15. OUTLINE ESTIMATION FOR DEVELOPMENT COSTS

15.1 CONSTRUCTION IMPLEMENTATION PLAN

The condition of construction sites, construction performance, experiences, machine and equipment available in Paraguay, the findings shall be considered as basic information for estimation.

15.1.1 Division of the Project Road into Subsections

Since the objective road has approximate 320km total length, it is necessary to divide it into some sections to implement the project efficiently. In the fist stage, objective road can be divided into following 3 groups;

1) Parana River Coastal Road,
2) Extension of National Road Route 15, and
3) Port access road of Natalio southward.

Regarding Parana River Coastal Road, the road (M-1 to M-8) has been divided into more 3 sections considering priority and earthwork volume and numbers of structures, and also considering the start of the construction at the same time.

The result of the dividing work of the construction lot is as following;

Section 1 Natalio～Intersection
Section 2 Intersection ～Ñacunday River
Section 3 Ñacunday River～Ciudad del Este
Section 4 Extension of National Road Route 15
Section 5 Port access road of Natalio southward

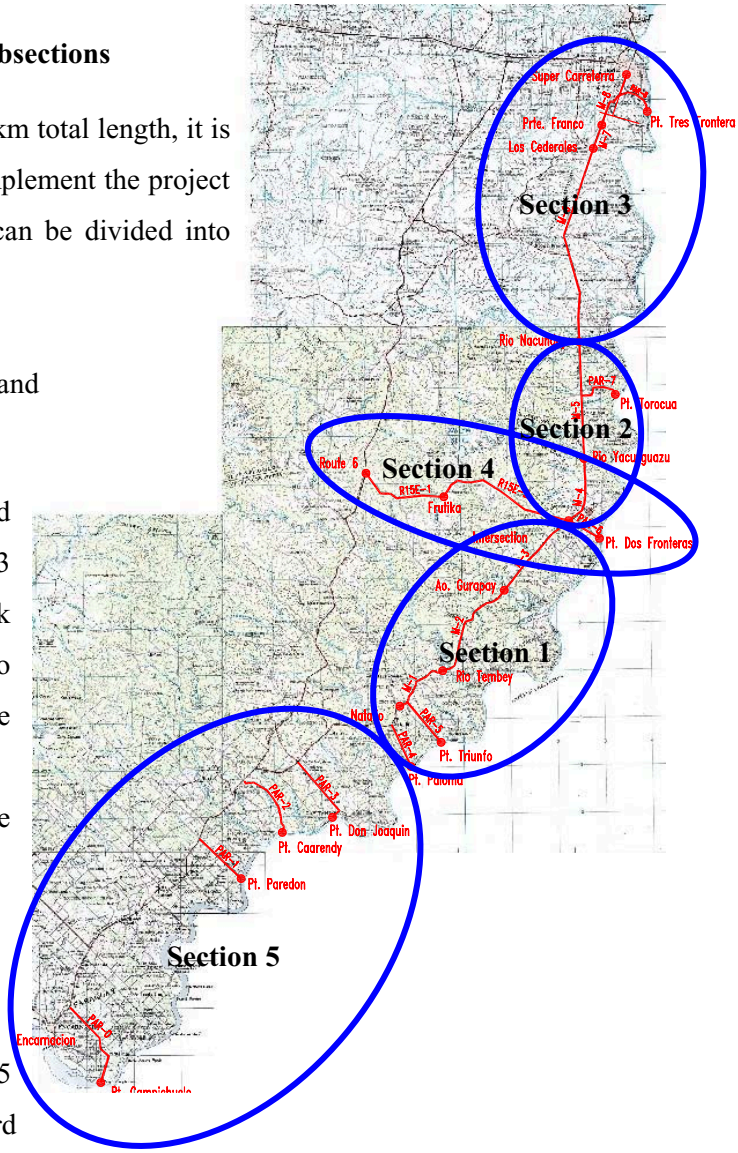


Figure 15.1-1 Construction section

The road construction work progress to be expected for this project was estimated to be 2 km per month by reviewing the past record in similar projects in Paraguay.

It would take approximate 4 years to complete the construction work of each section in Parana River Coastal Road because the road length in each section is about 60 km.

Information of each section such as location, road length, and number of bridge and structures is shown in the Figure 15.1-1 and Table 15.1-1.

Table 15.1-1 Division of the Project Road (Example)

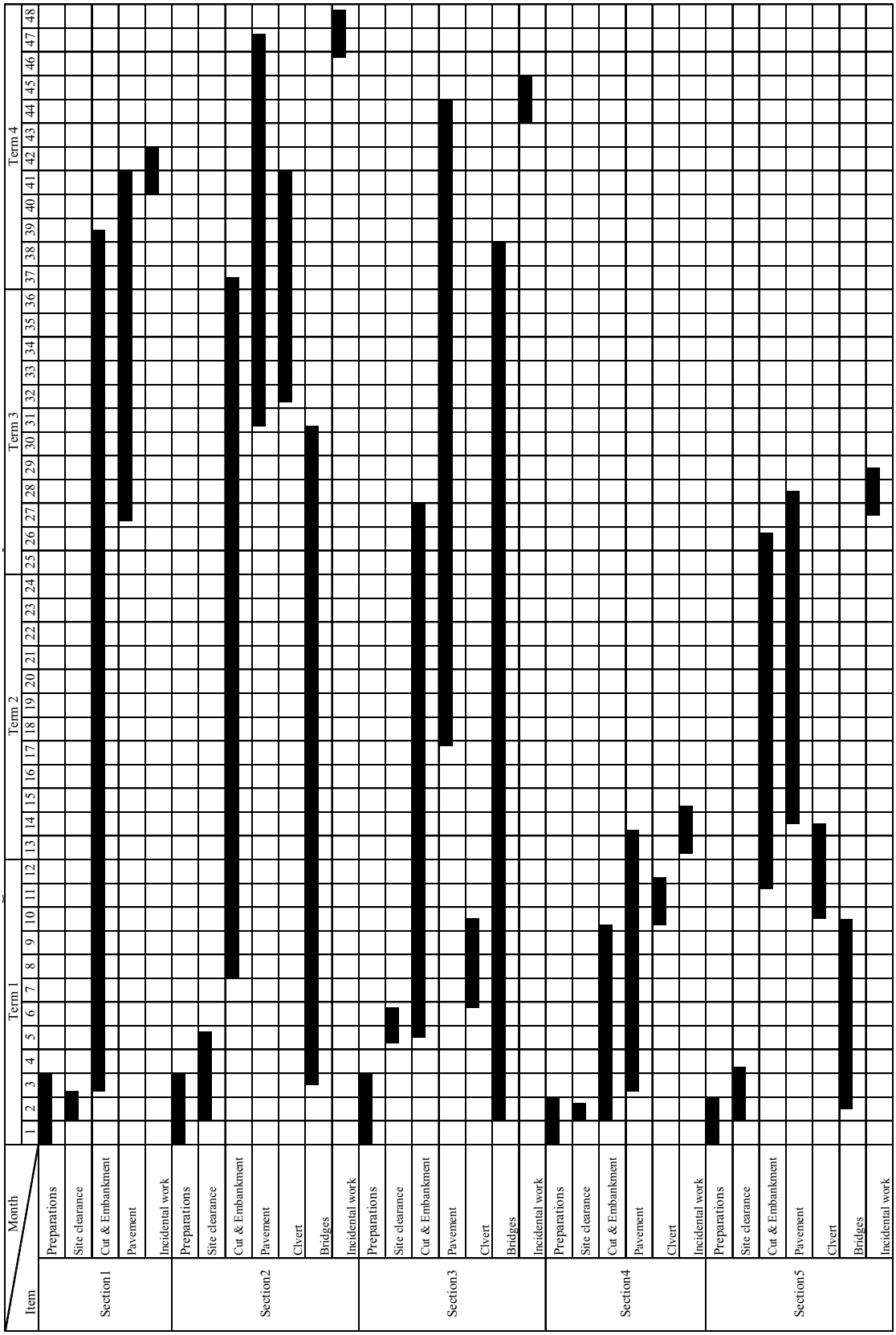
	Componente	Distancia		Clvert (place)	Bridge (place)
		Brakedown (km)	Count (km)		
Section 1	M-1	12.1	71.1		
	M-2	23.9			
	M-3	23.3			
	PAR-5	11.8			
Section 2	M-4	13.0	46.5	2	2
	M-5	24.8		3	3
	PAR-7	8.7			
Section 3	M-6	43.0	68.4	2	3
	M-7	7.4			1
	M-8	10.1			
	PAR-8	7.9			
Section 4	R15	54.4	60.1		
	PAR-6	5.7		1	
Section 5	PAR-0	19.7	73.5	2	1
	PAR-1	11.0			
	PAR-2	15.6			
	PAR-3	16.8		1	
	PAR-4	10.5			
Total			319.6	11	10

15.1.2 Outlined construction implementation schedule

The construction schedule in each section was planned as shown in Figure 15.1-2.

In this tentative schedule it is assumed that all the construction in 5 sections will start at the same time.

Figure 15.1-2 Construction schedule by road section

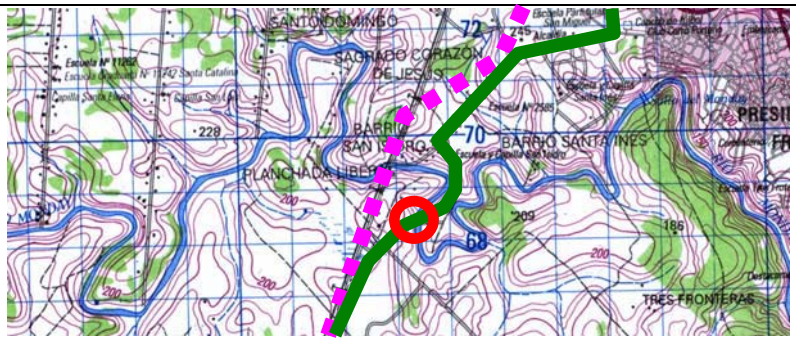
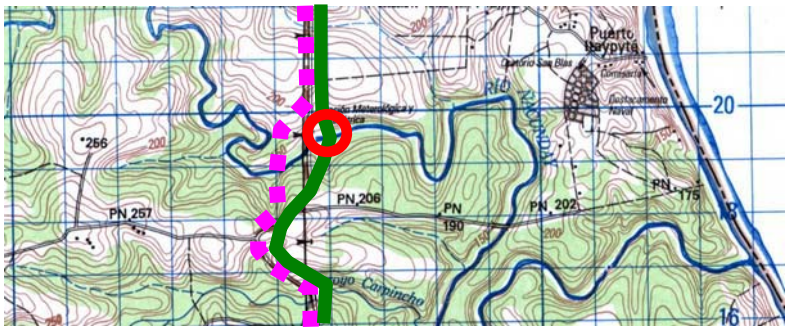
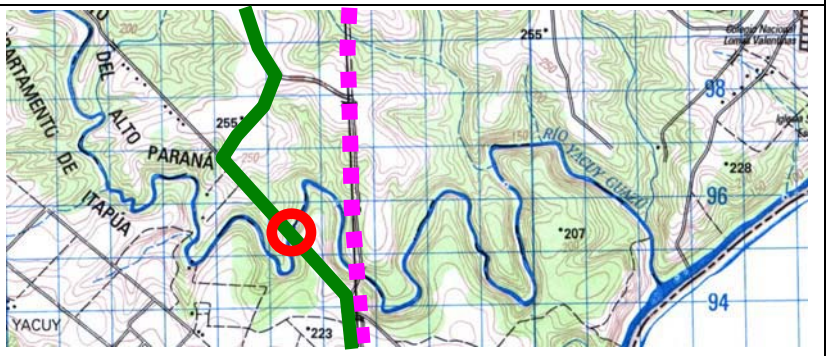
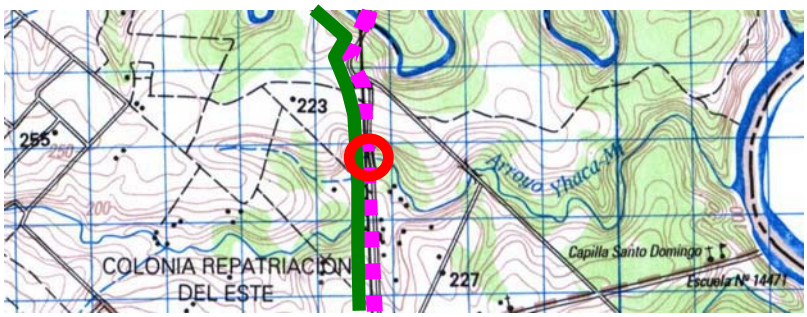


15.1.3 Availability of detours

There are 21 points where bridges and box culverts will be built or replaced, and detours for each point will be required during the construction.

Existing facilities can be used as detour at Monday River, Ñacunday River, Yacuy-Guazu River and Yhaca-Mi Stream.

Figure 15.1-3 Detour outline

Monday River An existing bridge in a current road will be utilized. Current Road Existing crossing facility Planned route	
Ñacunday River Existing barges can be used.	
Yacuy-Guazu River An existing bridge on a detour can be ensured.	
Yhaca-Mi Stream A new route will be constructed along an existing road therefore existing box culverts can be used.	

Simple detours can be placed at other points, using pipe culverts set upstream and downstream from construction sites.

However, the bridge development plan No. 22 (M-6) will require the further study due to the difficulty of provision of detour because back catchment area is relatively large and their topographic conditions is complicated.

15.2 COST ESTIMATE FOR IMPROVEMENT OF THE ROUTES COVERED IN THE PROJECT

15.2.1 Method

Figure 15.2-1 shows the process of estimating the project costs.

