.of Staff}}{34{,}800}=\frac{\text{Productivity(Thou.PT}-\text{km)}}{92.4}$$

According to the method of international comparison of labor productivity adopted in the Master Plan, there is a difference of 1/10,556 in the productivity levels of the existing VNR and JR in 1986 (92.4:975.4).

Assuming that this differential is to be removed within forty to fifty years, it is estimated that the labor productivity in VNR in 2010 will be 383,800 PT-km, or 4.154 times the present level. The required number of staff will be approximately 25,000.

$$\frac{\text{mil.P-km}}{4,456}+\frac{\text{mil.T-km}}{5,123}+\frac{\text{mil.PT-km}}{9,579}\div\frac{\text{Productivity(Thou.PT-km)}}{383.8}=\frac{\text{No.of Staff}}{24,958}$$

Using the above as a framework, the number of staff at the intermediate stages of 2000 and 2005, and the target labor productivity per staff member are set in the manner shown in the following table.

Table 11.2.4 Labor Productivity

	[Transport Volume]		[Productivity]	
	mil. PT-km		No. of Staff	p.h. Thou. PT-km
All VNR				
1994	3,215	(100.0)	34,800	92.4 (100.0)
2000	4,952	(154.0)	31,000	159.7 (172.8)
2005	7,014	(218.2)	28,000	250.5 (271.1)
2010	9,579	(297.9)	25,000	383.8 (415.4)
United Lines				
1994	2,559	(100.0)	23,460	109.1 (100.0)
2000	4,093	(160.0)	21,715	188.5 (172.8)
2005	5,380	(210.0)	18,188	295.8 (271.1)
2010	7,870	(307.6)	17,366	453.2 (415.4)

Yearly Growth Rate of Productivity
1995 - 2000..... 9.54% pa
2001 - 2005..... 9.42% pa
2006 - 2010..... 8.91% pa

Of the existing total number of staff of 34,800, it is estimated that approximately 11,200 work in transport operation (including Headquarters) and that approximately 23,600 are involved in the maintenance of track, bridges and rolling stock, etc. Because the maintenance costs involved in all infrastructure except for rolling stock will be transferred from VNR to the government account in line with the reorganization that comes into effect from 1995, it is considered that the salary burden for the above-mentioned maintenance staff (not including the rolling stock maintenance staff) will also be shifted to the government account. In this case, the personnel expenses of VNR will be greatly reduced, and this will not be due to any

actual improvements in productivity. However, as it is still uncertain as to when and on what scale such a shift will occur, for the time being, personnel expenses will have to be estimated in accordance with the above labor productivity framework.

(5) Without case

(a) Business Volume Increase and Revenue and Expense Rates in the Without Case

[Untitled Line]

	Passenger/mil P-km		Freight/mil T-km		Total/mil. PT-km	
1994	1,424	(100.0)	1,135	(100.0)	2,559	(100.0)
2000	1,637	(115.0)	1,315	(115.9)	2,952	(115.4)
2005	1,712	(120.2)	2,333	(205.6)	4,045	(158.1)
2010	1,573	(110.5)	2,674	(235.6)	4,247	(166.0)

Revenue rate :

Passenger: 152 Dong/P-km (132 + 20) × passenger transportation volume

Freight: 231 Dong/T-km × freight transportation volume

Material cost rate:

Passenger: 142 Dong/P-km × passenger transportation volume

Freight: 150.5 Dong/T-km × freight transportation volume

Personnel Expense 1994: 7.800 × 23,460 = 183,000 Dong

Using the above personnel expense as a base, the rate of increase in the transportation volume (PT-km) is multiplied to give the personnel expense for each year. In the case where no investment is carried out, increased productivity cannot be expected and the personnel expense will probably increase in line with greater business loads.

However, VNR is currently undergoing reorganization, and was mentioned previously, there is a possibility that the shift in management of the infrastructure maintenance staff to the government may lead to reduced personnel expenses and a high rate of revenue return.

(b) Increase in Rolling Stock Repair Cost

In the case where no investment is carried out, an increase in the cost of repairs of the existing rolling stock has to be expected. Regarding the rate of increase of the repair cost in this case, the following values are given for locomotive in a case study analysis conducted in America.

Year of service	0	Index	1
	5		1.333
	10		1.583
	15		1.75

There are no specific materials on rolling stock repair cost within VNR, however, the Big Repair Depreciation, which is counted as a separate item from Depreciation within the cost items, is in reality held internally and allotted to asset repairs, the large proportion of which are presumed to be performed on rolling stock. In the case where no investment is carried out, it is reasonable to assume that the accumulation of the allotment money will increase each year as an addition to the normal management and operation cost.

1994	42,250	mil. Dong	(100.0)	×	United Line's share 80%	=	33,800 mil. Dong
2000	56,333		(133.3)			=	45,066
2005	66,894		(158.3)			=	53,512
2010	73,978		(175.0)			=	60,782

* 2,558.5/3,215 PT-km ≒ 0.80

(6) Investment and depreciation

1) With regard to investment in railway facilities, from 1995, the account for all infrastructure, except for the transportation and operation departments including passenger and freight transportation and railway engineering) has been separated from VNR. Of the investment to be calculated here, only the three items of rolling stock, workshop and management should be treated within VNR's own account.

Rolling stock form the main assets of the railway concern and, as was stated in Section 11.2.1, the cost of all rolling stock to be newly introduced for the strengthening of the United Line, including the cost of rehabilitation of existing rolling stock, shall be counted within the VNR investment.

Workshop-related investment also belongs to the VNR account, however, the reason for why this has been excluded from the financial analysis (based mainly around the United Line) is that, as again was described in Section 11.2.1, this is regarded as indirect investment and not direct investment into the United Line.

The management-related investment is mainly for the introduction of computer equipment required for the modernization of the business management and materials management systems, and is the most important factor in the plan to improve the business running of the United Line. For this reason, this investment should be counted as a cost directly related to the United Line.

2) The investment cost and investment schedule are as indicated below.

(a) Rolling stock

The Initial Investment on Rolling Stock scheduled for the years up to 2000 amounts to 132.8 million Dollars. Details of the succeeding investment are shown in the foregoing Clause 8.12.6.

However, in financial calculation, we have to duly adjust that succeeding investment cost to a reasonable level in view of keeping financial position of the railway in sound condition.

The service life for all rolling stock (locomotives and passenger and freight cars), including that which is to be rehabilitated, has been set at a uniform 25 years, and the investment assets have been assumed uniformly depreciate over this 25-year period.

(b) Management

The service life of system instruments and other equipment has been set at five years, and it has been assumed that the equipment will uniformly depreciate over this five-year period. Moreover, renewed investment shall continue after this period.

Investment Amount:

Equipments	2.73 mil. $
System Designing etc.	4.39
	7.12 (78,320 mil. Dong)

The system design cost including the technical guidance cost is a one-off investment, and this shall be given a draw down period of three years from 1997 to 1999 with straight line depreciation taking place in the five years following that time.

11.2.3 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.

11.2.4 Evaluation

(1) 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,.

(a) 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%

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

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

(2) 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.

Chapter 12 Environmental Impact Assessment

12.1 Targets of EIA Study

Environmental impact study comprises the whole environmental elements. Environmental impact is very important tool for development project, because results of environmental impact study can be used information on change or modification of projects from environmental view point, if significant negative impact is predicted by the study.

