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	54,408	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	7,241	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.

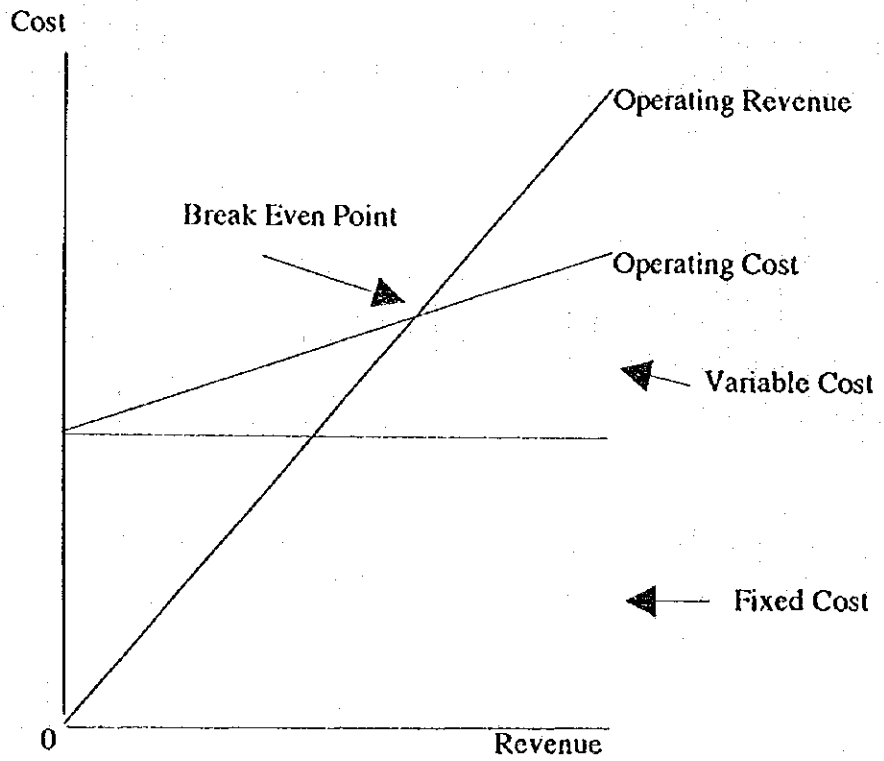


Fig. 5.2.1 Break Even Analysis

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	807,491
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	4.65
	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 Activcation 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	-1,763	-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 Accountng 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 JFTC 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	-24,393	-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 Activcation 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 responsibility 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 Studies on the Rehabilitation and Improvement of the Lao Cai-Cai Lan Line

Chapter 6 Introduction

The Lao Cai-Cai Lan line itself is composed of two parts, and consequently feasibility study on this whole line is separated into two;

first; Feasibility Study on the Rehabilitation and Improvement of the Hanoi-Lao Cai Line,

second; Feasibility Study on the Rehabilitation and Improvement of the Hanoi-Cai Lan Line.

This is because;

(1) Rehabilitation principles of two parts of the Lao Cai-Cai Lan line differ from each other since the status of existing infrastructure concerned are different.

(2) For the Cai Lan line, there are many urgent tasks besides ordinal rehabilitation works, to investigate and evaluate such as an extension of railway service to the Cai Lan Port Station, a change in gauge, a construction of new short-cut line. All these tasks are incorporated with each other, and the contents of one project might significantly influence the contents of other project.

(3) Potentiality of transport demand in the future are so different from each other. Especially the cargo handled at the new Cai Lan Port is determinant of the industrial development in the hinterland of the Port which is expected a significant expansion of cargo transport demand. On the contrary, the demand of Lao Cai line is expected to stagnate at the present level.

(4) Through traffic which uses both the Hanoi-Lao Cai line and the Hanoi-Cai Lan line, is limited even in the future and is expected to function independently from each other. This also give a rational to a separate treatment of two lines.

Section 1: Feasibility Study on the Rehabilitation and Improvement of the Hanoi - Lao Cai Line

Chapter 7 Long-Term Development Perspective up to 2010

7.1 Regional Development Perspective

The area along this line has a scarcely populated area and its economic activities have not been active. In a context of the focal economic area scenario, it is expected that this area will be left far below the national average.

Tables below shows GDP and population of the major 5 province.