The construction cost is derived from the quantity and construction unit price calculated in the preliminary designs of roads and structures. The project cost consists of construction cost, engineering cost, land acquisition cost, compensation cost, and contingency.
The basic prerequisites for assessing the construction cost price are as follows:

1) Exchange rate: US$1.0 = Gs.5500
2) IVA (Impuesto al Valor Agregado (Value Added Tax)): 30%
3) Import duties: 20% (iron, asphalt)

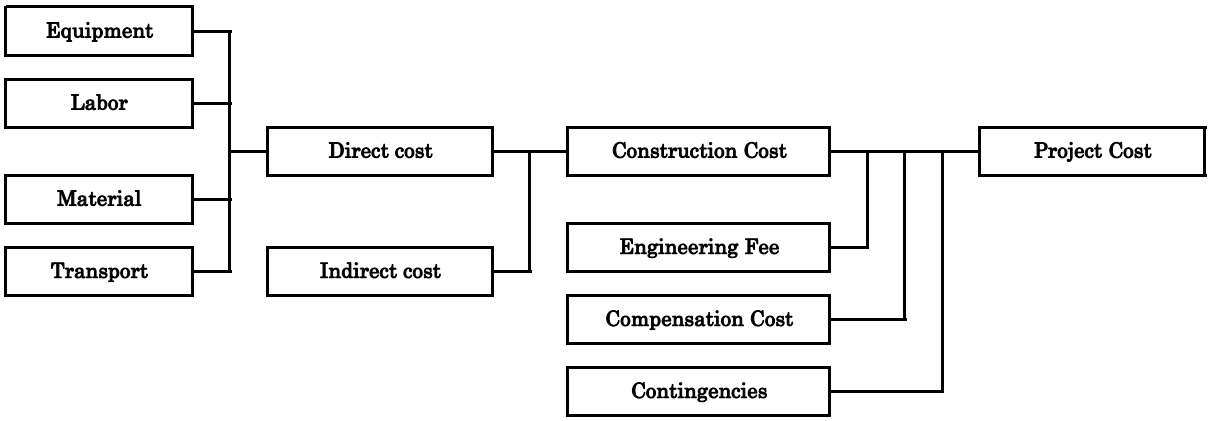


Figure 15.2-1 Cost Estimate Process

15.2.2 Labor Cost

As for the labor cost, the MOPC's past record of orders is referred and adopted.

The labor cost is categorized into five worker types: Foremen, Operators, Drivers, Skilled laborers and Unskilled laborers.

15.2.3 Material Cost

The latest market prices of construction materials are derived from market price research reports (data from CAPACO) and preceding similar projects carried out by MOPC.

The project will require two types of materials: commercially available materials and process materials.

15.2.4 Equipment Cost

The hourly expense for construction equipment is calculated based on the past records of similar projects at MOPC. The expenses on construction machines are based on the fixed costs and running costs. All the construction equipment pieces can be procured in Paraguay.

15.2.5 Indirect Cost

The indirect cost is expected as composed of common temporary construction costs for power supply, safety assurance, temporary construction, services, etc., management expenses at the construction site, including labor management cost, office supply expenses, miscellaneous expenses, etc., and profits.

These indirect costs need to be estimated based on assumptions, since they depend on the scale of work.

Thus, in order to simplify the assumptions, the indirect cost is set at 45% of the direct cost of each work item, based on past experience.

15.2.6 Construction Unit Price

The construction unit price of each work item is calculated by adding indirect costs to the direct costs that sum up costs for equipment, labor, materials and transportation of materials.

In addition, the cost for transporting the materials is calculated based on an assumption that all materials other than those to be procured at the site are transported from Asunción or Ciudad del Este.

Table 15.2-1 Earth Moving and Asphalt Paving Cost

Description \ Segment	Unit	Gs (5500 Gs./US$)	US$
(1) Earth Moving	—	—	—
Site clearing (Heaby)	m2	19,890	3.62
Site clearing (Normal)	m2	3,460	0.63
Cut	—	—	—
Excavation of no Classification	m3	13,970	2.54
Excavation of Rock	m3	13,970	2.54
Embankment	m3	18,930	3.44
Guter	—	—	—
Gutter of Crush Stone	m	156,250	28.41
Drainage	un	2,650,220	481.86
Segregation space	m	105,090	19.11
Appurtenances	—	—	—
Guardrail	m	223,050	40.55
Sign	place	1,663,320	302.42
Traffic Paint	m	13,180	2.40
Environmental Preservation Measures	m	2,650,220	481.86
Parking	place	11,156,220	2,028.40
(2) Asphart Pavement	—	—	—
Road Pavement Tipe1	m2	113,107	20.56
Road Pavement Tipe2	m2	141,396	25.71
Road Pavement Tipe3	m2	197,327	35.88
Shoulder Pavement Tipe1	m2	91,953	16.72
Shoulder Pavement Tipe2	m2	119,520	21.73
Shoulder Pavement Tipe3	m2	137,898	25.07
Shoulder for sidewalk	m2	579,088	105.29
Road Pavement of Stone Pave. Tipe1	m2	65,717	11.95
Road Pavement of Stone Pave. Tipe2	m2	95,451	17.35
Road Pavement of Stone Pave. Tipe3	m2	2,520	32.74
Shoulder Pavement of Stone Pave. Tipe1	m2	94,121	17.11
Shoulder Pavement of Stone Pave. Tipe2	m2	122,410	22.26
Shoulder Pavement of Stone Pave. Tipe3	m2	130,877	23.80

Table 15.2-2 Box Culvert Cost

Width	Heigh	Depth	Section	Type	Length	Unit Price	
B	H	D	N	N - B × H	L	Gs	US$
2.500	2.500	1.000	1	1-B2.500 × H2.500	16.0	167,236,218	30,407
3.500	3.000	1.000	1	1-B3.500 × H3.000	16.0	259,235,778	47,134
3.000	3.000	1.000	2	2-B3.000 × H3.000	16.0	389,752,859	70,864
3.500	3.000	1.000	2	2-B3.500 × H3.000	16.0	457,408,086	83,165
4.000	3.000	1.000	2	2-B4.000 × H3.000	16.0	531,396,617	96,618
4.500	3.000	1.000	2	2-B4.500 × H3.000	16.0	611,718,455	111,222

Table 15.2-3 Bridge Cost

Section	M-4		M-5			M-6			M-7	P-0	Total
Item	No 64+562 San Juan	No 70+447 Yhaca-Mi	No 72+250 Yacuy Guazu	No 88+291 Imperial	No 94+240 Carpincho	No 97+048 Nacunday	No 114+575 Pira Pyta	No 134+683 Yta Coty	No 149+845 Monday	No 0+6.2 Curi-Y	
Length(m)	15	25	75	15	20	100	20	15	150	15	4500
Width(m)	10	10	10	10	10	10	10	10	10	10	—
Area(m2)	150	250	750	150	200	1000	200	150	1500	150	4500
Superstructure	75,322	203,659	586,453	75,322	122,554	778,014	30,710	75,322	1,160,664	75,322	3,183,341
Abutment/Pier	72,330	70,916	90,666	79,682	59,122	219,333	78,247	47,507	195,824	72,359	985,987
Monsory Work	16,595	24,892	33,822	24,892	24,892	38,049	34,453	18,254	16,595	30,147	262,592
Access road	1,602	2,308	1,991	2,377	1,986	3,174	2,102	1,854	1,602	2,500	21,496
Approach Slab	5,053	8,563	8,857	9,660	6,735	16,120	8,637	5,565	5,053	9,367	83,610
Sub-total	170,901	310,339	721,788	191,934	215,289	1,054,691	154,150	148,502	1,379,738	189,695	4,537,027
Other expenses 15%	25,635	46,551	108,268	28,790	32,293	158,204	23,123	22,275	206,961	28,454	
Total	**196,536**	**356,890**	**830,056**	**220,724**	**247,582**	**1,212,895**	**177,273**	**170,778**	**1,586,698**	**218,149**	**5,217,581**
US$/m2	1,310	1,428	1,107	1,471	1,238	1,213	886	1,139	1,058	1,454	1,159

15.2.7 Construction Cost

The construction cost is calculated by adding up the costs for earthwork, pavement, drain and bridge, based on the quantities obtained in the outline designs for roads and structures.

15.2.8 Engineering Cost

Engineering cost depends on the scale and quantity of works in the project.
It is calculated by setting it at 13% of the construction cost based on past experience.

15.2.9 Compensation Cost

According to the survey on the records of land appropriation for road construction in the project areas by MOPC, an average unit land price is 1,000US$/ha. In addition to this, cost for compensation depending on the crops, etc. must also be taken into consideration.

The compensation cost necessary for land acquisition varies with the type and harvest of the crops. For the sake of simplification, however, two types of unit prices were set based on the records of preceding similar projects, one for expansion of existing roads and the other for the other uses, which include both land purchase and compensation.

The unit price for compensation for house buildings is set assuming typical standard houses observed along the project roads.

Table 15.2-4 Compensation Cost

Item	Unit price
Expansion of roads	2,000 US$/ha
Other uses	1,000 US$/ha
Compensation for houses	20,000 US$/place

15.2.10 Contingency

Contingency is counted as any cost incurred unexpectedly in the detailed design and construction stages only.
The objective roads are expected to involve difficulties in that the basic plan is to expand the existing roads passing through the residential and agricultural areas. 10% of the total of construction cost, engineering cost, land acquisition cost and compensation costs is allocated to the contingency.

15.2.11 Total Project Cost

The project cost is calculated for each of the Parana River Coastal Road, Extension of National Road Route 15, and Port Access Road.

The project cost was calculated as shown in Table 15.2-5 below.

Table 15.2-5 Summary of Project Costs (million US$)

Description \ Segment	Parana Coast road	National Highway No.15 Extension road	Sub total	Harbor Access Road	Total
Distance (km)	157.6	54.4	212.0	107.6	319.6
①Earth moving	14.8	1.7	16.5	3.1	19.6
Site clearing（Heaby）	0.8	0.0	0.8	0.0	0.8
Site clearing（Normal）	0.7	0.1	0.8	0.4	1.2
Cut	8.6	0.6	9.2	1.0	10.2
Embankment	0.0	0.0	0.0	0.0	0.0
Drainage	0.7	0.2	0.9	0.5	1.4
Segregation space	0.1	0.0	0.1	0.0	0.1
Appurtenances	3.0	0.5	3.5	0.8	4.3
Environmental Preservation Measures	0.2	0.0	0.2	0.0	0.2
Parking	0.6	0.2	0.8	0.4	1.2
②Asphart Pavement	51.8	10.5	62.3	24.1	86.4
③Box Clvert	0.6	0.0	0.6	0.3	0.9
④Bridge	5.0	0.0	5.0	0.2	5.2
(1) Construccion Cost ①+②+③+④	**72.1**	**12.2**	**84.3**	**27.8**	**112.1**
(2) Engineering Fee (1)× 13%	**9.4**	**1.6**	**11.0**	**3.6**	**14.6**
(3) Conpensation	**1.6**	**0.3**	**1.9**	**0.5**	**2.4**
(4) Contingencies (1)～(3)× 10%	**8.3**	**1.4**	**9.7**	**3.2**	**12.9**
(5) Project Cost	**91.4**	**15.4**	**106.8**	**35.1**	**141.9**
(million US$/km)	**0.58**	**0.28**	**0.50**	**0.33**	**0.44**

15.2.12 Maintenance Cost

Maintenance cost is necessary for financial and economic analyses of the project.

There are two types of maintenance works: periodical repair and maintenance work and routine maintenance work.

Type of the maintenance work was defined in accordance with the pavement condition of road.

Periodical repair and maintenance work

- Earthroad: leveling off after rainfall, compaction repair, cleaning
- Stone pavement: gap filling repair work, cleaning
- Asphalt pavement: cleaning

Routine maintenance work

- Earthroad, stone pavement: none
- Asphalt pavement: road marking, overlay

The frequency of maintenance work is considered as follows taking the record of maintenance work by MOPC.

- The periodical maintenance for road surface of earth road is set to be conducted when rainfall of 5 mm or more occurs. The frequency of the maintenance work is set at "Whole Day" for roads with the heaviest traffic and shorter for roads with less traffic.

- The periodical maintenance for the road surface of stone pavement is set at 20 days in a year.

- The periodical maintenance for the road surface of asphalt pavement is set as only cleaning works in order to prevent any impact of rainfall.

- The routine maintenance for earth road and stone pavement is not set, because it can be covered by periodical maintenance works.

- The routine maintenance for asphalt pavement is set as re-pavement in every 12 years for all roads, because the thickness of pavement is differently set according to the volume of traffic.

The maintenance cost in each case is shown in Table 15.2-6.

Table 15.2-6 Unit Cost of Maintenance Works

No.1

Parana Coast road							①						②	①+②=③
Description \ Distance (km)			Section of Plan Road	M-1	M-2	M-3	**Sub-Total**	M-4	M-5	M-6	M-7	M-8	**Sub-Total**	**ToTal**
	Existing	Earthen		12.0	23.9	23.3	**59.2**	13.0	24.8	43.0	0.3	4.5	85.6	144.8
		Stone-paved		0.1	0.0	0.0	**0.1**	0.0	0.0	0.0	7.2	2.6	9.7	9.8
	Plan	Asphalt Pavement		12.1	23.9	23.3	**59.3**	13.0	24.8	43.0	7.4	10.1	**98.3**	**157.6**
Situation	Frequency	Pavement Tipe of Plan Road		Tipe2	Tipe2	Tipe2		Tipe3	Tipe3	Tipe3	Tipe3	Tipe3		
Existing	Necessaly	Routine Maintenance Work		167,266	332,417	324,488	**824,171**	254,272	485,626	843,311	48,546	104,565	**1,736,320**	**2,560,491**
Plan	Every 1Years	Routine Maintenance Work		2,007	3,967	3,872	**9,846**	2,153	4,112	7,141	1,233	1,672	**16,311**	**26,157**
	Every 6 Years	Routine Maintenance Work Road Marking		89,077	176,018	171,819	**436,914**	95,537	182,463	316,856	54,715	74,212	**723,783**	**1,160,697**
	Every 12 Years	Routine Maintenance Work Road Marking Road Surface Repair		953,642	1,884,415	1,839,465	**4,677,522**	1,022,801	1,953,416	3,392,199	585,765	794,504	**7,748,685**	**12,426,207**

No.2

Harbor Acceso Road & National Highway No.15 Extension Road												④	⑤	③+④+⑤
Description \ Distance (km)			Section of Plan Road	P-0	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	**Sub-Total**	Ruto15	**Total**
	Existing	Earthen		19.7	6.6	15.6	16.8	10.5	0.0	5.7	8.7	0.0	**83.47**	28.7	**257.0**
		Stone-paved		0.0	4.4	0.0	0.0	0.0	11.8	0.0	0.0	7.9	**24.1**	20.9	**54.8**
	Plan	Asphalt Pavement		19.7	11.0	15.6	16.8	10.5	11.8	5.7	8.7	7.9	**107.6**	54.4	**319.6**
Situation	Frequency	Pavement Tipe of Plan Road		Tipe1	Tipe1	Tipe2	Tipe2	Tipe1	Tipe1	Tipe1	Tipe1	Tipe3		Tipe1	
Existing	Necessaly	Routine Maintenance Work		133,472	54,303	105,908	233,009	71,217	25,465	38,358	59,200	47,737	**768,669**	239,948	**3,569,108**
Plan	Every 1Years	Routine Maintenance Work		3,264	1,826	2,590	2,781	1,741	1,959	938	1,448	1,311	**17,858**	9,035	**53,050**
	Every 6 Years	Routine Maintenance Work Road Marking		144,816	81,026	114,910	123,381	77,269	86,919	41,618	64,232	58,191	**792,362**	400,931	**2,353,990**
	Every 12 Years	Routine Maintenance Work Road Marking Road Surface Repair		1,550,368	867,449	1,230,201	1,320,889	827,231	930,536	445,553	687,651	622,986	**8,482,864**	4,292,295	**25,201,366**

16. DEVELOPMENT OF THE ROAD MAINTENANCE PLAN

16.1 CURRENT CONDITION OF THE ROAD MAINTENANCE

17 district offices of MOPC conduct maintenance works of National Road and Departmental Road under the control of Road Conservation and Maintenance Division, MOPC at the present. Each district office has to repot its monthly activities to Road Conservation and Maintenance Division, and also sends information of road conditions in its territory once for three months. Road Conservation and Maintenance Division compile these road condition data, and elaborate annual maintenance plan for rods within its district by using SIAMV (Sistema Integral de Administracón del Mantenimiento), a software of road maintenance planning. On the other hand actual budget for road maintenance is executed only 10% of planned budget. Accordingly, road maintenance work is not enough to keep service level of paved road.

