5.2 Management Analysis

5.2.1 Structure and Purposes of Analysis

The management analysis of main business of Transport Division of the VNR is composed of the following items with purposes;

(1) Growth Analysis : To judge to what direction the VNR has changed in the past and will change in the future and to make a plan to improvement policy

(2) Profitability Analysis : To grasp the VNR's capability to make profit

(3) Break Even Analysis : To judge the VNR's stability by estimating break even point at which revenue and cost are equal

(4) Productivity Analysis : To judge the VNR's efficiency

(5) Safety Analysis : To judge soundness of the VNR's financial situation

(6) Forecast of Income Statement : To judge the VNR's profitability in future by comparing "with-the-project" and "without-the-project"

5.2.2 Growth Analysis

(1) Expansion of Management Scale

Criterion for judgment of balanced expansion of management scale is whether the growth rates of total capital, the number of staff, operating revenue and traffic volume are approximately the same level. Skewed growth performance among the various indicators reveals that some segments of the organization can not succeed in improving the productivity and have a problem core to be tackled.

Actual growth analysis of the VNR is conducted based on the data for three years from 1992 to 1994. Annual average growth rates of staff (2.4%), passenger transportation (pass.km. ; 2.5%) and parcels (ton km.;-5.67%) are very small or negative. On the contrary, annual average growth rates of operating revenue (main business; 23.18%, subsidiary business; 37.78%), total capital (36.39%), freight transportation (ton and ton km.; 29.14%) and total transportation (pass. ton km.; 12.36%) show large growth rates.

Performance mentioned above indicates that the number of both staff and transportation of passengers and parcels show similar performance: very little increase or decrease inspire of expansion of total capital. And it is also apparent that there is a balanced expansion between total capital and freight transportation. However, there can be seen no balanced expansion between the total capital and other management indicators such as transportation of freights, the passengers, parcels, and staff.

It is judged that managerial resources have not been utilized effectively for transportation of passengers and parcels. But this cannot stand true for the staff since its low growth rate is caused by rationalization.

For the purpose of balanced expansion of management scale, the transportation of passengers and parcels must be increased more corresponding to an increase of total capital (refer to Table 5.2.1).

(2) Substantiality of Management

Substantiality of management is evaluated based on the main business of Transportation Division. Subsidiary business should play a role to support and strengthen the management basis of main business. Then the VNR must strive to improve the management substantiality for main business in principle.

Substantiality of management is also very important to judge the soundness of company's growth. The growth rates of total profit of operating revenue for main activities (105.89%), total (109.47%) and current profit (84.27%) show high growth rates. But these growth rates are those of deficits. Only the subsidiary business and value added of main business show positive figures; 14.93% and 14.90%.

Then substantial growth of management is realized only in subsidiary business and value added of main business. The main reasons for high and positive growth rate of value added of main business are as follows;

(i) Annual average growth rate of components of value added from 1992 to 1994 are as follow;

- Personnel Cost: 37.89%
- Rental Fee : 27.55%
- Tax : 13.03%
- Depreciation Cost: 107.15%
- Current Profit: 107.15%(deficit)

Table 5.2.1 Growth Analysis(Transport Division)

(Unit: Mil. Dong)

Aspects	Items		1992	1993	1994	Annual Average Growth Rate(%) 1992/94
A. Expansion of Management Scale	1.Growth Rate of Staffs	Amounts	34,165	34,600	35,000	1.21
		Growth Rate(%)	100.0	101.3	102.4	1.21
	2.Growth Rate of Total Capital	Amounts	2,022,377	2,124,664	3,761,822	36.39
		Growth Rate(%)	100.0	105.1	186.0	36.39
	3.Growth Rate of Operating Revenue (1) Main Business	Amounts	400,128	469,835	607,115	23.18
		Growth Rate(%)	100.0	117.4	151.7	23.18
	(2) Subsidiary Business	Amounts	29,860	63,969	56,681	37.78
		Growth Rate(%)	100.0	214.2	189.8	37.78
	(3) Total	Amounts	429,988	533,804	663,796	24.25
		Growth Rate(%)	100.0	124.1	154.4	24.25
	4.Growth Rate of Passeger Transportation (1) Passengers(thous.pass.) *1)	Amounts	8,719	7793.0	8,938	1.25
		Growth Rate(%)	100.0	89.4	102.5	1.25
	(2) Passenger Km.(mil. pass.km.)	Amounts	1,752	1,721	1,796	1.25
		Growth Rate(%)	100.0	98.2	102.5	1.25
	5.Growth Rate of Percel Transportation (1) Tons (thous. ton) *1)	Amounts	178	154	158	-5.67
		Growth Rate(%)	100.0	86.5	89.0	-5.67
	(2) Ton Km.(mil. ton.km.)	Amounts	55	48	49	-5.67
		Growth Rate(%)	100.0	88.3	89.0	-5.67
	6.Growth Rate of Freight Transportation (1) Tons (thous.ton) *1)	Amounts	2,774	3,187	4,626	29.14
		Growth Rate(%)	100.0	114.9	166.8	29.14
	(2) Ton Km.(mil. ton km.)	Amounts	1,077	1,721	1,796	29.14
		Growth Rate(%)	100.0	159.8	166.8	29.14
	7.Growth Rate of Total Transportation(mil. pass. ton km.)	Amounts	2,884	3,490	3,641	12.36
		Growth Rate(%)	100.0	121.0	126.3	12.36
B. Substantiality of Management	8.Growth Rate of Total Profit of Operating Revenue (1) Main Business	Amounts	-35,400	-61,099	-150,059	105.89
		Growth Rate(%)	100.0	172.6	423.9	105.89
	(2) Subsidiary Business	Amounts	1,720	1,928	2,272	14.93
		Growth Rate(%)	100.0	112.1	132.1	14.93
	(3) Total	Amounts	-33,680	-59,171	-147,787	109.47
		Growth Rate(%)	100.0	175.7	438.8	109.47
	9.Growth Rate of Value Added	Amounts	211,485	239,085	279,186	14.90
		Growth Rate(%)	100.0	113.1	132.0	14.90
	10.Growth Rate of Current Profit	Amounts	-43,375	-59,389	-147,289	84.27
		Growth Rate(%)	100.0	136.9	339.6	84.27
	11.Growth Rate of Equity Capital	Amounts	1,839,205	1,895,637	3,371,237	35.39
		Growth Rate(%)	100.0	103.1	183.3	35.39

Source: "Balance Sheet of Transport Division" and "Income and Expenditure of Transport Division" (1992-1994), Department of Finance and Accounting of Head Quarter of VNR

Note: *1) Traffic Volume (pass. and ton) in 1994 was estimated by the JICA Study team.

(ii) Personnel cost and depreciation cost are mostly contributed to high growth rate of value added of main business.

(iii) But current profit is negatively contributed to growth rate of value added of main business.

On the other hand, growth rates of operating revenue for main business and total are high, but growth rates of total profit of operating revenue of them are high in negative. This means that increase of operating cost is larger than the increase of operating revenue. Substantiality of management for main business is getting worse because growth rate of current profit is negatively high in spite of high positive growth of value added.

There is no figures available for analysis on value added of subsidiary business, and comparison of main and subsidiary businesses in terms of value added has to be left for other opportunity.

5.2.3 Profitability Analysis

(1) Transport Division

1) Whole Division

Company grows by inputting its capital into management activity and gets profit by utilizing it and by increasing it. Therefore, it can be said that indicator showing most accurately company's profitability is "Rate of Return on Assets(ROA)". Total assets is used as assets and current profit is used as return.

ROA of total transport division shows negative from 1992 to 1994 except subsidiary business. Main business has changed from -1.57% to -3.93%, subsidiary business, from 0.09% to 0.06% and total, from -1.57% to -3.93%. Comparing with the average value for ROA, 1.33% of Transport and Communication Industry of Japan in 1993, the profitability of the VNR is extremely low level and un-profitability has progressed year by year. The reasons for un-profitability exist in the fact that although operating revenue has increased around more than 23% annually, current deficits have increased rapidly more than 105% annually except subsidiary business but total assets has increased 36.39% annually.(refer to Table 5.2.2)

ROA is broken down into "Rate of Return on Sales(ROS)" x "Rate of Sales on Total Assets Turnover(SOA)". We can make clear the reason for un-profitability of the VNR from another aspects by analysis of relation between ROS and SOA. SOA is a ratio of current profit on total assets and the most basic indicator representing the efficiency of activating capital.

Table 5.2.2 Profitability Analysis(Transport Division)

[Including Infrastructure] (Unit: Mil. Dong)

Items	Formula	1992	1993	1994	Annual Average Growth Rate(%) (1992/94)
1.Operating Revenue					
(1) Main Business	(A)	400,129	469,835	607,115	23.18
(2) Subsidiary Business	(B)	29,860	63,969	56,681	37.78
(3) Main+ Subsidiary Business	(C)	429,989	533,804	663,796	24.25
2.Current Profit					
(1) Main Business	(D)	-35,400	-61,099	-150,059	105.89
(2) Subsidiary Business	(E)	1,720	1,928	2,272	14.93
(3) Total of Current Profit *1)	(F)	-31,779	-59,494	-147,785	115.65
3.Total Assets	(G)	2,022,377	2,124,664	3,761,822	36.39
4.Rate of Return on Total Assets(%)					
(1) Main Business	{(D)/(G)} x 100	-1.75	-2.88	-3.99	50.96
(2) Subsidiary Business	{(E)/(G)} x 100	0.09	0.09	0.06	-15.73
(3) Main+ Subsidiary Business	{(F)/(G)} x 100	-1.57	-2.80	-3.93	58.12
5.Rate of Return on Sales (%)					
(1) Main Business (a)	{(D)/(A)} x 100	-8.85	-13.00	-24.72	67.15
(b)	{(F)/(A)} x 100	-7.94	-12.66	-24.34	75.07
(2) Subsidiary Business	{(E)/(B)} x 100	5.76	3.01	4.01	-16.58
(3) Main+ Subsidiary Business	{(F)/(C)} x 100	-7.39	-11.15	-22.26	73.56
6.Rate of Sales on Total Assets Turnover					
(1) Main Business	(A)/(G)	0.20	0.22	0.16	-9.68
(2) Subsidiary Business	(B)/(G)	0.01	0.03	0.02	1.02
(3) Main+ Subsidiary Business	(C)/(G)	0.21	0.25	0.18	-8.90

Source: "Income and Expenditure" and "Balance Sheet" of Transport Division (1992-1994), The Department of Financial and Accounting of VNR Head Quarter.

Note: *1) It does not include other expenses and special expenses for items of expenses and other incomes for item item of income. Then total of current profit is not equal to total of main business and subsidiary business.

ROS for main business has changed from -8.85% to -24.72%, for subsidiary business from 5.76% to 4.0% and for total, from -7.39% to -22.26%. As a reference, the another kind of ROS is calculated for main business. Current profit is used for total of main business and subsidiary business. This means that ROS is the ratio of total current profit on operating revenue of main business. This kind of ROS has changed from -7.94% to -24.34%. These figures show the decrease of un-profitability in comparison with the former ROS because the latter ROS includes current profit by subsidiary business which has positive current profit.

On the other hand, SOA for main business has changed from 0.20 times to 0.16 times, for subsidiary business from 0.01 times to 0.02 times and for total, from 0.21 times to 0.18 times. By observing these figures, the reason for worsening profitability is caused by negative increase of ROS and positive decrease of SOA. In another words, profitability has been worsened by increase of deficits and by lowering of efficiency of activating capital.

The mentioned above is analysis on conventional income statement of the VNR which includes infrastructure. It is predicted that expense relating to infrastructure will transferred to the Government account after separating assets of infrastructure from the VNR from January 1995. Then in this study, two cases are analyzed. Case 1 is the case that the ratio of depreciation cost for infrastructure of the total depreciation cost is 60.4% from 1992 to 1993 and 76% in 1995 and the depreciation cost for infrastructure with these ratios is excluded.

The ratio in 1995 is higher than another two years because it is assumed that increase of fixed assets is mainly caused not by increase of rolling stock but by increase of infrastructure. Case 2 is the case that the ratio of depreciation cost for infrastructure of the total depreciation is 60.4% from 1992 to 1993 and 76% in 1995 and also the depreciation cost for infrastructure with these ratios is excluded. The ratios of depreciation cost for infrastructure mentioned above are based on the railway operation cost in the Report "Transport, Roads, Rails, Vehicles, Bridges, Tax System and Traffic Forecasts", Ministry of Transport, Communication and Post", April, 1994. (refer to Appendix 5.2.7 - 5.2.10)

Comparing with these cases each other, improvement of not only ROA but of ROS and SOA can be observed from 1992 to 1993 except 1994 which also shows negative values for ROA and ROS apart from subsidiary business. It must be taken note that especially the figures for ROA of main business and total in 1992 for case 2 show 3.15% and 3.68% respectively which is low level of the average value of ROA but has changed to the positive figure showing profitability. (refer to Appendix 5.2.1 - 5.2.2)

These figures suggest us that if not only depreciation cost but also other expenditures of the VNR with regard to infrastructure were transferred to the Government account, profitability of the VNR could be considerably improved.

2) Unions

We can know more vividly the profitability of the VNR by analyzing 3 Unions composing the VNR. According to actual figures for main business of 1994, ROA for Union 1 is -3.00%, for Union 2, -4.17% and for Union 3, -8.04% respectively. Union 3 is the most unprofitable Union. Main reason for it comes from the fact that ROS for main business is -34.92% and for total, -33.35%, in another words, ratio of deficits on operating revenue is the highest of three Unions. But it is noticeable that ROS for subsidiary business is 12.45% which is the highest of three Unions while ROS for Union 1 is 3.33% and for Union 2, 1.22% respectively.

On the contrary, Union 1 shows the least negative figure of ROA for main business mentioned above as -3.00% which is caused by ROA as -23.25% and SOA as 0.13 times. The figure of SOA is the lowest of three Unions mainly because of the largest total assets, 2,485 billion dong, and its relatively small operating revenue, 321 billion dong. This means the efficiency of activation of capital is the lowest in spite of the least un-profitability of three Unions.(refer to Table 5.2. 3)

For Unions, the same kinds of two cases are studied by reduction of depreciation cost for infrastructure. The result of analysis shows that ROA is more worsened because ROS as deficits ratio on operating revenue is also negative although SOA as the efficiency of activation of capital is improved by reduction of depreciation cost.(refer to Appendix 5.2.3 - 5.2.4)

(2) Other Divisions

All figures for ROA of other divisions is positive except Industrial Division. Particularly ROA of Construction Div. as 3.60% is the highest of four divisions. This is mainly because of extremely high figure of ROS as 4.11% showing surplus of current profit and high value of SOA as 0.88 in spite of the largest in total assets as 118 billion dong. We must make attention for the profitability of Service Division. In spite of its low level of ROS as 0.08% meaning very few rate of current profit, SOA is very high as 3.13 times which means high efficiency of activation of its capital (refer to Table 5.2.4).

Table 5.2.3 Profitability Analysis(Unions:1994)

[Including Infrastructure] (Unit: Mil. Dong)

Items	Formula	Union1	Union2	Union3	Total
1.Operating Revenue					
(1) Main Business	(A)	321,027	141,119	144,968	607,114
(2) Subsidiary Business	(B)	15,987	26,241	10,215	52,443
(3) Main+ Subsidiary Business	(C)	337,014	167,360	155,183	659,557
2. Current Profit					
(1) Main Business	(D)	-74,633	-24,274	-50,628	-149,535
(2) Subsidiary Business	(E)	533	319	1,272	2,124
(3) Total of Current Profit *1)	(F)	-74,242	-24,593	-51,753	-150,588
3.Total Assets	(G)	2,485,412	582,207	629,358	3,696,977
4.Rate of Return on Total Assets(%)					
(1) Main Business	{(D)/(G)} x 100	-3.00	-4.17	-8.04	-4.04
(2) Subsidiary Business	{(E)/(G)} x 100	0.02	0.05	0.20	0.06
(3) Main+ Subsidiary Business	{(F)/(G)} x 100	-2.99	-4.22	-8.22	-4.07
5.Rate of Return on Sales (%)					
(1) Main Business (a)	{(D)/(A)} x 100	-23.25	-17.20	-34.92	-24.63
(b)	{(F)/(A)} x 100	-23.13	-17.43	-35.70	-24.80
(2) Subsidiary Business	{(E)/(B)} x 100	3.33	1.22	12.45	4.05
(3) Main+ Subsidiary Business	{(F)/(C)} x 100	-22.03	-14.69	-33.35	-22.83
6.Rate of Sales on Total Assets Turnover					
(1) Main Business	(A)/(G)	0.13	0.24	0.23	0.16
(2) Subsidiary Business	(B)/(G)	0.01	0.05	0.02	0.01
(3) Main+ Subsidiary Business	(C)/(G)	0.14	0.29	0.25	0.18

Source: "Income and Expenditure" and "Balance Sheet" for each Union (1994), The Department of Financial and Accounting of VNR Head Quarter.

Note: *1) It does not include other expenses and special expenses for items of expenses and other incomes for item of income. Then total of current profit is not equal to total of main business and subsidiary business

Table 5.2.4 Profitability Analysis(Other Divisions :1994)

(Unit:Mil.Dong)

Items	Formula	Construction Division	Industrial Division	Material Division	Servise Division	Total
1.Operating Revenue						
(1) Main Business	(A)	103,572	45,035	61,416	169,751	379,774
(2) Subsidiary Business	(B)	21,938	5,080	9,789	0	36,807
(3) Main+ Subsidiary Business	(C)	125,510	50,115	71,205	169,751	416,581
2. Current Profit						
(1) Main Business	(D)	4,257	-141	598	142	4,856
(2) Subsidiary Business	(E)	103	204	-176	0	131
(3) Total of Current Profit *1)	(F)	4,519	181	422	1,542	6,664
3.Total Assets	(G)	118,264	50,367	215,912	54,165	438,708
4.Rate of Return on Total Assets(%)						
(1) Main Business	{(D)/(G)} x 100	3.60	-0.28	0.28	0.26	1.11
(2) Subsidiary Business	{(E)/(G)} x 100	0.09	0.41	-0.08	0.00	0.03
(3) Main+ Subsidiary Business	{(F)/(G)} x 100	3.82	0.36	0.20	2.85	1.52
5.Rate of Return on Sales (%)						
(1) Main Business (a)	{(D)/(A)} x 100	4.11	-0.31	0.97	0.08	1.28
(b)	{(F)/(A)} x 100	4.36	0.40	0.69	0.91	1.75
(2) Subsidiary Business	{(E)/(B)} x 100	0.47	4.02	-1.80	-	-
(3) Main+ Subsidiary Business	{(F)/(C)} x 100	3.60	0.36	0.59	0.91	1.60
6.Rate of Sales on Total Assets Turnover						
(1) Main Business	(A)/(G)	0.88	0.89	0.28	3.13	0.87
(2) Subsidiary Business	(B)/(G)	0.19	0.10	0.05	0.00	0.08
(3) Main+ Subsidiary Business	(C)/(G)	1.06	0.99	0.33	3.13	0.95

Source: "Income and Expenditure" and "Balance Sheet" (1994) of each Division, The Department of Financial and Accounting of VN Head Quarter.

Note: *1) It does not include other expenses and special expenses for items of expenses and other item of income. Then total of current profit is not equal to total of main business and subsidiary business.

5.2.4 Break Even Analysis

(1) Transport Division

1) Whole Division

a. Break Even Point

Break even point (BEP) is the operating revenue or products (traffic volume) at a point on which operating revenue and operating cost is equal.(refer to Fig. 5.2.1) BEP is calculated by a formula, (Fixed Cost)/(Marginal Profit). Marginal profit is derived from a formula, 1-(Variable Cost)/(Sales). Operating revenue is applied to sales. Fixed cost and variable cost is estimated on the basis of the Report by MOT, April, 1995, mentioned above.(refer to Appendix 5.2.7-5.2.13)

According to the results of analysis, operating revenue at the BEP of main business has changed from 522 billion dong in 1992 to 1,368 billion dong in 1994, while the actual operating revenue from 400 billion dong to 607 billion dong. Operating revenue of subsidiary business at the BEP has changed from 27 billion dong to 52 billion dong while the actual operating revenue from 30 billion dong to 57 billion dong. On the other hand, the traffic volume as products at the BEP has increased from 3,763 million pass. ton km. from 7,244 million pass. ton km. , and the actual traffic volume has increased from 2,883 million pass. ton km. to 3,215 million pass. ton km.(refer to Table 5.2.5)

b. Rate of Break Even Point

Rate of break even point (RBEP) is gotten by a formula, "{(Operating Revenue at a BEP)/(Actual Operating Revenue)} x 100", or "{(Traffic Volume at a BEP)/(Actual Traffic Volume)} x 100".