Viet Nam Government has an environmental impact assessment system, Government Decree No. 175/CP, October, 1994, named Guidance for the Implementation of the Law on the Environmental Protection. The JICA Study Team will provide result of environmental impact study that can be used as materials for legal environmental impact assessment report prepared by Viet Nam side.

The Projects which occur impacts on environment require environmental impact study. When EIA study is carried out, we need detail information on location and layout of sites, contents of project, project activities and others. In the feasibility study phase, sub-projects that require environmental impact study are selected from Program 2000. Selected sub-projects are based on type, size and activities of sub-projects and accomplished level of feasibility study. Sub-projects of Program 2000 are screened by the following procedure (Fig. 12.1.1).

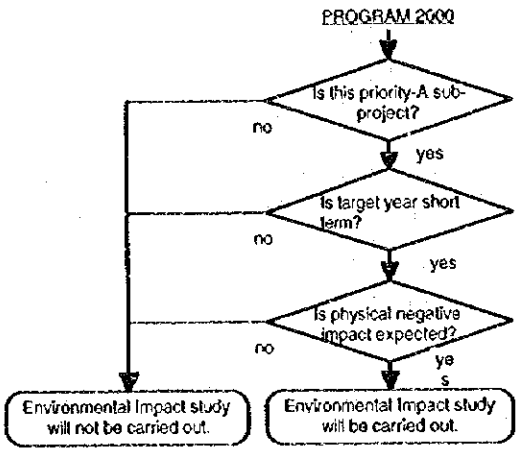


Fig. 12.1.1 Screening Procedure for Environmental Impact Study

As a result, the following sub-projects will be selected for environmental impact study:

- Overall rehabilitation project
  - Hanoi - Thanh Hoa 176 km
  - Hue - Da Nang 103 km
  - Muong Man - Saigon 179 km
- Gia Lam Workshop improvement project
- Ha Long - Cai Lan section rail installation

An outline of above projects is as follows:

12.1.1 Overall Rehabilitation Project

Objectives : improvement of management and operation, concentrated investment for overall rehabilitation and improvement, upgrading of services, positive marketing, rationalization.

Implementation schedule:

- Hanoi - Thanh Hoa 1996 - 1999
- Hue - Da Nang 1997 - 2000
- Muong Man - Saigon 1996 - 1999

Project components:

Hanoi - Thanh Hoa

- frequent service for inter-city and local passenger
- renovation of passenger car
- improvement of passenger service facilities at main stations
  (comfortable waiting room, convenient ticket counter, shopping, restaurant, parking lot)

Passenger Stations	Freight Station
Hanoi, Nam Dinh, Nam Binh, Thanh Hoa	Giap Bat, Van Dien, Ninh Binh, Cau Yen, Dong Giao, Bin Son, Tan Hoa, Yen Thai

- improvement of railway bridges
  5 bridges --- Ong Tao, Ninh Binh, Cau Yen, Tnog Giang, Cu
- elimination of staff members at small scale of freight stations
- equipping loading machines (fork-lift) for the remained stations
- equipping level crossing alarm
- equipping color light signals

Hue - Da Nang

- frequent service for inter-city and local passenger
- renovation of passenger car
- equipping seat reservation system at main stations
- improvement of passenger service facilities at main stations
  (comfortable waiting room, convenient ticket counter, shopping, restaurant)

Passenger Stations	Freight Station
Hue, Lang Co	Hue, Da Nang

- improvement of bridges

  12 bridges --- Huong Thuy, Phu Bai, Nong, La Son, Cho Hom, Truoi, Chia, Ong Loai, Hai, Nuoc Ngot, Thua Luu, Nam O

- improvement of tunnels

  2 tunnels --- Chu Hai, Phu Gia

- elimination of staff members at small scale of freight stations
- closing of small scale freight stations
- equiping loading machines (fork-lift) for the remained stations
- equiping level crossing alarm
- equiping color light signals

Muong Man - Saigon

- frequent service for inter-city and local passenger
- renovation of passenger car
- equipping seat reservation system at main stations
- improvement of passenger service facilities at main stations
  (comfortable waiting room, convenient ticket counter, shopping, restaurant, parking lot)

Passenger Stations	Freight Station
Muong Man, Bien Hoa, Saigon	Song Than

- improvement of bridges

  2 bridges --- Dong Nai Nho, Dong Nai Lon

- elimination of staff at small scale of freight stations
- closing of small scale freight stations
- equipping loading machines (fork-lift) for the remained stations?
- equiping level crossing alarm
- equiping color light signals

12.1.2 Gia Lam Workshop improvement project

Objectives : rehabilitation of rolling stock, saving rolling stock, purchasing coast

Implementation schedule:

1996 - 1999

Project components:

- installation of new machines, equipment and tools
- repair of buildings (Building No. 3B, 5B)
- installation of water treatment facility

- overseas training
- improving of production management and design capacity

12.2 Project Activities

Project activities can be divided into two phases, Construction Phase and Operation and Maintenance Phase. Environmental impact will be evaluated each phase. Expected project activities in each phase are as follows:

12.2.1 Overall rehabilitation project

Construction Phase

- land acquisition for building of safety fence on railway sides in Hanoi and Ho Chi Minh
- employment of labor for construction
- dismissal of staff of small scale of freight stations
- existing utility network removal and new utility installed
- temporary occupation of road and space for construction works
- mobilization of heavy equipment and construction materials
- operation of construction heavy equipment
- demolition of existing structures
- reinforcement of ballast
- changing 43 kg or 50 kg rail from 30 kg rail
- excavation for installation of cable
- building of safety fence at railway crossings
- construction of structures
- construction of new bridges, replacement of bridges, reinforcement of abutment, repair of beam
- chipping concrete wall of inner tunnels and spraying concrete on the wall of inner tunnel

Operation and Maintenance Phase

- increasing number of traveling train
- speed up of traveling train
- traveling new passenger cars
- maintenance of railway line
- using of improved passenger service facilities
- operation and maintenance of loading machines, level crossing and color signal

12.2.2 Gia Lam Workshop Improvement Project

Construction Phase

- employment of labor
- utility network removal and installed
- mobilization of heavy equipment and construction materials
- operation of heavy equipment such as truck, back hoe, compressor and others
- demolition of existing structures
- construction and improvement of structures
  construction of roof, wall (slate), floor at 3B, 5B, 44B
  painting inner building at 3B, 5B, 44B
  construction of pit at building 3B, 44B
- installation of new machines at 3B, 5B, 44B
- rehabilitation of water treatment facility

Operation and Maintenance Phase

- existence of structures
- operation and maintenance of new machines and equipment
- maintenance of buildings

12.3 Sources of Environmental Impact

Railway development projects have positive impacts as well as negative impact on the environment. Environmental impact assessment study provides identification of environmental impact by project activities.

These impacts depend on location size and shape of structures, conditions of train service, work schedule and others. Sources of environmental impact are listed below. Possible environmental impact matrix is shown in Table 12.3.1, 2.