In this circumstance, "Road Improvement and Maintenance Project in Paraguay" financed by World Bank is conducted at the present. This project consists of 3 components as following;

1) To establish a strategy for road development
2) To establish the maintenance plan of paved trunk road and improvement of service level on paved road
3) To improve accessibility of local poverty area to paved trunk roads

Among 3 components mentioned above, recommendation on improvement and maintenance of paved trunk road will be done in component (2).

1) To establish 5 years plan (2008-2012) on improvement and maintenance work of road network in Paraguay
2) To prepare the action plan for improvement of service level of paved road a certain level in 1 or 2 years within the 5 years plan for 1500 km paved trunk roads.
3) To conduct concession to private sector to maintain the service level of improved roads for 3-4 years after completion of improvement work mentioned in the previous b.

Improvement and maintenance work proposed in 5 years plan expects to use financial resource from World Bank under the concept of importance of maintenance work. After this finance from World Bank, this type of maintenance work will expect to be done by using domestic budget. On the other hand, project roads in this study will be completed in 2013 when 2nd 5 years plan would start. It is recommendable to adopt the way proposed by World Bank in the "Road Improvement and Maintenance Project in Paraguay", some problems will still remain even in this way regarding following matters;

1) Standards to adopt to keep the service level of paved road,
2) Inspection system (organization etc) to keep the service level of paved road

16.2 INVESTIGATION OF THE ROAD MAINTENANCE PLAN

(1) Investigation of Road Maintenance Cost by using Collected Toll

Maintenance cost for the objective roads in this study is estimated in the Table 16.2-1 and total maintenance cost for 12 years is estimated to be US$ 28,085,856. In this section, examination will be conducted for affordability of collected toll for this amount of maintenance cost.

Table 16.2-1 Maintenance Cost for the Objective Roads

year	Routine Maint.	Periodic Maint.	Overlay	Toatl
1	53,050			53,050
2	53,050			53,050
3	53,050			53,050
4	53,050			53,050
5	53,050			53,050
6		2,353,990		2,353,990
7	53,050			53,050
8	53,050			53,050
9	53,050			53,050
10	53,050			53,050
11	53,050			53,050
12			25,201,366	25,201,366
計	530,500	2,353,990	25,201,366	28,085,856

Unit: US$

It is appropriate to install 2 Toll gates on the main corridor along the Parana River. Traffic volume at these 2 points in 2015 are focused as mentioned in the Table 16.2-2

Table 16.2-2 Future Traffic Volume in 2015 at 2 Toll Gates

	Cars	Bus	Truck	Volume/day
Gate-1	1,000	80	340	1,420
Gate-2	1,130	90	620	1,840

Annual amount of toll collected in these 2 points comes up to approximate US$ 730,000- in 2015 based on the focused traffic volume by vehicle type. (toll will be charged at one side on the road) On the other hand, annual operation cost of each toll gate is estimated to be approximate US$ 60,000- based on the cost information from MOPC. Accordingly annual charged toll (US$ 730,000) will cover the annual routine maintenance cost including operation cost of 2 toll gates (total US$ 173,000). However, US$ 8.7 million of total charged toll during 12 years, can not cover at all the total road maintenance cost (US$ 29.2 million) including overlay cost in 12^{th} year.

Consequently, it is impossible to cover the road maintenance cost including overlay cost, but it is enough to cover the routine and periodical maintenance cost by using the collected toll. As it will be impossible to conduct the overlay works with private finance as mentioned in Table 16.2-3, MOPC has to do the work by itself using the domestic budget or finances from some donors.

Table 16.2-3 Maintenance Cost and Revenue from Toll

	Routine Maint. Annual Cost	Total Maint. Cost during 11 years Not incl overlay	Total Maint. Cost during 12 years incl. Overlay
Maintenance Cost	53,000	583,000	28,085,856
Operation cost of 2 Toll gate	120,000	1,320,000	1,440,000
Total Cost	173,000	4,256,900	29,525,856
	○	○	×
Revenue	730,000	8,030,000	8,760,000

Unit:US$

In this calculation, toll fee for each vehicle type was set as shown in the Table 16.2-4

Table 16.2-4 Toll fee for each vehicle type

Unit: Guaranies

Vehicle Type	Motor Car	Bus Micro-bus	Trailer (Middle)	Truck, Bus (Middle)	Truck, Bus (Large)
Toll Fee	5,000	7,000	7,000	8,000	15,000

These toll fees mentioned above are same as existing toll fees adopted by MOPC on the National Road and it is regarded to be appropriate level for road users when these figures would be adopted to project roads.

(2) Road Maintenance

As mentioned above, it is possible to cover the road maintenance cost except overlay cost by using the collected toll. Also it will be possible to contract out the maintenance work with toll collection work to private sector. Following alternatives are considered for the way of maintenance for project roads.

1) Using Budget of MOPC (In this case, a part of budget will be allocated to the project roads within the total budget of the district office)
2) To invest the toll collected by MOPC directly into road maintenance by contracting out to private companies. (In this case, it is necessary to pool the annual surplus over the fiscal year continuously)
3) To contract out all the works except overlay to private companies. Even in this case, it is necessary to conduct further examination regarding payment from private company to MOPC.

Regarding (1) mentioned above, it is very uncertain to confirm the actual budget for maintenance work, and sustainable maintenance work is not sure. (2) is the most steady way for realization of sustainable maintenance work if it would be possible to pool annual surplus over the fiscal year. And (2) will be able to success to the way proposed by World Bank mentioned previously. (3) can have a reliable revenue, but some conflicts between private company and MOPC will occur frequently.

Considering above, the way of (2) is recommendable in this study.

Merit and demerit in the introduction of private sector into road maintenance after the construction of project roads was summarized in the Table 16.2-5.

Table 16.2-5 Merit and Demerit on Introduction of Private Sector into Road Maintenance

	Merit	Demerit
Introduction of Private Sector into Road Maintenance	➢ Not affected by fluctuation or a lack of domestic budget ➢ Sustainable and steady maintenance work is expected ➢ Possible to store the financial resource for the future	➢ To occur some conflicts between MOPC on the matter of road condition ➢ Uncertainty to cope with the radical worsening of road condition

(3) Responsibility of MOPC

To conduct sustainable road maintenance work will make the life of road expanded steadily. However, overlay work to be conducted periodically would cost significantly, it is necessary for MOPC to assign the enough budget for it every year

MOPC has to study and examine following matters in case of contracting out the maintenance works to private company for keeping the certain level of pavement condition for some years after overlay.

1) Standard for setting the level of pavement condition
2) Inspection system for road condition by MOPC
3) Disposition against the damages of roads suffered from natural disasters

In examining these matters, recommendations and result of the project proposed in the “Road Improvement and Maintenance Project in Paraguay” financed by World Bank should be reviewed.

17. ECONOMIC AND FINANCIAL ANALYSIS

17.1 ECONOMIC ANALYSIS

17.1.1 Methodology

(1) Indicators for the Economic Analysis

Cost-benefit analyses are conducted in the economic analysis. The following indicators are calculated and used to evaluate economic feasibility of the project and its components. For the calculation of the net present value and cost-benefit ratio, opportunity cost of capital, i.e., the discount rate of 11% is adopted, referring several recent feasibility studies of road projects conducted by MOPC.

* Internal Rate of Return (IRR)
* Net Present Value (NPV, at discount rate of 11%)
* Cost-Benefit Ratio (C/B, at discount rate of 11%)

Sensitivity analyses are made for the case of implementation of all road components, shown as Case I below, checking changes in the above indicators under the conditions of 15% cost increase and/or 15% decrease in benefits of the project.

(2) Benefits Counted in the Economic Analysis

Tangible benefits directly caused by the implementation of the project are counted as follows. Saving in costs is calculated through comparison of the estimated costs under the conditions “with the project” and “without the project”.

* Travel/transportation Costs
  - Saving in vehicle operation costs (VOC) and transportation costs for export and local transport
  - Saving in traveling time of passengers
  - Elimination of costs caused by impassability of unpaved roads
* Saving in Maintenance Costs

(3) Unit VOC and Time Value Applied in the Analysis

Unit VOCs and time value of passengers applied in the economic analysis are those described in “Estructure de los Costos de Funcionamiento de Vehículos Automotores” prepared by Dirección Nacional de Transporte (DINATRAN) in December 2005. Due to the recent and sharp but insistently lasting price escalation of petroleum products (fuel for vehicles), however, unit VOCs are revised with the economic prices of fuel in May 2006, as listed below. Besides, unit time value of passengers applied for the study is the same figure as published by DINATRAN.

For the calculation of VOC, it is assumed that the truck fleet for the cereal export consists of semi-heavy trucks (81%) and heavy trucks (19%), that unit VOC of medium truck is applicable for the local cargo transport, and that VOC of long- or medium-distance bus can be applied for buses, according to traffic survey conducted within the JICA Study. Average passengers of 1.9 persons for a passenger car or a pick-up and 22.2 persons for a bus are also assumed according to the traffic survey.

Table 17.1-1 Economic Cost without Traveling Time Value of Passengers, May 2006

(Unit: Gs/km/vehicle)

Road Condition / Vehicle Type	Paved			Dirt		
	Paved	Stone-paved	Graveled	Principal	Collector	Feeder
Passenger Car	1,264.18	1,748.69		1,942.70	2,169.69	2,315.33
Pick-up	2,144.65	2,683.13		3,066.07	3,408.59	3,788.30
Small Truck	2,285.91	3,002.12		3,318.61	3,648.52	3,850.02
Medium Truck	3,751.49	4,891.41		5,483.85	5,982.14	6,369.25
Semi-heavy Truck	4,776.87	5,943.81		6,640.26	7,168.05	7,532.89
Heavy Truck	6,598.11	8,026.50		8,917.32	9,661.92	10,183.63
Bus (short distance)	3,206.42	3,795.70		4,050.27	4,460.16	4,713.24
Bus (long/medium distance)	4,310.26	4,874.80		5,418.71	5,971.69	6,562.33

Source: DINATRAN and JICA Study Team

Table 17.1-2 Economic Time Value of Passengers, December 2005

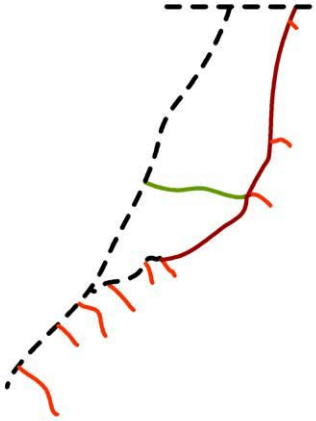
	Assumed Average Number of Passengers	Unit Time Value (Gs./hour)
Passenger Car and Pick Up	1.91 persons	12,485
Bus	22.2 persons	29,193

Source: JICA Study Team with Basic Data of DINATRAN

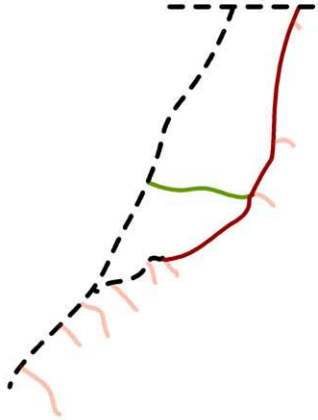
(4) Cases for the Economic Analysis

Regarding two proposed projects of the Paraná River Coastal Road and the Extension of National Road Route 15, the present study analyzed four alternative cases, as shown below, to evaluate their respective need and priority in the network development. Port access roads and Caarendy Port were individually evaluated.

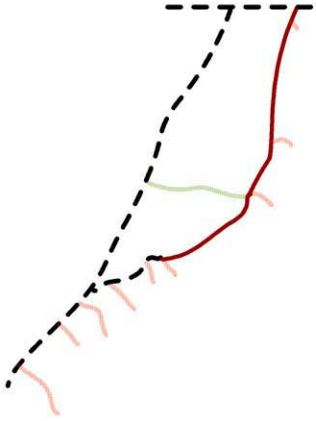
When each of the access roads is evaluated, the Paraná River Coastal Road and Extension of National Road Route 15 are assumed to be already constructed. For evaluation of the facility construction of Caarendy Port, all road components are assumed not to be implemented yet. For the analysis of access road to Caarendy Port, it is assumed that the port facility construction has finished already.