RBEP for operating revenue of main business shows the increase from 220% in 1992 to 335% in 1994 both of which are very high value comparing with 96.98% of the average value of Transport and Communication Industry of Japan in 1993. These figures express that the operating revenue and cost will not equal each other and generate deficits as long as the operating

Table 5.2.5 Break Even Analysis(Transport Division;Total)

[Including Infrastructure] (Unit: Mil. Dong)

Items	Formula	1992	1993	1994	Annual Average Growth Rate(%) 1992/94
1.Operating Revenue					
(1) Main Business	(A)	400,129	469,835	607,115	23.18
(2) Subsidiary Business	(B)	29,860	63,969	56,681	37.78
(3) Main+ Subsidiary Business	(C)	429,989	533,804	663,796	24.25
2. Traffic Volume(Mil. Pass. Ton km.)	(D)	2,883	2,747	3,215	5.60
3. Average Revenue	(D)/(A)=(E)	139	171	189	16.65
4.Operating Cost					
(1) Main Business	(F)	435,529	530,934	757,173	31.85
(2) Subsidiary Business	(G)	28,140	62,042	51,408	39.05
(3) Main+ Subsidiary Business	(H)	463,669	592,976	811,581	32.30
5. Fixed Cost					
(1) Main Business	(I)	149,652	191,845	269,784	34.27
(2) Susidiary Business	(J)	14,070	31,021	27,204	39.05
(3) Main+ Susidiary Business	(K)	163,722	222,866	296,988	34.68
6. Rate of Fixed Cost to Operating Revenue(%)					
(1) Main Business	(I)/(A)X100	37.4	40.8	44.4	9.00
(2) Subsidiary Business	(J)/(B)X100	47.1	48.5	48.0	0.92
(3) Main+ Subsidiary Business	(K)/(C)X100	38.1	41.8	44.7	8.40
7. Rate of Fixed Cost to Operating Cost(%)					
(1) Main Business	(I)/(F)X100	34.4	36.1	35.6	1.83
(2) Subsidiary Business	(J)/(G)X100	50.0	50.0	50.0	0.00
(3) Main+ Subsidiary Business	(K)/(H)X100	35.3	37.6	36.6	1.80
8. Variable Cost					
(1) Main Business	(L)	285,482	339,089	487,388	30.66
(2) Subsidiary Business	(M)	14,070	31,021	27,204	39.05
(3) Main+ Subsidiary Business	(N)	299,552	370,110	514,592	31.07
9. Rate of Variable Cost to Operating Revenue(%)					
(1) Main Business	(L)/(A)X100	71.3	72.2	80.3	6.07
(2) Subsidiary Business	(M)/(B)X100	47.1	48.5	48.0	0.92
(3) Main+ Subsidiary Business	(N)/(C)X100	69.7	69.3	77.5	5.49
10. Rate of Variable Cost to Operating Cost(%)					
(1) Main Business	(L)/(F)X100	65.5	63.9	64.4	-0.90
(2) Subsidiary Business	(M)/(G)X100	50.0	50.0	50.0	0.00
(3) Main+ Subsidiary Business	(N)/(H)X100	64.6	62.4	63.4	-0.93
11. Rate of Marginal Profit(%)					
(1) Main Business	{(A)-(L)}/(A)x100=(O)	28.7	27.8	19.7	-17.04
(2) Subsidiary Business	{(B)-(M)}/(B)x100=(P)	52.9	51.5	52.0	-0.83
(3) Main+ Subsidiary Business	{(C)-(N)}/(C)x100=(Q)	30.3	30.7	22.5	-13.92
12. Break Even Point					
(1) Operating Revenue(Mil. Dong)					
a. Main Business	(I)/{(O)/100}=(R)	522,300	689,395	1,368,031	61.84
b. Subsidiary Business	(J)/{(P)/100}=(S)	26,607	60,228	52,310	40.21
c. Main+ Subsidiary Business	(K)/{(Q)/100}=(T)	539,714	726,764	1,321,276	56.46
(2) Transport Volume(Mil. Pass.Ton km.)	(R)/(E)=(U)	3,763	4,031	7,244	38.75
13. Rate of Break Even Point(%)					
(1) Operating Revenue					
a. Main Business	(R)/(A)x100=(V)	130.53	146.73	225.33	31.39
b. Subsidiary Business	(S)/(B)x100=(W)	89.11	94.15	92.29	1.77
c. Main+ Subsidiary Business	(T)/(C)x100=(X)	125.52	136.15	199.05	25.93
(2) Traffic Volume(Mil. Pass. Ton km.)	(U)/(D)x100=(Y)	130.53	146.73	225.33	31.39
14. Rate of Management Safety(%)					
(1) Operating Revenue					
a. Main Business	100-(V)	-30.53	-46.73	-125.33	102.60
b. Subsidiary Business	100-(W)	10.89	5.85	7.71	-15.86
c. Main+ Subsidiary Business	100-(X)	-25.52	-36.15	-99.05	97.02
(2) Traffic Volume(Mil. Pass. Ton km.)	100-(Y)	-30.53	-46.73	-125.33	102.60

Source: "Income and Expenditure" and "Balance Sheet" of Transport Division (1992-1994), Department of Finance and Accounting of VNR Head Quarter.

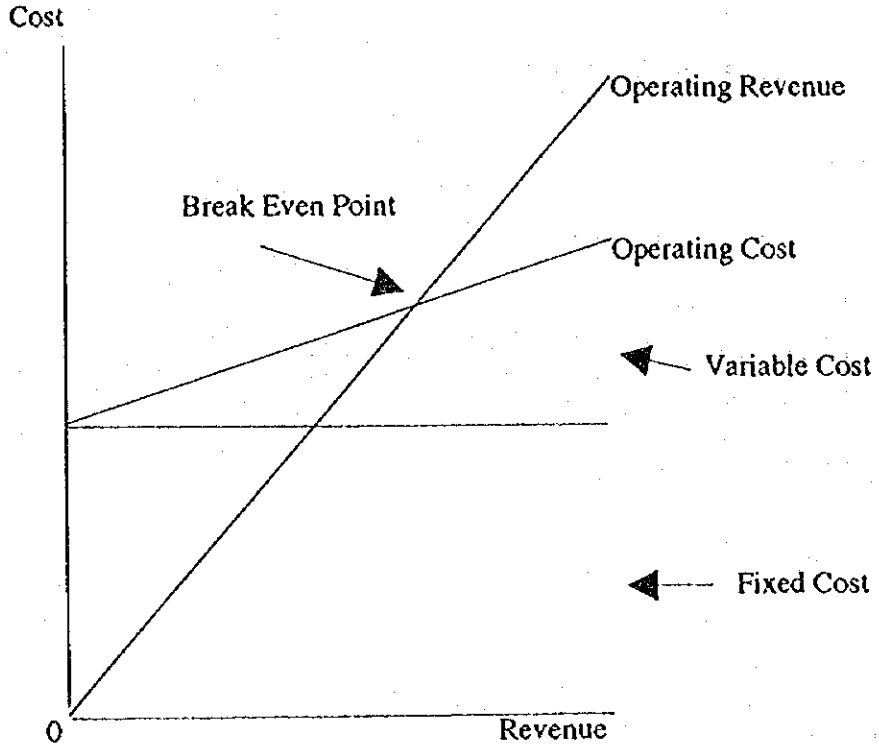

Fig. 5.2.1 Break Even Analysis

revenue will not increase 2.2 times or 3.35 times of the actual operating revenue or the actual traffic volume of each year.

The reasons for this high RBEP are considered to be the increase of fixed cost and the decrease of marginal deficit or increase of the ratio of variable cost on operating revenue by referring to a formula for the BEP mentioned above. In fact, the ratio of fixed cost on operating revenue has increased from 37.4% in 1992 to 44.4% in 1994. The ratio of variable cost on the operating revenue has also increased from 71.3% to 80.3% during the same period. On the other hand, the ratio of fixed cost on operating cost has not changed so much from 34.4% to 35.6% and the ratio of variable cost on operating cost has also no big change like from 65.5% to 64.4%.

These figures suggest that inefficient investment or surplus staff belonging to fixed cost must be reduced and materials, fuels and maintenance cost belonging to variable cost must also be saved or the operating revenue or traffic volume is needed to increase to make a BEP and RBEP lower.

On the other hand, RBEP for operating revenue of subsidiary business shows the increase from 89.11% in 1992 to 92.99% in 1994 which are less than 100%. These figures express that the operating revenue or traffic volume at a BEP is less than the actual operating revenue or actual traffic volume. Generally the operating revenue is less than the operating cost before a BEP and the operating revenue is more than the operating cost after a BEP.

The actual operating revenue or traffic volume of subsidiary business is more than the operating revenue or traffic volume at a BEP. Then the actual operating revenue is over the actual operating cost. In another words, subsidiary business is profitable.

The reasons for this high RBEP are considered to be the more marginal profit or less ratio of variable cost on operating revenue comparing with main business. In fact, the marginal profit has decreased from 52.9% in 1992 to 52.0. These figures are considerably higher than those of main business, 28.7% in 1992 and 19.7% in 1994. The ratio of variable cost on operating revenue has changed from 47.1% in 1992 to 48.0% in 1994 both of which are far less than those of main business (71.3% and 80.3%) on the basis of assumption that the ratios of fixed cost and variable cost on the operating cost are 50%.

Comparison of passenger transport with freight transport is carried out for RBEP. As for passenger transport, RBEP has changed from 313% in 1992 to 508% in 1994. RBEP for freight transport shows change from 83% to 145% during the same period. Passenger transport is in extremely bad condition compared with freight transportation mainly because of increase of fixed cost and the low value and decrease of rate of marginal profit changing from 14.7% in 1992 to 10.7% in 1994. That is to say, the rates of fixed cost and variable cost on operating revenue for passenger transport is considerably higher than those of freight transport. (refer to Table 5.2.6 and 5.2.7)

The more efforts toward management improvement are strongly required to passenger transport than freight transport.

c. Rate of Management Safety

Rate of management safety (RMS) is calculated by a formula, "100-(RBEP)".

In case that RMS is the less than 100%, which means RBEP is less than 100%, the management of the VNR is in a situation of safety. Because the value less than 100% for RBEP expresses that the actual operating revenue is over the actual operating cost. Looking at the results of calculation, RMS for main business shows negative values as -30.53% in 1992 and -125.33% in 1994, and RMS for the whole transport division shows -25.52% in 1992 to -99.05% in 1994. It goes without saying that there is no situation for telling about the management safety of

Table 5.2.6 Break Even Analysis for Transport Division (Passenger)

[Including Infrastructure] (Unit: Mil. Dong)

Items	Formula	1992	1993	1994	Annual Average Growth Rate(%) 1992/94
1.Operating Revenue	(A)	161,634	220,364	276,021	30.68
2. Traffic Volume(Mil. Pass. km.)	(B)	1,752	1,721	1,796	1.25
3. Average Revenue(Dong/Pass.km.)	(B)/(A)=(C)	92	128	154	29.07
4.Operating Cost	(D)	212,070	289,057	396,696	36.77
5. Fixed Cost	(E)	74,160	112,468	150,249	42.34
6. Rate of Fixed Cost to Operating Revenue(%)	(E)/(A)X100	45.9	51.0	54.4	8.92
7. Rate of Fixed Cost to Operating Cost(%)	(E)/(D)X100	35.0	38.9	37.9	4.07
8. Variable Cost	(F)	137,910	176,589	246,447	33.68
9. Rate of Variable Cost to Operating Revenue(%)	(F)/(A)X100	85.3	80.1	89.3	2.30
10. Rate of Variable Cost to Operating Cost(%)	(F)/(D)X100	65.0	61.1	62.1	-2.26
11. Rate of Marginal Profit(%)	{(A)-(F)}/(A)x100=(G)	14.7	19.9	10.7	-14.56
12. Break Even Point					
(1) Operating Revenue(Mil. Dong)	(E)/{(G)/100}=(H)	505,267	566,169	1,402,297	66.59
(2) Transport Volume(Mil. Pass. km.)	(H)/(C)=(I)	5,477	4,422	9,124	29.07
13. Rate of Break Even Point(%)					
(1) Operating Revenue	(H)/(A)x100=(J)	312.60	256.92	508.04	27.48
(2) Traffic Volume(Mil. Pass. km.)	(I)/(B)x100=(K)	312.60	256.92	508.04	27.48
14. Rate of Management Safety(%)					
(1) Operating Revenue	100-(J)	-212.60	-156.92	-408.04	38.54
(2) Traffic Volume(Mil. Pass. km.)	100-(K)	-212.60	-156.92	-408.04	38.54

Source: "Income and Expenditure" and "Balance Sheet" of Transport Division (1992-1994), The Department of Finance and Accounting of VNR Head Quarter.

Table 5.2.7 Break Even Analysis for Transport Division (Freight)

[Including Infrastructure] (Unit: Mil. Dong)

Items	Formula	1992	1993	1994	Annual Average Growth Rate(%) 1992/94
1.Operating Revenue	(A)	238,530	249,472	331,388	17.87
2. Traffic Volume(Mil. Ton km.)	(B)	1,131	1,026	1,419	12.01
3. Average Revenue(Dong/Ton km.)	(B)/(A)=(C)	211	243	234	5.23
4.Operating Cost	(D)	223,064	253,181	372,484	29.22
5. Fixed Cost	(E)	75,492	90,680	131,541	32.00
6. Rate of Fixed Cost to Operating Revenue(%)	(E)/(A)X100	31.6	36.3	39.7	11.99
7. Rate of Fixed Cost to Operating Cost(%)	(E)/(D)X100	33.8	35.8	35.3	2.15
8. Variable Cost	(F)	147,572	162,501	240,943	27.78
9. Rate of Variable Cost to Operating Revenue(%)	(F)/(A)X100	61.9	65.1	72.7	8.41
10. Rate of Variable Cost to Operating Cost(%)	(F)/(D)X100	66.2	64.2	64.7	-1.12
11. Rate of Marginal Profit(%)	{(A)-(F)}/(A)x100=(G)	38.1	34.9	27.3	-15.40
12. Break Even Point					
(1) Operating Revenue(Mil. Dong)	(E)/{(G)/100}=(H)	197,971	260,110	481,959	56.03
(2) Transport Volume(Mil.Ton km.)	(H)/(C)=(I)	939	1,070	2,064	48.27
13. Rate of Break Even Point(%)					
(1) Operating Revenue	(H)/(A)x100=(J)	83.00	104.26	145.44	32.38
(2) Traffic Volume(Mil.Ton km.)	(I)/(B)x100=(K)	83.00	104.26	145.44	32.38
14. Rate of Management Safety(%)					
(1) Operating Revenue	100-(J)	17.00	-4.26	-45.44	63.47
(2) Traffic Volume(Mil. Ton km.)	100-(K)	17.00	-4.26	-45.44	63.47

Source: "Income and Expenditure" and "Balance Sheet" of Transport Division (1992-1994), The Department of Finance and Accounting of VNR Head Quarter.

the VNR. The reasons for worsening RBEP and policies for its improvement are the same as those mentioned with regard to RBEP.

Now looking into more details, RMS for passenger transport has been worsened from -212.6% in 1992 to -408.04% in 1994. RMS for freight transport has a figure of 17.0% in 1992 which shows high management safety, but from 1993 to 1994, RMS has been worsened from -4.26% to -45.44%.

As for subsidiary business, the value of RMS has performed from 10.89% in 1992 to 7.71% in 1994. These value are very high comparing with 3.02% of the average value of RMS for Japanese transport and communication industry in 1993.

Also with regard to break even point analysis, two cases are analyzed by changing the ratio of depreciation cost for infrastructure. It is approved that management is extremely improved. That is to say, the values for rate of break even point are less than 100% and the values for rate of management safety are also less than 100% for main business and the whole transport division except in the year of 1994. (refer to Appendix 5.2.5 and 5.2.6)

2) Unions

a. Break Even Point

Fixed cost and variable cost is estimated on the basis of the Report by MOT, April, 1995, mentioned above.(refer to Appendix 5.2.16 - 5.2.21)

According to the results of analysis, operating revenue at the BEP of main business for each Union in 1994 has figured out as follows; 707 billion dong for Union 1, 238 billion dong for Union 2 and 486 billion dong for Union 3 respectively while the actual operating revenue for U 1, 321 billion dong, for U 2, 141 billion dong and for U 3, 145 billion dong. Operating revenue of subsidiary business at the BEP has figured out 15 billion for U 1, 26 billion dong for U 2 and 8 billion dong for U 3 while the actual operating revenue has figured out 16 billion dong for U 1, 26 billion dong for U 2 and 10 billion dong for U 3.

On the other hand, the traffic volume as products at the BEP has performed as 3,559 million pass. ton km. for U 1, 1,384 million pass. ton km. for U 2 and 2,601 million pass. ton km. for U 3 respectively. On the other hand, the actual traffic volume are observed as 1,616 million pass. ton km. for U 1, 822 million pass. ton km. for U 2 and 776 million pass. ton km. for U 3 respectively. (refer to Table 5.2.8)

Table 5.2.8 Break Even Analysis(Unions;Total:1994)

[Including Infrastructure] (Unit: Mil. Dong)

Items	Formula	Union1	Union2	Union3	Total
1.Operating Revenue					
(1) Main Business	(A)	321,027	141,119	144,968	607,114
(2) Subsidiary Business	(B)	15,987	26,241	10,215	52,443
(3) Main+ Subsidiary Business	(C)	337,014	167,360	155,183	659,557
2. Traffic Volume(Mil. Pass. Ton km.)	(D)	1,616	822	776	3,215
3. Average Revenue	(D)/(A)=(E)	199	172	187	189
4.Operating Cost					
(1) Main Business	(F)	395,661	165,713	195,801	757,175
(2) Subsidiary Business	(G)	15,454	25,922	8,943	50,319
(3) Main+ Subsidiary Business	(H)	411,115	191,635	204,744	807,494
5. Fixed Cost					
(1) Main Business	(I)	136,722	60,596	72,467	269,785
(2) Susidiary Business	(J)	7,727	12,961	4,472	25,160
(3) Main+ Susidiary Business	(K)	144,449	73,557	76,939	294,944
6. Rate of Fixed Cost to Operating Revenue(%)					
(1) Main Business	(I)/(A)X100	42.6	42.9	50.0	44.4
(2) Subsidiary Business	(J)/(B)X100	48.3	49.4	43.8	48.0
(3) Main+ Subsidiary Business	(K)/(C)X100	42.9	44.0	49.6	44.7
7. Rate of Fixed Cost to Operating Cost(%)					
(1) Main Business	(I)/(F)X100	34.6	36.6	37.0	35.6
(2) Subsidiary Business	(J)/(G)X100	50.0	50.0	50.0	50.0
(3) Main+ Subsidiary Business	(K)/(H)X100	35.1	38.4	37.6	36.5
8. Variable Cost					
(1) Main Business	(L)	258,939	105,117	123,334	487,390
(2) Subsidiary Business	(M)	7,727	12,961	4,472	25,160
(3) Main+ Subsidiary Business	(N)	266,666	118,078	127,805	512,550
9. Rate of Variable Cost to Operating Revenue(%)					
(1) Main Business	(L)/(A)X100	80.7	74.5	85.1	80.3
(2) Subsidiary Business	(M)/(B)X100	48.3	49.4	43.8	48.0
(3) Main+ Subsidiary Business	(N)/(C)X100	79.1	70.6	82.4	77.7
10. Rate of Variable Cost to Operating Cost(%)					
(1) Main Business	(L)/(F)X100	65.4	63.4	63.0	64.4
(2) Subsidiary Business	(M)/(G)X100	50.0	50.0	50.0	50.0
(3) Main+ Subsidiary Business	(N)/(H)X100	64.9	61.6	62.4	63.5
11. Rate of Marginal Profit(%)					
(1) Main Business	{(A)-(L)}/(A)x100=(O)	19.3	25.5	14.9	19.7
(2) Subsidiary Business	{(B)-(M)}/(B)x100=(P)	51.7	50.6	56.2	52.0
(3) Main+ Subsidiary Business	{(C)-(N)}/(C)x100=(Q)	20.9	29.4	17.6	22.3
12. Break Even Point					
(1) Operating Revenue(Mil. Dong)					
a. Main Business	(I)/{(O)/100}=(R)	706,924	237,522	485,595	1,368,066
b. Subsidiary Business	(J)/{(P)/100}=(S)	14,955	25,611	7,953	48,360
c. Main+ Subsidiary Business	(K)/{(Q)/100}=(T)	692,008	249,797	436,107	1,323,285
(2) Transport Volume(Mil. Pass.Ton km.)	(R)/(E)=(U)	3,559	1,381	2,601	7,241
13. Rate of Break Even Point(%)					
(1) Operating Revenue					
a. Main Business	(R)/(A)x100=(V)	220.21	168.31	334.97	225.34
b. Subsidiary Business	(S)/(B)x100=(W)	93.55	97.60	77.85	92.22
c. Main+ Subsidiary Business	(T)/(C)x100=(X)	205.33	149.26	281.03	200.63
(2) Traffic Volume(Mil. Pass. Ton km.)	(U)/(D)x100=(Y)	220.21	168.31	334.97	225.34
14. Rate of Management Safety(%)					
(1) Operating Revenue					
a. Main Business	100-(V)	-120.21	-68.31	-234.97	-125.34
b. Subsidiary Business	100-(W)	6.45	2.40	22.15	7.78
c. Main+ Subsidiary Business	100-(X)	-105.33	-49.26	-181.03	-100.63
(2) Traffic Volume(Mil. Pass. Ton km.)	100-(Y)	-120.21	-68.31	-234.97	-125.34

Source: "Income and Expenditure" and "Balance Sheet" for each Union (1994). The Department of Financial and Accounting of

b. Rate of Break Even Point

RBEP for operating revenue of main business shows the figures of 220% for U 1, 168% for U 2 and 335% for U 3. All unions have deficits because their RBEP is more than 100% but relatively un-profitability for U 2 is the least and the worst un-profitability is shown by U 3.

The reasons for high RBEP for U 3 are considered to be the highest ratio of fixed cost on operating revenue as 50.0% and the lowest ratio of marginal profit as 14.9% or the highest ratio of variable cost on operating revenue as 85.1%.

The policies to reduce high ratios of RBEP are not only to increase traffic volume but also to reduce inefficient investment or surplus staff belonging to fixed cost and to save cost for materials, fuels and maintenance cost belonging to variable cost.