12.3.1 Overall rehabilitation project

Construction Phase

- increasing employment opportunity
- temporary occupation of road and space for construction work
- increasing traffic volume around the access roads by transportation of heavy equipment, and construction materials and waste
- generating noise and vibration by operation of heavy equipment and transportation of construction materials
- generating construction waste

Table 12.3.1 (1) Possible Environmental Impact Matrix of Overall Rehabilitation Project

Environmental Elements / Project Components	Airpheres/Hydrospheres				Ecosystem		Physical Environment and Natural Resources										People living quality										
	Climate	Air quality	Water quality	Hydrological situation	Terrestrial ecosystem	Aquatic ecosystem	Slope stability	Soil erosion	Land subsidence	Groundwater level and quality	Water resources	Forest resources	Noise	Vibration	Offensive odor	Aesthetic	Land use	Resettlement	Split of community	Local economic activities	Employment	Traffic	Public facilities	Cultural property/Archaeology sites	Public health / Safety	Waste	Recreation
Construction Phase																											
Hanoi - Thanh Hoa																											
frequent service for inter-city and local passenger		C-											C-	C-							C+	B-				B-	
renovation of passenger car																											
improvement of passenger service facilities at main stations													C-	C-							C+					C-	
improvement of bridges			B-		U	C-		C-			U		C-	C-				U			C+	B-				C-	
elimination of staff at small scale of freight stations																					A-						
equipping loading machines for the remained stations																						B-					
equipping level crossing alarm																											
equipping color light signals																											
Hue - Da Nang																											
frequent service for inter-city and local passenger		C-											C-	C-							C+	B-				B-	
renovation of passenger car																											
equipping seat reservation system at main stations													C-														
improvement of passenger service facilities at main stations		C-											C-	C-							C+					C-	
improvement of bridges			B-		U	C-		C-			U		C-	C-				U			C+	B-				C-	
improvement of tunnels		C-	C-										C-	C-												C-	
elimination of staff at small scale of freight stations																					A-						
closing of small scale freight stations																			C-								
equipping loading machines for the remained stations																											
equipping level crossing alarm																						C-					
equipping color light signals																											
Muong Man - Saigon																											
frequent service for inter-city and local passenger		C-											C-	C-				B-			C+	B-				B-	
renovation of passenger car																											
equipping seat reservation system at main stations																											
improvement of passenger service facilities at main stations		C-											C-	C-							C+						
improvement of bridges			B-		U	C-		C-			U		C-	C-				U			C+	B-				C-	
elimination of staff at small scale of freight stations																					A-						
closing of small scale freight stations																											
equipping loading machines for the remained stations?																											
equipping level crossing alarm																						B-					
equipping color light signals																											

A+: Significant positive impact
B+: Moderately positive impact
C+: Negligible positive impact
U : Unclear

A-: Significant negative impact
B-: Moderately negative impact
C-: Negligible negative impact

Table 12.3.1 (2) Possible Environmental Impact Matrix of Overall Rehabilitation Project

Environmental Elements / Project Components	Airsheres/Hydrospheres				Ecosystem		Physical Environment and Natural Resources										People living quality											
	Climate	Air quality	Water quality	Hydrological situation	Terrestrial ecosystem	Aquatic ecosystem	Slope stability	Soil erosion	Land subsidence	Groundwater level and quality	Water resources	Forest resources	Noise	Vibration	Offensive odor	Aesthetic	Land use	Resettlement	Split of community	Local economic activities	Employment	Traffic	Public facilities	Cultural property/Archaeology sites	Public health / safety	Waste	Recreation
Operation & Maintenance Phase																												
Hanoi - Thanh Hoa																												
frequent service for inter-city and local passenger		C-											B-	C+/B-			C+		B-	B+	C+	B+/C-			B+/B-			
renovation of passenger car																B+												
improvement of passenger service facilities at main stations			C+													B+					C+							
improvement of bridges				U												B+									A+			
elimination of staff at small scale of freight stations																				C-	B-							
equipping loading machines for the remained stations													C-	C-														
equipping level crossing alarm													C-															
equipping color light signals																						B+						
Hue - Da Nang																												
frequent service for inter-city and local passenger		C-											B-	C+/B-			C+		C-	B+	C+	B+/C-			C+/C-			
renovation of passenger car																B+			C-	B+	C+	B+/C-						
equipping seat reservation system at main stations																												
improvement of passenger service facilities at main stations			C+													B+					C+							
improvement of bridges				U												B+									A+			
improvement of tunnels																									A+			
elimination of staff at small scale of freight stations																				C-	B-							
closing of small scale freight stations													B+	B+						C-		C+						
equipping loading machines for the remained stations													C-	C-														
equipping level crossing alarm													C-															
equipping color light signals																						B+						
Muong Man - Saigon																												
frequent service for inter-city and local passenger		C-											B-	C+/B-			C+		B-	B+	C+	B+/C-			B+/B-			
renovation of passenger car																B+												
equipping seat reservation system at main stations																												
improvement of passenger service facilities at main stations			C+													B+					C+							
improvement of bridges				U												B+									A+			
elimination of staff at small scale of freight stations																				C-	B-							
closing of small scale freight stations													B+	B+						C-		C+						
equipping loading machines for the remained stations?																												
equipping level crossing alarm													C-															
equipping color light signals																						B+						

A+: Significant positive impact
B+: Moderately positive impact
C+: Negligible positive impact
U : Unclear

A-: Significant negative impact
B-: Moderately negative impact
C-: Negligible negative impact

Table 12.3.2 Possible Environmental Impact Matrix of Gia Lam Workshop Improvement Project

Environmental Elements / Project Components	Airpheres/Hydrospheres				Ecosystem		Physical Environment and Natural Resources										People living quality												
	Climate	Air quality	Water quality	Hydrological situation	Terrestrial ecosystem	Aquatic ecosystem	Slope stability	Soil erosion	Land subsidence	Groundwater level and quality	Water resources	Forest resources	Noise	Vibration	Offensive odor	Aesthetic	Land use	Resettlement	Split of community	Local economic activities	Employment	Traffic	Public facilities	Cultural property/Archaeology sites	Public health / Safety	Waste	Recreation
Construction Phase																													
installation of new machines, equipments and tool																						C-			C-				
repair of buildings		C-											C-							C+	C+	C-			B-				
oversees training																													
improving of production management and design capacity																													
Operation & Maintenance Phase																													
installation of new machines, equipments and tool													C+											C+					
repair of buildings			B+													B+								C+					
oversees training																													
improving of production management and design capacity																													

A+: Significant positive impact
B+: Moderately positive impact
C+: Negligible positive impact
U : Unclear

A-: Significant negative impact
B-: Moderately negative impact
C-: Negligible negative impact

- generating air pollutant from heavy equipment and other construction activities
- hindering traffic around construction sites

Operation and Maintenance Phase

- increasing number and speed of trains
- increasing number of passenger
- changing existing land use
- generating noise and vibration by traveling trains
- generating air pollutant from heavy equipment
- discharging of sewage from stations and passenger cars

12.3.2 Gia Lam Workshop Improvement Project

Construction Phase

- increasing employment opportunity
- increasing traffic volume around the access roads by transportation of heavy equipment and construction materials
- generating noise and vibration by operation of heavy equipment and transportation of construction materials
- generating construction waste

Operation and Maintenance Phase

- generating noise and vibration from operation of new machines and equipment at Gia Lam Workshop

12.4 Environmental Impact Prediction

12.4.1 Overall rehabilitation project

Environmental negative impacts which may be caused by the proposed plan were observed in environmental impact matrix of Table 12.4.1 of the preceding section. These impacts are examined in this section.

(1) Air quality

Construction Phase

The following activities will generate air pollutants as CO_2 and NOx from construction vehicles and heavy equipment.

- transportation of construction materials and waste
- operation of heavy equipment for construction

It is expected that operation period of heavy equipment will not be long. Demolition of the existing passenger service facilities will cause generating dust. Provided that the following activities are taken up as countermeasures for air quality in construction phase, dust will no be generated to any high concentration level.

