Table 10-16 Weights for Road Classification

Road Class (Weight 30)			Function (Weight 50)			Service Conditions (Weight 20)		
	%	Weight		%	Weight		%	Weight
TP-I(s)	100	30	a	100	50	V	100	20
TP-I	80	24	b	90	45	IV	75	15
TP-II	60	18	c	60	30	III	50	10
TS-I	60	18	d	20	10	II	25	5
TS-II	40	12				I	0	0
CP-II	0	0						

The road classification weight might be over raped with the functional weight in some points; however, emphasis has been placed on aspects that are not related to road function, such as geometric alignment, traffic volume, roadside environment, etc. Therefore, the road classification function can be regarded to be independent of the road function.

The total weight of every road section in each of the sub-network is calculated as follows:

$$W_t = W_c + W_f + W_s$$

where;

W_t : Total Weight
W_c : Weight of Classification
W_f : Weight of Function
W_s : Weight of Service Condition

The values of W_c, W_f and W_s are shown in Table 10-18; however, if W_c equals 0, W_t should be set to be 0.

10.6.2 Priority Analysis Weighting

A priority analysis was carried out using the priority value (Pr_{ij}), which was modified by following equation:

$$Pr_{ij} = W_t \times C_i/CT_j$$

where,

Pr_{ij} : Priority value of the road section i in sub-network j
W_t : Weight
C_i : Unit improvement cost per km of road section i
CT_j : Average improvement cost per km in sub-network j

In the above equation, the "weight" is modified by C_i/C_t. C_i/C_t means that the higher the value is, the stronger the necessity to improve the road becomes. This is because the high cost of C_i suggests that much more money is required to improve the existing road section i, which has considerably bad road conditions compared with the desired criteria.

Moreover, the Pr_{ij} value was adjusted so that Pr_i would equal the network weight of sub-network j (referred to Table 10-15) to allow a comparison of the road section in sub-network j with road sections in other sub-networks. The results are summarized in Table 10-18. The road section Sébaco-Matagalpa has the highest priority value, 5.66.

After adjusting priority values, the priority level can be classified into the following six levels for further evaluation.

Table 10-17 Classification of Priority Levels

Priority Level	Evaluation	Value Range
Priority Level 1	Low	0 - 1.4
Priority Level 2	Middle	1.4 - 2.0
Priority Level 3	Middle-high	2.0 - 3.0
Priority Level 4	High	3.0 - 4.5
Priority Level 5	Very High - 1	4.5 - 5.2
Priority Level 6	Very High - 2	5.2 <

Each road section was evaluated from the lowest priority value to the highest priority value as shown in Table 10-19 and Figure 10-9. The road sections of La Cruz de la India-San Isidro and Sébaco-Matagalpa were classified as "Very High -2".

Table 10-18 Priority Value of the Road Network (1)

Section	Route from: A - to: B			Improvement Level (Class)	Improvement Width (m) W	Distance (km) L	Service Condition 1993	Basic Function	Importance Degree (Weights) Class max=30 wc	Function max=50 wf	Serv.Cond. max=20 ws	Total % wt	Cost/km (1000C$ August 1993) C/km	Priority Value Pr	Economic Evaluation IRR
SUB-NETWORK-1															
A- 1	Nandaime	-	Guanacaste	TP-I	12.00	9.10	IV	a	24	50	15	89	1,129.8	1.94	
A- 2	Guanacaste	-	Catarina	TP-I	12.00	8.90	IV	a	24	50	15	89	1,573.1	2.70	
A- 3	Catarina	-	Masaya	TP-I	12.00	9.10	IV	a	24	50	15	89	1,604.8	2.76	
A- 4	Masaya	-	Tipitapa	TP-I	12.00	22.10	IV	a	24	50	15	89	544.5	0.94	
A- 5	Tipitapa	-	San Benito	TP-I	12.00	13.30	III	a	24	50	10	84	408.1	0.66	
A-101	Guanacaste	-	Granada	TP-II	10.00	10.80	III	c	18	30	10	58	1,025.1	1.15	
A-102	Masatepe-San Marcos	-	Las Esquinas	TS-I	10.00	19.60	IV	d	18	10	15	43	1,414.8	1.17	
A-103	San Marcos	-	Jinotepe	TS-I	10.00	6.20	III	d	18	10	10	38	459.3	0.34	
A-104	Granada	-	Int.Tipitapa	CP-II	7.00	28.90	V	d	0	10	20	0	0.0	0.00	28.1%
A-104-1	Managua	-	Tipitapa	TP-I	12.00	21.00	III	a	24	50	10	84	1,164.9	1.89	
B- 4	Nandaime	-	Jinotepe	TP-I	12.00	18.00	III	a	24	50	10	84	958.7	1.55	
B- 5	Jinotepe	-	Las Esquinas	TP-I	12.00	9.50	III	a	24	50	10	84	1,085.9	1.76	
B- 6	Las Esquinas	-	El Crucero	TP-I	12.00	13.00	III	a	24	50	10	84	1,164.9	1.89	
B- 7	El Crucero	-	Nejapa	TP-I	12.00	15.40	IV	a	24	50	15	89	1,164.9	2.00	
B-105	El Crucero	-	Masachapa	TS-I	10.00	21.30	III	c	18	30	10	58	1,305.4	1.46	
C- 1	Granada	-	Masaya	TP-I	12.00	18.00	III	c	24	30	10	64	1,246.6	1.54	
C- 2	Masaya	-	Managua	TP-I(s)	21.00	29.00	V	a	30	50	20	100	2,468.3	4.77	
C-101	Esquipulas	-	Masatepe	TS-I	10.00	31.50	V	d	18	10	20	48	1,597.7	1.48	
			SubTotal			304.70			Sub-network Cost/km & Importance Weigth				1,166.0	30.00	
SUB-NETWORK-2															
B- 0	Peñas Blancas	-	Sapoa	TP-I	12.00	4.00	II	a	24	50	5	79	471.5	1.34	
B- 1	Sapoa	-	La Virgen	TP-I	12.00	20.80	IV	a	24	50	15	89	1,573.1	5.05	
B- 2	La Virgen	-	Rivas	TP-I	12.00	11.10	III	a	24	50	10	84	1,085.9	3.29	25.7%
B- 3	Rivas	-	Nandaime	TP-I	12.00	44.10	III	a	24	50	10	84	469.8	1.42	
B-102	La Virgen	-	San Juan del Sur	TS-I	10.00	18.30	II	c	18	30	5	53	285.9	0.55	
B-103	Rivas	-	Tola	TS-I	10.00	13.10	III	c	18	30	10	58	1,597.7	3.34	
			SubTotal			111.40			Sub-network Cost/km & Importance Weigth				839.7	15.00	