On the other hand, RBEP for operating revenue of subsidiary business shows the lowest value of 77.85% for U 3 followed by U 1 as 93.55% and U 2 as 97.60%. These figures express that the most profitable union is U 3 and the most unprofitable union is U 2 for subsidiary business.

Comparison of passenger transport with freight transport is carried out for RBEP. As for passenger transport, RBEP is figured out as -556% for U 1, as 108% for U 2 and as 119% for U 3 respectively. The negative value for U 1 is caused by the negative value for rate of marginal profit as -10.2% coming from the fact that ratio of variable cost on operating revenue is 110.2% which means the variable cost is over the operating revenue. The figures of RBEP for other two unions are more than 100% but very near to it which means that it is not so difficult for them to attain to 100% by increasing traffic volume and the operating revenue and/or saving the operating cost, especially, variable cost because ratios of variable cost on operating revenue are high like 65.2% for U 2 and 64.6% for U 3 comparing with ratios of fixed cost on operating cost (37.5% for U 2 and 35.4% for U 3).(refer to Table 5.2.9)

RBEP for freight transport shows 111% for U 1, 140% for U 2 and 260% for U 3 respectively. On the contrary to passenger transport, RBEP of U 1 is mostly near to 100% and that of U 2 is mostly far from 100% which stands for that U 1 can relatively more easily attain to a break even point than other two unions but it is more difficult for U 3 to make profit than other two unions. (refer to Table 5.2.10)

c. Rate of Management Safety

RMS for main business shows negative values as -120.21% for U 1, -68.31% for U 2 and -234.97% for U 3, while the whole transport division shows -105.33% for U 1, -49.26% for U 2 and -181.03% for U 3. Judging from these figures, management safety is considered to be

Table 5.2.9 Break Even Analysis for Unions(Passenger:1994)

(Unit: Mil. Dong)

Items	Formula	Union 1	Union 1	Union 3	Total
1.Operating Revenue	(A)	121,333	73,484	78,082	272,899
2. Traffic Volume(Mil. Pass. km.)	(B)	820	491	485	1,796
3. Average Revenue(Dong/Pass.km.)	(B)/(A)=(C)	148	150	161	152
4.Operating Cost	(D)	202,602	75,419	82,845	360,866
5. Fixed Cost	(E)	68,875	27,528	29,308	125,711
6. Rate of Fixed Cost to Operating Revenue(%)	(E)/(A)X100	56.8	37.5	37.5	46.1
7. Rate of Fixed Cost to Operating Cost(%)	(E)/(D)X100	34.0	36.5	35.4	34.8
8. Variable Cost	(F)	133,727	47,891	53,537	235,155
9. Rate of Variable Cost to Operating Revenue(%)	(F)/(A)X100	110.2	65.2	68.6	86.2
10. Rate of Variable Cost to Operating Cost(%)	(F)/(D)X100	66.0	63.5	64.6	65.2
11. Rate of Marginal Profit(%)	{(A)-(F)}/(A)x100=(G)	-10.2	34.8	31.4	13.8
12. Break Even Point					
(1) Operating Revenue(Mil. Dong)	(E)/{(G)/100}=(H)	-674,252	79,039	93,233	908,924
(2) Transport Volume(Mil. Pass. km.)	(H)/(C)=(I)	-4,559	528	579	5,981
13. Rate of Break Even Point(%)					
(1) Operating Revenue	(H)/(A)x100=(J)	-555.70	107.56	119.40	333.06
(2) Traffic Volume(Mil. Pass. km.)	(I)/(B)x100=(K)	-555.70	107.56	119.40	333.06
14. Rate of Management Safety(%)					
(1) Operating Revenue	100-(J)	655.70	-7.56	-19.40	-233.06
(2) Traffic Volume(Mil. Pass. km.)	100-(K)	655.70	-7.56	-19.40	-233.06

Source: "Income and Expenditure" and "Balance Sheet" for each Union (1994), The Department of Finance and Accounting of VNR Head Quarter.

Table 5.2.10 Break Even Analysis for Unions(Freight:1994)

(Unit: Mil. Dong)

Items	Formula	Union 1	Union 1	Union 3	Total
1.Operating Revenue	(A)	195,891	67,552	64,824	328,267
2. Traffic Volume(Mil. Ton km.)	(B)	796	332	292	1,419
3. Average Revenue(Dong/Ton km.)	(B)/(A)=(C)	246	204	222	231
4.Operating Cost	(D)	202,602	75,419	82,845	360,866
5. Fixed Cost	(E)	68,875	27,528	29,308	125,711
6. Rate of Fixed Cost to Operating Revenue(%)	(E)/(A)X100	35.2	40.8	45.2	38.3
7. Rate of Fixed Cost to Operating Cost(%)	(E)/(D)X100	34.0	36.5	35.4	34.8
8. Variable Cost	(F)	133,727	47,891	53,537	235,155
9. Rate of Variable Cost to Operating Revenue(%)	(F)/(A)X100	68.3	70.9	82.6	71.6
10. Rate of Variable Cost to Operating Cost(%)	(F)/(D)X100	66.0	63.5	64.6	65.2
11. Rate of Marginal Profit(%)	{(A)-(F)}/(A)x100=(G)	31.7	29.1	17.4	28.4
12. Break Even Point					
(1) Operating Revenue(Mil. Dong)	(E)/{(G)/100}=(H)	217,040	94,581	168,323	443,195
(2) Transport Volume(Mil.Ton km.)	(H)/(C)=(I)	881	464	757	1,916
13. Rate of Break Even Point(%)					
(1) Operating Revenue	(H)/(A)x100=(J)	110.80	140.01	259.66	135.01
(2) Traffic Volume(Mil.Ton km.)	(I)/(B)x100=(K)	110.80	140.01	259.66	135.01
14. Rate of Management Safety(%)					
(1) Operating Revenue	100-(J)	-10.80	-40.01	-159.66	-35.01
(2) Traffic Volume(Mil. Ton km.)	100-(K)	-10.80	-40.01	-159.66	-35.01

Source: "Income and Expenditure" and "Balance Sheet" for each Union (1994), The Department of Finance and Accounting of VNR Head Quarter.

negative. But there is some variety between three unions. The negative management safety is the least for U 2 as -49.2% followed by U 1.

Now looking into more details by comparing passenger transport with freight transport, RMS for passenger transport is calculated as 655.70% for U 1, -7.56% for U 2 and -19.40% for U 3. In principle, RMS must be less than 100%, then RMS for U 1 has no room for explanation of management safety because its RMS is more than 100%. Management safety of all unions are negative but the negative management safety is the least for U 2 of three unions.

RMS for freight transport is calculated as -10.80% for U 1, -40.01% for U 2 and -159.66% for U 3. Management safety of all unions are negative but the management unsafety is the least for U 1 although its management safety for passenger transport is the worst of three unions.

Also with regard to break even point analysis, two cases are analyzed by changing the ratio of depreciation cost for infrastructure. It is approved that management is improved. (refer to Appendix 5.2.14 and 5.2.15)

5.2.5 Productivity Analysis

(1) Transport Division

1) Whole Division

a. Productivity Improvement

Starting point for productivity analysis is to calculate investment efficiency of total capital (IFTC) which is an indicator to present that how much value added the VNR can produce by inputting how much its managerial resources. IFTC can be calculated by a formula, "{(Value Added)/(Total Capital)} x 100".

IFTC is figured out as 10.46% in 1992, 11.25% in 1993 and 7.42% in 1994. These figures are far less than 31.07% which is average value of Transport and Communication Industry of Japan in 1993. The cause of decrease of IFTC is explained by breaking down a formula for IFTC into (Value Added per Staff)/(Degree of Capital Intensification) or (Ratio of Value Added on Operating Revenue) x (Ratio of Operating Revenue to Total Capital Turnover).

Judging from the former formula, annual average growth ratio of value added per staff (13.84%) is less than that of degree of capital intensification (35.14%). Degree of capital intensification is deprived from a formula, "(Total Capital)/(Number of Staff)". Then this is caused by the fact that growth rate of total capital (36.39%) is bigger than those of value added

(14.90%) and number of staff (0.93%). Lower growth rate of value added is mainly generated by increase of negative current profit (107.15%). Then fundamental cause for decrease of IFTC can be said to the largest growth rate of total capital of other indicators.

From this fact, the policies to increase IFTC is to decrease of growth rate of total capital or to increase growth rate of value added, that is to say, to decrease negative current profit, and to increase the number of staff. But it is difficult to increase drastically the number of staff, then, the priority policy should be focused on increasing value added.

On the other hand, the analysis is carried out for the latter formula, "(Ratio of Value Added on Operating Revenue) x (Ratio of Operating Revenue to Total Capital Turnover)". Ratio of value added on operating revenue has decreased from 52.85% to 45.99%, which is less than 58.81% of the average value of Japanese Transport and Communication in 1992. Ratio of operating revenue to total capital turnover has also decreased from 0.20 time to 0.16 time while the average value of Japanese Transport and Communication is 0.53 time in 1993. This is another reason for the decrease of IFTC. The cause of decrease for value added on operating revenue seems to be the more annual average growth rate of operating revenue (23.17%) than that of value added (14.90%). The decrease of ratio of operating revenue to total capital turnover is happened by the more annual average growth rate of total capital (36.39%) and that of operating revenue (23.17%).

Then from another aspect, the main reason for decrease of IFTC can be maintained higher growth rate of total capital and operating revenue than that of value added. From these analysis, the policies to increase IFTC are to reduce growth rate of total capital and/or to increase growth rate of value added.

Then it can be concluded that performance of value added and control fort total capital is very important factor for improvement of IFTC.

Productivity with regard to traffic volume per staff has increased from 84,385 pass.ton km in 1992 to 92,385 pass.ton km. in 1994 with annual average growth rate of 4.63%. On the other hand, Pass km. per staff has increased from 51,281 pass. km to 51,609 pass.km. with growth rate of 0.32% while ton km. per staff has increased from 33,104 ton km. to 40,776 ton km. Productivity for freight transportation is higher than that of passenger transport. (refer to Table 5.2.11)

b. Activation for Equipment

Investment efficiency to tangible fixed assets is a ratio of value added on tangible assets. This ratio has decreased from 0.11 times in 1992 to 0.08 times in 1994 because of more growth rate

Table 5.2.11 Productivity Analysis(Transport Division;Main Business)

(UNit: Mil. Dong)

Items		Formula	1992	1993	1994	Annual Average Growth Rate(%) 1992/94
1.Value Added *1)						
(1) Personnel Cost		(A)	139,713	160,150	265,663	37.89
(2) Tax		(B)	28,867	32,034	36,882	13.03
(3) Financial Cost		(C)	n.a.	n.a.	n.a.	-
(4) Rental Fee		(D)	n.a.	n.a	n.a.	-
(5) Depreciation Cost		(E)	77,875	108,000	126,700	27.55
(6) Current Profit		(F)	-34,970	-61,099	-150,059	107.15
Total		(G)	211,485	239,085	279,186	14.90
2.Number of Staffs *2)		(H)	34,165	34,660	34,800	0.93
3. Operating Revenue		(I)	400,164	469,835	607,115	23.17
4.Traffic Volume						
(1) Passenger km.(mil. pass.km.)		(J)	1,752	1,721	1,796	1.25
(2) Ton km.(mil.ton.km.)		(K)	1,131	1,026	1,419	12.01
(3) Pass. Ton km.(mil.pass.ton km.)		(L)	2,883	2,747	3,215	5.60
5.Total Capital		(M)	2,022,377	2,124,664	3,761,822	36.39
6.Tangible Fixed Assets		(N)	1,867,866	1,927,705	3,500,499	36.90
A. Analysis of Productivity Improvement	a. Investment Efficiency of Total Capital(%)	{(G)/(M)}x100	10.46	11.25	7.42	-15.76
		or (R)x(S)	10.46	11.25	7.42	-15.76
		or {(O)/(Q)}x100	10.46	11.25	7.42	-15.76
	b. Value Added per Staff(Value Productivity)(thous.dong)	{(G)/(H)}x1,000=(O)	6,190	6,898	8,023	13.84
		or {(P)x(R)}/100=(O)	6,190	6,898	8,023	13.84
		or (T)x(U)=(O)	6,190	6,898	8,023	13.84
	c. Operating Revenue per Staff(Value Productivity)(thos..dong)	{(I)/(H)}x1,000=(P)	11,713	13,556	17,446	22.04
	d. Traffic Volume per Staff(Physical Productivity)					
	(a) Passenger km. per Staff(pass. km)	{(J)/(H)}x1,000,000	51,281	49,654	51,609	0.32
	(b) Ton km. per Staff(ton km)	{(K)/(H)}x1,000,000	33,104	29,602	40,776	10.98
	(c) Pass,.Ton km.(pass. ton. km.)	{(L)/(H)}x1,000,000	84,385	79,256	92,385	4.63
	e. Degree of Capital Intensification(thous.dong)	{(M)/(H)}x1,000=(Q)	59,194	61,300	108,098	35.14
	f. Ratio of Value Added to Operating Revenue(%)	{(G)/(I)}x100=(R)	52.85	50.89	45.99	-6.72
	g. Ratio of Operating Revenue to Total Capital Turnover(Time)	(I)/(M)=(S)	0.20	0.22	0.16	-9.69
B. Analysis of Activeation for Equipmnet	h. Investment Efficiency to Tangible Fixed Assets(Time)	(G)/(N)=(T)	0.11	0.12	0.08	-16.07
	i. Amounts of Labor Equipment per Staff(thou.dong)	{(N)/(H)}x1,000=(U)	54,672	55,618	100,589	35.64
C. Analysis of Distribution for Value Added	j. Personnel Cost per Staff(thous.dong)	{(A)/(H)}x1,000	4,089	4,621	7,634	36.63
	k. Labor Distribution Ratio of Value Added(%)	(A)/(G)x100	66.06	66.98	95.16	20.02
	l. Current Profit per Staff(thous. dong)	{(F)/(H)}x1,000	-1,024	-1,765	-4,312	105.25
	m. Profits Distribution Ratio of Value Added(%)	(F)/(G)x100	-16.54	-25.56	-53.75	80.29

Source: "Income and Expenditure" and "Balance Sheet" for Transport Division (1992-1994), The Department of Finance and Accounting of VNR Head Quarter.

Note:*1) Contents of value added is based on the form of the Bank of Japan.

*2) The number of staffs in 1994 is estimated by the JICA study team.

of tangible assets by 36.90% than value added by 14.90%. Ratios of value added on tangible assets of the VNR is far less than the average value, 0.92 times, of Transport and Communication Industry of Japan. On the contrary, the amounts of equipment for labor per staff have increased from 55 million dong in 1992 to 101 million dong. Then the VNR is in a situation of low level of equipment utilization in spite of increase of the amounts of equipment for labor per staff. It can be again pointed out that the more growth rate of value added is desired than that of tangible assets.

c. Distribution of Value Added

Value added per staff is broken down into a formula, "(Personnel Cost per Staff)/(Distribution Ratio to Labor of Value Added)". Value added per staff has increased from 6.2 million dong in 1992 to 8.0 million dong in 1994 with growth rate with 13.84%. On the other hand, personnel cost per staff has increased from 4.1 million dong to 7.6 million dong with growth rate of 36.63% and distribution ratio to labor of value added has increased from 66.06% to 95.16% with growth rate of 20.02%. Distribution ratio to labor of value added is considerably high especially in 1994 but personnel cost per staff is almost the same as value added per staff in the same year. The reason for this is caused by the low level of value added per staff. Policies to increase value added per staff are considered to be reduction of the number of staff and/or other component of value added, especially current profit

On the other hand, value added per staff is broken down into another formula, (Current Profit per Staff)/(Distribution Ratio to Current profit of Value Added). Current profit per staff has negatively increased from -1.0 million dong to -4.3 million dong with growth rate of 105.25% and distribution ratio to current profit of value added has also negatively increased from -16.54% to -53.75%. Negative distribution ratio to current profit of value added is considerably high especially in 1994. This means that only the negative current profit has increased, and positive current profit has not been distributed to staff of the VNR. It goes without saying that the most urgent policy must be focused on making current profit change from negative figure (deficits) to positive one (surplus).

2) Unions

a. Productivity Improvement

Investment efficiency of total capital (IFTC) is figured out as 6.57% for U 2, 10.74% for U 2 and 12.79% for U 3. The cause of low level of IFTC for U 1 is explained by breaking down a formula for IFTC into "(Value Added per Staff)/(Degree of Capital Intensification)" or "(Ratio

of Value Added on Operating Revenue) x (Ratio of Operating Revenue to Total Capital Turnover)".

Judging from the former formula, the ratio of value added per staff of U 1 (7.7 million dong) is the least figure and degree of capital intensification (116.8 million dong) is largest of all unions. Degree of capital intensification is deprived from a formula, "(Total Capital)/(Number of Staff)". Then the highest figure for degree of capital intensification is caused by the fact that total capital is the biggest as 2,485 billion dong in spite of the highest figure for the number of staff as 21,283.

From this fact, the policies to increase IFTC of U1 is to increase value added per staff and/or to decrease total capital per staff.

On the other hand, the analysis is carried out for the latter formula. The ratio of value added on operating revenue of U 1 is 50.84% which is more than that of U 2 but less than that of U 3 and ratio of operating revenue to total capital turnover is 0.13 which is the least of the three unions.

From these analysis, the policies to increase IFTC of U 1 are to reduce growth rate of total capital and/or to increase growth rate of value added than growth rate of operating revenue.

Looking at productivity with regard to traffic volume per staff, pass. ton km. is 161,439 for U 2, 117,344 for U 3 and 75,928 for U 1 respectively. Passenger km. is 73,272 for U 3, 71,118 for U 2 and 38,551 for U 1 and ton km. is 90,371 for U 2, 44,072 for U 3 and 37,377 for U 1. Then productivity with regard to traffic volume as products of U 1 is the lowest in spite of its the largest management scale. It is very clear that the policies to increase productivity of traffic volume of U 1 are to increase traffic volume by improving service level and reduce the number of staff by rationalization of maintenance and etc.(refer to Table 5.2.12)

b. Activation for Equipment

Investment efficiency to tangible fixed assets is a ratio of value added on tangible assets. The lowest level of this ratio is shown by U 1. as 0.07 times followed by U 2 as 0.12 times and by U 3 as 0.14 times.

On the other hand, the biggest amounts of equipment for labor per staff is also observed by U 1 as 112.3 million dong by U 1 followed by U 3 as 84.6 million dong and by U 2 as 78.0 million dong respectively. Then U 1 is in a situation of the lowest level of three unions for equipment utilization.

c. Distribution of Value Added

Value added per staff is broken down into a formula, "(Personnel Cost per Staff)/(Distribution Ratio to Labor of Value Added)". Value added per staff ranges from 7.7 million dong for U 1 to 12.2 million dong for U 3 which shows the highest figure of three unions. On the other hand, personnel cost per staff is varied from 7.2 million dong for U 2 to 9.1 million dong for U 3 which is also the highest value of the three unions. Distribution ratio to labor of value added is the highest for U 1 as 93.79% followed by U 2 as 83.51% and by U 3 as 74.97%. The highest value of value added per staff is reflected on the lowest value of distribution ratio to labor of value added and the highest level of personnel cost per staff. The most effective distribution to labor of value added is shown by U 3 and the most ineffective one is shown by U 1.

On the other hand, value added per staff is broken down into another formula, "(Current Profit per Staff)/(Distribution Ratio to Current profit of Value Added)". Current profits per staff of all unions are negative. The least negative figure is shown by U 1 because negative current profit is the largest as -74.6 billion dong and the number of staff are also the largest as 21,283 but the ratio of the two is relatively smaller than other unions.

(2) Other Divisions

1) Productivity Improvement

The highest Investment efficiency of total capital (IFTC) is shown by Industrial Division as 27.37% which is around 3.7 times of Transport Division. The lowest value IFTC is shown by Material Division by 2.79%. The cause of the highest level of IFTC for Industrial Div. is explained by breaking down a formula for IFTC into "(Value Added per Staff)/(Degree of Capital Intensification)" or "(Ratio of Value Added on Operating Revenue) x (Ratio of Operating Revenue to Total Capital Turnover)".

Judging from the former formula, value added per staff of Industrial Div. (4.4 million dong) which is the highest of all other divisions and degree of capital intensification (16.2 million dong) is relatively smaller than other divisions. Degree of capital intensification is deprived from a formula, "(Total Capital)/(Number of Staff)". Then this smaller value of degree of capital intensification is caused by the fact that total capital is 50.4 billion dong which is the smallest of other divisions. and the number of staff is 3,104 which is secondly bigger than other divisions.

On the other hand, the analysis is carried out for the latter formula. The ratio of value added on operating revenue of Industrial Div. is 27.50% which is extremely higher than other divisions

and ratio of operating revenue to total capital turnover is 0.99 which is the least of four divisions. The main reason for the highest value of IFTC of Industrial Div. comes from the extremely high value of the ratio of value added on operating revenue and the highest figure of value added as 13.8 billion dong which is more than two times of value added of other divisions. (refer to Table 5.2.13)

2) Activation for Equipment

Investment efficiency to tangible fixed assets is a ratio of value added on tangible assets. The lowest level of this ratio is shown by Construction Div. as 0.4 times followed by Industrial Div. and Service Div. as 0.6 times and by Material Div. as 0.7 times.

On the other hand, the biggest amounts of equipment for labor per staff is observed on Industrial Div. as 7.9 million dong followed by Service Div. as 4.1 million dong and by Construction Div. as 3.8 million dong. Then Construction Div. is in a situation of the lowest level of three unions not only for investment efficiency to tangible assets but also the amounts of equipment to labor per staff.