- demolition of structures will not be carried out on windy days in urban and residential areas
- water will be sprinkled at the construction sites where demolition work takes place

Hue - Da Nang section, two tunnels require to improve. Concrete is chipped from the inner wall, and concrete is sprayed on the inner wall. These activities will generate concrete dust, so that working circumstances will be deteriorated.

Operation and Maintenance Phase

Traveling locomotives generate emission gas so that amount of air pollutant will increase due to increasing amount of train service. According to TEDI and VRDI, emission gas factors of Viet Nam's locomotives are not obtained. Therefore, we can not conduct quantitative analysis. However, it is reasonable to support the presumption that concentration of air pollutants will not increase due to frequency of trains.

(2) Water quality

Construction Phase

It is possible that construction of bridges may generate turbid water by soil erosion on river embankment and construction of piers. Environmental impact depends on improvement level of bridges.

Operation and Maintenance Phase

Improvement of passenger service facilities includes drainage of waste water from restaurant and toilet. It is expected that the quality of discharging waste water will become better than the present. Therefore, water quality of discharged rivers and ponds will be improved.

(3) Hydrological situation

Operation and Maintenance Phase

Several bridges require constriction of piers. Assuming that piers will be built on the river bed, river stream will be changed, and flow capacity will be decreased by obstructions. It is expected that these impacts will be larger during rainy season. However, this impact is not clear at the present. Further study will be required before detail design.

(4) Terrestrial ecosystem

Construction Phase

If the bridges are replaced, new railway will be required from the existing railway to new bridge. Provided that new railway will be constructed in mountains area and others, flora and habitat of animals will be lost. However, this impact is not clear at the present.

(5) Aquatic ecosystem

Construction Phase

It is possible that improvement of bridges may cause deterioration of aquatic ecosystem for the following reasons:

- construction of abutment generates turbid water by soil erosion.
- construction of concrete piers generates an alkaline solution.
- construction of piers obstructs river flow capacity and flow pattern.
- occupied with piers cause extinction of benthos.

First and second reasons are categorized into chemical impact, and third and last are physical impact. However, impact by second and last one will not be serious.

(6) Soil erosion

Construction Phase

If we do not carry out measurement of soil erosion, river embankment may be eroded by construction of abutment. It is possible that heavy soil erosion leads to corrosion of structures, and deterioration of water quality.

(7) Water resources

Construction Phase

We have mentioned about deterioration of water quality and changing river flow capacity in section of "(2) Water quality". Provided that above impact occurs, and river water is used for water supply and irrigation, river water use may be hindered for water resources during construction of foundation. However, we do not have detail information on river water use, so that this impact is not clear at the present.

(8) Forest resources

Construction Phase

If the bridges are replaced, new railway requires from the existing railway to new bridge. Provided that new railway will be constructed in forest area, a part of forest area will be lost. However, this impact is not clear at the present.

(9) Noise

Construction Phase

Construction activities generate noise. Impact of noise may be the same at any section. However, construction of the stations for improvement of passenger facilities which are located in urban areas will cause greater impact than that is other areas. Therefore, impact of noise on Hanoi - Tanh Hoa and Muong Man - Ho Chi Minh sections will be greater than Hue - Da Nang section.

Construction of passenger service facilities requires back hoes and concrete breaker. It is estimated that the noise level will be raised by heavy equipment as follows:

Noise levels are calculated by the following formula which represents a hemisphere for sound.

$$Lr = Lw - 8 - 20\log r$$

where,

Lr	: noise level at (r) m from the noise source	dB(A)
Lw	: average power level of the noise source	dB(A)
r	: distance between the noise source and receiver	m

Conditions for calculation of the noise level by heavy equipment are set in Table 12.4.1. The background noise level is set at 55 dB.

Table 12.4.2 Condition of Noise Calculation

Items	Conditions	
Power level	Back hoe	Lw = 118 dB
	Concrete breaker	Lw = 113 dB

The predicted noise level caused by heavy equipment is shown in Table 12.4.3. Provided that there is not any obstacle, noise of a back hoe is similar to the background noise level at 500 m from the source of noise, and noise of a concrete breaker at 300 m distance reaches a noise similar to the background level. These noises will be emitted intermittently. It is recognized from the above results that there will be some influence in the area near the work site, though, the impact-generating period is short. Therefore, the impact of noise is not expected to be serious for people.

Table 12.4.3 Predicted Noise Level Caused by the Heavy Equipment

Unit : dB(A)

Equipment	Distance from source of noise (m)										
	5	10	20	50	100	150	200	250	300	400	500
Back hoe	96	90	84	76	70	67	64	62	60	58	56
Concrete breaker	91	85	79	71	65	62	59	57	55	53	51

Installation of communication cables for level crossing alarm requires excavation along the railway. Communication cables will also be installed in residential area. Provided that heavy equipment such as back hoes is used for excavation, residents will be influenced by generated noise. However, construction period will not be long, so that its impact will not be serious.

Hue - Da Nang section, we will operate concrete chipping machines, concrete spray guns for improvement of tunnels. However, project sites are located in mountains areas, so that generating noise will not influence to people.

Operation and Maintenance Phase

It is expected by the following reasons that noise level along railway will increase.

- number of passing train will be increase by frequent service
- train speed will be higher than the present

Period of noise exposure will increase by frequent service. Noise level from trains is made to increase by speed-up of trains. Generally, noise level goes up in proportion to train speed. Therefore, noise level will keep growing higher.

(10) Vibration

Construction Phase

Improvement of railway and passenger service facilities causes vibration. However, construction period will not be long so that its impact will not be serious.

Operation and Maintenance Phase

Frequent service will increase the period of vibration. On the other hand, the existing rails will be changed to 43 kg-rail or 50 kg-rail on sections of 30 kg-rail. Generally, trains on heavier rails generate lower noise than on light rails. Therefore, train noise level will decrease after installation of heavy rail.

(11) Aesthetic

Operation and Maintenance Phase

Railway stations will be beautified by improvement of passenger service facilities. It is expected that passenger will feel much more comfortable with the additional help of renovation of passenger cars. Improvement of railway bridges also contributes beautification of bridges.

(12) Land use

Operation and Maintenance Phase

Viet Nam railway will be convenient by more frequent service. As a result, people may use

railways more often. It is possible that some cities will grow rapidly, and land use will be more efficient.

(13) Resettlement

Construction Phase

Urban areas, Hanoi and Ho Chi Minh, require construction of fence for safety around railway crossings. There are lots of houses along the railway in this area so that residents should be resettled on the site for installation of fence. At the present, number of resettled residents is not clear.

Provided that new railway will be constructed in residential and commercial areas, residents will remove. However, it is not clear that residents should be resettled for replacement of railway bridges. Further study is required before detail design.

(14) Split of community

Operation and Maintenance Phase

There will not be new line on Hanoi - Ho Chi Minh Line. Although frequent service gives rise to more difficulty of crossing the railway compared with the present service, that will no be serious.

(15) Local economic activities

Operation and Maintenance Phase

It is not clear how local economy will be influenced by implementation of the project. However, it is possible that closing of small scale freight stations will bring about influence on person concerned.

(16) Employment

Construction Phase

Closing small-scale freight stations will give rise to a lot of unemployment. Although some staff members can be transferred to other sections such as conductors, lots of staff members will be discharged.

On the other hand, reconstruction of railway and stations may require construction workers, so that employment opportunity of construction worker will increase.