Table 7.1.1 GDP Projection

	GDP		
	1994	2000	2010
Lao Cai	57	85	139
Yen Bai	93	142	378
Vinh Phu	366	529	1,304
Hanoi	1,037	2,175	7,159

Source; SPC, and the JICA study Team's projection

Table 7.1.2 Populations

	Population		
	1994	2000	2010
Lao Cai	537	604	735
Yen Bai	658	762	925
Vinh Phu	2,246	2,469	2,777
Hanoi	2,186	2,348	2,536

Source; SPC, and the JICA study Team's projection

Major industry at present and in future along the line are mining. Along this line, there are many kinds of mineral resources are under exploitation or be investigated. Major ones are:

Apatite; 100 million tons are subject of exploitation (120 million ton reserved)

iron ore; 119 million tons (reserved)

Iron ore exploitation is deadlocked because of transportation cost. The price of break-even point of the iron ore company is 1.5 US cent/km-ton, while the VNR requests the company 2.5 US cent/ton-km.

There is no other industrial development plan and tourism development plan envisaged.

However, it is a very potential tourism spot. That is Sa Pa and Tam Dao. The former does not have a transport access at present. But it is a one of the best resorts to spend a summer season. The later are also attracting the people. There is a possibility that those resorts will be more developed and raise the transport demand in the future. However, no concrete development plans have been prepared.

7.2 Role of Railway and Hanoi - Lao Cai Line

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

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

(1) To assure an east-west axis of transport network

This line forms a very east-west axis in the northern part of the Viet Nam, pivoting at Hanoi. Actually some of the products are planned to transport to the Cai Lan Port via Yen Vien station. This requires to guarantee the fundamental features of railway; safety and stable operation. Since there are some reports of natural disasters, the counter-measures must require a due attention.

(2) To assure an access to a remote area with no other transport mode

This suggests that the continuous operation of the Hanoi - Cai Lan line should be guaranteed so as to keep a daily life of the inhabitants along the line. Many of the freight are the goods that the merchants are dealing with and are carried by themselves. They do not have any substitutive transport mode, and this can be especially true for the section between Lao Cai and Yen Bai.

With the assured operation with safety and stability, any people can have an access to the market. Without it, revenue sources will be confined, and widen the regional disparity of the income.

(3) To transport the mining products, and to provide a foundation of fertilizer industry and agriculture

In Lao Cai province, there is an apatite mining and there produces 300,000 tons of apatite every year. And its company have a plan to increase the apatite production according to the capacity of railway transportation. These apatite will be used as a material for the chemical fertilizer that contributes to increase the agricultural production. The railway service should be sufficient to serve this kinds of large customers by guaranteeing the safety, stable operation, and line capacity. At present, the major rehabilitation task falls on safety assurance measures.

(4) To share the potential international freight transport in future

Lao Cai station has been already rehabilitated to cope with a international freight from China. International agreement of railway service has not yet been contracted, but the VNR has already commenced a preparation for it.

Volume of freight from/to China has to face a sever competition with a new Nanning - Kumming line, which leads to a sea shore and a deep sea ports are available in its own territory. When we consider the alignment of railway with continuous small curves, it is judged that the

increase of the traffic is not so easy task. However, it is necessary to pay attention to the way how to cope with an increase of freight volumes on this line.

7.3 Outline of Long-Term Railway Development

Long term perspectives for this railway development is outlined in "The Study on the Transport System of the Northern Part in Viet Nam (JICA, 1994)," which sets a target year at 2010. In this study, some modifications are also involved in relation with the Cai Lan Port Plan.

Major tasks of the rehabilitation up to the year 2010 are a restoration of the safety operation and the operation rationalization.

(1) Safety restoration

Major elements of this task are bridge rehabilitation and realignment of curve.

There are many curves with radius less than 100 m between Bao Hao and Lao Cai. This can be an obstacle to guarantee the safe and stable operation. The geographic condition, it is judged, is stable enough to conduct a shift of track toward the mountain side, and realignment of the sharp curves with R=100 m. In addition, river bank protection works are also important to conserve the bridges free from the wash-away.

Signaling improvement are also required in terms of tokenless, and color light signaling.

(2) Management rationalization

This aims at transforming the VNR management into a new one operated with a minimum cost. Major element is an integration of cargo handling stations into a few stations. Number of station staff are also required to be reduced. And it is requested to introduce some machines for loading, and machines/tools for the track maintenance such as rail welding machine, hopper car and so on.

All the rehabilitation plans are formulated in a small scale of investment. This is because the future railway demand is expected to be stagnated. There are three major items that affect the railway demand and its rehabilitation plan.