3) Distribution of Value Added

Value added per staff is broken down into a formula, "(Personnel Cost per Staff)/(Distribution Ratio to Labor of Value Added)". Value added per staff ranges from 1.3 million dong for Construction Div. to 4.4 million dong for Industrial Div. which shows the highest figure of four divisions. On the other hand, personnel cost per staff varies from 0.9 million dong for Construction Div. to 3.5 million dong for Industrial Div. which is also the highest value of four divisions.

Distribution ratio to labor of value added is the highest for Industrial Div. as 79.58% followed by Construction Div. as 70.86% and the lowest one is for Service Div. as 42.61%. The highest figure of value added per staff (4.4 million dong for Industrial Div.) is reflected on the lowest value of distribution ratio to labor of value added and the highest level of personnel cost per staff.

On the other hand, value added per staff is broken down into another formula, "(Current Profit per Staff)/(Distribution Ratio to Current profit of Value Added)". On the contrary to Transport Div., current profits per staff of all other divisions are positive. The largest figure is shown by Service Div. as 0.6 million dong because its current profit is the largest as 1.5 billion dong and the number of staff are the least as 2,684. But its value added per staff (2.5 million dong) is not the highest figure. It is noticeable that value added per staff of Industrial Div. is the highest one as 4.4 million dong although its current profit per staff as .04 million dong and distribution ratio

Table 5.2.12 Productivity Analysis(Unions;Main Business)

(Unit: Mil. Dong)

Items		Formula	Union 1	Union 2	Union 3	Total
1.Value Added *1)						
(1) Personnel Cost		(A)	153,085	52,226	60,353	265,664
(2) Tax		(B)	18,524	8,547	36,882	63,953
(3) Financial Cost		(C)	n.a.	n.a.	n.a.	0
(4) Rental Fee		(D)	n.a.	n.a	n.a.	0
(5) Depreciation Cost		(E)	66,240	26,359	34,101	126,700
(6) Current Profit		(F)	-74,633	-24,593	-50,832	-150,058
Total		(G)	163,216	62,539	80,504	306,259
2.Number of Staffs *2)		(H)	21,283	6,900	6,616	34,800
3. Operating Revenue		(I)	321,027	141,119	144,968	607,114
4.Traffic Volume						0
(1) Passenger km.(mil. pass.km.)		(J)	821	491	485	1,796
(2) Ton km.(mil.ton.km.)		(K)	796	623	292	1,710
(3) Pass. Ton km.(mil.pass.ton km.)		(L)	1,616	1,114	776	3,506
5.Total Capital		(M)	2,485,412	582,207	629,358	3,696,977
6.Tangible Fixed Assets		(N)	2,390,146	538,133	559,643	3,487,922
A. Analysis of Productivity Improvement	a. Investment Efficiency of Total Capital(%)	{(G)/(M)}x100	6.57	10.74	12.79	8.28
		or (R)x(S)	6.57	10.74	12.79	8.28
		or {(O)/(Q)}x100	6.57	10.74	12.79	8.28
	b. Value Added per Staff(Value Productivity)(thous.dong)	{(G)/(H)}x1,000=(O)	7,669	9,064	12,167	8,801
		or {(P)x(R)}/100=(O)	7,669	9,064	12,167	8,801
		or (T)x(U)=(O)	7,669	9,064	12,167	8,801
	c. Operating Revenue per Staff(Value Productivity)(thos..dong)	{(I)/(H)}x1,000=(P)	15,083	20,453	21,910	17,446
	d. Traffic Volume per Staff(Physical Productivity)					
	(a) Passenger km. per Staff(pass. km)	{(J)/(H)}x1,000,000	38,551	71,118	73,272	51,610
	(b) Ton km. per Staff(ton km)	{(K)/(H)}x1,000,000	37,377	90,321	44,072	49,147
	(c) Pass..Ton km.(pass. ton. km.)	{(L)/(H)}x1,000,000	75,928	161,439	117,344	100,757
	e. Degree of Capital Intensification(thous.dong)	{(M)/(H)}x1,000=(Q)	116,777	84,380	95,120	106,236
	f. Ratio of Value Added to Operating Revenue(%)	{(G)/(I)}x100=(R)	50.84	44.32	55.53	50.45
	g. Ratio of Operating Revenue to Total Capital Turnover(Time)	(I)/(M)=(S)	0.13	0.24	0.23	0.16
B. Analysis of Activeation for Equipmnet	h. Investment Efficiency to Tangible Fixed Assets(Time)	(G)/(N)=(T)	0.07	0.12	0.14	0.09
	i. Amounts of Labor Equipment per Staff(thou.dong)	{(N)/(H)}x1,000=(U)	112,301	77,992	84,583	100,229
C. Analysis of Distribution for Value Added	j. Personnel Cost per Staff(thous.dong)	{(A)/(H)}x1,000	7,193	7,569	9,122	7,634
	k. Labor Distribution Ratio of Value Added(%)	(A)/(G)x100	93.79	83.51	74.97	86.74
	l. Current Profit per Staff(thous. dong)	{(F)/(H)}x1,000	-3,507	-3,564	-7,683	-4,312
	m. Profits Distribution Ratio of Value Added(%)	(F)/(G)x100	-45.73	-39.32	-63.14	-49.00

Source: "Income and Expenditure" and "Balance Sheet" for each Union (1994), The Department of Finance and Accounting of VNR Head Quarter.

Note:*1) Contents of value added is based on the form of the Bank of Japan.

*2) The number of staffs in 1994 was estimated by the JICA Study Team.

Table 5.2.13 Productivity Analysis(Other Divisions:1994)

(Unit:Mil. Dong)

Items		Formula	Construction Division	Industrial Division	Material Division	Service Division	Total *3)
1.Value Added *1)							
(1) Personnel Cost		(A)	3,670	10,968	3,670	2,871	17,509
(2) Tax		(B)	-	923	844	239	1,162
(3) Financial Cost		(C)	-	-	-	772	772
(4) Rental Fee		(D)	-	-	-	-	-
(5) Depreciation Cost		(E)	1,087	1,768	1,087	1,314	4,169
(6) Current Profit		(F)	422	124	422	1,542	2,088
Total		(G)	5,179	13,783	6,023	6,738	25,700
2.Number of Staffs *2)		(H)	3,927	3,104	n.a.	2,684	9,714
3. Operating Revenue		(I)	125,510	50,115	71,205	169,751	345,376
4.Total Capital		(M)	118,264	50,367	215,912	54,165	222,796
5.Tangible Fixed Assets		(N)	14,764	24,404	8,920	11,034	50,202
A. Analysis of Productivity Improvement	a. Investment Efficiency of Total Capital(%)	{(G)/(M)}x100	4.38	27.37	2.79	12.44	11.54
		or (R)x(S)	4.38	27.37	2.79	12.44	11.54
		or {(O)/(Q)}x100	4.38	27.37	-	12.44	11.54
	b. Value Added per Staff(Value Productivity)(thous.dong)	{(G)/(H)}x1,000=(O)	1,319	4,440	-	2,511	2,646
		or {(P)x(R)}/100=(O)	1,319	4,440	-	2,511	2,646
		or (T)x(U)=(O)	1,319	4,440	-	2,511	2,646
	c. Operating Revenue per Staff(Value Productivity)(thos..dong)	{(I)/(H)}x1,000=(P)	31,965	16,145	-	63,257	35,554
	d. Degree of Capital Intensification(thous.dong)	{(M)/(H)}x1,000=(Q)	30,119	16,226	-	20,184	22,936
	e. Ratio of Value Added to Operating Revenue(%)	{(G)/(I)}x100=(R)	4.13	27.50	8.46	3.97	7.44
	f. Ratio of Operating Revenue to Total Capital Turnover(Time)	(I)/(M)=(S)	1.06	0.99	0.33	3.13	1.55
B. Analysis of Activation for Equipmnet	g. Investment Efficiency to Tangible Fixed Assets(Time)	(G)/(N)=(T)	0.4	0.6	0.7	0.6	0.5
	h. Amounts of Labor Equipment per Staff(thou.dong)	{(N)/(H)}x1,000=(U)	3,760	7,862	-	4,112	5,168
C. Analysis of Distribution for Value Added	i. Personnel Cost per Staff(thous.dong)	{(A)/(H)}x1,000	935	3,534	-	1,070	1,802
	j. Labor Distribution Ratio of Value Added(%)	(A)/(G)x100	70.86	79.58	60.93	42.61	68.13
	k. Current Profit per Staff(thous. dong)	{(F)/(H)}x1,000	107	40	-	575	215
	l. Profits Distribution Ratio of Value Added(%)	(F)/(G)x100	8.15	0.90	7.01	22.89	8.12

Source: "Income and Expenditure" and "Balance Sheet" for other Divisions (1994), The Department of Finance and Accounting of VNR Head Quarter.

Note:*1) Contents of value added is according to the form of the Bank of Japan.

*2) are estimated by the JICA Study Team.

to current profit as .90 million dong is the lowest one. Main reasons for it are seemed to be its highest value added as 13,783 million dong and its lowest current profit as 124 million dong.

5.2.6 Safety Analysis

(1) Transport Division

1) Whole Division

a. Analysis of Raising Funds

Judgment of suitability for raising funds is carried out with regard to "Ratio of Equity Capital to Total Capital", "Ratio of Depending to Loans Payable" and Ratio of Total Liabilities to Net Worth".

With regard to ratio of equity to total capital, it is considered that a standard value had better to be generally more than 35%. This ratio for the whole Transport Division has slightly decreased from 90.94% in 1992 to 89.62% in 1994. These values are very high than 35% and also much higher than 28.73% of average value of Transportation and Communication Industry of Japan in 1993.

On the other hand, a standard value for ratio of depending to loans liability is considered to be less than 30%. This of Transport Div. has increased from 0.98% to 1.54% because of more increase rate of loans payable than total capital. But these values are very low comparing with 35% as a standard value and also with 44.54% of the average value of Transport and Communication Industry of Japan.

A standard value of ratio of total liabilities of net worth is assumed to be less than 200%. This ratio of Transport Div. has slightly increased from 9.96% to 11.59%. Again these values are also much lower than 200% and 71.3% as average value of Transport and Communication Industry of Japan.

It can be concluded that situation of raising funds of the Transport Div. of the VNR is very high degree of soundness and suitability.(refer to Table 5.2.14)

b. Analysis of Activation of Funds

Whether the funds is effectively activated or not is evaluated by "Ratio of Fixed Assets to Net Worth" and "Ratio of Sales to Fixed Assets Turnover".

Table 5.2.14 Safety Analysis(Transport Division)

(Unit: Mil. Dong)

Items		Formula	1992	1993	1994	Annual Average Growth Rate(%) 1992/94
1.Equity Capital		(A)	1,839,205	1,895,637	3,371,237	35.39
2.Total Capital		(B)	2,022,377	2,124,664	3,761,822	36.39
3.Loans Payable		(C)	19,886	40,732	58,049	70.85
4.Total Liabilities		(D)	183,172	229,027	390,585	46.03
5.Fixed Assets		(E)	1,871,756	1,930,217	3,504,163	36.83
7.Operating Revenue		(F)	429,989	533,804	663,796	24.25
8.Current Assets		(G)	150,041	194,447	257,659	31.04
9.Current Liabilities		(H)	182,912	228,423	388,845	45.80
10.Quick Assets		(I)	100,794	130,989	188,346	36.70
11.Net Working Capital		(G)-(H)=(J)	-32,871	-33,976	-131,186	99.77
A.Analysis of Raising Funds	a.Ratio of Equity Capital to Total Capital(%)	{(A)/(B)}X100	90.94	89.22	89.62	-0.73
	b.Ratio of Depending to Loans Payable(%)	{(C)/(B)}X100	0.98	1.92	1.54	25.27
	c.Ratio of Total Liabilities to Net Worth(%)	{(D)/(A)}X100	9.96	12.08	11.59	7.86
B.Analysis of Activation of Capital	d.Ratio of Fixed Assets to Net Worth(%)	{(E)/(A)}X100	101.77	101.82	103.94	1.06
	f.Ratio of Sales to Fixed Assets Turnover(Time)	(F)/(E)	0.23	0.28	0.19	-9.19
C.Analysis of Payability	g.Current Ratio(%)	{(G)/(H)}X100	82.03	85.13	66.26	-10.12
	h.Quick Ratio(%)	{(I)/(H)}X100	55.11	57.34	48.44	-6.25
	i.Ratio of Managing Funds(%)	{(J)/(F)}X100	-7.64	-6.36	-19.76	60.79

Source: "Income and Expenditure" and "Balance Sheet" for Transport Division (1992-1994), The Department of Finance and Accounting of VNR Head Quater.

A standard value of ratio of fixed assets to net worth is considered to be less than 100%. Actual figures of this ratio of the whole Transport Div. have slightly increased from 101.77% to 103.94% which are more than 100% but much less than 271.74% of the average value of Transport and Communication Industry of Japan.

On the other hand, there is no fixed standard figure for ratio of sales of fixed assets turnover. Actual figures of this ratio have decreased from 0.23 times to 0.19 times which is less than 0.68 times of the average value of Transport and Communication of Japan. All of them are less than 1.00 times and then efficiency of funds utilization is low level.

Judging from these figures, the funds of Transport Div. has not been effectively activated its funds in these three years.

c. Analysis of Payability

The capacity of paying debts by short term funds of the VNR is judged by three ratios. One of them is "Current Ratio " of which formula is "{(Cured Assets)/(Current Liabilities)} x 100.

A standard value of current ratio is assumed to be more than 130% and the average value of Transport and Communication of Japan is 93.49%. Actually this ratio of Transport Div. has decreased from 82.03% to 66.26% because of more increase rate of current liabilities than that of current assets. These values are less than a standard value and the average value of Transport and Communication Industry.

The second indicator is "Quick Ratio" which is derived from a formula, "{(Quick Assets)/(Current Liabilities)} x 100". The standard value is assumed to be more than 80% and the average value of Transport and Communication Industry is 63.72%. This ratio of Transport Div. has sightless decreased from 55.11% to 48.44% because of more increase ratio of current liabilities than quick assets. These values are also less than two values mentioned above.

The third indicator is "Ratio of Managing Funds" of which formula is {(Net Working Capital)/(Operating Revenue)} x 100. Net working capital is derived from a formula, (Current Assets)-(Current Liabilities). A standard value of this ratio is more than 10% and the average value of Transport and Communication of Japan is -2.92%.

This ratio of Transport Div. of the VNR has negatively increased from -7.64% to -19.76%. Drastic decrease of negative value is caused by the rapid increase of negative value of net working capital and relatively slow increase of operating revenue. Rapid increase of negative net working capital has come from more rapid increase of current liabilities than that of current assets.

It can be summarized from these ratios that the capacity of paying debts by short term funds of Transport Div. of the VNR has been weakened year by year mainly because current liabilities has more rapidly increased than current assets, quick assets and operating revenue.

2) Unions

a. Analysis of Raising Funds

The ratio of equity to total capital for three unions ranges from 83.08% of U 3 to 93.78% of U 1 in 1994. The lowest ratio of depending to loans payable of three unions is shown by U 2 as 0.54 followed by U 3 as 1.12 and the lowest ratio of total liabilities of net worth is 6.63% of U 1 followed by 12.03% of U 2.

It can be concluded that situation of raising funds of all unions is very high degree of soundness and suitability but U 1 has relatively the highest degree of soundness and suitability of its raising funds.(refer to Table 5.2.15)

b. Analysis of Activation of Funds

The least ratio of fixed assets to net worth is 102.56% of U 1 followed by 65.46 of U 3. The highest ratio of sales to fixed assets turnover is 0.31 tine of U 2 followed by U 3. Judging from these figures, the funds of all unions are not enough activated as a whole but relatively U 1 and U 2 activate their funds effectively.

c. Analysis of Payability

Three kinds of ratios to judge the capacity of paying debts by short term funds of unions is low level comparing with standards level and the average level of Transport and Communication of Japan. The biggest values are shown by U 2 for current ratio and quick ratio and the smallest negative value for ratio of managing funds is shown also by U 2.

Then it can be judged from these ratios that the capacity of paying debts by short term funds of U 2 is relatively highest of all unions.

Finally the relatively high degree of safety is kept by U 1 or U2 but relatively low degree of safety is shown by U 3.

Table 5.2.15 Safety Analysis(Unions:1994)

(Unit: Mil. Dong)

Items		Formula	Union 1	Union 2	Union 3	Total
1.Equity Capital		(A)	2,330,837	519,697	522,852	3,373,386
2.Total Capital		(B)	2,485,412	582,207	629,358	3,696,977
3.Loans Payable		(C)	46,978	3,132	7,040	57,150
4.Total Liabilities		(D)	154,576	62,510	106,506	323,592
5.Fixed Assets		(E)	2,390,416	538,133	559,643	3,488,192
7.Operating Revenue		(F)	337,014	167,360	155,183	659,557
8.Current Assets		(G)	95,266	44,073	69,715	209,054
9.Current Liabilities		(H)	154,576	62,510	106,506	323,592
10.Quick Assets		(I)	59,099	30,876	45,606	135,581
11.Net Working Capital		(G)-(H)=(J)	-59,310	-18,437	-36,791	-114,538
A.Analysis of Raising Funds	a.Ratio of Equity Capital to Total Capital(%)	{(A)/(B)}X100	93.78	89.26	83.08	91.25
	b.Ratio of Depending to Loans Payable(%)	{(C)/(B)}X100	1.89	0.54	1.12	1.55
	c.Ratio of Total Liabilities to Net Worth(%)	{(D)/(A)}X100	6.63	12.03	20.37	9.59
B.Analysis of Activation of Capital	d.Ratio of Fixed Assets to Net Worth(%)	{(E)/(A)}X100	102.56	103.55	107.04	103.40
	f.Ratio of Sales to Fixed Assets Turnover(Time	(F)/(E)	0.14	0.31	0.28	0.19
C.Analysis of Payability	g.Current Ratio(%)	{(G)/(H)}X100	61.63	70.51	65.46	64.60
	h.Quick Ratio(%)	{(I)/(H)}X100	38.23	49.39	42.82	41.90
	i.Ratio of Managing Funds(%)	{(J)/(F)}X100	-17.60	-11.02	-23.71	-17.37

Source: "Income and Expenditure" and "Balance Sheet" for each Union (1994), The Department of Finance and Accounting of VNR Head Quarter.

(2) Other Divisions

1) Analysis of Raising Funds

The ratio of equity to total capital for four divisions ranges from 25.34% of Construction Div. to 77.15% of Material Div. in 1994. The lowest ratio of depending to loans payable is shown by Material Div. as 2.49% followed by Service Div. as 7.80% and the lowest ratio of total liabilities of net worth is 29.62% of Material Div. followed by 67.51% of Industrial Div.

It can be concluded that the situation of raising funds of other divisions of the VNR is relatively high degree of soundness and suitability for Material Div. followed by Service Div. or Industrial Div. Construction Div. is in the worst situation. (refer to Table 5.2.16)

2) Analysis of Activation of Funds

The least ratio of fixed assets to net worth is 5.35% of Construction Div. It is noticeable that all figures of this ratio are less than 100% as a standard value while this ratio of Transport Div. is more than 100%. The highest ratio of sales to fixed assets turnover is 15.38 times of Service Div. followed by Material Div. as 7.98 times. The highest value of Material Div. as 15.38 times is based on extremely high figure of operating revenue.

Judging from these figures, Material Div. activates the most highly its funds followed by Construction Div. and Service Div.

3) Analysis of Payability

The current ratios of Industrial Div. and Material Div. are 132.87% and 419.845 which are more than 130% as a standard value. The quick ratios more 80% as a standard value are belonging to Construction Div. as 85.29% and to Material Div. 189.37% and the ratios of managing funds more than 10% as a standard value are all divisions except Service Div. Especially this figure for Material Div. is extremely high as 221.46% which is caused by high values of net working capital and current assets.

Then it can be judged from these ratios that the capacity of paying debts by short term funds of U 2 is relatively highest of all unions.

Table 5.2.16 Safety Analysis(Other Divisions:1994)

(Unit: Mil. Dong)

Items		Formula	Construction Division	Industrial Division	Material Division	Service Division	Total
1.Equity Capital		(A)	29,965	30,068	166,574	14,632	241,239
2.Total Capital		(B)	118,264	50,367	215,912	54,165	438,708
3.Loans Payable		(C)	19,416	8,282	5,373	4,225	37,296
4.Total Liabilities		(D)	88,300	20,300	49,338	39,532	197,470
5.Fixed Assets		(E)	14,764	24,404	8,920	11,034	59,122
7.Operating Revenue		(F)	103,577	50,115	71,205	169,751	394,648
8.Current Assets		(G)	103,501	25,963	206,993	43,131	379,588
9.Current Liabilities		(H)	85,010	19,540	49,303	38,307	192,160
10.Quick Assets		(I)	72,508	14,182	93,363	19,426	199,479
11.Net Working Capital		(G)-(H)=(J)	18,491	6,423	157,690	4,824	187,428
A.Analysis of Raising Funds	a.Ratio of Equity Capital to Total Capital(%)	{(A)/(B)}X100	25.34	59.70	77.15	27.01	54.99
	b.Ratio of Depending to Loans Payable(%)	{(C)/(B)}X100	16.42	16.44	2.49	7.80	8.50
	c.Ratio of Total Liabilities to Net Worth(%)	{(D)/(A)}X100	294.68	67.51	29.62	270.17	81.86
B.Analysis of Activation of Capital	d.Ratio of Fixed Assets to Net Worth(%)	{(E)/(A)}X100	49.27	81.16	5.35	75.41	24.51
	f.Ratio of Sales to Fixed Assets Turnover(Time	(F)/(E)	7.02	2.05	7.98	15.38	6.68
C.Analysis of Payability	g.Current Ratio(%)	{(G)/(H)}X100	121.75	132.87	419.84	112.59	197.54
	h.Quick Ratio(%)	{(I)/(H)}X100	85.29	72.58	189.37	50.71	103.81
	i.Ratio of Managing Funds(%)	{(J)/(F)}X100	17.85	12.82	221.46	2.84	47.49

Source: "Income and Expenditure" and "Balance Sheet" for other Divisions (1994), The Department of Finance and Accounting of VNR Head Quarter.