(17) Traffic

Construction Phase

Reconstruction of railway and installation of equipment will influence traffic conditions,

especially railway crossings. When ditches are made at crossings for installation of cables for level crossing alarm, it will obstruct road transportation. However, construction period is for a half day. Furthermore, provided that constructor make an appropriate work schedule based on land use, impact of transportation can be reduced.

Several railway bridges are used for not only trains but also vehicles in common. Trains and vehicles can not go across river. Therefore, traffic congestion will be occurred during construction and improvement of bridges.

Operation and Maintenance Phase

Frequent service gives rise to difficulty of crossing the railway and bridges. It is expected that transportation of vehicles will be hindered by increasing train service.

(18) Public health and safety

Operation and Maintenance Phase

At the present, there are lots of traffic accidents in the urban areas at the present, because space between railway and houses is very narrow, and there is not fence on boundary of railway. Increasing of number and speed of train may causes increasing traffic accidents. On the other hand, traffic safety will be improved after installation of fence around crossings, and improvement of railway bridges and tunnels.

(19) Waste

Construction Phase

Demolition and exchange of the existing structures generate waste. Major waste is as follows:

improvement of station building --- wood, metal, ceramics, concrete debris
changing rail ---------- metal

Some parts of waste can be recycled for other purposes. However, most parts of waste should be disposed so that life span of disposal sites will decrease. We should pay attention to construction waste disposal.

12.4.2 Gia Lam Workshop Improvement Project

(1) Air quality

Construction Phase

Dust will be generated by demolition of existing structures of 3B and 5B, especially on windy days. However, generated dust and its spread may be within the workshop. Therefore, it is expected that impact by the construction will not influence to residents around the workshop.

(2) Water quality

Operation and Maintenance Phase

Waste water that contents metals and oil will be generated by working activities in the workshop so that waste water needs to be discharged outside of the workshop through waste water discharge system. Waste water treatment facility does not work at the present. However, waste water treatment facility will be rehabilitated in this project. Therefore, water quality of discharged pond will be improved.

(3) Noise

Construction Phase

Noise will be generated by the following activities:

- demolition of existing structures
- operation of heavy equipment

Building No. 3B and 5B are facing the south of wall, so that noise by construction activities may increase. However, the south area of the workshop is a commercial area, and construction period of demolition of existing structures and operation of heavy equipment will not be long. Therefore, impact of noise will not be serious.

Operation and Maintenance Phase

Outside of the workshop, there is not impact of noise by operation from the workshop at the present. Furthermore, Building No. 5B and 3B are not good conditions. There are holes on the walls of buildings. These buildings have been damaged by weather and others. Interception of noise is effective owing to the construction of new building including walls and roofs made in slate. Furthermore, the machines and equipment will be changed from old type to new type. As a result, newly installed machines and equipment will generate noise smaller than old type. It may be expected that noise will not reach outside of the workshop. It will be the same as the present conditions for the above reasons.

(4) Aesthetic

Operation and Maintenance Phase

It is expected that building No. 3B and 5B will be beautified by construction of external walls and others.

(5) Local economic activities

Construction Phase

Provided that construction materials can be bought in Hanoi, it can contribute to local economy.

(6) Employment

Construction Phase

Construction of buildings will require workers. Therefore, employment opportunity will slightly increase.

(7) Traffic

Construction Phase

The followings will be carried out inside and outside of the workshop during construction phase.

from outside of the workshop into the workshop
- construction heavy equipment
- construction materials
- installed new machines and equipment

from the workshop to outside
- construction heavy equipment
- construction waste
- no used machines and equipment
- worker

The vehicles will come through Highway No. 1A. Transportation of above will influence traffic conditions on the access road, Highway No. 1A. Number of vehicles for construction is not relatively much existing traffic volume on Highway No. 1A. Therefore, this impact will not be serious.

(8) Public health/safety

Operation and Maintenance Phase

Improvement of building and installation of new machines and equipment will bring about improvement of working environment.

(9) Waste

Construction Phase

Changing machines and equipment and demolition of building will generate waste. External walls, especially, should be disposed at solid waste disposal sites. If the waste is carried to disposal sites, life span of disposal site will be reduced. We should pay attention to waste as accumulated sand on floor and ditches. This is because accumulated sand contains oil and metals. Therefore, disposal the above mentioned waste kinds should be handled carefully.

12.5 Environmental Impact Evaluation

12.5.1 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.

12.5.2 Gia Lam Workshop Improvement Project

(1) Construction Phase

Positive impact

It is expected that there will be slight impact such as inreasing 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 impact after construction.

12.6 Environmental Consideration

As a result of environmental impact study, we should notice about environmental impact on the project sites and the suburb area such as socio-economic environment, and natural and physical environment. It is necessary that we choose considered deciding location, appropriate structure design, construction method and schedule. We should consider the following items for implementation of the project.

(1) Construction Phase

- land acquisition and resettlement will be minimized.
- traffic on roads that cross and along railway will not be hindered.
- traveling vehicles cross railway should be managed
- appropriate construction methods and schedule should be chosen.
- generating air pollutants, noise and vibration by construction activities will be minimized.
- construction waste should be recycled and minimaized
- generated turbid water will not be discharged into river.

Especially, construction of new railway line bridges, should be conducted detail environmental impact study. Because we do not have detail information such as design of structures, and construction of method and schedule.

(2) Operation and Maintenance Phase

- traffic safety should be secured.
- landscape will not be gotten worse.
- land use conditions will not be changed rapidly

12.7 Environmental Monitoring

The aims of environmental monitoring are:

- to obtain information on the existing environmental conditions
- to evaluate and confirm this environmental impact assessment
- to obtain information on changes in environmental conditions as a result of implementation of the project
- to optimize positive environmental impact and to minimize negative impact by the project
- to use environmental consideration for new railway development project in the future

Environmental monitoring can be used for not only understanding the environmental conditions, but also for judging if measures of environmental impact are required. Environmental monitoring flow is shown in Fig. 12.7.1.

Environmental monitoring covers Construction Phase and Operation and Maintenance Phase. Monitoring elements are selected from possible impact elements. The proposed environmental monitoring plan is shown in Table 12.7.1.

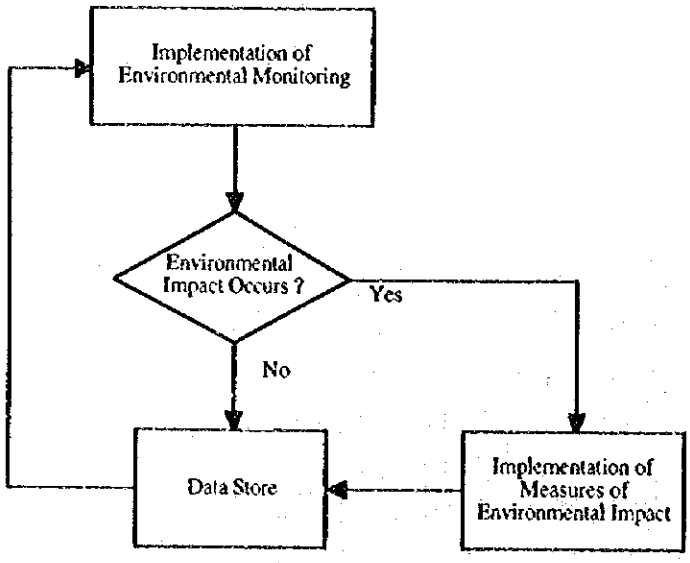


Fig. 12.7.1 Environmental Monitoring Flow

Table 12.7.1 Environmental Monitoring Plan for Hanoi - Ho Chi Minh Line

[Construction Phase]