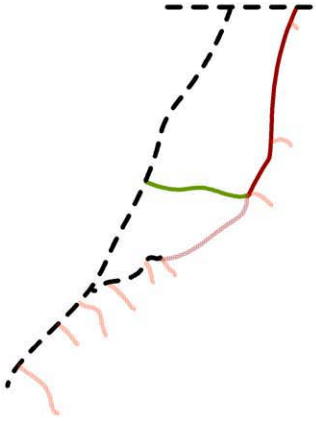
Case I: All road components are implemented



Case II: Components of the coastal road along the Paraná River and Extension of National Road Route 15 (temporary name) are implemented



Case III: Only the component of the coastal road along the Paraná River is implemented



Case IV: Components of northern part of the coastal road along the Paraná River and Extension of National Road Route No. 15 are implemented

(5) Benefits of Saving in VOC and Transportation Costs

As main sources of benefits generated by the implementation of the project, saving in VOC and transportation costs for export and local transport is estimated and counted. Because of the improvement of road conditions by the implementation of the project, people and transporters will be able to enjoy cheaper vehicle operation costs and less time for travels. The difference in the VOC and time of passengers for the travels and transports are calculated using unit VOC and time value as shown above. As for export transportation, saving in total transportation cost from areas of the production to the gateway for the export, namely Nueva Palmira of Uruguay or Buenos Aires of Argentine is estimated.

(6) Benefits Caused by Elimination of Impassability

Benefits accrue from the improvement to all-weather type are counted as done in other feasibility studies, such as "Feasibility Study of Route No. 8 (Section: Ñumi-Caazapa)" (1991, MOPC), "Arterial Road Development Project in the Central Eastern Area" (1997, JICA-MOPC), and so on. The benefits of elimination of impassability are estimated with the following formula. Time related costs, which are and will be lost during the period of impassability even the vehicles are not operated, such as costs for drivers, interests (opportunity cost of capital) and indirect costs (administration, insurance costs, etc.) are calculated. In this economic analysis only time related costs of trucks (for export as well as local transport) are counted as benefits of the project. Costs of impassability are divided by two because only one trip is assumed to be hampered during the round trip, as can be seen in the formula.

$$B_{all-weather} = ADT \times \frac{CTD \times \sum_{i=1}^{n} D_i}{2} \times (p + a \times f_i)$$

where:

$B_{all-weather}$; Annual benefit from improvement to all-weather road

ADT; Average daily traffic volume of trucks

CTD; Vehicle operation cost of which related to time (fixed costs to occur without relation of running distance). Though "depreciation" cost may relate to time, the cost is not included for the calculation of benefits because the cost may also relate to travel distance as well. Based on an investigation on unit VOC, CTD of Gs. 228,593/day for an export truck and that of Gs. 152,796/day for a truck of local cargo transport are applied in the calculation.

n; Times of road impassability for a year. In this study, 44 times are applied, referring "Feasibility Study Route: Cnel. Bogado-Caazapá (1994, MOPC)

D_i; Duration of road impassability in number of days for each time of impassability. In this study, an average of 2.28 days for each time of impassability is applied, referring above-mentioned feasibility study.

a; Proportion of number of vehicles with origin and destination outside the adjacent areas to the road under the study or to routes permanently connected to the road. Refer to the figure below. In this study a varies

p; Proportion of number of vehicles with origin and destination on the road under the study or routes permanently connected to the studied road, which will be free from impassability (closure) after the improvement by the project. It should be; $a + p = 1$. Refer to the figure below.

For this analysis, *a* and *p* is roughly estimated depending on the cases as follows:

	a	*p*
Case I	0.3	0.7
Case II	0.5	0.5
Case III	0.6	0.4
Case IV	0.7	0.3
Each Access Road	0.3	0.7

f_i; Factor for degree of simultaneousness of impassability (closure) in sections of studied roads and their feeder roads. In case that there is no relation in impassability f_i makes one (1). In case the impassability occurs absolutely simultaneously, f_i becomes 0 (zero). In this analysis, 0.5 is applied for f_i.

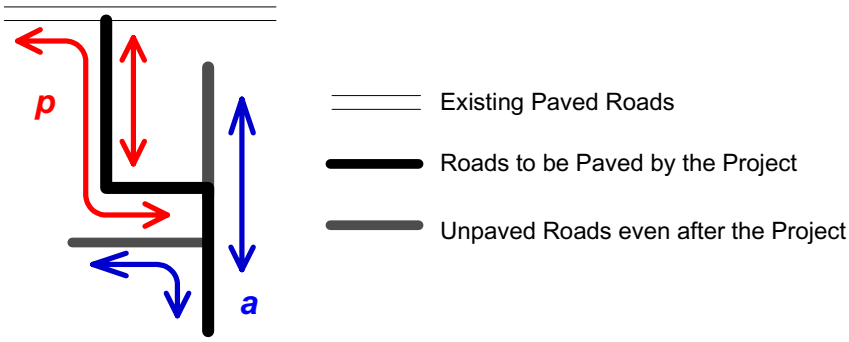


Figure 17.1-1 Coefficient "*p*" and "*a*" for the Calculation of Benefit from Improvement to All-weather Road

(7) Benefits of Saving in Road Maintenance Cost

Dirt roads require more cost for maintenance than paved roads especially for those with large traffic volume of heavy vehicles. Maintenance cost in case of "without project" is estimated and counted as benefits of the project, while maintenance cost for paved roads ("with project" case), including that for routine maintenance, marking, overlay, etc., is counted as a part of project costs.

(8) Estimation of Economic Cost

Financial costs estimated by engineers are converted into economic ones by deducting taxes and duties. As for the economic cost for land expropriation, existing incomes/benefits foregone by use of the lands for the project are estimated. Based on the investigation on land use along the project sites and agricultural productivity, economic prices of land are estimated as follows.

Table 17.1-3 Estimated Economic Price of Land to be Expropriated for the Project

	Assumed Portion		Assumed Economic Price (US$/ha.)		Average Economic Land Price (US$/ha.)
	Agriculture /Residence	No Specific Use	Agriculture /Residence	No Specific Use	
Road along the Paraná River	70%	30%	1,700	100	1,220
Extension of Route No. 15, and Access Roads to Ports	80%	20%	1,700	100	1,380

17.1.2 Results of the Analysis

(1) Estimated Economic Cost and Benefits

Adopting the methods mentioned in the previous section, costs and benefits of the project are estimated as shown below. Saving in transportation costs, both for exports and local transportation, accounts for a major part of the benefits. Benefits from elimination of impassability and saving in maintenance follow and share roughly 10% or 15% of the total benefits, respectively.

Table 17.1-4 Estimated Economic Costs and Benefits and Economic Viability of Case I

Case I: All Roads (Unit: US$ thousand at prices of May, 2006)

		Costs			Benefits						Balance (Benefit - Cost)
		Construction	Maintenance	Total	Saving in export transportation costs	Saving in local transportation costs	Saving in transportation costs by diverted transport from Route No. 6	Elimination of impassability	Saving in maintenance cost	Total	
-4	2010	31,421		31,421						0	-31,421
-3	2011	31,421		31,421						0	-31,421
-2	2012	31,421		31,421						0	-31,421
-1	2013	31,421		31,421						0	-31,421
1	2014		53	53	5,660	8,298	682	2,025	3,453	20,118	20,065
2	2015		53	53	5,849	8,576	705	2,053	3,569	20,752	20,699
3	2016		53	53	6,019	8,799	725	2,113	3,673	21,328	21,275
4	2017		53	53	6,193	9,027	746	2,174	3,779	21,919	21,866
5	2018		53	53	6,373	9,262	768	2,236	3,889	22,528	22,475
6	2019		2,354	2,354	6,558	9,503	790	2,301	4,001	23,153	20,799
7	2020		53	53	6,748	9,750	813	2,367	4,118	23,795	23,742
8	2021		53	53	6,917	9,974	833	2,426	4,220	24,371	24,318
9	2022		53	53	7,090	10,204	854	2,487	4,326	24,960	24,907
10	2023		53	53	7,267	10,438	875	2,549	4,434	25,564	25,511
11	2024		53	53	7,449	10,678	897	2,613	4,545	26,182	26,129
12	2025		25,201	25,201	7,635	10,924	920	2,678	4,659	26,815	1,614
13	2026		53	53	7,787	11,143	938	2,732	4,752	27,352	27,299
14	2027		53	53	7,943	11,365	957	2,787	4,847	27,899	27,846
15	2028		53	53	8,102	11,593	976	2,844	4,944	28,458	28,405
16	2029		53	53	8,264	11,825	995	2,901	5,043	29,028	28,975
17	2030		53	53	8,429	12,061	1,015	2,960	5,143	29,609	29,556
18	2031		2,354	2,354	8,598	12,302	1,036	3,020	5,246	30,202	27,848
19	2032		53	53	8,770	12,548	1,056	3,081	5,351	30,807	30,754
20	2033		53	53	8,945	12,799	1,077	3,143	5,458	31,424	31,370
21	2034		53	53	9,124	13,055	1,099	3,207	5,567	32,053	32,000
22	2035		53	53	9,307	13,316	1,121	3,273	5,679	32,696	32,642
23	2036		53	53	9,493	13,583	1,143	3,340	5,792	33,351	33,298
24	2037		25,201	25,201	9,683	13,854	1,166	3,408	5,908	34,020	8,819
25	2038	-56,615	53	-56,562	9,876	14,131	1,190	3,478	6,026	34,702	91,264

Economic Construction Costs (Unit: US$ thousand)	
Roads Improvement	125,685
Caarendy Port	0
Total	125,685

IRR=	14.3%
NPV (11%)=	33,178
B/C (11%)=	1.32

(2) Economic Feasibility of the Project and Its Components

Annual economic costs and benefits are calculated per proposed project. When all the projects are combined (Case I), the economic internal rate of return (EIRR) is estimated to be 14.3%, which is significantly higher than the normal opportunity cost of 11% in Paraguay. This indicates that the implementation of the proposed projects is economically feasible as a whole. The Parana River road alone (Case III) shows the highest EIRR. In other words, the top priority is assignable to the Paraná River Coastal Road, to be followed by the Extension of National Road Route 15.

EIRRs of individual port access roads vary from 7.8 to 20.6%. The rate is higher in those areas with denser roadside population, indicating the higher need of their implementation by the public sector. However, their combined EIRR exceeds 11%. From the viewpoint of social equity, it is more appropriate to assume the improvement of all proposed access roads and to start implementing one by one in the order of higher EIRRs. The Caarendy Port project shows a significantly high EIRR, mainly because its proximity to grain producing areas is expected to realize the benefit of a substantial saving in operation costs.

Table 17.1-5 Estimated Economic Indicators of the Project

Case \ Indicators		IRR	NPV	B/C
		%	US$ million	Ratio
			at discount rate of 11%	
Case I	All Roads	14.3%	33.18	1.32
Case II	Coastal Road + Extension of Route No. 15	15.1%	31.83	1.42
Case III	Coastal Road	15.4%	29.67	1.46
Case VI	Northern Part of Coastal Road + Extension of National Road Route 15	13.6%	14.83	1.26
PAR-0	Campichuelo	8.3%	-1.12	0.77
PAR-1	Paredón	20.6%	2.56	2.05
PAR-2	Caarendy	8.3%	-0.96	0.77
PAR-3	Don Joaquín	13.3%	1.06	1.22
PAR-4	Paloma	11.8%	0.18	1.07
PAR-5	Triunfo	7.8%	-0.52	0.75
PAR-6	Dos Fronteras	14.8%	0.51	1.37
PAR-7	Torocuá	11.9%	0.18	1.09
PAR-8	Tres Fronteras	9.8%	-0.17	0.90
	All Access Roads	11.2%	0.42	1.02
Caarendy Port		22.8%	6.02	2.00

(3) Results of Sensitivity Analysis

The indicators for Case I that includes all road improvement components are verified in case of cost increase and/or benefit decrease as shown below. Economic indicators remain barely feasible level even at the incident of 15% of cost increase and 15% of benefit decrease at the same time.

Table 17.1-6 Results of Sensitivity Analysis

Internal Rate of Return (IRR)

	Benefits: -0%	Benefits: -15%
Costs: +0%	14.3%	12.3%
Costs: +15%	12.6%	10.8%

Net Present Value (NPV, at discount rate of 11%, US$ million)

	Benefits: -0%	Benefits: -15%
Costs: +0%	33.2	12.9
Costs: +15%	17.9	-2.4

Benefit/Cost Ratio (B/C)

	Benefits: -0%	Benefits: -15%
Costs: +0%	1.32	1.13
Costs: +15%	1.15	0.98

17.2 FINANCIAL ANALYSIS ON CAARENDY PORT

Financial aspects will be examined in this section on the operation of Caarendy Port financed by Japanese Grant Aid.

17.2.1 Operation Cost

Construction cost is ignored because Japanese Gran Aid Cooperation will be expected to realize the project. Operation cost of Caarendy Port consists of 1) Personal cost, 2) Maintenance cost (for building etc.), and 3) other direct cost (water, electricity, gasoline, communication etc.).

(1) Personal Cost

As mentioned in the previous part of “Operation Plan”, 26 staff members will operate Caarendy Port. Referring to financial data in Concepción Port which ANNP is managing, personal cost in Caarendy Port is estimated in Gs 528,415,200 (Approx. US$ 88,000, @=6,000) per year.

Table 17.2-1 Estimated Personal Cost in Caarendy Port (2015)

Sector	Annual Cost (Gs)
Management	192,897,600
Maintenance	126,855,600
Assistance	208,662,000
Total	528,415,200

(2) Maintenance Cost

Maintenance cost of Caarendy Port including cost for maintenance of building, machines, and restaurant, is estimated to be Gs 160,000,000 (Approx. US$ 27,000, @=6,00) equivalent to 30% of personal cost referring to other ports ANNP mare managing.

(3) Other Direct Cost

Other direct cost including water, electricity, communications etc. is estimated to be Gs 131,250,000 (Approx. 22,000, @=6,000) equivalent to 25% of personal cost referring to financial information of other ports ANNP is managing.

(4) Total Operation Cost

Total annual operation cost of Caarendy Port will be calculated to add 1), 2) and 3) and to be Gs 819,665,200 (Approx. US$137,000, @=6,000).

Table 17.2-2 Total Operation Cost

Sector	Annual Operation Cost (Gs)
Personal Cost	528,415,200
Maintenance Cost	160,000,000
Other Direct Cost	131,250,000
Total	819,665,200

(5) Volume of Cargo of Caarendy Port in 2015

Total 235,450 ton of cargo is estimated to be handled for export and import in Caarendy Port in 2015. Since no detailed demand forecast of Caarendy Port, profitability is calculated based on the volume of cargo in 2015 previously estimated in this study.