5.2.7 Forecast of Income Statement

(1) Purpose of Forecast

Purpose of forecast of income statement is to grasp the impact of this Project to financial profitability of main activities of Transport Division of the VNR. For this purpose, the projections for income statements with regard to "With-The-Project" and "Without-The-Project" is carried out. The financial impact can be known by the difference between projected income statements of "With-The-Project" and "Without-The-Project"

(2) Basic Conditions

a) Basic Year for Analysis

The basic year for analysis is set up on the year of 1994.

2) Period for Forecast

Period for forecast is set at 25 years from 1995 to 2020.

3) Main Activities

a. Income

(a) Passenger

a) Average Fare and Interval of Revision

It is assumed that the average revenue per passenger kilometer in 1994 is 152.0 dong/pass.km and passenger fare will raise up 5% with four years interval. This average value is applied to calculation of income of passenger as a unit value. For "with-the-project, 25% of average fare is assumed to be raised at the year of 2000. Because passenger cars will be rehabilitated and the new car will be introduced in this project and then the accommodation will be improved and the comfort is expected to be promoted. After the completion year of this project, it is recommended that passenger fare system will be revised. Especially special charges for sleeping car and soft sheet separating from basic fare is recommended to be raised up. The details are explained in chapter relevant to a financial analysis.

b) Traffic Volume

Traffic volume in future is based on the traffic demand forecast for "without-the-project" and "with-the-project" for the year of 2000, 2005 and 2010 respectively.(refer to Chapter 4 Transport Modeling and Demand Forecast).

b. Percales

a) Average Fare

It is assumed that the average revenue per ton kilometer in 1994 is 554.5 dong/ton.km and ton kilometer will increase in proportion to passenger kilometer by observing statistical performance in the past ten years. This unit value is applied to calculation of revenue from parcels.

b) Traffic Volume

The ratio of ton km. of parcels to passenger km. is calculated as 0.027 on the basis of data in 1994. This ratio is applied to estimate ton km. of parcels. It means that traffic volume of parcels is estimated by multiplying 0.027 by the future traffic demand of passenger km.

(c) Freight

a) Average Fare

It is assumed that the average revenue per ton kilometer in 1994 is 219.9 dong/ton.km. This unit value is applied to calculation of income of freight. The fare for freight is assumed to raise up 3% with four years interval.

b) Traffic Volume

Traffic volume in future is based on the traffic demand

forecast for "without-the-project" and "with-the-project" for the year of 2000, 2005 and 20210 respectively.(refer to Chapter 4 Transport Modeling and Demand Forecast).

(d) Other Revenue

It is assumed that the ratio of other revenue to total revenue will keep constant as .98% on the basis of total revenue and other revenue in 1994. Then, the other revenue is divided into

passenger revenue and freight revenue in proportion to revenue from passenger transport and revenue from freight transport mentioned above.

b. Expenditure

(a) Passenger

a) Operating Cost

i Personnel Cost

(i) Average Personnel Cost

Personnel cost is composed of salaries and social securities. It is assumed that the average personnel cost per staff of Transport Division in 1994 is 7.830 million dong/person. This unit value is applied to calculation of total personnel cost for passenger and freight. There is no available information with regard to the number of staff specified to passenger transport. Then, the personnel cost for passenger transport is calculated by applying the ratio of income from passenger to total income including income from passenger and freight.

(ii) The Number of Staff

According to the estimates by the study team, there are approximately 34,800 of the VNR staff in 1994. Then, it is assumed that 10% of the staff of the VNR is reduced in 1995 according to the Government regulation, 5% is reduced annually from 1996 to 2000. It has been recognized that there are many surplus or idle staff in the VNR. These kinds of staff are needed to be transferred to other divisions in the VNR or completely changed to other kinds of works outside the VNR. Reduction of these staff should be carried out by managerial efforts by the VNR itself with no relation to the project.

With the project, the rationalization of staff is expected. Accurate degree of rationalization is not obvious but approximately 1,850 staff of the VNR could be rationalized by this project. The contents of rationalization are that 200 is for train operating, 350 for station, for signaling, 500, track maintenance, 800. On the contrary, the sewerage treatment staff will increase as 10. Then in the year of 2000, this rationalization is assumed to be executed.

(iii) Rate of Basing Up of Wages

The rate of basing up of wage is set at 6% with three years interval.

ii. Rental Fee for Infrastructure

The VNR must pay the rental fee for infrastructure as 10% of the revenue to the Government because the infrastructure is owned by the Government from January, 1995.

iii. Incentive Rental Fee for Rolling Stock

The rolling stocks have been owned by the Government and the VNR has paid incentive rental fee for rolling stock as 3.6% of their depreciation cost which is not much in amounts. But after the separation of infrastructure from the VNR, the rolling stocks are expected to be owned by the VNR itself and the VNR will no need to pay the rental fee. Then, in this study, the incentive rental fee for the rolling stocks of passenger is not taken account of as an item of expenditure.

vi. Rate of Raising up of Price for Supplies

It is assumed that the prices of supplies such as materials, fuels and electricity will be raised up in accordance with the price level of each year.

The fact is that the price level of the VNR has been drastically fluctuated before 1992 but seemed to be stabilized from 1993 because the price level is lower than 10% high than 1993. But in 1994, the price level was again raised up more than 10% in spite of the Government Plan to control inflation within single digit. Taking into consideration of these recent price situation, it is very difficult to predict the future price level of Vietnam. But in this study, it is assumed that the price level will raise up at the rate of 7% per annum from 1995 to 2000, 6% from 2001 to 2005 and 5% from 2011 to 2020 under the prediction that price level will stabilize in long-term.

v. Materials

(i) Average Cost per Train Kilometer

It is assumed that cost of materials will increase in proportion to passenger train kilometer with raising up of price level mentioned above. The average cost of materials per passenger train kilometer in 1994 is estimated as 11,745.0 dong/train km. This unit value cots is applied to calculation for cost of materials.

(ii) Forecast of Passenger Train Kilometer

The future passenger train kilometer is forecast for "without-the-project" and "with-the-project" on the basis of traffic demand forecast respectively by setting passenger train operation schedule. With regard to passenger train operating schedule for "without-the-project", it is

approximately estimated on the basis of passenger train operating schedule of "with-the-project".

vi. Fuels

(i) Average Cost per Ton Kilometer

It is assumed that cost of fuels will increase in proportion to ton kilometer with raising up of price mentioned above. Ton includes the weight of passenger and rolling stock. The average cost of fuels per ton kilometer in 1994 is estimated as 13.4 dong/ton.km. This unit value is applied to calculation for cost of fuels for passenger transport service.

(ii) Forecast of Ton Kilometer

Ton kilometer is forecast on the basis of passenger train kilometer. It is assumed that the average number of passenger cars per train is 8 and the average weight of passenger car is 42 tons. Then passenger ton kilometers is calculated by multiplying 42 by 8 and by the number of passenger train kilometers.

vii. Electricity

It is assumed that cost of electricity will also increase in proportion to passenger train kilometer with raising up of price mentioned above. The average cost of electricity per passenger train kilometer in 1994 is estimated as 469.3 dong/train km. This unit value is applied to calculation for cost of electricity.

viii. Depreciation Cost

(i) Average Depreciation Cost per Car Kilometer

Infrastructure has been separated from the VNR on January 1 in 1995, and transferred to property of the Government. Infrastructure include track, bridge, signal and telecommunication, and station. Then assets belonging to these items are excluded from the analysis and the depreciation for assets of rolling stock is mainly taken into consideration of the analysis.

Depreciation cost is composed of basic depreciation and large scale repairs. Total of both depreciation cost for rolling stock is divided into passenger and freight by car kilometers. According to MOTE Report in April, 1994, the ratio of depreciation cost for rolling stock to total depreciation cost and the ratio of passenger car kilometers to total car kilometers is estimated to

be 39.6% and 48.5% respectively on the basis of data in 1991. There is no available actual data for these ratios in 1994, then these ratios are applied to this study. The ratio of depreciation cost for passenger car is estimated to be 19.2%(=39.6% x .485). By applying this ratio, the depreciation cost for rolling stock of passenger is estimated to be 24,118 million dong in 1994. It is assumed that the depreciation cost will increase in proportion to passenger car kilometers. Then unit value of depreciation cost is calculated as 407.2 dong/car km in 1994.

(ii) Forecast of Passenger Car Kilometers

Passenger car kilometer is forecast on the basis of passenger train kilometer. It is assumed that the average number of passenger cars per train is 8. Then passenger car kilometers is calculated by multiplying 8 by the number of passenger train kilometers.

b. Non-Operating Cost

i. Others

There is no available data of others cost, then it is assumed that the ratio of total others cost to the total operating cost of passenger and freight is constant. This ratio is estimated as 14 % on the basis of actual figure of 1994. Then, first of all, the total others cost is estimated by applying the ratio mentioned above and is divided into others cost for passenger by applying the ratio of total operating cost of passenger to total operating cost including passenger and freight.

ii. Tax

(i) Revenue Tax

According to Financial and Accounting Department of the VNR Head Quarter, the revenue tax of 4% will be imposed to total revenue of passenger. Then this rate is applied to this study.

(ii) Capital Tax

Capital tax is usually calculated on the basis of tax rate and the amounts of assets for passenger cars. But there is no accurate information of them. Then as the second best, it is assumed that the capital tax of passenger transport service increase in proportion to passenger train kilometers. The average capital cost per train kilometer is estimated as 1,418.9 dong/train km. on the basis of data in 1994. This unit value is applied to calculate the capital tax for passenger transport service.

(b) Freight

a. Operating Cost

i. Personnel Cost

The average personnel cost per staff of Transport Division in 1994 estimated as 7.830 million dong/person mentioned above is applied to calculation of total personnel cost for freight. Then, the personnel cost for freight transport is calculated by applying the ratio of income from freight to total income including income from passenger and freight.

ii. Rental Fee for Infrastructure

the VNR must pay the rental fee for infrastructure as 10% of the revenue to the Government because the infrastructure is owned by the Government.

iii. Rate of Raising up of Price for Supplies

It is assumed that the same price level is applied to the supplies for freight transport.

iv. Materials

(i) Average Cost per Train Kilometer

It is assumed that cost of materials will increase in proportion to freight train kilometer with raising up of price mentioned above. The average cost of materials per freight train kilometer in 1994 is estimated as 11,745.0 dong/train km. This unit value cots is applied to calculation for cost of materials.

(ii) Forecast of Freight Train Kilometer

The future freight train kilometer is forecast for "without-the-project" and "with-the-project" on the basis of traffic demand forecast respectively by setting freight train operation schedule. With regard to freight train operating schedule for "without-the-project", it is approximately estimated on the basis of freight train operating schedule of "with-the-project".

v. Fuels

(i) Average Cost per Ton Kilometer

It is assumed that cost of fuels will also increase in proportion to ton kilometer including the weight of freight and rolling stock with raising up of price mentioned above. The average cost of fuels per ton kilometer in 1994 is estimated as 13.4 dong/ton.km. This unit value is applied to calculation for cost of fuels freight transport service.

(ii) Forecast of Ton Kilometer

Ton kilometer is forecast on the basis of freight train kilometer. It is assumed that the average number of freight cars per train is 13 and the average weight of freight car is 44 tons. Then freight ton kilometers is calculated by multiplying 44 by 13 and by the number of freight train kilometers.

vi. Electricity

It is assumed that cost of electricity will also increase in proportion to freight train kilometer with raising up of price mentioned above. The average cost of electricity per freight train kilometer in 1994 is estimated as 469.3 dong/train km. This unit value is applied to calculation for cost of electricity.

vii. Depreciation Cost

(i) Average Depreciation Cost of Car Kilometer

According to MOTC Report in April, 1994, the ratio of depreciation cost for rolling stock to total depreciation cost and the ratio of freight car kilometers to total car kilometers is estimated to be 60.4% and 51.5% respectively on the basis of data in 1991. There is no available actual data for these ratios in 1994, then these ratios are applied to this study. The ratio of depreciation cost for freight car is estimated to be 31.1% (=60.4% x .515). By applying this ratio, the depreciation cost for rolling stock for freight is estimated to be 206.56 million dong in 1994. It is assumed that the depreciation cost will increase in proportion to freight car kilometers. Then unit value of depreciation cost is calculated as 407.2 dong/car km in 1994.

(ii) Forecast of Freight Car Kilometers

Freight car kilometer is forecast on the basis of freight train kilometer. It is assumed that the average number of freight cars per train is 13. Then freight car kilometers is calculated by multiplying 13 by the number of train kilometers.

b. Non-Operating Cost

i. Others

On the same way as others cost for passenger, the total others cost of freight is estimated by applying the ratio mentioned above and is divided into others cost for freight by the ratio of total operating cost of freight to total operating cost including passenger and freight.

ii. Tax

(i) Revenue Tax

According to Financial and Accounting Department of the VNR Head Quarter, the revenue tax of 2% will be imposed to total revenue of freight transport service. Then this rate is applied to this study.

(ii) Capital Tax

The same way of thinking as passenger transport is applied to freight transport. The average capital cost per train kilometer is estimated as 1,418.9 dong/train km. on the basis of data in 1994. This unit value is applied to calculate the capital tax for freight transport service.

(3) The Result of Forecast for "Without-The-Project

1) Income

The revenue of passenger shows the increase from 276 billion dong in 1994 to 529 billion dong (1.91 times) in 2000, to 651 billion dong (2.36) in 2010 and to 800 billion dong (2.90) in 2020. On the other hand, the revenue of freight shows increase from 331 billion dong in 1994 to 417 billion dong (1.26), to 716 billion dong (2.16) and 921 billion dong (2.78) during the same period. There seems to be no big difference with regard to increase ratio of revenue between passenger and freight in spite of the more growth rate of average fare for passenger. One of the main reason for it seems to be that growth rate of traffic demand of freight is more than that of

passenger and the revenue by freight includes the revenue from parcels. The growth factors of passenger kilometer and ton kilometer from 1994 to 2020 are 2.27 and 2.39 respectively.

On the other hand, total income will increase from 607 billion dong in 1994 to 946 million dong (1.56 times) in 2000, to 1,366 billion dong (2.25) in 2010 and to 1,721 (2.84) in 2020.

2) Expenditure

The expenditure of passenger shows the increase from 349 billion dong in 1994 to 653 billion dong (1.87 times) in 2000, to 1,052 billion dong (3.01) in 2010 and to 1,716 billion dong (4.92) in 2020. On the other hand, the expenditure of freight shows increase from 333 billion dong in 1994 to 445 billion dong (1.34), to 702 billion dong (2.11) and 1,029 billion dong (3.10) during the same period. Especially the increase rate of passenger in 2020 is bigger than that of freight. One of the main reason for it seems to be the higher increase rate of fuels, materials and electricity caused by the rapid increase of train kilometer, car kilometer and ton kilometer respectively during the period from 2010 to 2020.

Looking at performance of total expenditure, we can know that it will increase from 682 billion dong in 1994 to 1,099 million dong (1.61 times) in 2000, to 1,754 billion dong (2.57) in 2010 and to 2,745 billion dong (4.02) in 2020.

3). Net Profit

Net profits of passenger before and after depreciation are negative every year during the study period and then accumulated net profit is also negative. The accumulated deficits after depreciation will increase from 784 billion dong in 2000 to 10,120 billion dong in 2020. On the contrary, the net profit before depreciation will continue to be positive from in 1994 as 25 billion dong until 2017 as 799 billion dong. But the net profit after depreciation is showing negative values. Then the accumulated profit after depreciation show also negative from 157 billion dong in 2000 to 684 billion dong in 2020 but is extremely lower negative values than that of passenger. And the total accumulated net profit after depreciation will be 10,804 billion dong in 2020. (refer to Appendix 5.2.22 - 5.2.27)

4) Working Ratio

Profitability of transport service is summarized in the figure of working ratio. Working ratio is derived from a formula, (expenditure/income) x 100. For example, working ratio, 120, means that 120 dong costs to get revenue of 100 dong. Then it goes without saying that working ratio less than 100 shows profitable business.

Taking a glance at the figures of working ratio of "without-the-project", it changes from 126.5 excluding parcels in 1994 to 123.5 in 2000, 141.7 in 2005, 161.7 in 2010, 185.4 in 2015 and 214.5 in 2020. Profitability is worsened year by year. On the other hand, working ratios for freight including parcels decrease from 100.5, to 106.7, 95.4, 98.1 and 104.6 and 111.7 during the same period. The profitability of freight is slightly worsened.

The working ratios for total shows also worsening profitability by increase from 112.3 in 1994 to 116.1 in 2000, 128.4 in 2010 and 159.5 in 2020 respectively. (refer to Table 5.2.17)

(4) The Result of Forecast for "With-The-Project

1) Income

The revenue of passenger shows the increase from 276 billion dong in 1994 to 791 billion dong (2.87 times) in 2000, to 1,521 billion dong (5.51) in 2010 and to 2,860 billion dong (10.36) in 2020. On the other hand, the revenue of freight shows increase from 333 billion dong in 1994 to 622 billion dong (1.86), to 1,087 billion dong (3.26) and 1,743 billion dong (5.23) during the same period. It is noticeable that revenue from passenger is expected to increase more rapidly than freight. The main reason for it seems to be that the some part of traffic demand of freight is projected to divert to coastal shipping, and the fare system of passenger is assumed to be revised and it's level will be raised up from 2000.

On the other hand, total income will increase from 607 billion dong in 1994 to 1,413 million dong (2.34 times) in 2000, to 2,609 billion dong (4.30) in 2010 and to 4,603 (7.58) in 2020.

2) Expenditure

The expenditure of passenger shows the increase from 349 billion dong in 1994 to 868 billion dong (2.49 times) in 2000, to 1,668 billion dong (4.78) in 2010 and to 3,144 billion dong (9.01) in 2020. On the other hand, the expenditure of freight shows increase from 333 billion dong in 1994 to 631 billion dong (1.89 times), to 1,188 billion dong (3.57) and 2,038 billion dong (6.12) during the same period. Especially the increase rate of passenger in 2020 is bigger than that of freight. The same performance as revenue for freight can be observed for expenditure. One of the main reason for it seems to be the higher increase rate of fuels, materials and electricity caused by the rapid increase of train kilometer, at the same time, car kilometer and ton kilometer respectively .

With regard to total expenditure, it is recognized that total expenditure will increase from 682 billion dong in 1994 to 1,499 million dong (2.20 times) in 2000, to 2,856 billion dong (4.19) in 2010 and to 5,182 billion dong (7.60) in 2020.

3) Net Profit

Net profits of passenger before depreciation for "with-the-project" can be observed also as negative ones until the year of 1999 and will change into positive from 2000 as 26 billion dong but will change again into deficits from 2003 to 2020. The accumulated deficits after depreciation will increase from 846 billion dong in 2000 to 4,442 billion dong in 2020. But the amounts of deficits for both of the annual and the accumulated are less than those of "without-the-project".

Net profit of freight before depreciation shows positive from 1994 to 2010, and accumulated net profit before depreciation also shows positive from 1994 to 2019. but the annual and accumulated net profit after depreciation can be observed as negative. The accumulated deficits before and after depreciation are predicted as 151 billion dong and 2,645 billion dong respectively.

The total accumulated deficits after depreciation will increase from 1,101 billion dong to 7,087 billion dong in 2020. (refer to Appendix 5.2.28 - 5.2.33)

4) Working Ratio

The working ratios of "with-the-project" for passenger changes from 126.5 in 1994 to 109.7 in 2000, 110.7 in 2005, 109.6 in 2010, 108.1 in 2015 and 109.9 in 2020. Profitability is considerably improved year by year comparing with "without-the-project". But the working ratio is not yet less than 100 as a break even point. On the other hand, working ratio for freight change from 100.5 to 116.9 during the same period. It is noticeable that profitability is not improved but rather a little bit worsened. It can be observed that the profitability of passenger is more largely improved than freight. Main reason for it is considered that some part of traffic demand of railway will be diverted to other mode, particularly coastal shipping while the traffic demand of passenger is expected to increase more rapidly than that of freight.

The working ratios for total are performing almost the same level as that of 1994 with slight decrease from 112.3 in 1994 to 106.1 in 2000, 109.5 in 2010, 112.6 in 2020. But comparing with "without-the-project", extreme improvement of profitability can be observed.

The figures for working ratios are summarized as follows

Table 5.2.17 Improvement of Working Ratios

[Excluding Depreciation Cost for Infrastructure] (Unit: %)

Items		1994	2000	2005	2010	2015	2020
Passenger	Without	126.5	123.5	141.7	161.7	185.4	214.5
	With	-	109.7	110.7	109.6	108.1	109.9
Freight	Without	100.5	106.7	95.4	98.1	104.6	111.7
	With	-	101.4	101.8	109.3	111.3	116.9
Total	Without	112.3	116.1	117.9	128.4	142.6	159.5
	With	-	106.1	106.8	109.5	109.4	112.6

As already mentioned, the infrastructure of the VNR will be transferred to the Government and the cost for investment, maintenance, repairs and depreciation for infrastructure will be burdened by the Government. Then, in this study, sensitivity analysis is carried out by changing the ratio of cost of infrastructure on total operating cost.