In order to increae the passenger demand and revenue, an improvement of station buildings are important as well as an introduciton of the reservation system.

(1) Apatite

Exploitation of apatite is active. However, in projecting the future volume of apatite transportation, a difference in prices of apatite between a local one and international price has a significant impact. Former is priced at 30 US$/ton at average, while the latter is only 20 US$/ton. Large demand of apatite does not necessarily result in the increase in apatite transport demand. The mild increase of the apatite transport is assumed in this study.

(2) Iron ore

Exploitation of the iron ore mining along this line is judged not feasible because of its transportation cost. And thus the transport demand of iron is not realistic assumptions for the demand forecast in the future.

Pay-off charge of the iron ore company is 1.5 US cent/ton-km for the mining company, while the VNR's charge is 2.5 US cent/ton-km. There has been no compromises between two. Market principle suggests as many feasibility study on this mining project that the iron ore development be suspended since it cannot be paid off for both the VNR and the iron company, and reveals that the more the iron ore is exploited, the more deficit compounds.

One exemption is the case that trickle-down effect of iron ore exploitation can overweight the pecuniary deficit of the private company, which has to be compensated by the government subsidy. While the government can induce the more job opportunities, additional production of iron and related industries attributable to the new iron own exploitation.

(3) International transport

International transport between Vietnam and China by means of the Lao Cai line can not be expected as described in "Master Plan in the Northern Part of Viet Nam". The reasons are:

1) Service commencement of parallel line in China

In 1997, the new railway line between Kunning and Nanming is to commence. Service commencement of this line will lessen the transportation burden of the Hanoi -

2) High charge for container and freight shipping

Charges of container of the shipping service stationed at the Hai Phong port are set 2 times as high as that of the neighboring country. If this level of charge is applied to the container stationed at the Cai Lan port, the price will depress the demand of international container transport.

Chapter 8 Principles, Target, and Technical Standard for Rehabilitation and Improvement up to 2000

8.1 Principle

8.1.1 Principles

The Team formulated the projects, following the principles below.

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

(1) To assure a safety and stable operation all over the line

These two feature the most important role that the railway has to share. Whenever it is, the railway service should not be suspended and a safety of the operation should be guaranteed. In this sense, a track improvement and a rehabilitation of deteriorated bridges are indispensable. In addition, anti-natural disaster measures should be well facilitated. With these measures, the safety and stable operation can be guaranteed.

(2) To induce a management rationalization

It is not expected to increase drastically the revenue both from the passengers and freight. That is why there must be a management target to reduce an expense. Such a measure includes to an integration of cargo handling stations, an abolishment of station staff, installation of cargo handling facilities at the main stations etc. On the other hand, more user-oriented booking system should be introduced. With these measures, it is suggested to reduce the expense and to increase the revenue.

(3) To induce a modernization of maintenance works

This aims at introducing new equipment and facilities for the maintenance works. Those includes truck and motor car, crashed stone machine, potter car etc.

With a introduction of new facilities, it is suggested to induce the capital intensive maintenance works that cost totally less.

8.1.2 Priority Section: Selection Criteria and its Results

In selecting the priority section, the Team picked up one priority section from the Lao Cai - Cai Lan line. And unfortunately, no part from the Hanoi - Lao Cai line was designated as a priority section.

Details are explained in the corresponding part of description on the Hanoi - Cai Lan line.

8.2 Target

Target to be obtained by 2000 with the program 2000 and perspectives until 2010 are shown in Fig 8.2.1 Target of Hanoi-Lao Cai Line.