Table 17.2-3 Volume of Cargo of Caarendy Port in 2015

Trade	Items	Volume	Unit
Export	1. Soybeans	173,600	Ton/year
	2. Wheat	25,600	Ton/year
	Sub-total	199,200	Ton/year
Import	1. Fuel	11,250	Ton/year
	2. Fertilizer	24,000	Ton/year
	3. Agric. Chemical	1,000	Ton/year
	Sub-total	36,250	Ton/year
Total		235,450	Ton/year

17.2.2 Revenue

Revenue on Caarendy Port operation consists of machine charge on tonnage of handled cargo, silo storage charge, assurance charge, and miscellaneous charge on valued price of handled cargo.

(1) Machine Charge

Gs 3,000 will be charged per 1 ton on exported grain. As to import, Gs 6,000 equivalent to 2 times of amount of export will be charged for cargo except grain.

(2) Silo Storage Charge

0.20% and 0.65% of valued price of exported cargo and imported cargo, respectively.

(3) Assurance Charge

0.25% of valued price of exported cargo will be charged.

(4) Miscellaneous Charge

For the Caarendy Port operation, 25% of minimum salary of 10 assistant staff will be charged. Gs200,000,000 is estimated to be annual cost for this item.

(5) Total Annual Revenue

Unit price of each item of cargo that is based on the calculation of revenue is set according to ANNP suggestion as shown in Table 17.2-4.

Table 17.2-4 Unit Price of Each Item of Cargo

Trade	Item	Volume	Unit
export	1. Soybeans	1,093,300	/Ton
	2. Wheat	1,008,930	/Ton
import	1. Fuel	3,800	/Litter
	2. Fertilizer	1,600,000	/Ton
	3. Agric. Chemical	1,000,000	/Ton

Total annual revenue is calculated by using unit price mentioned above and volume of cargo and come

up to Gs 2,612,014,696 mentioned following tables. ((1)+(2)+(3))

Table 17.2-5 Revenue from Machine Charge

Trade	Item	Volume	Unit	U. Cost	Revenue
export	1. Soybeans	173,600	Ton/year	3,000	520,800,000
	2. Wheat	25,600	Ton/year	3,000	76,800,000
	Su-total	199,200	Ton/year	3,000	597,600,000
import	1. Fuel	11,250	Ton/year	6,000	600,000,000
	2. Fertilizer	24,000	Ton/year	6,000	144,000,000
	3. Agric. Chemical	1,000	Ton/year	6,000	6,000,000
	Sub-total	36,250	Ton/year	6,000	217,500,000
Total		235,450	Ton/year	(1)	815,100,000

Table 17.2-6 Revenue from Silo Storage Charge, Assurance Charge

Trade	Item	Volume	Unit	Unit Price	%	Revenue
export	1. oybeans	173,600	Ton/year	1,093,300	0.45	854,085,960
	2. Wheat	25,600	Ton/year	1,008,930	0.45	116,228,736
	Sub-total					970,314,696
import	1. Fuel	11,250	Ton/year	3,800	0.65	370,500,000
	2. Fertilizer	24,000	Ton/year	1,600,000	0.65	249,600,000
	3.Agric.Chemical	1,000	Ton/year	1,000,000	0.65	6,500,000
	Sub-total					626,600,000
Total					(2)	1,596,914,696

＊ % to export is 0.45% (Silo Charge 0.2% + Assurance Charge 0.25%)

Table 17.2-7 Miscellaneous Charge

Miscellaneous Charge (3)	Gs 200,000,000/year

(6) Profitability

Comparing Annual operation cost to annual revenue calculated mentioned above, Gs1,792,349,496 (Approx.US$298,000, @=6,000) of surplus will be generated and operation will be judge to be profitable.

Table 17.2-8 Profitability of Caarendy Port Operation

Annual Ope. Cost(Gs)	Annual Revenue(Gs)	Profit/year (Gs)
819,665,200	2,612,014,696	1,792,349,496

More detailed study will be necessary just before the start of the operation on the unit price and the level of charges.

17.3 PROJECT IMPACT ANALYSIS

In the economic analysis, the benefits were estimated from the operation expense reduction cost and the saved travel time cost. However, other benefits that cannot be translated into currency must also be evaluated correctly. The following six items are also measured or analyzed in this Study:

- Strengthening export competitiveness
- Enhanced regional integration
- Poverty reduction
- Increase of life opportunities and interchange
- Population stability
- Creation of working opportunities in terms of construction works

(1) Strengthening Export Competitiveness by Transport Stabilization

The access to grain exporting ports is nearly impossible on rainy days in the study area. The implementation of all road projects will ensure stable all-weather access to port facilities for exporting soybean and wheat. The improvement of port access roads will reduce the cost of rain-delayed transport (the loss of profit caused by the delay) and the asphalt-paved surface will help cut down the cost of vehicle operation and maintenance. If all the road projects are implemented, the combined saving by such cost reductions is estimated to reach some US$7.9 million per annum. Given the annual export of approximately 2.8 million tons in the study area, the saving will amount to US$2.8 per ton of exported grain. This amount is equivalent to 50% of the current cost of truck transport (see Table 17.3-1). The costs accruing from the risks of delayed transport and vehicle operation are now presumably reflected in the alongside-silo price at the port received by the farmers. Then, the project implementation, by eliminating such risks, will serve to increase the producer price and reduce the FOB export price. Moreover, the project implementation that enables all-weather collection and delivery of grains will boost Paraguay's market reliability as well as contributing to its price competitiveness. The overall export competitiveness will be greatly enhanced by these projects.

(2) Enhanced Regional Integration through IIRSA Transnational Network Formation

Land-locked Paraguay has to rely on the links with neighboring countries for external trade and requires a well-developed transnational transport network to promote its export. The country's structure of external trade in 2004 shows a large proportion of such neighboring countries as Brazil, Argentina and Uruguay, all together accounting for 60% of export and 80% of import (see Table 17.3-1). This indicates the vital importance to Paraguay of transnational transport infrastructure. In the past, the country benefited from the thriving parallel export at such border cities as Ciudad del Este, Encarnación and Pedro Juan Caballero. Brazil and Argentina in these days had the protective trade policy for their own industries, while Paraguay, with no significant domestic manufacturing industries to protect, adopted low tariffs on imports and kept the domestic taxation level low. By taking

advantage of this situation, border cities of Paraguay sold electric appliances, liquors, cigarettes and so on to the visitors from Brazil and Argentina and the income from such transactions was of considerable importance in the national economy. In 1995, Paraguay joined the regional Common Market (MERCOSUR) which abolished trade tariffs and promoted free trade among member countries. As a result, the parallel trade quickly dwindled to a negligible level. Given the changed external circumstances, the development and formation of IIRSA transnational transport network has an important bearing on Paraguay centrally located among the Common Market countries. The country will possibly emerge as one of the hubs in the well-developed transnational network.

Table 17.3-1 Export and Import Structure of Paraguay (2004)

	EXPORT		IMPORT	
	ton	%	ton	%
Brazil	1,448,571.0	25.9	1,337,586.0	38.1
Argentina	396,137.3	7.1	1,390,199.0	39.6
Uruguay	1,691,762.0	30.2	95,475.4	2.7
Chile	33,650.3	0.6	24,455.0	0.7
Bolivia/Peru	21,395.2	0.4	36,795.7	1.0
Middle & South America	1,193,980.0	21.3	46,010.0	1.3
North-America	88,797.1	1.6	39,145.7	1.1
Europe	543,755.8	9.7	245,210.6	7.0
Asia/Oceania	142,252.7	2.5	285,673.6	8.1
Africa/Middle East	32,203.8	0.6	11,674.5	0.3
Others	120.6	0.0	105.2	0.0
Total	5,592,625.8	100.0	3,512,330.7	100.0

Source: OCIT

(3) Road Improvement Impact on Poverty Reduction

1) Study on Current Poverty Level

The last data on poverty in Paraguay come from the Surveys carried out from August to December 2004. According to these, the monthly cost per family (4.4 people) of the Basic Consumer Products (Extreme Poverty Line) and of the Total Consumer Goods (Poverty Line) in the countryside is 550,479 and 1,026,562 PYG/month.

Table 17.3-2 Monthly Value of Basic Consumer Products

(October 2004 PYG)

Geographic Domain	Basic Consumer Products		Family Size (number of people per household)	Basic Consumer Products	
	Food (Extreme Poverty Line)	Total (total poverty line)		Food (Extreme Poverty Line)	Total (total poverty line)
Asunción	168,964	358,822	4.3	727,733	1,545,457
Urban centers	167,074	355,181	4.2	708,701	1,506,621
Other urban areas	126,807	223,469	4.2	533,132	939,526
Rural areas	**87,269**	**135,000**	**4.7**	**410,189**	**643,539**
Country	**124,422**	**232,028**	**4.4**	**550,479**	**1,026,562**

Source: STP/DGEEC. Permanent Home Survey 2004.

If this reference is maintained, poverty and extreme poverty indexes in the country are 39.2% and 17.1%, respectively. Also, the zones that are under direct influence of the road works are 5 departments located in the East and South regions of Paraguay, which are Caazapá, Alto Paraná, Itapúa, Caaguazú and Canindeyú. The poverty index in these areas reaches 29.9 – 48.7%, and the extreme poverty index goes from 15.0% to 29.8%. In other words, the poverty index in these departments is above the national average, excepting only the Alto Parana Department.

Table 17.3-3 Poverty Estimations

Residential Area	Total Population	Poor Population	Poor Population %	Extremely Poor Population	Extremely Poor Population %
Country Total	5,701,675	2,232,868	39.2	974,403	17.1
Asuncion	509,190	136,207	26.7	37,364	7.3
Urban centers	1,331,170	655,783	49.3	191,097	14.4
Other urban areas	1,401,143	454,009	32.4	185,009	13.2
Rural area	2,406,172	986,869	40.1	560,933	22.8
Caazapá			46.5		26.4
Alto Paraná			29.1		15.0
Itapúa			41.1		24.1
Caaguazú			48.7		29.6
Canindeyú			44.2		29.8

Source: STP/DGEEC. Permanent Home Survey 2004, Paraguay Poverty and Department Income Differences (2004)

2) Road Improvement Impact on Poverty Reduction

Once the road is constructed or maintained, the movement in the related area becomes early and easy. As a result, some industries are located, the job opportunity to the city increases, and the average income in the related area rises. By studying the pavement proportion and poverty (extreme poverty) ratio per Department with a correlative analysis, we have come to the relation showed in Table 17.3-4. Especially, the extreme poverty index shows a strong correlation. The extension of the rate of paved roads by 10% is expected to provoke a 1.8% decrease of the extreme poverty index.

Table 17.3-4 Road Area, Pavement Proportion and Poverty Index Ratio

$y = a_0 + a_1 x_1 + a_2 x_2$

Here $, a_0, a_1, a_2$: *Quotient*

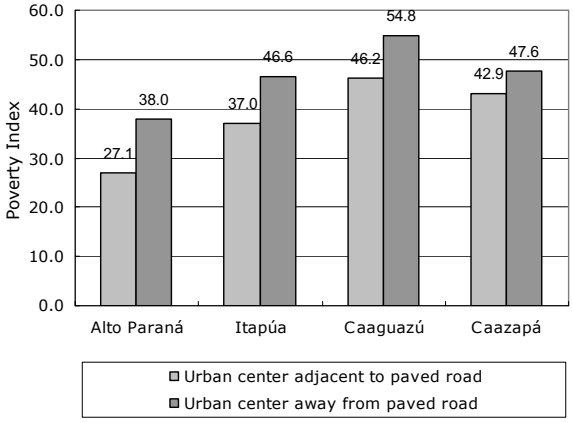
y : *Poverty or Extreme Poverty Index*

x_1 : *Road Area (Km)*

x_2 :*Pavement Proportion (%)*

Quotient	Poverty	Extreme Poverty
a_0	44.50506	29.81258
a_1	0.041671	- 0.00452
a_2	- 0.18711	- 0.18139
R	0.457	0.650

Also, Figure 17.3-1 shows the estimation of the poverty index and of the extreme poverty index in urban zones close to and away from paved roads. With the interconnection of urban centers and a paved road, the poverty index and the extreme poverty index would improve between 4.7% - 10.9% and 5.9% - 10.8%, respectively.



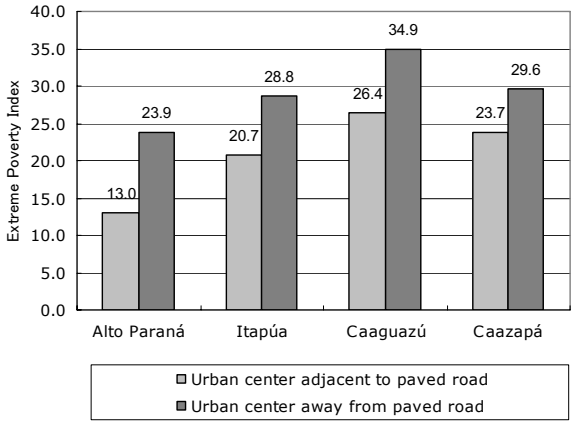


Figure 17.3-1 Main Road and Poverty/Extreme Poverty Index Ratio

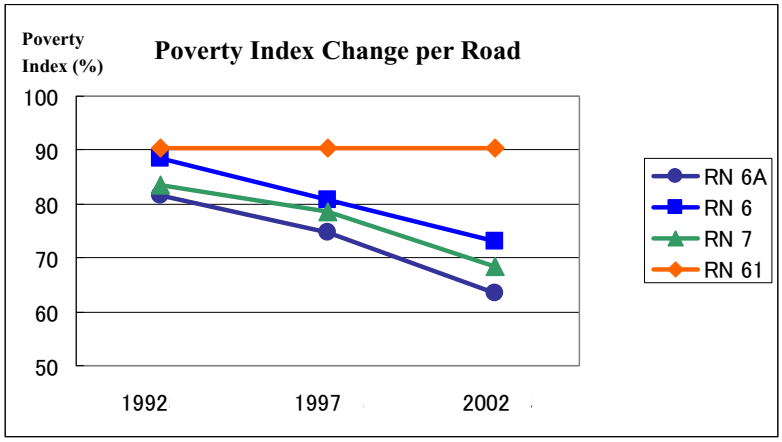
Also, the Post Project Evaluation Study of the Cambodia Local Road Improvement Project carried out in 2003 mentions a 20% poverty reduction in its report in relation to the communities adjacent to the road (please refer to Table 17.3-5). The mentioned incidence is not considered overvalued at all.

The estimation of the benefits of the Road Improvement Project in relation to poverty reduction in the influence area along the road starts with an 8% reduction on poverty and extreme poverty indexes. The forecast carried out based on the 2002 population margin shows an approximate reduction of 9,100 people from the poor population and 9,900 people from the extremely poor population (see Table 17.3-6).