The results of analysis are summarized as follows;

It is clearly recognized that the smaller the ratio of cost of infrastructure is, the larger the improvement of profitability is. Especially, the considerable improvement is expected for passenger transport.

Table 5.2.18 Sensitivity Analysis of Improvement of Working Ratios-(1)

[Case 1: Only the Cost of Rolling Stock] (Unit: %)

Items		1994	2000	2005	2010	2015	2020
Passenger	Without	126.5	73.7	84.4	95.9	108.8	124.5
	With	-	69.7	69.2	68.1	66.7	67.3
Freight	Without	100.5	69.1	59.9	61.9	65.4	69.5
	With	-	69.7	67.9	72.1	73.0	76.3
Total	Without	112.3	71.7	71.9	78.1	85.8	95.1
	With	-	69.7	68.6	69.8	69.2	70.7

Table 5.2.19 Sensitivity Analysis of Improvement of Working Ratios-(2)

[Case 2: Cost of Rolling Stock & 20% Cost of Infrastructure] (Unit: %)

Items		1994	2000	2005	2010	2015	2020
Passenger	Without	126.5	95.7	109.2	123.9	140.4	160.7
	With	-	86.6	86.0	84.4	82.4	83.0
Freight	Without	100.5	88.9	75.9	77.8	82.0	86.8
	With	-	85.0	82.1	86.9	87.7	91.4
Total	Without	112.3	92.7	92.1	99.8	109.5	121.1
	With	-	85.9	84.3	85.5	84.5	86.2

Table 5.2.20 Sensitivity Analysis of Improvement of Working Ratios-(3)

[Case 3: Cost of Rolling Stock & 40% of Cost of Infrastructure] (Unit: %)

Items		1994	2000	2005	2010	2015	2020
Passenger	Without	126.5	117.7	134.0	151.9	172.1	196.8
	With	-	103.5	102.8	100.7	98.2	98.8
Freight	Without	100.5	108.7	91.8	93.8	98.6	104.2
	With	-	100.3	96.3	101.6	102.4	106.5
Total	Without	112.3	113.8	112.4	121.5	133.2	147.2
	With	-	102.1	100.0	101.1	99.9	101.7

Table 5.2.21 Sensitivity Analysis of Improvement of Working Ratios-(4)

[Case 4: Cost of Rolling Stock & 50% of Cost of Infrastructure] (Unit: %)

Items		1994	2000	2005	2010	2015	2020
Passenger	Without	126.5	128.7	146.4	165.9	187.9	214.9
	With	-	112.0	111.2	108.9	106.1	106.7
Freight	Without	100.5	118.6	99.7	101.8	106.9	112.8
	With	-	107.9	103.5	109.0	109.8	114.1
Total	Without	112.3	124.3	122.5	132.3	145.0	160.3
	With	-	110.2	107.8	108.9	107.6	109.5

5.3 Technology Development

(1) Introduction

Many improvements and development projects for railways will carried out in Viet Nam. These projects will bring money, technology and jobs to VNR.
Therefore, it is a good opportunity to develop technology, vitalize affiliate industries, and upgrade the capabilities of employees of VNR.

(2) Implementation of projects

The implementation of projects will be designed and supervised by consultants composed of local engineers and of experts from abroad. It is necessary for VNR to inform these consultants of acceptances and rejections concerning designs, criteria, standards and construction works.
Implementation of projects will include technology transfer and domestic and overseas training.

It is necessary to establish a project management group and a strategy group in order to do the following:

-to set up management targets and strategies for project formation,
-to manage and control projects,
-to execute the procedure of project implementation,
-to concentrate authority to implement projects,
-to have responsibility for projects, and
-to absorb technology from abroad.

(3) Upgrading of domestic technology and production capacity

Industries and production technology that support railways in Viet Nam have not grown sufficiently. Functions in VNR and affiliated industries should be utilized and vitalized through the implementation of improvement and development projects.
They will play an important role in projects by

-reducing costs,
-creating jobs, and
-raising the level of technology.

The production of the following fields will be used in project forecasting:

-the production field (crushed stone, sleepers, rail fastening, turnouts, and bridges)
-the construction field (Gia Lam Workshop, consultants, construction companies, track construction companies), and
-the service field (tourist agencies and forwarders)

(4) Upgrading of maintenance technology and capacity

1) Track maintenance

Track maintenance is presently executed by staff walking along track visually checking for static(no load) irregularities in alignment. Dynamic(train load) irregularities should be measured and track repair should be executed based on the dynamic track irregularity measurements.

Track maintenance work should be upgraded from being purely manual to work using sophisticated equipment.

2) Bridge maintenance

Bridge repair and replacement costs are estimated at US$427 million in the Master Plan. The limited budget for bridges should be used efficiently based on scientific data. It should be kept in mind that one of the merits of steel structures is that it is possible to repair or replace individual members. Japanese railways have established an inspection system to estimate the strength of bridge members, a repair theory and manuals. It is seriously recommended that these technologies be introduced for advanced railways. The order of priority for repair or replacement work will be derived scientifically. The Long Bien Bridge in Hanoi needs to be replaced; however, detailed analysis is necessary to make a final decision and to design a replacement.

Useful technology will be transferred to Vietnamese engineers in the procedures for making a final decision.

3) Bridge technology center

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

(5) Disaster prevention

It is difficult to prevent natural disasters; however, it is possible to prevent train accidents caused by natural disasters via appropriate countermeasures, which is what is recommended.

There is a clear relationship between the accumulation of rainfall or heavy rainfall in a short time and disasters. When accumulated rainfall reaches a critical level, trains should be stopped. This relationship is determined from accumulated records on rainfall and disasters. It is recommended that VNR have an expert group to study disaster prevention measures.

(6) Train operation safety

1) Safety of train operation

The safety of train operation is the most important matter for a railway. Several improvement projects will be recommended by JICA for train operation safety, such as a tokenless block system, color light signals and electric interlocking devices. However, there are many other measures that VNR could implement with only a small amount of money. They are training, the review of manuals and the raising of morale.

2) Safety at level crossings

Approximately 34% of train accidents occurred at level crossings in 1994, resulting in 87 people being killed and 123 people being injured. These statistic account for about 90% of all those killed and injured in railway accidents. The volume of road traffic has been increasing rapidly, so the accidents at level crossings will increase. Consequently, safety at level crossings will be come a serious problems in the near future.

VNR is recommended to take the following measures:

- To establish a group to have responsible for level-crossing safety in VNR,
- To survey traffic volume at all level-crossings in order to rank level-crossing safety,
- To promote safety facilities for level crossings according to their priority determined by traffic surveys,
- To promote grade separation at high-priority level crossings; Especially, road improvement projects on Route 1, 5, 18 should be grade separated with railways, and
- To promote education and training for school children on safety at level crossings.

Part II Feasibility Study on Hanoi - Ho Chi Minh Line Rehabilitation and Improvement

Chapter 6 Long-Term Development Perspective up to 2010

6.1 Regional Development Perspective

6.1.1 Regional Development Plan

There are three focal economic areas (FEA): the Northern FEA, Central FEA, and Southern FEA. These have a character of growth center, which growth effects are expected to trickle down to the adjacent regions. Thus growth scenario of these FEAs prepared by the State Planning Committee sets very high targets as shown in Table 6.1.1.

Table 6.1.1 Growth Target of Economic Focal Area

	GDP (mil. US$)			Growth Rate	
	1994	2000	2010	1994 - 2000	2000 - 2010
Northern FEA	2,348	4,916	16,250	13.1	12.7
Central FEA	693	1,477	4,702	13.4	12.3
Southern FEA	5,393	12,608	41,129	15.2	12.6
Other Area	10,003	14,927	38,688	6.9	10.0
Total	18,437	33,930	100,770	10.7	11.5

Source; State Planning Unit

Growth pole are apparent in three FEA, and shows a sharp difference between FEAs and others.

There are apparent gap of the growth rate between the FEA and others, especially at the period 1994-2000. This will leads a widening of per capita GDP among the regions, and will aggravate the equity of income distribution. There remains a room of discussion on whether this phenomenon can be a necessary temporary evil that is known as a U-shaped Kuznets effect of the income equity apparent in a course of early stage of economic development.

6.1.2 Industrial Development Plan

There are 38 plans of industrial estates and export processing zones. Some are at conceptual plan stage and the others are valid. As shown in Interim Report (1), all of those locate in three FEAs. Those impacts on the regional economy are not so clear since the content of many of industrial zones are not yet so clearly defined. However, it is sure that the industrial estates function to raise the GDP of the province, and its pressure was taken into consideration when the Team conducted a GDP projection by province.

6.1.3 Infrastructure Development Plan

(1) Road

Rehabilitation works of the National Road 1 will soon start, which covers 1,422 km, more than 80% of the section between Hanoi and Ho Chi Minh City. These rehabilitation works are expected to complete by 1997. Remaining parts are waiting for the F/S study.

Section that the D/D has been completed:

Hanoi - Vinh	;	184 - 463 km
Nha Trang - HCMC	;	1451 - 1900

Section that F/S has been offered:

Dong Ha - Nha Trang	;	757 - 1451

(2) Port and Airport

Improvement plans of port and seaport along the line are as follows;

[port]

- Combination of an improvement of Hai Phong and Cai Lan Ports
- Combination of an improvement of Saigon port and a construction plan of new Ti Bai/Vung -Tau port.

[airport]

- Expansion plan of Hanoi Noi Bai airport

(3) Tourism

There are two major resorts along the line; Nha Trang and Da Nang/Hue. There are many hotel expansion plans that the foreign investors has been involved. All of these plans might generates passengers of the railway.

6.2 Role of Hanoi - Ho Chi Minh Railway Line

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

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

(1) To form a north-south axis of national transport network

This line penetrates the Vietnamese land in a shape narrow in the east-west axis and long in the north-south axis, and forms a backbone of the national transport network. This axis should guarantee its continuous operation whenever it is. And it should contribute to form a dual transport system for the emergency case.

The target of service level is set by taking into considerations those matters, and the expansion of the line capacity will be stressed especially at the Hai Van Pass.

(2) To perform an inter-regional transport mode

A distance less than 500 km is suitable for the railway service, and the study of the Master Plan clarified that the inter-regional trips are also playing an important role in total passenger trips. This principle aims at services for these passengers. Average trip distance in 1993 is 300 km, and it will be extended to 400 km on the Hanoi - Ho Chi Minh line.

This distance of trips can be a majority of all the trip by the railway in future when the level of average income reaches a certain stage. This is because the long distance passengers in general prefer the aviation services with a short travel time but with rather high charge. This principle for inter-regional transport aims at strengthening this specialized task of the railway.

(3) To share a burden to strengthen the transaction between the north and the south

It is one of the national task to improve the transport capacity between the south and the north. At present, the line capacity at Hai Van Pass reaches the limit and can not expand any more without some counter-measure. Various measures should be compared, which includes a construction of new Hai Van tunnel.

Other obstacle for the railway to perform this task is a safety matter. Countermeasures cover wide range of technical fields and are related with principle describe above. But, with a counter-measures against these issues, the VNR has to share a burden to strengthen the transaction between the north and the south.

This also suggests proposals for a feeder service, comfort of coaches, frequency service etc.

(4) To provide a transport mean for industrial products

The government assigned the railway as a transport mode for some industrial products such as cement and fertilizer. A new cement plant is also planned along the line.

This role of the railway relates with stable and punctual operation of the train. Since a strict production schedule is a key factor to guarantee the profit of the manufacturing company, it is an indispensable for the VNR to cope with a quality of these services and to attract much customers.

Chapter 7 Principles, Target, and Technical Standard for Rehabilitation and Improvement up to 2000

7.1 Principle

7.1.1 Principles

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

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

(1) To consolidate safety, and stable operation all over the line

This is the basic principle whenever the railway project aims at. This principles will be applied to the whole part of the Hanoi - Ho Chi Minh Line as a minimum condition that the rehabilitation plan seeks for. The Team judges that safety and stable operation should be put a priority so as to attract a higher demand of railway. With a budget constrain, the VNR is suggested to go along with this line.

As for the section where the most severe competition are expected with the National Road 1, the Study sets the priority sections for a total rehabilitation, containing service improvement as well as safety and stable operation.

(2) To make the railway competitive with road and other modes at the priority sections

Some parts of the National Road 1 will be up-graded up to the year 1997, and the remaining up to the year 2000. Since the railway runs in parallel with this Road, it is expected that some will transfer from the railway to the road services so as to receive the door-to-door service, especially for a short distance passengers.

The railway is rather competitive at a medium- distance trips for the inter-regional traffic as the many countries experienced. The rehabilitation plan also put an emphasis on this target. For this purpose, the Team sets three priority sections so that the intensive investment will be planned and service level will be improved. This priority section can be a model rehabilitation section.

(3) To adopt a step-by-step policy: demonstrating the investment efficiency of the railway for a priority section, and then expanding the fund with cooperation with new supporters

The VNR is now free from funding the infrastructure investment by itself. However it does not automatically mean that the budget for rehabilitation is un-limitedly available for the railway rehabilitation. Rather an investment plan should be formulated to prove its effect by itself up to the year 2000, and should provide a evidence to apply for a permission of new rehabilitation and improvement works. This kind of self-proving and effect-demonstrating plans are required in the market-oriented economy.

All these conditions are summarized as "step-by-step" policy in this Study.

(3) To introduce and strengthen a capability of scientific inspection works for bridges, tunnel and so on.

Inspection of bridges, for instance, requires a equipment and facilities in order to specify the deteriorated degree of the structure and to specify the points to rehabilitate. Comparing with all the results, the rehabilitation priority can be set with a due consideration of other conditions such as speed, locomotive, and continuity of small curves etc. These inspection is indispensable for the detail rehabilitation works of all the bridges.

However, this kind of study is beyond the Team's capacity of this Study, and thus they are listed in Program 2000 for a recommended inspection/project.

7.1.2 Criteria of Selecting Priority Section

(1) Criteria

1) One Priority Area for Each Union

[Reasons]

1. Equal opportunity for 3 unions (= equality within VNR)
2. Contribution to working incentives
3. Sufficient attention to minimize regional disparity

The party declared that it is one of the national policy to minimize a regional disparity and to develop human resources. In this context, the Team judges that an equal opportunity for railway rehabilitation is given to each union, an to compete with each other so as to attract more users.

2) Densely Populated Region and/or Economic Focal Region

(= highly inter-connected region)

(= near urban area)

[Reasons]

1. High potentiality of new traffic demand
2. Contribution of accelerating economic development
3. Stronger connection between those regions

These regions are featured by an agglomerated economic activities, and can generate high demand of transport. With a sufficient access mode within and between those regions, its is sure to further activate and accelerate the economic activities. It also improves a region al integration. Railway can contribute to facilitate this function, especially for medium distance trips.

It is apparent that three regions; a Hanoi-centered region, a Ho Chi Minh-centered region an Da Nang-centered region are well qualified for these conditions.

Analysis of reginal integrity shows a high degree of inter-regional integration. And the best one in each region are:

[conclusion]

Union 1 ; Hanoi - Than Hoa section

Union 2 ; Dong Ha - Da Nang section

Union 3 ; Saigon - Nha Trang section

3) Area with High Demand of Railway

[Reasons]

1. High level of railway demand at present
2. High level of demand at years 2000 and 2010
3. Distinction of a long distance trip demand from a short- and medium-distance trip demand
4. High level of investment return expected

High demand can contribute to improve a financial status of the VNR, and makes it rather easier to pay back the investment cost with high investment efficiency.

Figure 2 indicates the level of demand at the year 2000 (based on the Master Plan with some modifications). Sections with relatively high demand in each union are as follows:

[conclusion]

Union 1 ; Hanoi - Vinh section

Union 2 ; Hue - Da Nang section

Union 3 ; Saigon - Muong Man section

4) Appropriate distance to be competitive

a. Historical experience (= competitive length can be less than 300 ~ 500 km)

b. Competitive to attract traffic demand of short- and medium distance trips

All of the candidate sections are less than 500 km of a criteria.

(2) Candidates and the Selected Priority Rehabilitation Sections

The Team sets the following sections as candidates, and selected three sections for a priority rehabilitation sections.

Union 1:	1.	Hanoi ~ Than Hoa	175 km	(priority section)
	2.	Hanoi ~ Vin	319 km	
Union 2:	1.	Hue ~ Da Nang	103 km	(priority section)
	2.	Dong Hoi ~ Da Nang	269 km	
Union 3:	1.	Saigon ~ Muong Man	175 km	(priority section)
	2.	Saigon ~ Nha Trang	415 km	

7.2 Target

Target to be obtained by 2000 with the program 2000 and perspectives until 2010 with the master plan are shown in Table 7.2.1 Target of Hanoi-Saigon Line.

Table 7.2.1 **Target of Hanoi-Saigon Line**

Items	1995	2000		2010
		Priority Sections	Other Sections	
Sectional Distance	Hanoi-Saigon 1,726km	Hanoi-Thanh Hoa 175km Hue-Da Nang 103km Muong Man-Saigon 175km	1,273km	
Track Structure	43kg/m,12.5m in length 30kg/m rail(276km)	Replace of 69km of 30kg with 50kg rail in MM-SG	Replacement of 208km of 30kg rail	Completed
Rail Welding		Approximately 410km	None	Completed
Track machines	Insufficient	Machines for 17 depots	None	Completed
Ballast Thickness	150-250mm	≥250mm	200-250mm	≥250mm
Bridge Inspection		Inspections for least stable bridges		Completed
Bridge Rehabilitation	Rehabilitation≤30km/h, 1,562m		≤15km/h, 3.205m	Completed
Tunnel Repairs		Repair≤15km/h,. inspection		Completed
Submerged Track		Expansion of culvert. Inspection and study		Completed
Prevention of disaster		To equip rain gauge at 17 spots.		Same as 2000
Interlocking System	Tokenless, tablet	Tokenless and electric interlocking systems completed		Same as Master Plan
Signal	Mechanical, color light	Color light signals, power sources completed		Same as Master Plan
Telecom. Cable	Bare Wire, partial cable	Optical cable (HN-TH, MM -SG)	TH-VH	Completed
Telecom. Exchanger	Superannuated	Exchangers installed for (HN-TH, HE-DN, MM-SG)	None	Completed
Maximum Speed	60, 70km/h	80km/h	60,70km/h	110km/h
Travel Time	Express 36 hours	33 hs		24 hours
Commercial Speed	Express 46km/h	52km/h		72km/h
Locomotives Express PCs Local PCs Freight cars	D12E, etc. D12E, etc. D18E(HN-DN), etc.	For passengers: 5 sets of push-pull, 17D18Es, 75D12Es, 474 passenger cars For freight: 32D18Es, 46D12Es, 2,400 wagons		44 sets of P-P, 87D18Es, 92D12Es

7.3 Technical Standards

The following standards are applied in this Study for the new construction work of Hanoi-Ho Chi Minh line. In the case of reusing the current structure with repairing, the current technical specifications are applied.

1) Gauge	: 1,000mm
2) Minimum curve radius	: 600m
	: 300m(special case)
3) Maximum gradient	: 10‰
4) Rail	: 50kg/m 25m length or welded long rail
	43kg/m 25m length(in case of only exchange rail)
5) Sleeper	: monoblock PC sleeper 64cm space
6) Ballast depth under sleeper	: more than 25cm
7) Turnout on main line	: 1:10 with 50kg/m rail
8) Railway formation width	: 5.0m (Fig. 7.3.1)
9) Effective siding length	: 500m
10) Design live load	: 14tons/axle(Double locomotives)
11) Maximum cant	: 95mm
12) Allowable cant deficiency	: 50mm
13) Bridge clearance	: The maximum height of passing ship or planned high water level + 1m (in case HWL is available)
	: More than the water level which has been observed (in case HWL is not available)
14) Submerged frequency for design at flood prone section	: 1/30 years (in case rainfall data is available)
	: Decide the submerge height to the highest level which has been observed (in case rainfall data is not available)

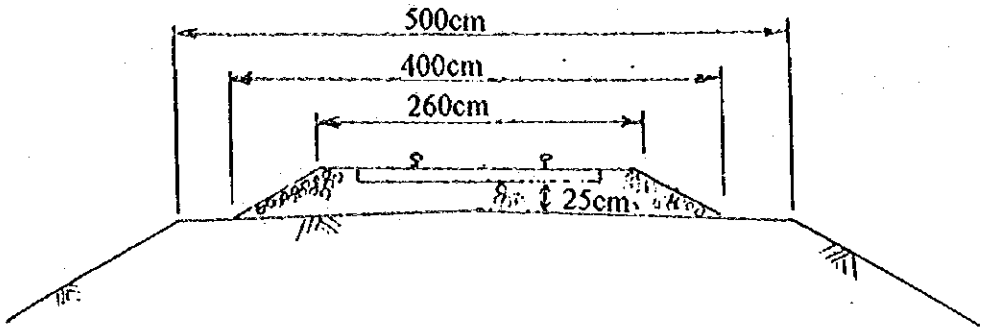

Fig. 7.3.1 Track Profile

(1) Construction gauge

In this study the current construction gauge of VNR is applied. In future, cope with electrification or elevated platform, the construction gauge shall be changed in some portions. The construction gauge also needs to expand at small curve section.