Targets	Indicators	Monitoring Area	Methods	Frequency	Proposed Implementation Sectors
Complain from Residents	Number of complain Type of complain	Whole line	Checking record book based on telephones, letters, hearing and others from residents	To take proper measures	Each Union
Traffic Congestion	Conditions of congestion	Around construction sites	Watching	During construction work	Contractor

[Operation and Maintenance Phase]

Targets	Indicators	Monitoring Area	Methods	Frequency	Proposed Implementation Sectors
Complain from Residents	Number of complain Type of complain	Whole line	Checking record book based on telephones, letters, hearing and others from residents	To take proper measures	Each Union
Noise Level	Noise level	Along railway in residential area Around Gia Lam Workshop	Measurement by noise level meter	To take proper measures	Union
Traffic Safety	Number of accident	Whole line	Recording type, number of accident	Receiving report each accident	Union and VNR

Chapter 13 Conclusion and Recommendation

(1) General

The Study Team formulated the rehabilitation projects with due consideration on (a) train operation safety and reliability, (b) the improvement in management, (c) principle that the rehabilitation projects should contribute to financially sound operation of the VNR, and (d) the setting of priority sections. It has been proved that this principle improves the investment efficiency of the rehabilitation projects, and it is recommended that the projects be implemented.

(2) With the conditions of GDP forecast as the SPC sets, an economic evaluation clarifies that the four rehabilitation projects are feasible and can be recommended. They are;

(a) rehabilitation and improvement the whole line (Hanoi-Ho Chi Minh)

(b) priority section 1 (Hanoi -Than Hoa)

(c) priority section 2 (Hue- Da Nang)

(d) priority section 3 (Muong Man- Saigon)

Projects (a), (b), (d) are given higher priority, less priority is given to project (c) from the national economic point of view.

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

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

(5) Total cost for rehabilitation and improvement of Hanoi - Ho Chi Minh line amounts to US$ 533 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.

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

APPENDIX

Appendix 4 Traffic Survey

1. Traffic Count Survey on the Hanoi Cordon Line

In order to confirm the volume and distribution pattern of dominant traffic generation zones, traffic count and roadside interview survey was conducted in the end of June, 1995 on the Hanoi cordon line. The survey locations are presented in Figure 1.1.

Total volume of traffic generation and attraction of Hanoi account for 74,000 in non-motorized-vehicle (NMV), 90,000 in motor cycle (MC), and 24,000 in motorized vehicles of more than four wheels (MV). More than 80% of traffic is made by NMV and MC, while only 13% of traffic is made by MV.

Table 1.1 Traffic Volume on the Hanoi Cordon Line

(1) 16 Hours Ttraffic Volume (Vehicles)

Location	From Hanoi			To Hanoi			Both direction			Both direction share		
	NMV	MC	MV	NMV	MC	MV	NMV	MC	MV	NMV	MC	MV
(1)	2,046	2,138	793	2,100	2,305	737	4,146	4,443	1,530	5.6	5.0	6.4
(2)	972	637	335	896	589	71	1,868	1,226	406	2.5	1.4	1.7
(3)	3,476	6,566	1,544	3,159	5,885	1,447	6,635	12,451	2,991	8.9	13.9	12.5
(4)	2,326	4,982	2,249	2,138	4,433	2,365	4,464	9,415	4,614	6.0	10.5	19.4
(5)	2,373	3,645	2,660	2,547	4,903	2,699	4,920	8,548	5,359	6.6	9.5	22.5
(6)	17,916	17,819	2,097	18,717	20,864	2,533	36,633	38,683	4,630	49.3	43.2	19.4
(7)	7,049	5,142	961	4,753	4,567	995	11,802	9,709	1,956	15.9	10.8	8.2
(8)	177	80	16	169	127	20	346	207	36	0.5	0.2	0.2
(9)	1,833	2,607	1,139	1,619	2,335	1,174	3,452	4,942	2,313	4.6	5.5	9.7
Total	38,168	43,616	11,794	36,098	46,008	12,041	74,266	89,624	23,835	100.0	100.0	100.0