Table 17.3-5 MLIT Study Profile on the Effectiveness Analysis of the Road Improvement Project

This study was carried out by the Japanese Ministry of Land, Infrastructure and Transport in order to evaluate the positive effects of infrastructure projects, especially focusing on the effects on poverty. This study has two stages. Stage I was carried out in Bangladesh in order to analyze the positive effects of the bridge project subsidy help. Stage II was carried out in Cambodia in order to analyze the positive effects of the road and bridge project subsidy help. During Stage II of the Study, a quantitative analysis of poverty relief was carried out, and the poverty levels of the residents along the road with or without the project were compared before and after the project for a 10 year period.

As a result of the Study Stage II, the poverty reduction index (around 20%) for roads with a project (NR6A, NR6 and NR7) was demonstrated, whereas the poverty index remained the same in the road without a project (NR61), as the following Figure shows.



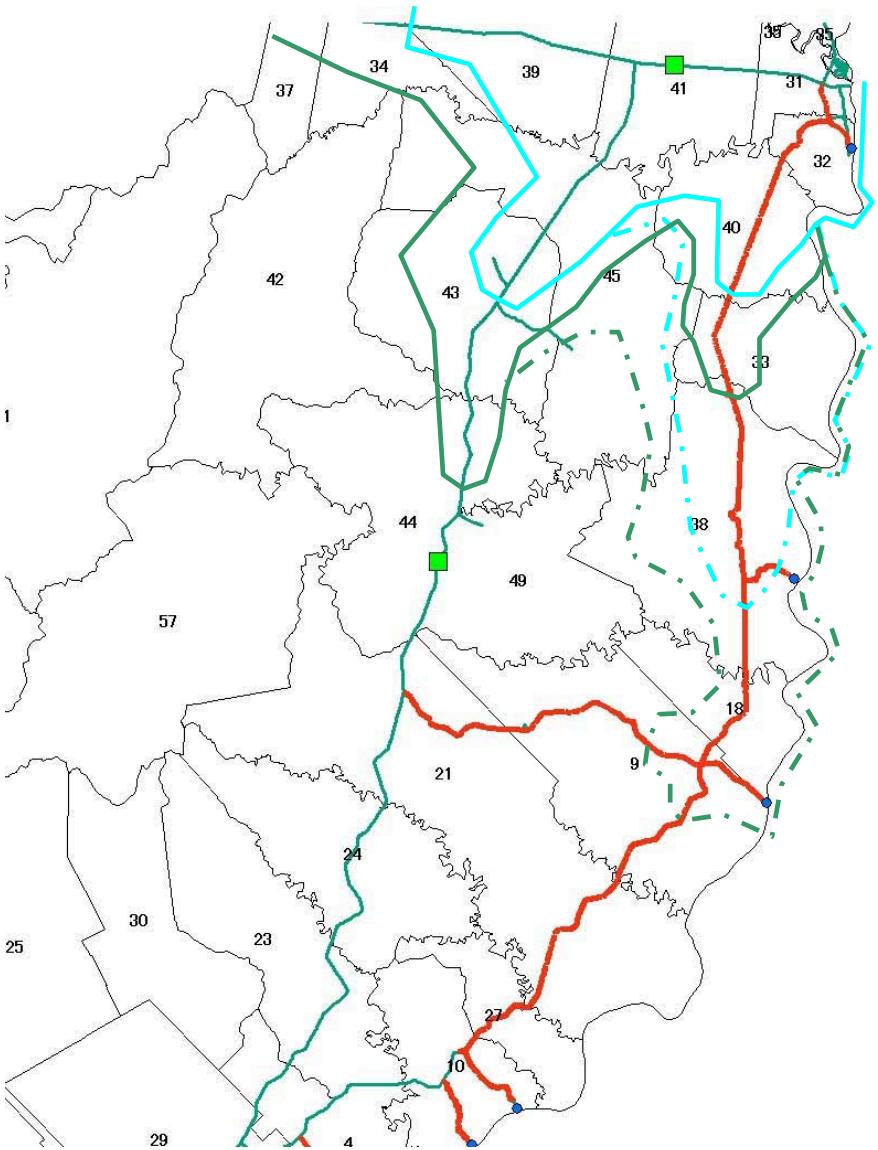
Source: "Study on Effectiveness Analysis of Infrastructure Projects", Ministry of Land, Infrastructure and Transport, Japan, March, 2003

Table 17.3-6 Estimation of Impact on Poverty Reduction

Department	District	Population (2002)	Poverty Population			Extremely Poverty Population		
			Without Project	With Project	Expected Reduction	Without Project	With Project	Expected Reduction
Alto Paraná	Domingo M. de Irala	6,734	2,949 (43.8%)	2,411 (35.8%)	538	1,751 (26.%)	1,212 (18.%)	539
	Ñacunday	8,403	3,983 (47.4%)	3,311 (39.4%)	672	2,504 (29.8%)	1,832 (21.8%)	672
	Los Cedrales	9,003	2,530 (28.1%)	1,810 (20.1%)	720	1,485 (16.5%)	765 (8.5%)	720
	Total	24,140	9,462 (39.2%)	7,532 (31.2%)	1,930	5,740 (23.8%)	3,809 (15.8%)	1,931
Itapua	Cambyreta	27,808	7,397 (26.6%)	5,172 (18.6%)	2,225	3,977 (14.3%)	1,752 (6.3%)	2,225
	Capitan Meza	10,384	3,717 (35.8%)	2,887 (27.8%)	830	2,118 (20.4%)	1,288 (12.4%)	830
	Carlos Antonio López	17,622	7,895 (44.8%)	6,485 (36.8%)	1,410	4,740 (26.9%)	3,331 (18.9%)	1,409
	Mayor Otaño	12,157	6,370 (52.4%)	5,398 (44.4%)	972	3,829 (31.5%)	2,857 (23.5%)	972
	San Rafael del Paraná	20,434	6,723 (32.9%)	5,088 (24.9%)	1,635	3,964 (19.4%)	2,329 (11.4%)	1,635
	Yatytay	11,415	6,849 (60.%)	5,936 (52.%)	913	4,532 (39.7%)	3,619 (31.7%)	913
	Total	99,820	35,249 (35.3%)	28,094 (28.1%)	7,170	23,161 (23.2%)	15,176 (15.2%)	7,985
Total		123,960	44,711 (36.1%)	35,626 (28.7%)	9,100	28,901 (23.3%)	18,985 (15.3%)	9,916

(4) Increase of Life Opportunities and Interchange

A road improvement comes along with access improvement towards other districts and a wide range of institutions, and better interchange opportunities. The population of areas at a 1 to 1.5 hour distance from Encarnacion and Ciudad del Este will show an important growth in comparison to their current state, as shown in Figure 17.3-2. Since Ciudad del Este has a higher population density, the comparative study of population index increase before and after a Road Improvement Project implementation, the population at a 1 to 1.5 hour distance from the urban center of this city will show an increase of 15,000 to 29,000 people, corresponding to 3.8% to 6.6%. However, the benefits that would come along with an increase of the region's potential are considerable. They would shorten the time needed from Encarnacion or Ciudad del Este to no more than 2 hours, instead of the 3 hours required with the current road infrastructure.



	(A)Without Projects	(B)With Projects	Increment(B-A)
Population within range of 1.0 hour			
Alto Paraná	0	0	0
Itapúa	385,632	400,337	14,705
Caaguazú	0	0	0
Total	385,632	400,337	14,705
Population within range of 1.5 hours			
Alto Paraná	0	0	0
Itapúa	440,835	469,893	29,058
Caaguazú	0	0	0
Total	440,835	469,893	29,058

Figure 17.3-2 Arriving Population Per Period of Time from Encarnación and Ciudad del Este

(5) Population Stability

Table 17.3-7 shows the population growth index corresponding to 10 years from 1992 in districts with or without road. Road adjacent districts show a higher population increase than districts away from paved roads. Therefore, we consider that road pavement and the consequent life quality improvement in the area, along with the hiring of personnel would translate into population stability or increase in the area in question.

Table 17.3-7 Comparison of the Population Increase Index per Paved Road and Unpaved Road Districts

Population Increase Index (2002/1992)			
	District with a Road	District without a Road	Total
Itapua	1.16	1.28	1.20
Alto Parana	1.44	1.05	1.37
Total	1.32	1.20	1.29

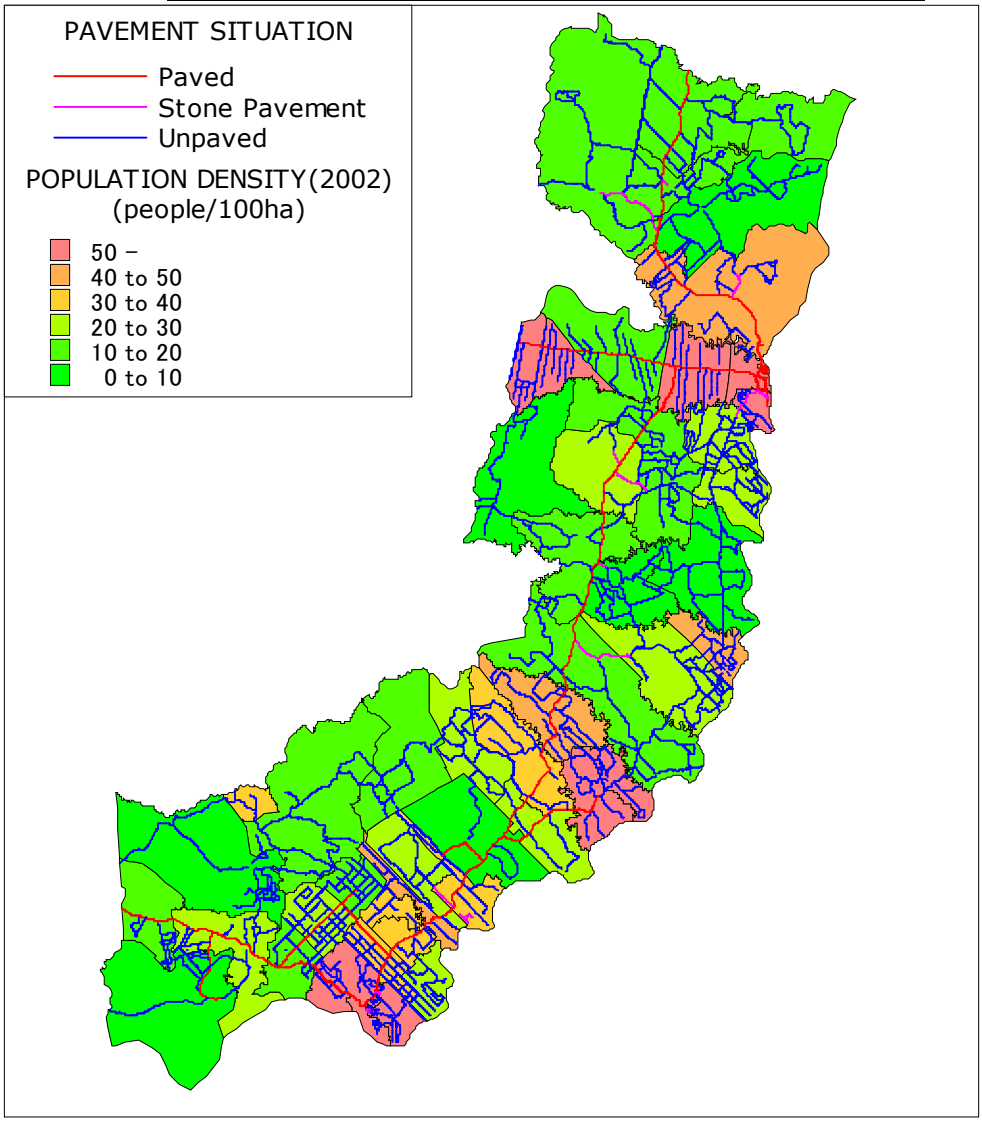


Figure 17.3-3 Road Net and Population Density Distribution

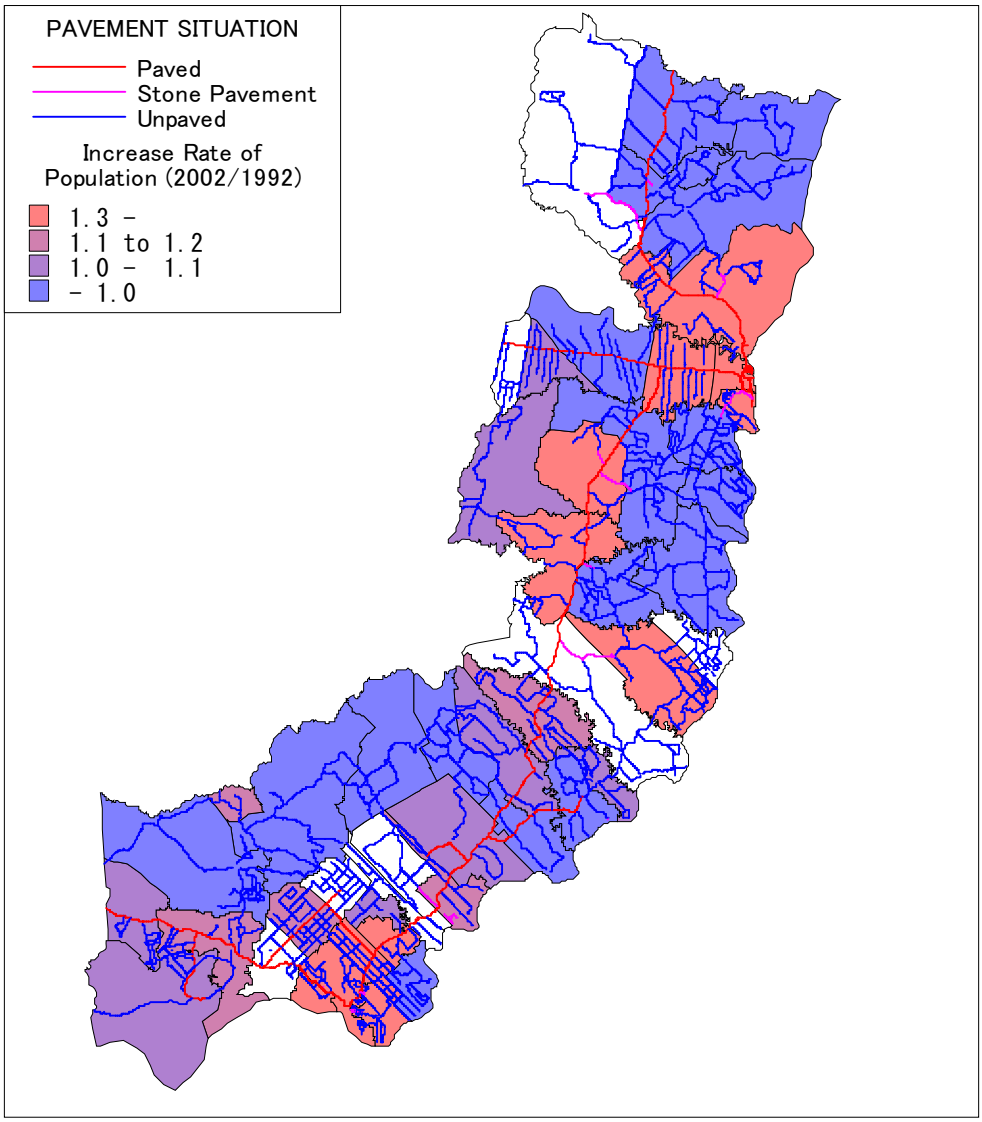


Figure 17.3-4 Road Net and Population Increase

(6) Labor Opportunity Generation in the Construction Works

Very important works such as this Project require worker hiring. This personnel gets supplies in part from the population of the area. According to the estimations of the test, in case of all of the road works – excepting the port improvement work – a total of 123,000 people/day would be needed, approximately, for a 4-year work (1,000 days), which would generate permanent jobs for about 120 permanent workers.