According to Japanese railway regulation, the expansion rate is calculate with following formula;

$$W = 22500 / R$$

W: Necessary expansion width(mm) R: Curve radius(m)

(2) Minimum curve radius shall restrict the train speed most seriously after structures are repaired. It is desirable to set curve radius more than 800m of which speed restriction is 100km/h. At 600m radius curve section, it may increase the train speed to 100km/h with using the special car.

(3) Maximum gradient should be decreased in the small curve section to cope with the curve resistance. The decreased amount of gradient is calculated with the formula ; $i' = 600/R$ ‰
Maximum gradient 10 ‰ includes such curve resistance.
In some qualified sections, smaller gradient should be taken, for example at Hanoi-Vinh section, 6 ‰ is appropriate.

(4) Heavy rail makes a great contribution to keep the track stability.
In Japan, 60 kg/m rail is used for important lines. Considering the line traffic volume, in Hanoi-Ho Chi Minh line, 50kg/m rail is suitable.

(5) Monoblock PC sleeper is superior than 2-block sleeper in anti-vibration and workability of tamping. At small curve sections (R<600m), sleeper space should decrease to 60cm.

(6) 25cm ballast depth is enough by using monoblock sleepers. In Japan, with 50 kg rail, PC sleeper, 25 cm depth ballast of 1067 mm gauge track bears 16 ton axle load.

(7) Turnout is a weak point of the track. It is desirable to use 1:12 crossing for higher ability trains, but in current situation of VNR trains, 1:10 crossing shall be used for some periods.

(8) The current formation width of VNR of 4.4m is too narrow even to keep ballast on it.
It is desirable to secure the path for railway workers, the railway formation should have 5.0m width. The formation width also needs to expand at curve section or high embankment section.

An example of widening (Japanese regulation)

(a) Curve section	a) Cant <30mm	Outside of the curve	100mm
	b) 30mm<Cant<60mm	Outside of the curve	200mm
	c) 60mm<Cant	Outside of the curve	300mm

(b) Embankment section	a) 6m<Bank height<9m	150mm
	b) 9m<Bank height<12m	300mm
	c) 12m<Bank height	450mm

(9) In Hanoi - Ho Chi Minh line, the maximum traction weight of a train is assumed as 1,000 ton. The effective siding length of 500m has some room for siding a 1,000 ton-train.

(10) In this study, we use the future live load of VNR. After the determination of future locomotive type, the distribution of the load axle for design is desirable to make similar to the actual locomotive axle disposition for economic design.

(11) The allowable maximum cant for 1000m gauge is about 95mm. It is necessary to set a cant with enough transition length. And the cant transition should not compete with vertical curve as far as possible, because such competition up to cause derailment.

(12) In some countries, allowable cant deficiency is adapted more than 50mm, but from a point of safety cant deficiency of 50mm is suitable.

(13) Bridge clearance from river water surface is necessary not to damage the beam cause with flood water or driftwood, and also to pass ships under the bridge.

(14) It is desirable not to rise the water level up to the rail level, but to prevent it perfectly is difficult. Train accident by submergence is easy to prevent, because submergence occurs only after heavy rainfall. Design frequency of submergence should be decided with comparing investment cost and loss by the submergence.

7.4 Overall Rehabilitation Plan for Priority Sections

Three sections are selected as a priority sections for the rehabilitation an improvement. Basic aim of this setting is to intensively put the fund and make this section as a model sections. Almost all the possible rehabilitation works are planned in this section prior to other sections. With a condition of limited budgetary fund, this section is expected to prove the effectiveness of railway investment and to attract the further rehabilitation fund in the future.

In these priority sections, all the speed restriction sections are subject of the rehabilitation. The safety and stable operations are also guaranteed by all means.

(1) Hanoi - Than Hoa Priority Section

Basic principle for the rehabilitation of this section is an establishment of the high level of railway service, an overall rationalization of railway management, and a frequent service for the commuters. Urgent measures to cope with the traffic interruption at the level crossing in the urban area of Hanoi is also taken into considerations. However, detail device for this matter is expected to be formulated in the Hanoi Urban Master Plan Study. With the growth pressure of the population and employment opportunity in Hanoi urban area, it is expected to commute massive number of labors by the railway. Frequent service for the commuters are paid sufficient emphasis.

Track Improvement	• Rail welding • Introduction of maintenance machines	• welding 12.5m rail into 25m rail • allocation of maintenance machines to 7 maintenance sections	• total length of rail welding is 135 km • reduction of maintenance staff by 270 persons • speed up
	• Inside Hanoi urban area	• alarm device, crossing bar, track improvement, fences, side road, land compensation	
Station Improvement	• waiting room, ticketing booth, parking space of motorcycle/bicycle, shop and restaurant	• improvement of 3 stations: Hanoi, Nam Dinh, Than Hoa	
Establishment of Stations with No	• 18 stations in section	• reduction of passenger handling staff at 18 stations	• necessary to increase the number of

Passenger Handling Staff			passenger conductors
Integration of Freight Handling Stations	• Abolishment of freight handling station which volume is less than 50 ton/day	• integration of 13 stations in total	
Introduction of Cargo Handling Tools and Machines	• Installation of forklift	• at 8 stations: Gip Bat, Van Dien, Ninh Binh, Gau Yen, Dong Giao, Bin Son, Thanh Hoa, Yen Thai	
Seat Reservation System	• Closed system computer	• installation at 3 stations: Hanoi, Nam Dinh, Than Hoa	
Improvement of Passenger Car	• Improvement of passenger cars • Installation of air condition		
Locomotives	• Express train • Local passenger car • Freight car	• P-P, D12E, D18E • D12 and others • D12E, D18E	
Speed	• Maximum speed • Travel speed • Average speed	80 km/h 36 hours at present 46 km/h at present	

(2) Hue - Da Nang Priority Section

This section has been a bottle-neck to the transportation between the North and the South of the Vietnam because of its low transportation capacity at the Hai Van Pass. And this section has famous tourist destinations at both ends of the section and the railway can be the most reliable mode. Thus some measures to cope with these issues are incorporated in the rehabilitation plan. Emphasis are put on the followings:

Track Improvement	• Rail welding • Introduction of rack maintenance machines	• welding 12.5m rail into one • Allocation of track maintenance machines to 7 groups	• speed improvement
Station Improvement	• Waiting room, ticketing booth, parking space, shops, restaurant	• Hue, and Lang Co stations	• improvement of 2 stations except Da Nang (completed)

Establishment of Stations with No Passenger Handling Staff	• All stations except Hue and Da Nang	• passenger handling staff will be removed from 7 stations	• Necessity to increase the number of conductors
Integration of Freight Handling Stations	• All stations except Hue and Da Nang	• integration of 5 stations into Hue and Danang stations	
Introduction of Cargo handling Tools and Machines	• Installation of forklift	• installation of forklift at Hue and Da Nang stations	
Seat Reservation System	• Closed system computer	3 stations; Hue, Lang Co, Da Nang	
Improvement of Passenger Car	• Improvement of passenger car, installation of air conditioning facility		
Locomotives	• Express train		
Speed	• Maximum speed; • Travel time;	80 km/h 4 hours at present	• section subject of maintenance modernization
Line Transport Capacity	• Establishment of signal station at Hai Van Pass	• temporary facility up to a new tunnel construction	

(3) Muong Man - Saigon Priority Section

This section is featured by relatively low number of passengers and freight users, and those are not sufficient to justify measures of service improvement by itself. On the contrary, the long-distance passengers are full of the train at the Muong Man station. As for the freight, the Muong Man and Song Than stations are the major cargo handling stations in this section, and few cargo handling were recorded at other stations in the past.

Basic rehabilitation policy is a establishment of high level of service level, a operation rationalization both for the passenger and freight, and introduction of a frequent service between Bien Hoa and Saigon stations (35 km), where is a densely populated area and a commuter passengers can be expected in the future. Existing locomotives and cars are planned to be utilized for this frequent services for commuting passengers.

Furthermore, the Saigon station is not located at the center of Saigon city, and thus it is recommended to allow to load their motorcycle/bicycle into the train (only for local train).

Rehabilitation emphasis is set on the followings:

Track	• Implementation of maintenance modernization and rationalization	• installation of maintenance machines to the 6 maintenance groups • welding 12.5m rail into 25m • speed up to 80km/h
Station Improvement	• Improvement of major stations	• renovation of waiting room, ticketing booth, parking space for motorcycle/bicycle, shop and restaurant at 3 stations: Muong Man Bien Hoa, and Saigon
	• Improvement of commuters' stations	• establishment of new station in the Ho Chi Minh city • leveling of platform • construction of side station at Ha Nai station
Remove of Passenger Handling Staff	• All the stations except commuting stations	• passenger handling staff stationing at the stations between Muong Man and Ho Nai, and increase the number of passenger conductors
Integration of Freight Handling Station	• To integrate into 1 station	• 16 stations in total will be integrated.
Introduction of Freight Handling Machines	• Installation of forklift	• Installation of forklifts at Song Than station
Seat Reservation	• Closed system computer	• Installation at three stations; Mung Man, Ben Hoa, Saigon
Locomotives and Cars	• Express train • Local commuter train	
Speed	• Maximum speed; • Travel time	80 km/h (This section is a subject of track maintenance modernization) Muong Man-Saigon ; 4hours20min. Ho Nai-Saigon ; 1hours20min.

7.5 Rehabilitation Plan for Hanoi-Ho Chi Minh City Section

Rehabilitation between Ha Noi-Saigon will be implemented for improvement of passenger and freight services, reduction of manpower, track maintenance modernization, track structure improvement, inspection and rehabilitation of deteriorated bridges and tunnels, other civil engineering facilities, signal and telecommunication improvement, and procurement of additional rolling stock.

Above mentioned improvement will be implemented in priority section projects and other projects for other sections(Thanh Hoa-Hue, Da Nang-Muong Man). Table 7.5.1 shows components included in priority section at Union 1, 2 and 3 projects, and other sections. Some projects will cover the whole section between Hanoi-Ho Chi Minh.

Table 7.5.1 Components of rehabilitation projects:(O: to implement)

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

* : to be executed

Each project formulated in Program 2000 has multi-purposes, because the railway is an integrated industry composed with many fields. The following table shows the relations of projects with improvement principles and target:

Table 7.5.2 relations between each project and improvement targets

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

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

*: related

Chapter 8 Current Conditions, Problems and Countermeasures

8.1 Management

8.1.1 Management Profit and Loss

Each union is suffering from management deficit. By recognizing seriously the competition with other modes, especially road, each union has positively invested into railway sections which can compete with road. The main reasons of the deficits are considered to be the increase of costs for strengthening of track and repairs of bridges for speeding up, the increase of investment cost for factories of rolling stocks and saturating of traffic volume by competition with road. Each union has carried out the policies for reducing the deficits such as propaganda or public relations, grading up quality of service, keeping better relations with major consignors and improving track condition for speeding up.

VNR must pay fees for usage of infrastructure, 10% of total revenue, to the Government, but is no need to burden costs of repairs and maintenance, and depreciation for assets of infrastructure. Then financial situation will be improved, but there is no guarantee for surplus of profit and loss account and severe management environment will be continued.

The following are indispensable and urgent tasks to improve the management of VNR.

8.1.2 Policy for Increasing Revenue

(1) Passenger

As policy for increasing passenger revenue, strengthening transport capacity for medium distance (300km-500km) as well as improvement of transport service as usual should be conducted as a first priority. Secondly, the increase of frequency of long distance trains like a train between Hanoi - Ho Chi Min are necessary. Now, transport by air and road(bus) are overwhelmingly advantageous than railway. It must be noted that users of air plane get mostly high level income but those of railway get generally low level income. Therefore, quality of users are basically different between railway and air plane. Transport by road has disadvantages to transport by railway with regard to safety because road conditions are not so good and its high speed operation is very dangerous for passengers. This means that high potentiality of traffic demand is expected for long distance transport by railway especially transport between Hanoi - Ho Chi Min.

High potentiality of long distance transport by railway is based on the precondition that train on Hai Van Pass will speed up, but when national road No.1 will be completed, railway must cope with fierce competition with road. Therefore, VNR is expected to improve the quality of railway service than ever before. In short distance transport, as railway will be forced to compete with road at high degree, some railway lines may probably withdraw in future.

There are many tourism resources scattered alongside Ha Noi - Ho Chi Min line. They are Vinh, Hue, Nha Tran, Vung Tau, Dalat, Hai Van Pass and so on and potentiality of passenger traffic demand seems to be considerably high. The positive development of potential demand of tourism should be carried out by more frequency of special trains for tourists to tourism zones, setting up special fares, construction of hotels and so on. In case that there are no railways to tourism zones, survival of abolished lines (ex. Thap-Dalat line) or construction of new lines (ex. Hanoi - Vung Tau line) should be carried out.

(2) Freights

For the purpose of increasing revenue from freights, as mentioned already with regard to directions for managerial improvement of VNR, in the market of general cargoes, it is indispensable that thorough efficiency oriented devices should be conducted by introducing container suitable for rail transportation, adopting pallets, positive investment of handling machines and integrating cargo stations so that VNR would be able to overcome fierce competition with other modes. Furthermore, it is also necessary to promote freight forwarder service to play important role for door-to-door service.

In the market of bulk cargoes(coal, cement, apatite and so on), railway has advantages in transportation from inland to sea ports, but ship has advantages in transport for long distance because of its low transport cost. VNR is required to set cheaper fare than ship by thorough reduction of its transportation cost and to conduct containerization.

8.1.3 Management Diversification

First of all, the promotion of new business can be considered on the basis of multi-functionalization of station facilities by making use of its attracting power of users of railway services. Saigon station has already been facilitated with restaurant, coffee corner, Karaoke room in waiting room and tennis coat next to the station building which are opened to the public use in charge. In future, hotel is planned to be constructed under the direct management of Saigon station and now main building of the station and square in front of the station are under reformation.

Saigon station has another aspect that space for small shops on the platform in the station is opened almost in free to the group of poor residents surrounding the station, which is contribution to employment policy and improvement of welfare for local residents. This aspect must be noticeable as the new function of the station.

There is not enough space for parking in Hanoi station as there is a road in front of the station and the space for waiting room is rather narrow. It is strongly desired that the quarter in front of station and parking area for cars, buses, motor bikes and bicycles are facilitated. Furthermore, the Hanoi station is needed to be changed into more familiar with citizens by equipment of a hotel in front of station and restaurants inside or near the station.

Expansion and promotion of new business by multi-functionalizing stations should be carried out and mulitipurpose use of function of characteristic station closely related to the local area is required to be progressed by taking account of needs and seeds of local residents.

In Transport Block, door-to-door service of freight by truck (Da Nang station) and passenger transport service by taxi between station and company or home by contract between Saigon station and taxi company are already undergoing as well as hotel construction. These terminal transport service must be strongly promoted as complementary function for railway transport because it will lead to save transport time in total.

8.1.4 Rationalization of Personnel and Saving Expenditures

Rationalization of personnel and saving expenditures are also tasks to be urgently tackled. Idle facilities must be withdrawn and for the leveling up of productivity should be implemented by reviewing allocation and work efficiency of personnel and making the first priority for reduction of personnel belonging to unnecessary or inefficient sections for the purpose of 10% reduction. Besides, it is expected that the Government will actively conduct financial support to secure the living of retired personnel.

8.1.5 Policy for Abolishment of Non-Profitable Branch Line

Cau Giat - Nghia line (31.0km) is planned to be abolished. This line was decided to be abolished by VNR in 1992 because woods to be transported were scarce. But there is a plan to develop the forest resources and to build export processing zone alongside line and then the abolishment of line is temporarily suspended. Final decision for the

abolishment is necessary to be treated carefully by taking account of future traffic demand, regional economy, road transport and so on. Its management structure is needed to be studied in more detail.

8.1.6 Review of Cost Accounting System

Transport cost is a basis for setting up rational fares. The works for dividing transport cost into passenger transport cost and freight transport cost is conducted by each union. The study is necessary toward establishment of more rational criteria for separating transport cost because criteria for separating the common cost to passenger and freight in particular is not always reasonable. The study in detail for cost accounting system not only by line but by train are also necessary to be done

8.2 Railway Transportation Market

8.2.1 Passenger Transport

(1) Current status & problems

1) Outline of railway passenger transport

Despite the recovery and increased activity of the socioeconomy, VNR's share of the passenger transportation market, which was 7.80 million passengers and 1.72 billion passenger-km in 1993, was an extremely low 5%. Of this, the extremely important north-south railway trunk line that connects Hanoi and Ho Chi Minh City accounted for 47% of the total number of passengers (3.70 million) and 81% of the passenger-km (1.4 billion).

Moreover, from the standpoint of peak railway demand in 1987, there has been a drop of approximately 30-35% in rail usage. If transportation density (the number of passengers per km of commercial track) is examined, it can be seen that it dropped from 6294 passengers per km of commercial track in 1987 to 2222 passengers per km of commercial track in 1993. It can be said that the current state of the railway is one of relative inactivity.

2) Transportation service & rolling stock

Ont he Hanoi-Ho Chi Minh Line, express trains make three round-trips between these two cities. In addition, after taking into consideration regional passenger flows to such places as Da Nang, there are also local trains that run on each section.

The travel time for express trains between Hanoi and Ho Chi Minh City is 36 hours in fast cases and 47 hours in slow cases, resulting in an average travel time of 43 hours. In fast cases, express trains stop only at 6 stations and stop at 22 stations in slow cases. The scheduled operating speed is 48 to 37 km/h. This speed cannot be said to be sufficient enough for the express trains operating on the Hanoi-Ho Chi Minh Line (an important trunk line).

The consists of the express trains are composed of a mixture of sleeper cars and regular passenger cars. Based on passenger flow trends, the number of cars in a consist can vary from 8 to 12. However, consists with a locomotive and a dining car, 4 second-class passenger cars (wood box seats), 3 first-class passenger cars (vinyl row seats), 3 second-class sleeper cars (3-tiered bunk beds), 2 first-class sleeper cars (2-tiered bunk beds), and 1 mail car in that order are being used. All the passenger cars are extremely old and the sleeper cars are very uncomfortable.

3) Fares, etc.

Passenger train fares are decided by a complex fare system that decides fares by train type. In addition, the ridership charge, express train charge, sleeper car charge, etc., are lumped together. This system is difficult to understand and inconvenient for riders.

Furthermore, while the train fare between Hanoi and Ho Chi Minh City for an air-conditioned sleeper car with a soft bed (1,036,000 dong or approx. US$100) or for a regular passenger car with a soft seat (562,000 dong or approx. US$56) is cheaper than air fare, from the viewpoint of travel time and comfort it will be difficult to attract new customers for the railway, excluding riders with small budgets and tourists that are train enthusiasts.

(2) Measures for improvement

The Hanoi-Ho Chi Minh Line, which forms a north-south axis and is the most important transportation artery in Vietnam, will need the following market-oriented improvements to complement the basic transportation improvements in track, rolling stock, etc., to be executed from hereon:

1) Increasing express train speeds & improving rolling stock

The cause for the stagnation in railway transportation volume is that only low-income travellers mostly use the railway, and relatively high-income travellers and tourists are switching to airplanes.

For this reason, in order to improve ridership, it will be necessary to implement comfortable service with sleeper cars, etc., on the 1700km trip from Hanoi to Ho Chi Minh City and to cover that distance in one day.

2) Introduction of seat reservation system

To secure riders, it must be possible first to make a reservation when choosing a mode of transport. For this reason, a seat reservation system will be installed at the major stations the express trains start and stop at.

3) Improvement of fare system

The current fare system does not distinguish between the different charges, making it difficult to understand and inconvenient for riders. For this reason, together with clarifying the different charges and fares, it will be necessary to improve the system so that the appropriate fares for the above-mentioned service improvement in 1) can be collected.

8.2.2 Freight Transport

(1) Current status & problems

1) Outline of railway freight transport

Despite the increases in total domestic freight, freight transport volume in VNR has continued to fluctuate. In 1993, VNR transported 3.18 million tons of freight for 978 million freight ton-km. Of the total freight transport market, railways have a very lowly 5% share and play only a very small role.

If a breakdown of the goods transported by the railway is examined, it becomes clear that coal (760,000 tons), appatite (phosphate rock) (580,000 tons), chemical fertilizers (270,000 tons), cement (780,000 tons), aggregate (600,000 tons), wood products (130,000 tons), foodstuffs (80,000 tons), and animals (70,000 tons) account for most of the freight transported by the railway. Most of the goods transported on the Hanoi-Ho Chi Minh Line consist of cement, coal, aggregate, fertilizer, wood products, and foodstuffs. As for cement and coal, their flows center on a cement factory in Bim Son in the North. If these are excluded, then most of the products transported on the north-south line consist of fertilizer, wood products, foodstuffs, and aggregate. However, this means only 1.58 million tons of freight is transported, which can not be said to be large for the railway trunk line connecting the north and south of Vietnam.

2) Outline of freight station locations & freight handling

There are 162 stations (172 if branch lines are included) on the 1726km Hanoi-Ho Chi Minh Line. Almost all the stations handle freight, with 163 stations doing so in 1993. As for station location, which is fundamental for the freight business, there was a station approximately every 11km. The amount of incoming/outgoing freight handled by this line was 3.246 million tons. Of this, 40 station handled more than 10,000 tons, or approximately 2.906 million tons to account for about 90% of the volume. Therefore, there are 123 stations that handle less than 10,000 tons, or approximately 230,000 tons to account for about 10% of the freight volume (refer to Table 8.2.1).