Target of Ha Noi-Lao Cai

Items	1995	2000	2010
Total Track Length	Hanoi-Lao Cai 293.6km		
Fixed Facility Improvement			
Track Structure	43kg/m, 12.5m in length	43kg/m, 12.5,/25m in length	43kg/m, 12.5m/25m in length
Track Maintenance Machines		A set of machine for 10 depots	
Rail Welding		Rail welding to 25m rail, 200km	welding completed, long rail
Ballast Thickness	150-250mm	200-250mm	≥250mm
Long Bien Bridge		Survey, study and urgent repair	Replacement completed
Bridge Rehabilitation		Inspection.	Being improved
Train Blocking System	Tablet, mechanical interlocking	Tokenless, electric interlocking, color light signals	Modernized
Telecommunications	Bare wire line	Underground cable and wireless transmission (Hanoi-Viet Tri)	Modernization completed
Train Operation			
Maximum Speed on Track	60km/h	80km/h after modernization	80km/h after modernization
Maximum Operation Speed	60km/h	70km/h with improved D4H	80km/h by D12E
Locomotives	D4H,D5H	D4H, D5H, double heading,D12E	Same as 2000
Passenger Trains	HN-LC 2,HN-YB 2,YB-LC 1	HN-LC Ex2, Locl 3.HN-YB Ex1, Lcl 1.HN-VT Ex1,Lol 3.	4 Express, 4 local trains
Planned Travel Time	Express 9h 50m	9hs	8 hours
Planned Commercial Speed	30km/h	33km/h	37km/h
Prevention of Disasters		Train operations are restricted during heavy rains and strong wind	
Management Improvement			
Unmanned Station Excluding Dispatchers: D Anh-Lao Cai	Staff for sales, cargo, dispatching and point switching	Unmmanned stations are 13 Manned stations are 20	Same as 2000
Installation of Spring Points	Manual switching	24 stations	Same as 2000
Cargo Business:D Anh-LCai	28 stations operated	General 4 stations, bulk 5 stations	Same as 2000
Cargo Loading Machines	None	4 main stations	Same as 2000
International Transport			
Passenger and Freight	Transport by domestic ones	By domestic transport	Transit train after agreements

Fig.8.2.1 Target of Hanoi-Lao Cai Line

8.3 Technical Standards

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

1) Gauge	: 1000mm
2) Minimum curve radius	:300m 150m(special case)
3) Maximum gradient	:12‰ (Yen Vien- Lao Cai) 9‰ (Lao Cai Yen Vien)
4) Rail	: 43kg/m 25m length
5) Sleeper	: 2 block RC sleeper
6) Ballast depth	: 30cm
7) Turnout on main line	: 1:10
8) Railway formation width	: 5.0m
9) Design live load	: 14tons/axle(double locomotives)
10) Maximum cant	: 95mm
11) Allowable cant deficiency	: 50mm
12) 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)
13) Submerged frequency for design at flood prone section	: 1/10 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)

(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.

(2) Minimum curve radius shall restrict the train speed most seriously after structures are repaired.

(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 ; $i' = 600/R$ ‰

(4) Heavy rail makes a great contribution to keep the track stability. It is desirable to change to heavier rail step by step.

(5) Monoblock PC sleeper is superior than 2-block sleeper in anti-vibration and workability of tamping. When current 2-block sleepers deteriorate, mono-block sleepers should be replaced.

(6) 25cm ballast depth is enough by using monoblock sleepers.

(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.

(9) 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.

(10) The allowable maximum cant for 1000mm 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, because such competition causes derailment.

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

(12) 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.

(13) 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.

8.4 Overall Rehabilitation Plans for Hanoi-Lao Cai Line

The gap in economic development between the Northern Mountain and Midland Region and the Red River Delta is forecasted to increase. Socio-political considerations require the economic growth of the Lao Cai Line to keep pace with national economic growth. This requires an improvement in the quality and efficiency of the service of the line.

Since the road network along the Lao Cai Line is not adequately developed, especially in the section between Yen Bai and Lao Cai, railway transport service should be improved.

Current and anticipated future passenger and freight demand on the line is rather limited for a commercially oriented railway operation. The line needs to have cost efficient system.

This improvement plan excludes that of Hanoi, Yen Vien and Dong Anh stations because they should be improved with Hanoi urban area transportation improvement plan.

(1) Passenger transport

Railway and road links in the plains continue up until Viet Tri and Yen Bai. Since road improvements plan will not be adequate until 2000, the railway can compete with the road. Therefore, the railway should prepare more frequent service than current operation until Viet Tri and Yen Bai.

The line is an important means of transport for residents between Yen Bai and Lao Cai. The railway needs to prepare adequate transport services beyond Yen Bai.
High-grade service will be planned for international passengers and tourists in order to attract and increase the number of profitable passengers.

(2) Freight transport

General cargo is not increasing much. However, the modernization of freight marketing is necessary. Loading machines will be installed at Viet Tri, Yen Bai, Pho Lu and Lao Cai. On the other hand, freight operation at other stations with small amount of cargo should be closed.

The transpiration of petrochemical products is dangerous, so they should be carried by rail. Petroleum terminals with siding, an oil pumping system and oil tanks will be constructed at the Yen Bai and Lao Cai stations. The marketing area of the Lao Cai oil terminal will expand to China in the near future.