18. IMPLEMENTATION PLAN

18.1 ROAD DEVELOPMENT

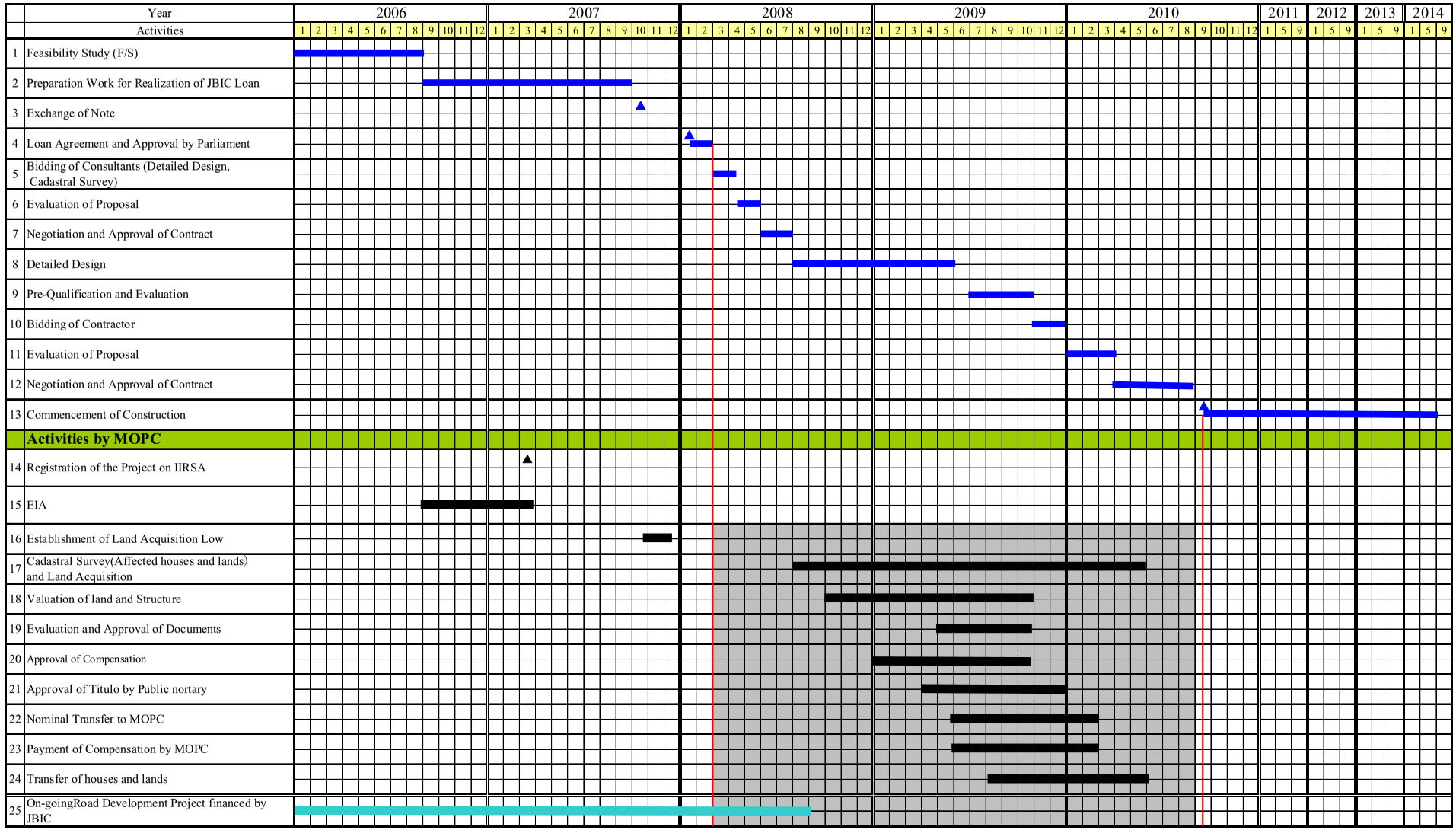
18.1.1 Implementation Schedule

Several procedures to realize the project are necessary to be completed after this feasibility study in case of using the finance some donor. In case of JBIC (Japan Bank for International Cooperation) loan, detailed design will start at the middle of the year of 2008, the construction work will commence at the second half of the year of 2010. Tentative implementation schedule of road development is shown in Table 18.1-1.

Implementation schedule in Table 18.1-1 is elaborated based on following premises;

1) Loan Agreement will approved by parliament of Paraguay in January, 2008.
2) Detailed design will take 10 months to complete.
3) Cadastral survey will be conducted during the same period of detailed design.
4) Pre-qualification will be conducted before bidding of contractor.
5) Bidding period for consultant will be 45 days, and 60days for contractors.
6) Road Construction period will be set for 48 months.

Table 18.1-1 Tentative Implementation Schedule of Road Development



18.1.2 Responsibility of Paraguay Side

Paraguay side has to complete its responsibility by the time of commencement of construction for the smooth implementation. Especially, it is very important to have completed some procedures such as final confirmation of number of houses to be transferred, topographic survey of houses, and payment of compensation before the contract of contract. Accordingly, it is inevitable to progress the procedure to get the budget for topographic survey and resident transfer in the previous year. However, Paraguay side have to take an action of these procedures paying attention to on-going road development projects financed by some donors.

Following activities will be requested to Paraguay side;

(1) Environmental Impact Assessment (EIA)

In case that SEAM judges to implement the EIA for this project, SEAM will prepare the TOR for EIA and will contract out to the consultants. It is desirable to complete EIA before Exchange of Note (E/N) in case of JBIC loan. It would take 5 months including 2 months of bidding for consultants to finish the EIA, and it is necessary to complete within the year of 2006.

(2) Land Acquisition for Road and Resident Transfer

Detailed areas for land acquisition and detailed location, final number of resident transfer have not yet been proved at the moment. Cadastral survey for land acquisition will be done at the same period of detailed design of this road development project by suggestion from MOPC. Accordingly, detailed areas to be surveyed and the proper technical specifications for the survey should be included in the TOR for the consultant bidding.

1) Land Acquisition for Road

Land acquisition will be needed for 296.2 km within 315km of the whole distance of the project roads. Total area for land acquisition counts 700ha. Total cost for land acquisition is estimated to be approximate US$ 1.4 million as shown in Table 18.1-2.

Table 18.1-2 Road Distance for Land Acquisition etc.

Road Section	Distance (km)	Area (ha)	Cost (US$)
Main Corridor	134.2	362.3	686,832
Port Access Road	107.6	216.2	467,072
Extension of Route No.15	54.4	122.2	244,452
Total	296.2	700.7	1,398,356

Land acquisition is inevitable action to be completed for whole line of the road in advance to conduct the project road construction. It is recommended to start the procedure from the road sections that would take long time due to difficulty of acquisition because almost area to be acquired contain no

difficulties to progress the procedure.

2) Resident Transfer

Number of resident transfer within road width (13.5m) with the advance of implementation of the project counts 43 and 45 for the access point to Ciudad del Este along the main corridor and for the whole sections of main corridor, respectively. On the other hand, there exist only 2 for the extension of route No.15 and for port access roads.

However, number of resident transfer within the right of way (50m in Paraguay) counts 490 (not incl. within road width) as shown in Table 18.1-3, which means that total number of resident transfer with the advance of this project counts 538. However, almost all of them do not contain any difficulty for the construction work. Further study is necessary to grasp the detailed number of resident transfer and it will be necessary to clear the number at the period of detailed design at latest.

The cost for resident transfer that will be prepared by domestic budget is estimated to be US$ 1.0 million in this study. (This cost should be reviewed and calculated based on precise information same as the number of resident transfer). Since a various procedure such as payment the compensation, preparation of new land to transfer, and devolution etc. will be needed; the executing agency of this project should deal with promptly.

Table 18.1-3 Number of Resident Transfer

	Road Section	Within Road Width (13.5m)	Within Right of Way (50m)
M-1	Natalio - Otano	0	12
M-2	Tembey River– Gurapay Stream	0	46
M-3	Gurapay Stream– Intersection on R15E	0	22
M-4	Intersection on R15E – Yacuyguazu River	0	11
M-5	Yacuyguazu River– Nacundy River	1	0
M-6	Nacundy River– Los Cedrales	1	7
M-7	Los Cederales – Pdt. Franco	0	5
M-8	Pdt. Franco – Route No.7	43	123
	Sub-total	45	226
R15E-1	Route No.6 - Frutika	1	0
R15E-2	Frutica - Corredor Principal	0	17
	Sub-total	1	17
PAR-0	Campichuelo Port	2	21
PAR-1	Paredón Port	0	17
PAR-2	Caarendy Port	0	0
PAR-3	Don Joaquín Port	0	14
PAR-4	Paloma Port	0	17
PAR-5	Triunfo Port	0	37
PAR-6	Dos Fronteras Port	0	14
PAR-7	Torocua Port	0	0
PAR-8	Tres Fronteras Port	0	127
	Sub-total	2	247
	Grand-total	48	490

(3) Preparation of Financial Resource

Even in case of loan from some donors or international funds, a part of project cost should be prepared by domestic budget of Paraguay. It is necessary to deal with the big amount from the budget of Paraguay due to large scale of the project.

The allocation of the project cost between the donor and Paraguay side and necessary amount of domestic budget is estimated in the Table 18.1-5. In this table, all the works assumed to be started at the same time.

Budget of the Road Direction after1997 are shown in the Table 18.1-4. Domestic budget for Road construction and maintenance went down significantly in 2002 and in 2003, however it has been keeping a level more than average US$ 45 million. Since 3.76% and 3.29% is expected for economic growth rate from 2005 to 2010 and from 2011 to 2015 respectively, around US$ 50 million can be allocated for the domestic budget after 2008 while this project will be executed. Premising that road construction cost will be US$ 112 million and construction period will be 4 years, US$ 28 million, which is equivalent to 89% of domestic budget for road construction (2005), is necessary for domestic budget only for this project. It is severely hard to prepare this amount from their own budget, and the finance from some donors is expected.

Table 18.1-4 Executed Budget of Road Division

	1997	1998	1999	2000	2001	2002	2003	2004	2005
1.Total Budget Execution	95,898	148,726	123,939	110,390	83,819	72,191	62,771	111,212	77,808
2. Construction (domestic)	52,292	71,067	59,223	34,900	33,239	2,576	11,613	41,936	35,702
3. Construction (foreign)	26,010	61,757	51,464	62,591	36,300	62,826	45,888	64,496	31,804
4. Administrative and Maintenance	17,569	15,902	13,252	12,899	14,280	6,789	5,270	4,779	10,302
5. Domestic budget (2. + 4.)	69,861	86,969	72,475	47,799	47,519	9,365	16,883	46,715	46,004

* Unit: US$ 1,000, MOPC

Even in case of finance of donors, US$ 39 million equivalent to 25% of the total project cost (US$ 156 million) will fall on the Paraguay's side, it means that Paraguay side will prepare US$ 10 million as domestic budget for this project.

According to this table, MOPC has to allocate approximate US$ 2 million and US$ 9 million to this project as domestic budget from 2007 to 2009, and from 2010 to 2013 respectively. These budgets can be prepared within MOPC's budget, it will be necessary to progress the procedures for preparation of the budget intentionally, considering the situation that some road development projects financed by several donors are conducted in parallel with this project. Additionally, to ensure the preparation of domestic budget, it will be recommendable to shift the timing of bidding of contractors by dividing the contracts.

Table 18.1-5 Financial Plan and Assignment of Fund

Project Cost (PC)	112.1	million US$
DD/Project Cost	3%	
SV/Project Cost	10%	
Contingency/PC	10%	10% of (2.+5.+6.), not incl. Escalation
Unit Price /km	4,439	US$/km
Land Acquisition Cost(315km)	1.40	million US$
IVA	10%	(10% of total of 1.- 6.)