Table 10-18 Priority Value of the Road Network (2)

Section	Route from: A - to: B		Improvement Level (Class)	Improvement Width (m) W	Distance (km) L	Service Condition 1993	Basic Function	Importance Degree (Weights) Class max=30 wc	Function max=50 wf	Serv.Cond. max=20 ws	Total % wt	Cost/km (1000C$ August 1993) C/km	Priority Value Pr	Economic Evaluation IRR
SUB-NETWORK-3														
B- 8	Managua	Nejapa-Izapa	TP-I	12.00	66.40	I	a	24	50	25	37	1,246.7	0.37	
B- 9	Izapa	León	TP-I	12.00	25.50	IV	a	24	50	15	89	1,178.5	0.83	
B- 10	León	Chinandega	TP-I	12.00	40.00	IV	b	24	45	15	84	1,178.5	0.78	
B- 11	Chinandega	Somotillo	TP-I	12.00	68.50	IV	a	24	50	15	89	1,242.5	0.87	
B- 12	Somotillo	Guasaule	TP-I	12.00	6.10	III	a	24	50	10	84	1,762.9	1.17	
B-106	Nejapa-Mateare	Izapa	TP-II	10.00	60.10	IV	c	18	50	15	83	1,449.9	0.95	
B-107	Izapa	Puerto Sandino	TP-II	10.00	9.60	III	c	18	30	10	58	1,256.7	0.57	23.0%
B-114	Chinandega	Corinto	TP-II	10.00	20.00	IV	c	18	30	15	63	1,352.8	0.67	
B-115	Chinandega	El Viejo	TS-I	10.00	7.00	III	c	18	30	10	58	19,254.0	8.80	
B-117	Somotillo	Villa Nueva	CP-II	7.00	16.00	III	d	0	10	10	0	0.0	0.00	
B-116-1	Puerto Morazán	Ranchería	CP-II	7.00	19.80	V	d	0	10	20	0	0.0	0.00	
		SubTotal			339.00			Sub-network Cost/km & Importance Weigth				1,524.7	15.00	
SUB-NETWORK-4														
A- 6	San Benito	Puertas Viejas	TP-I	12.00	36.70	III	a	24	50	10	84	471.5	0.63	
A- 7	Puertas Viejas	Sébaco	TP-I	12.00	32.40	III	a	24	50	10	84	1,164.9	1.57	
A- 8	Sébaco	San Isidro	TP-I	12.00	13.60	III	a	24	50	10	84	1,085.9	1.46	
A- 9	San Isidro	Esteli	TP-I	12.00	31.30	III	a	24	50	10	84	1,164.9	1.57	
A- 10	Esteli	Somoto	TP-I	12.00	67.80	III	a	24	50	10	84	2,589.6	3.48	
A- 11	Somoto	El Espino	TP-I	12.00	21.60	III	a	24	50	10	84	1,164.9	1.57	
A-106	Matagalpa	Yali	TS-II	9.00	76.60	V	d	12	10	20	42	1,597.7	1.07	
A-107	Esteli	Yali	TS-II	9.00	60.70	V	d	12	10	20	42	1,597.7	1.07	4.6%
A-108	Somoto-Yalaguina	Ocotal	TP-II	10.00	29.20	III	c	18	30	10	58	1,417.3	1.32	
A-109	Ocotal	Las Manos	TP-II	10.00	24.00	III	c	18	30	10	58	1,351.6	1.26	
A-107-1	Esteli	El Sauce	CP-II	7.00	44.60	V	d	0	10	20	0	0.0	0.00	
A-107-2	El Sauce-Achuapa	La Sirena	CP-II	7.00	73.00	V	d	0	10	20	0	0.0	0.00	
A-107-3	Yali	Condega	CP-II	7.00	42.40	III	d	0	10	10	0	0.0	0.00	
A-107-4	Condega-P.Nuevo	Somoto	CP-II	7.00	34.50	IV	d	0	10	15	0	0.0	0.00	
A-107-5	Palacaguina	Wiwili	CP-II	7.00	107.70	IV	d	0	10	15	0	0.0	0.00	
A-107-6	La Reforma	Jalapa	CP-II	7.00	55.10	IV	d	0	10	15	0	0.0	0.00	
		SubTotal			751.20			Sub-network Cost/km & Importance Weigth				799.0	15.00	