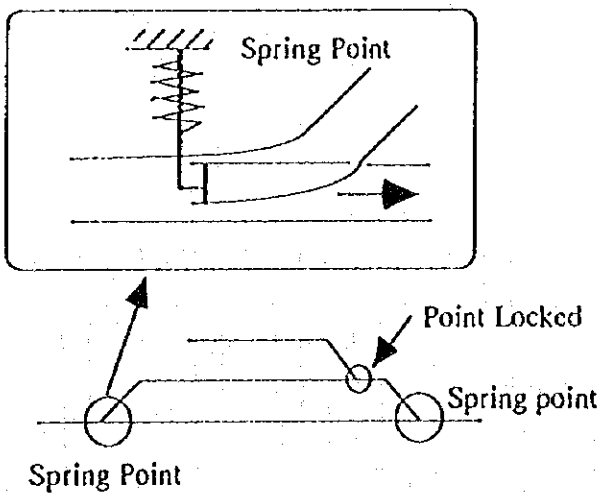
The transpiration of apatit will be transported by using current spare of transport capacity.

Regarding the transportation of iron ore, there should still be enough capacity to handle this. If the demand of iron ore transport exceeds excess capacity of the line, investment to increase transportation capacity should be realized by an iron ore development project. VNR should receive a profitable tariff from the mine.
In a free market economy, the railway does not need to bear extra charges nor investments for mineral resources transport.

(3) Fixed facility improvement

Track maintenance machines and equipment will be installed to modernize and improve of productivity. A rail by sections of two are planned to be welded. As a result, track maintenance productivity will be raised. The maximum speed of train will also be increased, but the capacity of locomotives for raising the maximum speed will be limited.

The signaling system will also be modernized. A tokenless blocking system and color light signals will be installed simultaneously. Electric power supply facilities will be constructed for stations with no electricity.



Turnouts at stations, except for the 4 main stations, will be modified. Points, a part of a turnout will be replaced with a spring point. As a result, point-men at stations will be

eliminated. Unnecessary sidings and turnouts will be removed or locked. When a siding must be used for an emergency or temporary operation, a conductor unlocks it with a key.

(4) Overall management improvement

The prospects for demand and revenue on the Lao Cai line are not bright.
This is a due to the depopulation of this region may be progressed according to the development of Viet Nam economy.

The Lao Cai line needs to have a cost efficient system in order to modify for a commercially oriented management. One of the important strategies of investment is to contribute to the reduction of operation costs in the future.

- Passenger and freight operation staff at stations except for Viet Tri, Yen Bai, Pho Lu and Lao Cai should be eliminated due to the small number of customers.
- Freight marketing will be closed at all stations except for Viet Tri , Yen Bai, Pho Lu and Lao Cai
- Staff for point operation will be eliminated by installing spring points.
- Track maintenance work will be reduced as a fruit of modernization investment.
- The tokenless interlocking system, colors light signals, and supply of electricity to a station will make the work of dispatchers and drivers be easy.
- Rail welding will reduce track maintenance work

Increasing revenue is essential for the business of the line. Therefore, innovations with passenger car accommodations is important.
Reserved seats will be expanded and a seat reservation systems will be installed at Viet Tri, Yen Bai, Pho Lu and Lao Cai stations. Reserved seats tickets will also be sold at the Sapa resort(e.g. Sapa post office) via Lao Cai station.

The apatit mining railway lines should be separated from the management and operation of VNR. The mining railway should be managed by a third sector railway company. Train operation and maintenance within the mining railway network and investment for fixed facilities and rolling stock for wagons should be supported by mining finances.

A weighing machine should be installed at Pho Lu Station in order to detect over loaded or bias loaded wagons for bridge safety and preventing derailment at small curves. A bias loaded wagon that has difference weight by over 10% between right and left wheels should be cut off in order to prevent derailment.

It is impossible to prevent natural disasters but it is possible to prevent train accidents caused by natural disasters. When there is heavy rainfall, train operation should be stopped. Rain gauges will be equipped at 4 main stations or track maintenance depots. The standard for restricting train in Japan is explained in the train operation chapter.

The relationship between rainfall and disasters has been studied and conclusions reached based on data for Japan.
It is recommended that VNR apply temporarily the standards of Japan and then study the above-mentioned relations and modify the standards in the near future accordingly. Slide detector devices will be installed at embankments near the Red River in order to detect embankment washouts.