Assignment of Total Project Cost

millones de US$

	Total	'06	'07	'08	'09	'10	'11	'12	'13	14	Total
1. EIA	0.20	0.10	0.10								0.20
2. Detailed Design	3.36			1.68	1.68						3.36
3. Land Acquisition for Road	1.40			0.70	0.70						1.40
4. Resident Transfer	1.00			0.50	0.50						1.00
5. Construction Work	112.10					8.17	25.77	28.00	28.00	22.17	112.10
6. Supervision	11.21					0.82	2.81	2.80	2.80	1.98	11.21
7. Contingency	12.67			0.17	0.17	0.90	2.86	3.08	3.08	2.42	12.67
8. IVA	14.17			0.30	0.30	0.99	3.14	3.39	3.39	2.66	14.17
Total	156.11	0.10	0.10	3.35	3.35	10.87	34.58	37.27	37.27	29.22	156.11

Local Cost by MOPC

milliones de US$

	Total	'06	'07	'08	'09	'10	'11	'12	'13	14	Total
1. EIA	0.20	0.10	0.10								0.20
2. Detailed Design	0.00										0.00
3. Land Acquisition for Road	1.40			0.70	0.70						1.40
4. Resident Transfer	1.00			0.50	0.50						1.00
5. Construction Work	20.00					1.46	4.60	4.99	4.99	3.95	20.00
6. Supervision	0.00										0.00
7. Contingency	2.26			0.03	0.03	0.16	0.51	0.55	0.55	0.43	2.26
8. IVA	14.17	0	0.00	0.30	0.30	0.99	3.14	3.39	3.39	2.66	14.17
Total	39.03	0.10	0.10	1.53	1.53	2.61	8.25	8.93	8.93	7.04	39.03

Cost by Loan

milliones de US$

	Total	'06	'07	'08	'09	'10	'11	'12	'13	14	Total
1. EIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Detailed Design	3.36	0.00	0.00	1.68	1.68	0.00	0.00	0.00	0.00	0.00	3.36
3. Land Acquisition for Road	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
4. Resident Transfer	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
5. Construction Work	92.10	0.00	0.00	0.00	0.00	6.71	21.17	23.01	23.01	18.21	92.10
6. Supervision	11.21	0.00	0.00	0.00	0.00	0.82	2.81	2.80	2.80	1.98	11.21
7. Contingency	10.41	0.00	0.00	0.14	0.14	0.74	2.35	2.53	2.53	1.98	10.41
8. IVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	117.08	0.00	0.00	1.82	1.82	8.26	26.33	28.34	28.34	22.18	117.08

SUMMARY OF COST

	LOCAL	LOAN	TOTAL	LOAN PORTION
	million US$			%
1. EIA	0.20	0.00	0.20	0%
2. Detailed Design	0.00	3.36	3.36	100%
3. Land Acquisition for Road	1.40	0.70	2.10	33%
4. Resident Transfer	1.00	0.50	1.50	33%
5. Construction Work	20.00	92.10	112.10	82%
6. Supervision	0.00	11.21	11.21	100%
7. Contingency	2.26	10.41	12.67	82%
8. IVA	14.17	0.00	14.17	0%
Total	39.03	117.08	156.11	75%

Nota: Porcion de MOPC=100%

18.1.3 Consideration on Ordering of Construction Work

Road distance of this road development project come up to 315km, and work volume of the contractor is significant large. Considering the contract scale for similar works in Paraguay and the maximum annual work volume (approx. 20km/year) in the past in Paraguay, it is recommendable to divide the contract into 5 or 6 sections, and to contract out to different contractors. More than this, difficulty of work, locations of quarries, the number of bridges and structures should be considered for deciding the sections. One of the example for division of contract lot considering work volume and continuity of the work is shown in following Table 18.1-6 and Figure 18.1-1.

Table 18.1-6 Tentative Idea for Contract Lot

Section	Road	Origin	Destination	km	Distance
Section-1	PAR-0	Main Corridor	Pt. Campichuelo	21.0	67.0
	PAR-1	Main Corridor	Pt. Paredon	12.1	
	PAR-2	Main Corridor	Pt. Caarendy	15.5	
	PAR-3	Main Corridor	Pt. Don Joaquin	18.4	
Section-2	M-1	Natalio	Tembey River	12.7	81.1
	M-2	Tembey River (inc.bridge)	Gurapay Stream	24.2	
	M-3	Gurapay Stream	Intersection with R15E	22.6	
	PAR-4	Main Corridor	Paloma Port	10.6	
	PAR-5	Main Corridor	Triunfo Port	11.0	
Section-3	M-4	Intersection with R15E	Yacuyguazu River	15.1	53.7
	M-5	Yacuyguazu River (inc.bridge)	Nacunday River	29.8	
	PAR-7	Main Corridor	Torocua Port	8.8	
Section-4	M-6	Nacunday River (inc.Rio)	Los Cedrales	43.4	65.9
	M-7	Los Cederales	Prte. Franco	7.6	
	M-8	Prte. Franco	Super Carreterra	9.5	
	PAR-8	Main Corridor	Tres Fronteras Port	5.4	
Section-5	R15E-1	Route 6	Frutika	20.9	65.5
	R15E-2	Frutika	Main Corridor	28.7	
	PAR-6	Main Corridor	Dos Fronteras Port	15.9	

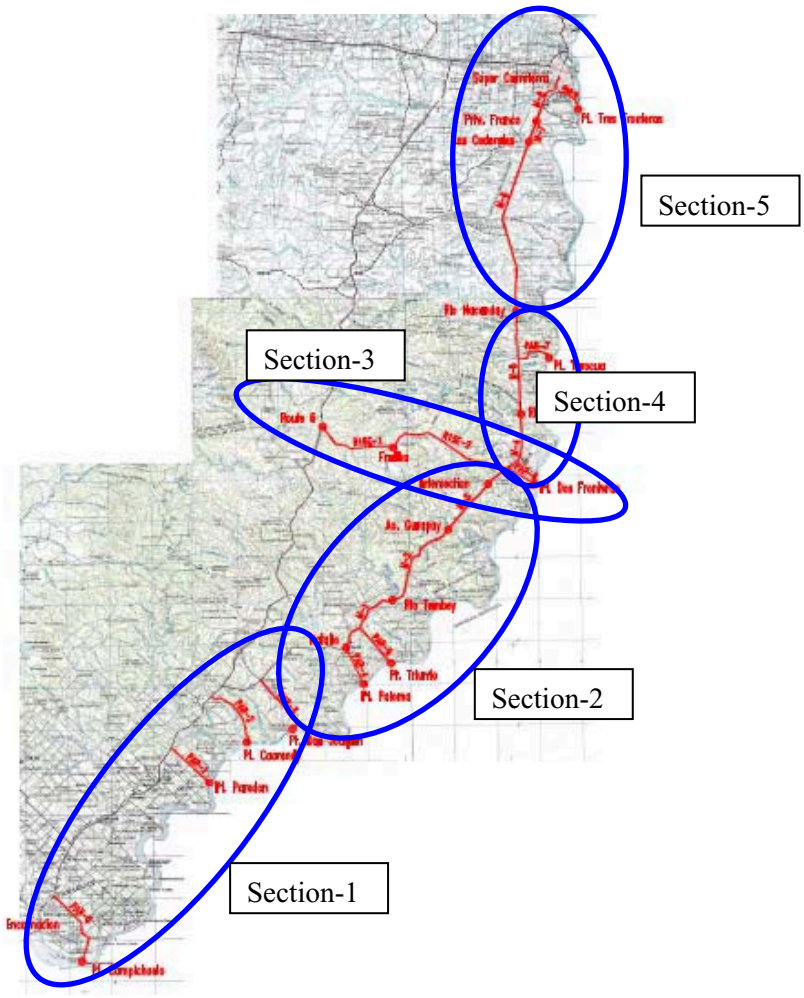


Figure 18.1-1 Tetntative Proposal for 5 Sections

18.2 DEVELOPMENT OF CAARENDY PORT

The implementation schedule until the completion of the construction work of Caarendy Port Project is shown in the following Table 18.2-1 in case of finance of Japan Grant Aid Cooperation.

1)	Preliminary Study	Start at the middle of 2007
2)	Basic Design	Start at the end of 2007
3)	Exchange of Note	Second half of 2007
4)	Detailed Design	Start in February of 2008
5)	Bidding of Contractor	September, 2008
6)	Commencement of Construction	October, 2008
7)	Construction Period	17 months

Paraguay side should conduct following activities by the time of commencement of the construction.

1) EIA
2) Land acquisition
3) Installation of necessary utilities
4) Contract with consultant and contractor

EIA should start after basic design and complete before construction work. Regarding land acquisition for the project, even Agricultural Corporation of Pirapo has agreed to provide their own land to ANNP, some appropriate procedures to Japan Grant Aid Cooperation should be discussed and examined between Agricultural Corporation of Pirapo and ANNP or MOPC.

Table 18.2-1 Tentative Implementation Schedule of Caarendy Port Project

	Year	2006												2007												2008												2009												2010			2011			2012			2013		
	Activities	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	5	9	1	5	9	1	5	9	1	5	9
1	Feasibility Study (F/S)																																																												
2	Application to Japanese Government																																																												
3	Preliminary Study (in Paraguay)																																																											
4	Preliminary Study (in Japan)																																																											
5	Bidding of Consultant (in Japan)																																																											
6	Basic Design																																																											
7	Exchange of Note																																																											
8	Detailed Design																																																											
9	Bidding of Contractor (in Jpan)																																																											
10	Commencemnet of Construction																																																											
11	Inspection after completion																																																											
	Activities by MOPC																																																											
16	EIA																																																											
17	Land Acquisition																																																											
18	Installation of Neccesary Facilies																																																											
19	Contract with Consultant																																																											
20	Contract with Contractor																																																											

19. CONCLUSIONS AND RECOMMENDATIONS

The present study has found that all the projects proposed for the export corridor plan are justifiable for their implementation. Their early construction and operation are recommended for the following two reasons.

1) The road projects are proposed to overcome the weakness of Paraguayan transport infrastructure and to serve as the integral part of the national development planning strategy. The implementation of these projects will improve the transport efficiency, raise the productivity of export commodities and thereby strengthen Paraguay's export competitiveness. Ultimately, these projects will contribute to the economic activation of the country as a whole.
2) As long as the projects are constructed, operated and maintained in the appropriately required manner, their combined economic internal rate of return is estimated to be 14.3%, i.e., their implementation is judged economically feasible. Their implementation will alleviate the problem of poverty and improve the overall living conditions in the country.

(1) Development of Southern Integrative Roads

- Regarding the Parana River Coastal Road and the extension of National Road Route 15, their respective technical feasibility is justified by paying attention to a number of relevant factors. Namely, routing decisions are made with due caution to minimize the possible environmental disturbance and the relocation of local communities. Longitudinal and cross-sectional designs are made carefully to suit their respective design speed. Roadside structures are designed so as to economize on the costs of construction and maintenance without sacrificing traffic safety. The number of lanes and the pavement structure are determined in close conformity with the projected future traffic demand. The combined economic internal rate of return is estimated to be a little over 15%, sufficient to justify the implementation of these projects. The proposed roads are to serve as crucial part of the arterial network that will integrate the southeastern region of Paraguay and are thus to be named "southern integrative roads". Their earliest possible implementation is advisable for the following reasons.

- The proposed southern integrative roads are expected to complete the arterial network interconnecting the provinces in the southeastern part of Paraguay. In other words, they will play a decisive role in activating regional economic activities and mitigating the problem of regional poverty.

- The proposed roads are expected to function as the Paraguayan link in the transnational highway between the Atlantic and the Pacific Coasts along the IIRSA tropico de Capricornio axis.

- The proposed roads are expected to reduce the transport costs of export commodities. This means that they will contribute, in no uncertain terms, to the improvement of agricultural productivity

and the strengthening of export competitiveness, two of the major goals advocated in the national development strategy.

(2) Development of Port Access Roads

- To strengthen the country's export competitiveness, it is vital to link up between the proposed southern integrative roads and the port facilities available along Parana River. The paving of such feeder roads will realize the all-weather accessibility of the existing river ports and enable the year-round utilization of port facilities for commodity exports. The transport efficiency of grain exports will be accordingly upgraded, while local population will benefit from the convenience of better and easy daily mobility.

- The technical feasibility is justified by heeding the need of minimizing local community relocation in the route selection, making the cross-sectional and longitudinal designs consistent with the design speed, determining the number of lanes and the structure of pavement in accordance with the projected future traffic volume, and so forth.

- There is a recent example of private investment in a port access road regarding Campichuelo Port. The said project was the construction of a new unpaved dirt road. The pavement, with associated structural improvements, of the existing roads requires a sizable outlay of capital, and it is rather unrealistic to expect similar private sector involvement. The economic internal rate of return for the port access roads alone is estimated to be a little over 11%, indicating reasonable benefits to the national economy that accrue from their implementation. Therefore, it is concluded that the public sector investment is justifiably needed for the improvement of port access roads.

(3) Development of Caarendy Port

- It is forecast that the production of soybean, Paraguay's primary export commodity, will be more than twice as large as the present level by the year 2015. Consequently, the country's export that relies on riverine transport will increase by 1.9 times over the same period. Many privately owned and operated port facilities now dot the banks of Parana River. However, these small-scale facilities will not be able to cope with the expected growth of grain export. A number of actions need be taken to expand the country's cargo-handling capacity to the level sufficient for the future demand.

- Most of the existing port facilities are in the hands of large private companies and operated for their own exclusive use. These companies buy grains only from large farmers. Even if the country's output of soybean and other grains should increase as forecast, the future growth of export would be more likely to end up benefiting large farmers only, and hardly likely to activate the country's economy as a whole.

- The development of Caarendy Port is not simply to handle the future growth of export in line with

the country's export promotion policy, but also to serve as a policy instrument for having the small-scale farmers participate in the export promotion, and thereby having the benefits of export growth shared by the regional population as a whole. Accordingly, it is recommended that the proposed port meets the following requirements.

a) The port is operated by some public-sector body in order to have the accruing benefits reach as many people as possible.
b) The port is to have the cargo handling capacity (annual export of 200,000tons) that will not adversely affect the operation of privately owned ports.
c) The port handles the import of fertilizers, fuels and agricultural chemicals, which cannot be done by the existing ports.
d) The port management should take note of the self-organizing needs among local medium- and small-scale farmers. The managing body should work closely with the existing agricultural cooperatives and thereby ensure the sustainability of its port operation.

- The simultaneous development of an access road is desirable.

(4) Recommendations for Expediting Smooth Project Implementation

To ensure smooth implementation of the proposed projects, it is recommended that the Government of Paraguay takes the following steps.

- To put appropriate EIA into effect and expedite the procedure of land appropriation for the right of way acquisition.

- To request and obtain some external development financing of higher concessionality like Japanese yen credit for the purpose of expediting the early project implementation, while allocating the adequate domestic counterpart fund in the government budget.

(5) Recommendations Toward Increasing the Potential Impact of the Proposed Project Implementation

To enhance the positive impact of the proposed projects, it is recommended that the Government of Paraguay proceeds with the following measures.

- To strengthen the linkage of the proposed projects to the IIRSA endeavor and to promote thereby the development of a wider transnational road network with neighboring countries.

- To sustain the appropriately disciplined procedure of operation and maintenance after the completion of the proposed projects.

- To take policy measures that will support the upgrading efforts of the river port facilities and ensure the stability and safety of riverine transport.