3) Freight transportation service

The freight system that copes with handling the freight of this line has coal arriving from Na Dung and Ninh Binh to a cement factory in Bim Son. Then, the cement is transported in 3 round trips to the Hanoi area and each of the stations along the 1700km Hanoi-Ho Chi Minh Line by cutting off the necessary freight cars from a train. Furthermore, these trains have the freight cars that are unhooked properly handled at intermediate stations such as Dong Hoi, Quang Tri, Dien Tri, etc. For this reason, it takes freight trains going from Hanoi to Ho Chi Minh City 56 hours in fast cases or an average of 73 hours.

Table 8.2.1 The No. of Stations Handling Freight by Freight Volume

Scale of Freight Volume	No. of Stations	Tons of Freight Handled	Amount of Freight Handled by Major Stations (Unit; 1,000 tons)
More than 0.5 million tons/year	1	799,000 tons	Bim Son 799
More than 100,000 tons/year but less than 500,000 tons/year	8	1,254	Giap Bat 195, Van Dien 142, Ninh Binh 158, Vinh 141, Don Ha 143, Da Nang 114, Song Than 158, Thimh Chau 204
More than 50,000 tons/year but less than 100,000 tons/year	4	238	Cau Yen 56, Trupng Lam 64, Dong Hoi 55, Hue 64
More than 10,000 tons/year but less than 50,000 tons/year	27	615	Nam Dinh 14, Dong Giao 23, Thanh Hoa 46, Yen Thai 45, Nghia Dan 34, Cho Sy 18, Than Ap 11, Nyoc Lam 10, My Duc 28, Quang Tri 14, Huong Thuy 17, Lang Co 16, Kim Lien 21, Antan 33, Quang Ngai 22, Duc pho 36, Dieu Tri 27, Dong Tacll, Hoa Huynh 14, Ninh Hoa 12, Cay Cay 28, Ka Rom 49, Thap cham 13, Ho Nai 12, Di Am 12, Saigon 45, Phan Thiet 15
Subtotal	40	2,906 (89.5)	
More than 5,000 tons/year but less than 10,000 tons/year	17	111	Dong Van 6, Phu Ly 8, Minh Khoi 8, Van Trai 5, Yen Ly 6, Cho Thnong 5, Chule 7, Huong Pho 9, Dong Le 7, Sa Lung 5, Van Xa 5, Tun Quan 6, Bong Son 9, Binh Dinh 9, Nha Trang 6, Muong Man 5, Gia Huynh 5
Subtotal	57	3,017 (93)	
Morethan 1,000 tons/year but less than 5,000 tons/ear	76	214	
Less than 1,000 tons/year	30	15	
GrandTotal	163	3,246,000tons (100)	

Note: 1. Handled is the total of incoming and outgoing freight.
2. Figurs in parentheses represent the percent of freight handled on the line.

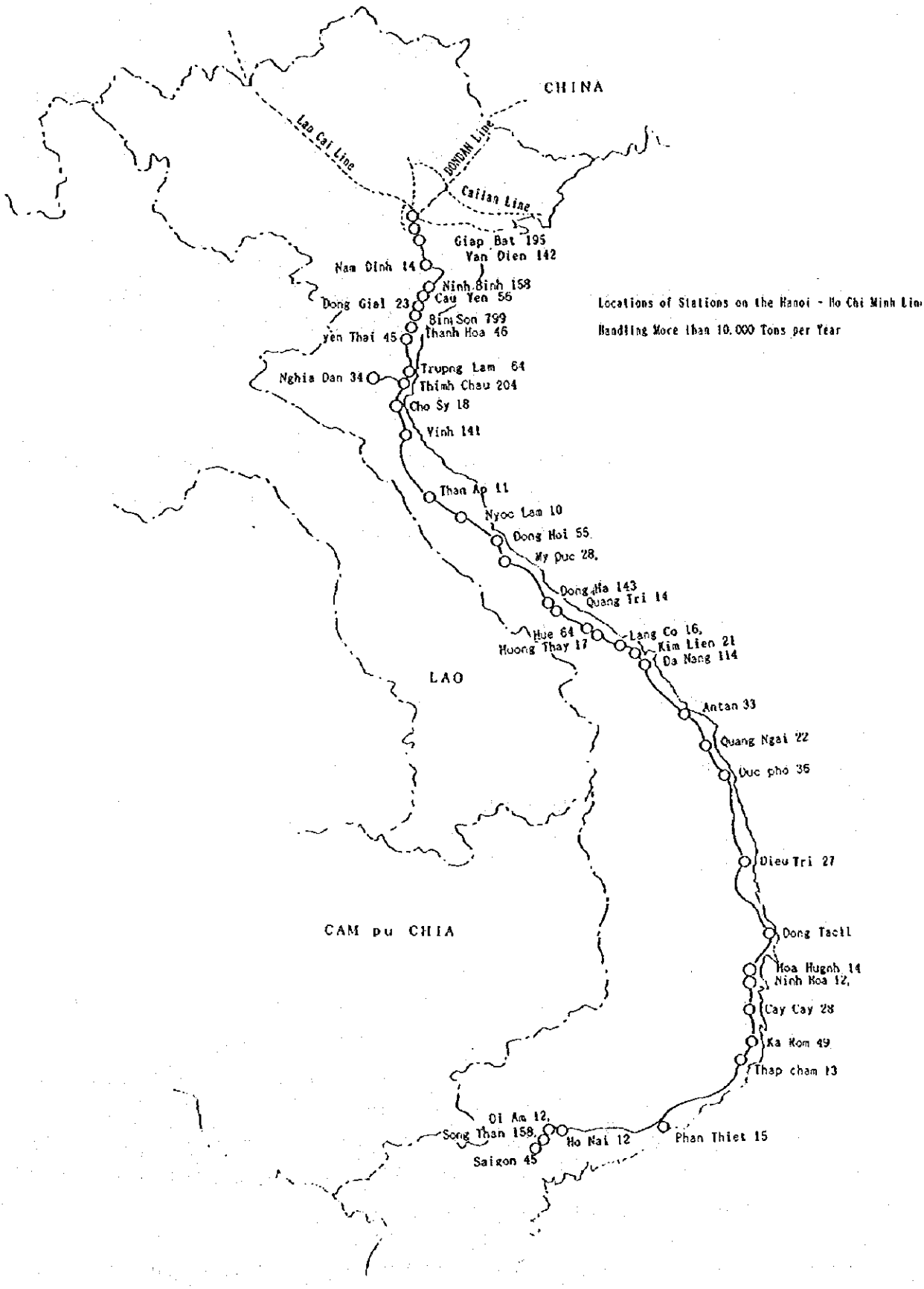
CHINA
Lao Cai Line
DONDAN Line
Cailan Line
Giap Bat 195
Van Dien 142
Nam Dinh 14
Ninh Binh 158
Cau Yen 56
Dong Giai 23
Bim Son 799
Thanh Hoa 46
Yen Thai 45
Trupng Lam 64
Nghia Dan 34
Thimh Chau 204
Cho Sy 18
Vinh 141
Than Ap 11
Nyoc Lam 10
Dong Hoi 55
My Duc 28,
Dong Ha 143
Quang Tri 14
Hue 64
Huong Thay 17
Lang Co 16,
Kim Lien 21
Da Nang 114
LAO
Antan 33
Quang Ngai 22
Duc pho 36
Dieu Tri 27
CAM pu CHIA
Dong Tachl
Hoa Hugnh 14
Ninh Hoa 12,
Cay Cay 28
Ka Rom 49
Thap cham 13
Phan Thiet 15
Ho Nai 12
Saigon 45
Song Than 158,
Di An 12,
Locations of Stations on the Hanoi - Ho Chi Minh Lin
Handling More than 10,000 Tons per Year

Fig. 8.2.1

4) Freight-related facilities & freight cars

The freight loading/unloading facilities are all superannuanated and dilapidated. In addition, almost all loading/unloading is done manually and not by machine. Also, small to medium-sized stations have no loading/unloading facilities and loading/unloading from departure and arrival siding can be seen. There are 5500 freight cars, but due to superannuation only 2500 cars can be used. This makes it difficult to meet shipper demands and is a problem for increasing transportation volume. Moreover, there is no transportation company to handle small off-rail freight, meaning that shippers have to make their own arrangements. The present system does not adequately ensure the smooth flow of freight from a freight forwarder to a freight receiver.

(2) Measures for improvement

The Hanoi-Ho Chi Minh Line, which forms a north-south axis and is the most important transportation artery in Vietnam, will need the following market-oriented improvements to complement the basic transportation improvements in track, rolling stock, etc. to be executed from hereon:

1) Changes in the arrangement of stations

The middle to long-distance mass transportation capabilities of the railway should be realized, taking into consideration the future fast progress in socioeconomic recovery and activity and harmonization with other modes of transport (especially trucks). For this reason, it is necessary to rearrange stations in order to realize these capabilities more easily. As mentioned before, 123 stations out of 163 stations account for only 10% of total freight volume on the line. Therefore, these stations should be focused on in the rearrangement and the other stations either eliminated or integrated.

2) Improvement in transportation system

Because growth in the gross distribution volume and development of the infrastructure will both advance in line with economic development, it is expected that each mode of transportation will develop and increase its transportation volumes. Under these circumstances, the areas where the railway can exploit its own characteristics are, assuming low costs to be a precondition, exclusive direct transportation for bulky cargo, and container transportation for general cargo. In order to make such forms of transportation work, the transportation of bulky cargo must be in large units and set forms, and the container transportation of general cargo must be fast and make arrival times clear.

Container transportation can be further broken down into the domestic transportation of marine containers, which targets international cargo, and the domestic transportation of containers which targets domestic cargo.

If one takes a look at the current cargo transportation of VNR, it can be seen that the share accounted for by rail transportation is small and the railway is not fulfilling a sufficient role. With respect to general cargo, the reasons for this are insufficient on-rail transportation service and a poorly developed feeder transportation service.

Consequently, regarding the transportation improvements to be made from now on, it will be necessary to develop container transportation suited to general cargo moving along the north-south line. This will need to involve the establishment of container bases in Hanoi, Ho Chi Minh and on other major distribution sections, together with the development of feeder systems between container handling stations and customer doorways, in order to implement a transportation service that is fast and can give clear arrival times through the provision of an integrated, doorway to doorway transportation service.

Through doing this, major increases can be expected in transportation loads on the north-south line, along which the movement of general cargo, which is suited to container transportation, is great.

Regarding the domestic transportation of marine containers, as it is expected that the large proportion of demand for this will be concentrated in the major cities of Hanoi and Ho Chi Minh, as well as conducting a rail, marine container transportation service between Hanoi and Cai Lan Port, which is to be developed as a container port, the use of rail transportation shall be promoted in other sections where a demand for marine container transportation can be anticipated.

Although no specific recommendations regarding container transportation along the north-south line were made in the Study, the Improvement of Freight Transportation Capacity Study, which the JICA Study Team proposed be implemented by 2000, should be advanced straight away as a means of making clear the concrete methods for and effects of container transportation.

3) Improvement in freight handling facilities at stations and establishment of off-rail freight system

As for the above-mentioned improvements, it is necessary to improve the freight handling facilities including the improvement of the superannuated and dilapidated facilities, and introduction of freight handling machines. Further in order to strengthen ties with existing forwarders in each region, new transportation companies for railway freight should be established and nurtured when necessary.

Estimated Transport Volume on the Hanoi-Ho Chi Minh Line

Passenger transport (unit: thousands)

Year	National			Hanoi - Ho Chi Minh Line		
	Ps/year	Ps-km/year	Index	Ps/year	Ps-km/year	Index
1980	33,815	4,487,707	100	18,263	3,380,590	100
1981	21,682	3,011,708	67	9,908	2,150,521	64
1982	18,692	2,952,919	66	9,332	2,263,276	67
1983	21,201	3,009,750	67	9,435	2,157,424	64
1984	23,723	3,628,591	81	10,602	2,688,519	80
1985	19,120	3,358,684	75	9,396	2,638,676	78
1986	21,127	4,195,605	94	11,110	3,445,866	102
1987	24,042	4,884,071	109	12,152	3,965,516	117
1988	17,750	3,505,558	78	8,632	2,857,365	85
1989	11,768	2,109,341	47	5,232	1,656,141	49
1990	10,443	1,912,957	43	5,057	1,544,440	46
1991	9,158	1,757,060	39	4,567	1,424,316	42
1992	8,719	1,751,663	39	4,358	1,436,202	43
1993	7,793	1,720,384	38	3,675	1,400,530	41

Note 1: Based on documents provided by VNR.
Note 2: The index is for Ps-km (passenger-km) and uses the figure for 1980 as 100.

Estimated Transport Volume on the Hanoi-Ho Chi Minh Line

Freight transport (unit: thousands)

Year	National			Hanoi - Ho Chi Minh Line		
	Tons/year	Ton-km/year	Index	Tons/year	Ton-km/year	Index
1980	3,509	752,080	100	1,275	402,411	100
1981	3,420	786,765	105	1,361	491,153	122
1982	3,235	650,331	86	1,222	378,946	94
1983	4,209	757,652	101	1,566	424,944	106
1984	4,146	838,414	112	1,525	485,912	121
1985	4,050	863,785	116	1,582	518,103	129
1986	4,137	960,601	128	1,663	571,256	142
1987	4,003	1,001,173	133	1,521	588,591	146
1988	3,923	1,015,575	135	1,432	582,083	145
1989	2,432	743,329	99	915	422,973	105
1990	2,341	847,023	113	992	489,337	122
1991	2,567	1,103,309	147	1,215	707,293	176
1992	2,774	1,076,879	143	1,298	689,796	171
1993	3,137	978,132	130	1,581	601,797	150

Note: The index is for Ps-km (passenger-km) and uses the figure for 1980 as 100.

8.2.3 Vehicle transport

(1) Demand of car transport

Several Japanese and USA motor vehicle manufacturing companies are now constructing factories to assemble cars in Hanoi on the line of domestic production policy in Viet Nam.

Targets of production by respective companies are said as follows:

TOYOTA	20,000/year
Ford	20,000/year
DAIHATSU	15,000/year
Mitsubishi	15,000/year
Honda	motorbike

These target will be achieved in around 2010 and about half of them will be assembled in 2000. It is estimated that approximately 70% of cars produced in Hanoi will be sold in Ho Chi Minh City and southern part of Viet Nam and transport of cars to the southern region is necessary.

Production of cars will be commenced soon and first cars will be transported in coming July. Therefore, establishment of car transport system is an urgent issue.

How to transport to Ho Chi Minh, 1,700km is a serious problem for companies now.

Alternative 1: Road transport

Transport by road using carriers is impossible because road condition is bad and big carriers will disturb road traffic.

Alternative 2: Transport by ship

There are no ship to transport cars and lot of cars is too small for sea transport.
Monthly or weekly transport by ship will not satisfy the request of customers, because they want to acquire cars ordered as soon as possible.
Transport by ship will be commenced after 2000 with monthly frequency and the remained demand will be transported by railways every day.

Alternative 3: Transport by rail

Transport by rail is the most possible transport means at present.
Therefore, the railway transport is the most dominant transport.

(2) Issues to transport cars and countermeasures

However, there are many technical and safety problems need to be resolved in transport by rail.

- Stain and dirty mark by oil and smoke discharged from diesel locomotives.
- Robbery of parts
- Throwing stones
- Cost reduction by efficient loading, and
- Prompt delivery for customers

(i) Prevention of stain and dirty marks

Washing at destination station or coating of paint was tried in Japan, but they were not succeeded. Using sheet cover for cars loaded on upper floor is the final solution for this issue. Design of sheet covers were investigated with aerodynamics in order not to flutter in the wind. Design and material of sheet have densely relations, so that special designed sheet covers need to be used.

(ii) Robbery of parts

There are wary for robbery of part of cars. Trains that transport cars is better to pass almost stations without stopping. This train runs like as express passenger trains

(iii) Throwing stones

If there is damage by throwing stones, it is necessary to guard wagon sides with nets.

(iv)Cost reduction by efficient loading

Fig 8.2.2 shows a car carrier wagon in Japan. Cars are loaded with double decker and the capacity to carry is twice that of a flat wagon. Cost of car transport will be reduced.

(v)Prompt delivery for customers

A car that are ordered from a customer will be assembled in one or two days with current production system. Reduction of stock volume is one of the most typical production management in car production.

Therefore, motor vehicle need to be transported as fast as possible. Railway transport has dominant in this point, because it is possible to transport every day.

(3) Recommendation to transport cars

(i) Demand

Demand by 2000 will not sufficient for a train every day, so that car carrier train will be operated every 2 or 3 days.

A train will be operated every day after 2000 and it will be 2 trains every day in 2000. However, some part of demand may be taken over by sea transport after 2000.

(ii) Carrier

45 Carriers shown in Fig.8.2.2 are idle in Japan due to stopping of car transport by rail. It is better to use these carriers with traversers for an urgent demand.

Feature of carrier:

Empty load	22 ton
Pay load	12 ton
Maximum speed	100km/h

Unit cost:

Unit price of used carrier	US$ 4,000
Bogie modification from 1,067mm gauge to 1,000mm gauge	US$ 10,000
Cost for insurance and freight	US$ 10,000
Total cost	US$ 240,000/wagon
2 set of traverser	US$ 10,000(CIF)

(iii) Terminals

Factories of cars are located around Phuc Yen station, so that the terminal in Hanoi will be Phuc Yen station(39.0km from Hanoi) on Lao Cai Line and that in Ho Chi Minh City is Song Than station.

(iv) Management

Prompt actions are necessary to commence car transport from July in 1996. If request to use used wagons in Japan is delay, wagons will be scrapped at the end of this year. Therefore, it is recommended that a private sector composed with car manufacturers and forwarders owns these wagons and operates loading and unloading at both terminal stations.

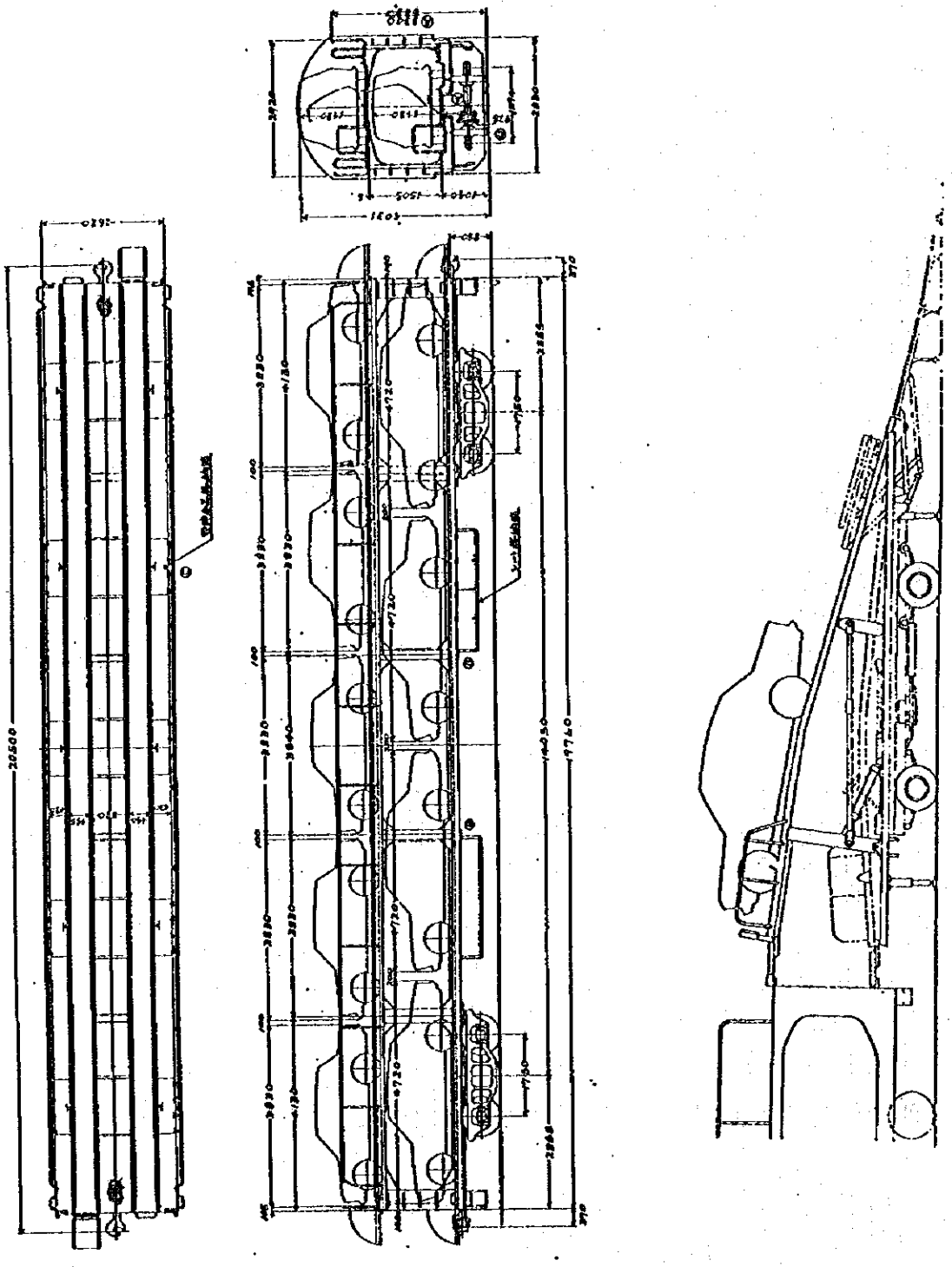

Fig. 8.2.2 Car carrier wagon and traverser