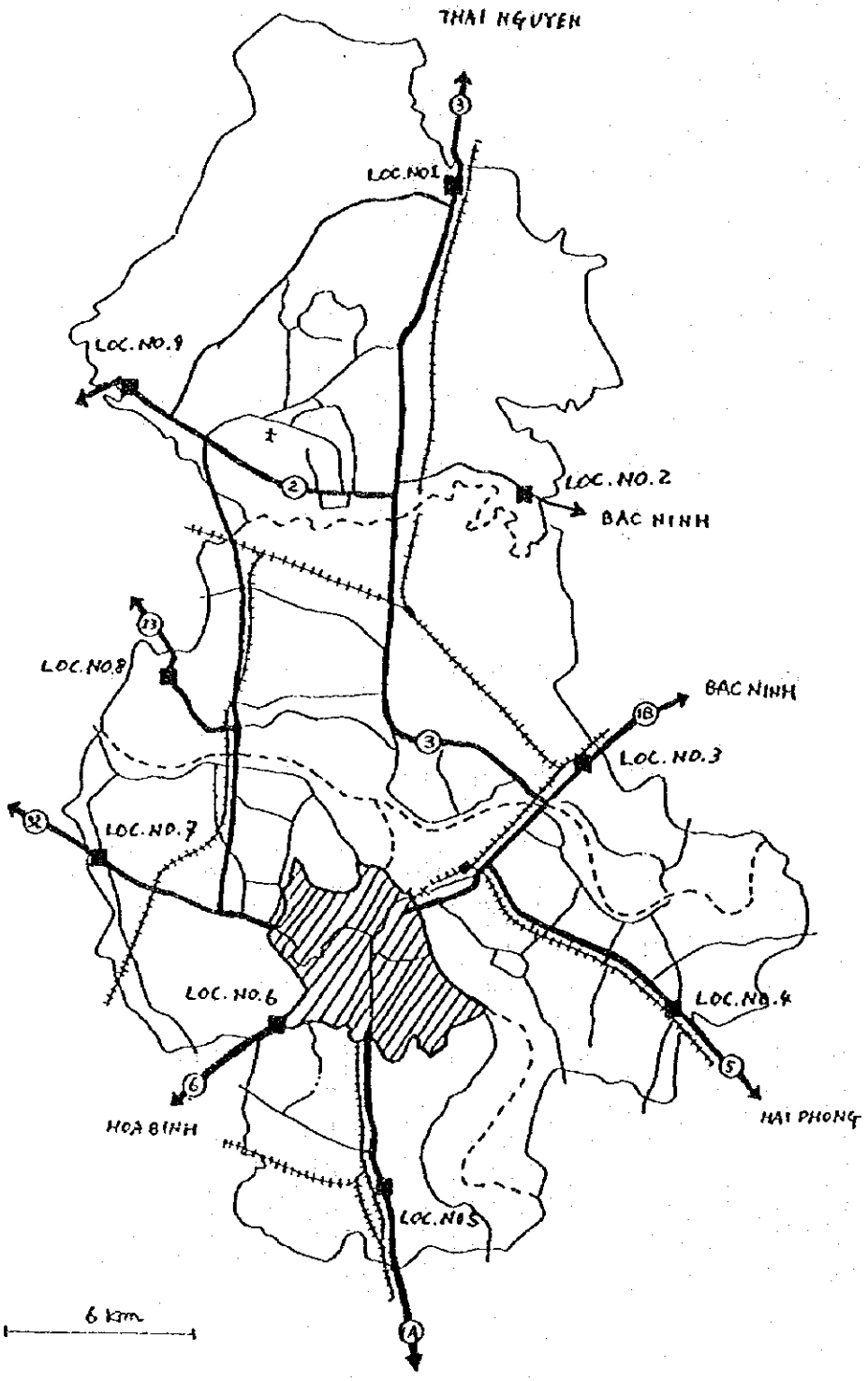


Figure 1.1 Survey Locations

(2) Share by Vehicle Type

Location	From Hanoi			To Hanoi			Both direction		
	NMV	MC	MV	NMV	MC	MV	NMV	MC	MV
(1)	41.1	43.0	15.9	40.8	44.8	14.3	41.0	43.9	15.1
(2)	50.0	32.8	17.2	57.6	37.9	4.6	53.4	35.0	11.6
(3)	30.0	56.7	13.3	30.1	56.1	13.8	30.1	56.4	13.5
(4)	24.3	52.1	23.5	23.9	49.6	26.5	24.1	50.9	24.9
(5)	27.3	42.0	30.7	25.1	48.3	26.6	26.1	45.4	28.5
(6)	47.4	47.1	5.5	44.4	49.5	6.0	45.8	48.4	5.8
(7)	53.6	39.1	7.3	46.1	44.3	9.6	50.3	41.4	8.3
(8)	64.8	29.3	5.9	53.5	40.2	6.3	58.7	35.1	6.1
(9)	32.9	46.7	20.4	31.6	45.5	22.9	32.2	46.2	21.6
Total	40.8	46.6	12.6	38.3	48.9	12.8	39.6	47.7	12.7

(3) 24 Hours Traffic Volume

Location	From Hanoi			To Hanoi			Both direction		
	NMV	MC	MV	NMV	MC	MV	NMV	MC	MV
(3)	3,591	6,857	1,701	3,297	6,062	1,678	6,888	12,919	3,379
(4)	2,359	5,177	2,526	2,294	4,559	2,672	4,653	9,736	5,198
(5)	2,431	3,830	2,918	3,033	5,072	3,144	5,464	8,902	6,062
(9)	1,908	2,676	1,255	1,824	2,404	1,275	3,732	5,080	2,530

(4) 42/16 Ratio

Location	From Hanoi			To Hanoi			Both direction		
	NMV	MC	MV	NMV	MC	MV	NMV	MC	MV
(3)	1.033	1.044	1.102	1.044	1.030	1.160	1.038	1.038	1.130
(4)	1.014	1.039	1.123	1.073	1.028	1.130	1.042	1.034	1.127
(5)	1.024	1.051	1.097	1.191	1.034	1.165	1.111	1.041	1.131
(9)	1.041	1.026	1.102	1.127	1.030	1.086	1.081	1.028	1.094
Average	1.028	1.042	1.106	1.104	1.031	1.141	1.065	1.036	1.124

2 Traffic Characteristics of Passengers of Long-Distance Trip

Three transport modes are available for a long-distance person trip in Viet Nam, those are railways, buses, and air. Motor vehicles are scarcely used for long-distance trips of Vietnamese people since private vehicle ownership is very limited at present.

Questionnaire surveys were conducted in order to find the traffic characteristics of long-distance passengers in Viet Nam. The survey forms presented in the appendix are translated into Vietnamese and the trained survey staffs from TEDI and VRDI asked domestic passengers (Vietnamese) to answer the questions at the Noi Bai airport, the three bus terminals in Hanoi, the three railway sections of the Hanoi - Ho Chi Minh line, the Hanoi-Lao Cai line and the Hanoi-Ha Long line.

Table 2.1 Survey Performance

Survey Location	No. of Samples	
Noi Bai Airport	Hanoi - Ho Chi Minh	404
	Hanoi - Da Nang	122
	Hanoi - Hue	15
	Hanoi - Vinh	34
Railways	Hanoi - Vinh	243
	Da Nang - Hue	204
	Ho Chi Minh - Muong Man	273
	Hanoi - Lao Cai Line	177
	Hanoi - Ha Long Line	219
Bus Terminals	Giap Bat	280
	Gia Lam	171
	Kim Ma	170

In the questionnaire survey, nationality, age, sex, type of job, personal income, household income and permanent address were inquired as a personal profile. Since there have been no such the survey in Viet Nam, it provide very valuable information to understand the characteristics of travelers by each mode.

As a traffic characteristics, trip origin and destination places, available stations or terminals for the trip, trip purpose, travel cost, travel time, departure frequency, access mode and its cost and time. Besides the above mentioned questions which are described in a numeric variables, each passenger's evaluation on the cost, time, frequency, comfortableness and safety is inquired in a form of ordering of five steps. Since, this information directly indicates people's awareness to the transport systems, it must be useful to developing a principle of improvement of LOS (level of service).

(1) Age

Age is widely distributed from one to eighty years old. The average ages by the type of transport mode are slightly different. The average age of air transport user is 42 years old. The average age of the others are middle of thirty's.

Survey Location	Average Age
Noi Bai Airport	42.0
HN-HCM Line	38.0
HN-Lao Cai Line	34.6
HN-Ha Long Line	36.8
Giap Bat Bus Terminal	34.0
Gia Lam Bus Terminal	35.0
Kim Ma Bus Terminal	29.0

(2) Sex

More than half of the passengers of every transport mode are male. Rather good occupation by female (40% of total passenger) was observed on the Hanoi - Ho Chi Minh line and Hanoi - Ha Long line. On the contrary, about 70% of passenger are male in the other modes.

(3) Job

There are significant difference in type of job between the modes. About 30% of air passenger and 20% of Hanoi-Ho Chi Minh line are government officials, which are the most dominant passenger for the two transport modes. On the Hanoi - Lao Cai line, about 20% of passenger belong to tertiary industry, which is followed by peddler (16.6%) and farmer / fishermen

(12.9%). On the Hanoi - Ha Long line, about half of the passengers are the employee of secondary and tertiary industry, which is followed by peddler. It is generally observed that employee and peddler have rather high proportion in the East - West lines in Northern part of Viet Nam, which indicates that the lines have an important role for the regional economy. In the bus passenger, it is noted that rather good proportion was occupied by students.

Major Users by Type of Job

Survey Location	Ranking		
	1	2	3
Noi Bai Airport	Government(27.9)	Employee II(22.5)	Employee III(15.6)
HN-HCM Line	Government(18.2)	Self-business(18.2)	Employee II(12.9)
HN-Lao Cai Line	Employee III(22.9)	Self-business(16.6)	Farmer(13.7)
HN-Ha Long Line	Employee II(29.2)	Employee III(21.5)	Self-business(16.4)
Giap Bat Bus Terminal	Student(21.1)	Self-business(20.4)	Employee(16.1)
Gia Lam Bus Terminal	Farmer(27.3)	Employee II(13.3)	Student(12.7)
Kim Ma Bus Terminal	Employee II(13.9)	Self-business(12.7)	Student(10.3)

(4) Personal and Household Income

There is a significant difference among the modes in level of passenger's income. It is generally observed that income level of passenger in the North - South direction is higher than that of the East - West direction.