The following improvements and measures are planned for the line:

- The frequency of passenger train operation from Hanoi to Viet Tri and Yen Bai will be increased.
- Passenger cars accommodation will be improved.
- Ticket reservation systems will be installed at the Viet Tri, Yen Bai, Pho Lu and Lao Cai stations. Seat reservations for the Sapa resort will be possible from the Lao Cai Station.
- Buildings and accommodations at the Viet Tri, Yen Bai, Pho Lu and Lao Cai stations will be upgraded
- Spring points will be installed at turnouts.
- Staff, except for dispatchers at stations excluding the Viet Tri, Yen Bai, Pho Lu and Lao Cai will be eliminated.(Stations will be unmanned except for one(1) dispatcher)
- Loading machines will be installed at the Viet Tri, Yen Bai, Pho Lu and Lao Cai stations
- Other stations that have small amounts of cargo will be closed.
- An oil terminal will be constructed at the Yen Bai and Lao Cai stations.
- Weighing machines will be installed at the Pho Lu Station.
- Track maintenance work will be modernized and the number of track maintenance staff reduced.
- Rainfall gauges will be installed at the main stations or track maintenance depots.
- A tokenless blocking system and color light signals will be installed. Electric power sources will also be constructed for stations with no electricity.

8.5 International Transport Plan for Lao Cai Corridor

(1) Prospects for international transport

Diplomatic negotiations to reopen international transport between Viet Nam and China is underway. Railway facilities for border connections have already been prepared. Political uncertainties make demand forecasting for international transport extremely difficult.

Transit cargo from Yunnang Province is not expected after 1997.

China Railways has been constructing a new high grade electrified railway line from Kunming to Nanning. Therefore, the utilization of the Lao Cai Line from Kunming to Hai Phong Port will drop after the completion of the this electrified new line in 1997. Moreover, the high shipping tariff of Hai Phong Port presents a further obstacle to transit cargo. Demand of container transport from Yunnan Province to sea ports is estimated as 19,000TEU in 2000.(Sources: Trans-Asian Railway Study by ESCAP in 1995) As a result, the tentative demand forecast for the Lao Cai corridor is that there will be very small transit cargo and that border trade will be small due to the small scale of the local market. Moreover, China Rail ways has intention to covert the gauge from 1,000mm to 1,435mm in the future. Consequently, almost cargo to sea ports in Yunnan Province will be transported through 1,435mm gauge in China.

(2) Measures for international transport

International transport is better to be operated by means of domestic transport.

1) International passenger

Lao Cai Station will have no immigration facilities or offices. Passengers who have finished immigration procedures will take a train at Lao Cai Station. VNR will supply high-grade passenger cars for them and a comfortable waiting room at the station.

2) Border cargo

Cargo from China that has passed customs will be transferred VNR wagons at Lao Cai Station.