Survey Location	Private Income	Household Income
Noi Bai Airport	981,939 Dong	1,918,489 Dong
HN-HCM Line	489,781 Dong	898,299 Dong
HN-Lao Cai Line	447,725 Dong	845,417 Dong
HN-Ha Long Line	268,673 Dong	479,904 Dong
Giap Bat Bus Terminal	373,939 Dong	1,210,435 Dong
Gia Lam Bus Terminal	394,429 Dong	501,434 Dong
Kim Ma Bus Terminal	306,893 Dong	476,364 Dong

(5) Trip Purpose

About half of the air passengers and 13.9 % of the Hanoi - Ho Chi Minh railway passengers have "official" purpose for their trips. On the contrary, "official" purpose passengers are scarcely observed in the other transport modes. It is safely stated that there is almost no possibility that half of the air passenger who have the "official" purpose use other modes for their trip. The other transport mode except the air are mainly used by the passenger whose trip purpose is "self-business", which account about 30 to 40 % of total.

Major Trip Purpose

	Ranking		
Survey Location	1	2	3
Noi Bai Airport	Official(52.4)	Self-business(22.5)	Recreational(14.6)
HN-HCM Line	Self-business(25.8)	Recreational(17.7)	Official(13.9)
HN-Lao Cai Line	Self-business(41.8)	Employer's-business(12.4)	Others(11.3)
HN-Ha Long Line	Self-business(35.2)	Recreational(20.1)	Other to home(14.6)
Giap Bat Bus Terminal	Self-business(25.7)	School to home(13.9)	Recreational(12.9)
Gia Lam Bus Terminal	Self-business(34.3)	Other to home(21.5)	Home to work(10.5)
Kim Ma Bus Terminal	Self-business(58.2)	Others(12.1)	Shopping(9.7)

(6) Decision Making Factors for Selection of Transport Mode

Five items; cost, time, frequency, comfortableness and safety are presented in the questionnaire as factors which make effect on decision making for selection of transport mode. Each interviewee was asked to select one factors which have the most dominant effect in selection of transport mode.

There observed significant difference between the modes. Almost all the air passenger selected "time" for their dominant decision making factor. The railway passenger of significant proportion selected the "Safety" and "Comfortableness" and the major bus passenger selected the "Frequency" and "Time". It may say that since there is not significant difference in travel cost between the railway and the buses, these two transport modes are substitution for each

other in terms of the other four factors.

Major Decision Making Factors for Selection of Transport Mode

Survey Location	Ranking (%)		
	1	2	3
Noi Bai Airport	Time(82.3)	Comfortableness(6.7)	Cost(6.3)
HN-HCM Line	Safety(49.2)	Comfortableness(31.5)	Cost(9.8)
HN-Lao Cai Line	Comfortableness(74.0)	Safety(16.9)	Others(4.0)
HN-Ha Long Line	Safty(64.8)	Comfortableness(30.1)	Cost/Time(1.8)
Giap Bat Bus Terminal	Frequency(49.4)	Time(29.6)	Cost(16.6)
Gia Lam Bus Terminal	Time(36.1)	Frequency(34.9)	Cost(19.9)
Kim Ma Bus Terminal	Frequency(48.2)	Time(31.0)	Cost/Comfort(8.9)

(7-1) Evaluation on Travel Cost

The most frequent answer for the cost evaluation is "Reasonable" , which well exceed 50 % of total passengers by each mode except the Hanoi - Ho Chi Minh line passenger. More than half of the passengers on the Hanoi - Ho Chi Minh line answered "Rather expensive", which indicates that there exist other important factors to select the railway such as "Safety" and "Comfortableness".

Survey Location	Mode (%)
Noi Bai Airport	Reasonable (64.4)
HN-HCM Line	Rather expensive (54.3)
HN-Lao Cai Line	Reasonable (65.3)
HN-Ha Long Line	Reasonable (70.3)
Giap Bat Bus Terminal	Reasonable (57.3)
Gia Lam Bus Terminal	Reasonable (69.4)
Kim Ma Bus Terminal	Reasonable (67.3)

(7-2) Evaluation on Travel Time

The most frequent answer for the cost evaluation in the air passengers is "Rather short" , which coincides with the fact that the dominant decision making factor for the air passengers is "Time". There are variations in the railway passengers' responses. Major part of the railway passengers on the Hanoi - Ho Chi Minh line and the Hanoi - Ha Long line responded "Rather long", on the contrary the passengers on the Lao Cai line responded "Rather short". The bus passengers at the Giap Bat bus terminal which is used for the south direction bus services responded "Reasonable", that seems to be a contrast with the responses of the Hanoi - Ho Chi Minh railway passengers.

Survey Location	Mode (%)
Noi Bai Airport	Rather short (51.7)
HN-HCM Line	Rather long (54.3)
HN-Lao Cai Line	Rather short (47.5)
HN-Ha Long Line	Rather long (53.0)
Giap Bat Bus Terminal	Reasonable (40.6)
Gia Lam Bus Terminal	Reasonable (53.2)
Kim Ma Bus Terminal	Rather short (46.4)

(7-3) Evaluation on Departure Frequency

The most frequent answer for the frequency evaluation common to all the passenger except at the Kim Ma bus terminal is "About Average" or "Convenient". The average occupancy ratio against the maximum available seats are 27.0% at the Giap Bat terminal, 68.3% at the Gia Lam terminal and 90.9% at the Kim Ma terminal. This fact indicates that supply of bus services at the Kim Ma is very close to its maximum capacity, which may lead to the major responses of "Inconvenient" at the Kim Ma bus terminal.

Survey Location	Mode (%)
Noi Bai Airport	Convenient (46.2)
HN-HCM Line	About average (78.6)
HN-Lao Cai Line	Convenient (48.6)
HN-Ha Long Line	About Average (42.9)
Giap Bat Bus Terminal	Convenient (57.7)
Gia Lam Bus Terminal	About Average (62.0)
Kim Ma Bus Terminal	Inconvenient (52.4)

(7-4) Evaluation on Comfort of Travel

The most frequent answer for the comfortableness evaluation common to all the passenger except at the Giap Bat bus terminal is "About Average" or "Satisfied". Even the passengers at the Giap Bat bus terminal responded "Dissatisfied", they used the buses, that indicates that they valued other factors such as "Frequency" and "Time" in comparison with the Hanoi - Ho Chi Minh railway..

Survey Location	Mode (%)
Noi Bai Airport	Satisfied (66.7)
HN-HCM Line	About average (55.2)
HN-Lao Cai Line	Satisfied (79.1)
HN-Ha Long Line	Satisfied (47.5)
Giap Bat Bus Terminal	Dissatisfied (43.8)
Gia Lam Bus Terminal	About average (43.6)
Kim Ma Bus Terminal	Satisfied (49.4)

(7-5) Evaluation on Comfortableness of Travel

The most frequent answer for the safety evaluation common to all the passenger is "Rather safe" or "About average". However, it should be noted that about 20 % of the Giap Bat bus terminal passengers and about 10 % of the Gia Lam bus terminal passengers responded "Rather dangerous".

Survey Location	Mode (%)
Noi Bai Airport	Rather safe (85.3)
HN-HCM Line	Rather safe (73.3)
HN-Lao Cai Line	Rather safe (80.7)
HN-Ha Long Line	Rather safe (47.3)
Giap Bat Bus Terminal	Rather safe (48.1)
Gia Lam Bus Terminal	Rather safe (58.1)
Kim Ma Bus Terminal	Very safe (39.9)