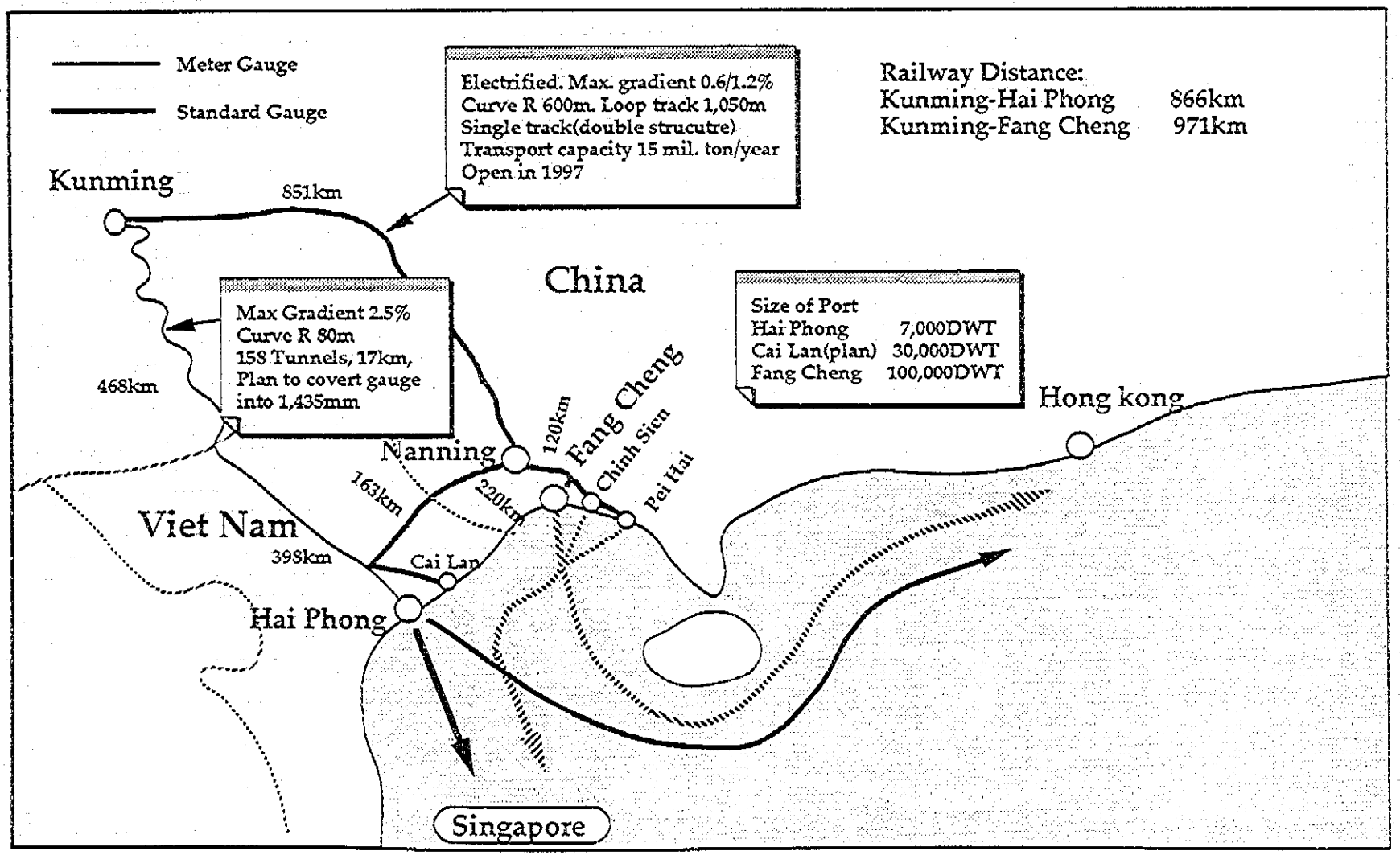
3) Transit cargo

Small loading machines will be installed to modern domestic freight transportation at Lao Cai Station.

However, these machines don't have the capacity to transfer containers from Chinese wagons to VNR's wagons. Transit cargo is transshipped as same means as border trading cargo for a while.

A diplomatic agreement would be necessary to transport cargo and containers with respective wagons without transshipment.

Fig. 8.5.1 Container Transport Route from Kunming to Ports



Chapter 9 Current Conditions, Problems and Countermeasures

9.1 Management

9.1.1 Situation of Management and Contestability of Railway

Hanoi-Lao Cai Line belongs to Union 1 and is suffering from managerial deficit. Main reasons for the deficit are that traffic volume is small as a whole, train speed is slow with average speed ranging from 20 to 30 km/h, transport capacity is shortened and maintenance cost is increasing. Besides, it is negative factor for management that there are many free riders on trains.

There is freight transportation between Lao Cai province and China. Chemical products and gypsum are mainly transported from China and mining ores are transported from Vietnam. Most of cargoes are arriving ones at Yen Bai province and cargoes for departure are very few except apatite ore, coal, cement and tea for export which are transported mainly through Hai Phong Port.

Passengers between Yen Bai and Lao Cai are occupied by commuters as 70%, farmers to sell their agricultural products and others. This line has been important transport means almost like foots for local residents.

Inter regional transport of long distance by railway has an advantage in points that traffic volume by ship on river is few and transport cost by road is higher than railway because road(ex. national road, No.70) is runs on steeper mountainous area with many curves.

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

9.1.2 Policy for Increasing Revenue

(1) Passenger

Hanoi-Lao Cai Line has railways of 200 to 300km which are suitable distance for the best use of railway characters. As policies for increasing passenger revenue, speeding up of train by strengthening track, improvement of accommodation for passenger coaches and strengthening transport capacity should be carried out. Platforms are crowded by sales of agricultural goods, descending and ascending of passengers and luggage handling. Various devices are requested to shorten time for train to stop at station. These devices

include leveling floor of coaches and platform and introducing new handling machines to stations.

There are two big tourism attractives such as resort in high land Sapa and Thac Bac Reservoir alongside Lao Cai line. If market pioneering by operating high speed through train and packaging hotel reservation and round trip of attractive points is conducted, drastic increase of tourists can be expected.

(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 like apatite, 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 transportation cost and to promote container transportation by constructing inland container depots (ICD). Positive market pioneering must be developed by the strategic establishment of fare toward generating railway traffic demand.

9.1.3 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. Lao Cai station has a plan to construct and facilitate a square in front of the station, planting trees, separation of building by function such as office for staffs and dancing hall, cargo handling machine and so on. The station will be the breathing place for local residents in the near future. The multipurpose use of station will induce traffic demand so that revenue will increase which is called "synergy effect".

We recommend that the most of stations must be facilitated with equipment for luggage handling, restaurants and resting room for farmers to come to stations to sell their agricultural products so that not only many passengers but residents will be attracted to stations.

Besides, hotels in front of stations, telephone boxes, wider space of waiting room and simple sports equipment like table tennis are needed to be facilitated with local cities.

Expansion and promotion of new business by multi-functionalizing stations should be carried out and multipurpose 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, and passenger transport service by taxi between station and company or home by contract between station and taxi company as well as hotel construction. These terminal transport service must be strongly promoted as complementary function for railway transport because it leads to save transport time in total.

9.1.4 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.

9.1.5 Revision 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

9.2 Railway Transportation Market

(1) Current status & problems

The Lao Cai Line is both an important transport route for Yen Bai and Lao Cai provinces in northern Vietnam and an international communications route linking Vietnam with Kunming in the Chinese province of Yunnan.

Passenger transport on this section has shown a tendency to decrease somewhat. In 1993 the line carried some two million passengers for 180 million passenger kilometers for a transport density (passengers per kilometer of commercial track) of 1,683 passengers per kilometer, a transport volume slightly less than on the north-south line end-to-end. On the other hand, a relatively large number of persons make use of the train stations, and the weight of passenger mobility along the line is considered to be high.

There are round-trip express trains between Hanoi and Lao Cai each evening and afternoon on this section, and two round-trip local trains daily to Yen Bai. Travelling time over the 293km between Hanoi and Lao Cai is about ten hours, at a running speed of about 30kmh.

The area along this line has mineral resources, and freight transport consists primarily of apatite, fertilizer, cement, quarrying and the like. Thirty-six stations along this section (including branch lines) handle 1.28 million tons of freight a year. Twelve of these stations handle over 10,000 tons of freight a year, accounting for 96% of the total with 1.23 million tons between them. Therefore, the remaining 24 stations, with 48,000 tons, handle no more than 4% of the total.

The majority of the freight consists of apatite from Pom Han to Lam Thao, and fertilizer shipped from the fertilizer plant in Lam Thao throughout the country. To handle this freight transport, in addition to a dedicated freight train making three round trips daily between Pom Han and Lan Thao, and four scheduled round trips daily from, for example, Tien Kien towards Hanoi, there are two scheduled round trips daily by local trains on the length of the line.

Stations Handling Freight Ranked by Volume

Volume of Freight	Stations	Tons	Thousand Tons per Station
100,000 tons or more annually	3	966,000 tons	Co Loa 105, Lam Thao 441, Pom Han 420
10,000-100,000 tons annually	9	264,000 tons	Dong Am 52, Vinh Yen 11, Viet Tri 16, Phu Duc 32, Tien Kien 32, Yen Bai 43, Lam Giang 18, Pho Lu 48, Lao Cai 11
Subtotal	12	1,230,000 tons (96%)	
Under 10,000 tons annually	24	48,000 tons (4%)	
Total	36	1,280,000 tons (100%)	

N.B. 1. Tons handled are totals departing and arriving.
2. Figures in (parentheses) are percentages of total tons of freight on this section.

(2) Measures for Improvement

Yen Bai, Pho Lu and the like serve over a thousand passengers a day, and other stations have a considerable number of passengers as well. As this region has a high mobility weight and there is a demand for thorough transport services in the region, it is necessary to increase the speed and frequency at which trains run, to upgrade the passenger cars and otherwise work to attract passengers and expand their volume.

As the transport of apatite, fertilizer, cement and other essential resources has a high weight among freight transport, the allocation of stations shall be reorganized around Co Loa, Dong Am, Tien Kien, Lam Thai, Yen Bai, Pho Lu, Pom Han, Lao Cai, etc., and capacities intensified at stations now handling little freight. This will require an effective scheme of operation for combining passenger and freight traffic on this section.

The necessary measures for international communications and transport would be implemented in view of how the situation develops in future.