Table 10-18 Priority Value of the Road Network (3)

Section	Route from: A	-	to: B	Improvement Level (Class)	Improvement Width (m) W	Distance (km) L	Service Condition 1993	Basic Function	Importance Degree (Weights) Class max=30 wc	Function max=50 wf	Serv.Cond. max=20 ws	Total % wt	Cost/km (1000C$ August 1993) C/km	Priority Value Pr	Economic Evaluation IRR
SUB-NETWORK: 5															
A-105	Sébaco	-	Matagalpa	TP-II	10.00	26.90	IV	b	18	45	15	78	1,328.3	5.66	
B-110	Telica	-	LaCruzdelaIndia	TS-I	10.00	73.70	IV	b	18	45	15	78	922.4	3.93	8.7%
B-111	LaCruzdela India	-	Int.San Isidro	TS-I	10.00	23.10	IV	b	18	45	15	78	1,267.1	5.40	
B-110-1	Int.Telica	-	Larreynaga	CP-II	7.00	6.40	III	d	0	10	10	0	0.0	0.00	
			SubTotal			130.10			Sub-network Cost/km & Importance Weigth				1,022.2	15.00	
SUB-NETWORK: 6															
D- 1	San Benito	-	Las Banderas	TP-II	10.00	11.70	III	b	18	45	10	73	820	0.41	
D- 2	Las Banderas	-	San Francisco	TP-II	10.00	50.70	V	b	18	45	20	83	1,487	0.85	
D- 3	San Francisco	-	Lovago	TP-II	10.00	72.00	IV	b	18	45	15	78	1,429	0.77	
D- 4	Lovago	-	La Gateada	TS-I	10.00	54.00	IV	b	18	45	15	78	1,598	0.86	
D- 5	La Gateada	-	El Rama	TS-I	10.00	71.70	IV	b	18	45	15	78	1,598	0.86	
D-101	Monte Grande	-	Boaco	TP-II	10.00	14.00	V	d	18	10	20	48	1,519	0.50	-3.0%
D-102	Lovago	-	Los Chiles	TP-I	9.00	134.30	V	a	12	30	20	62	1,756	0.75	
D-103	La Gateada	-	Nueva Guinea	CP-II	7.00	62.50	III	d	0	10	10	0	0.0	0.00	
D-101-1	San Francisco	-	Camoapa	CP-II	7.00	21.00	III	d	0	10	10	0	0.0	0.00	
D-101-2	Las Lajitas	-	San Pedro	CP-II	7.00	15.30	III	d	0	10	10	0	0.0	0.00	
D-102-1	Santo Tomás	-	Santo Domingo	CP-II	7.00	37.20	III	d	0	10	10	0	0.0	0.00	
			SubTotal			544.40			Sub-network Cost/km & Importance Weigth				1,186.3	5.00	
SUB-NETWORK: 7															
A-104-2	Ciudad Dario	-	Mulukuku	CP-II	7.00	192.90	III	d	0	10	10	0	0.0	0.00	
A-104-3	San Dionisio	-	San Ramon	CP-II	7.00	24.30	III	d	0	10	10	0	0.0	0.00	-11.3%
A-105-1	Matagalpa	-	Siuna	TS-II	9.00	115.70	V	b	12	45	20	77	1,438	2.37	
A-105-2	Siuna	-	Puerto Cabezas	TS-II	9.00	218.50	V	b	12	45	20	77	1,598	2.63	
			SubTotal			551.40			Sub-network Cost/km & Importance Weigth				934.7	5.00	

Table 10-19 Priority Level (1)

Section	Route		Improvement		Distance	Service Condition	Basic Function	Priority Value	Economic Evaluation	Priority Level
	from: A	to: B	Level (Class)	Width (m) W	(km) L	1993		Pr	IRR	
A-104	Granada	Int.Tipitapa	CP-II	7.00	28.90	V	d	0.00	28.1 %	
B-117	Somotillo	Villa Nueva	CP-II	7.00	16.00	III	d	0.00	19.1 %	
B-118	Somotillo	San Juan de Limay	CP-II	7.00	68.00	V	d	0.00	19.1 %	
B-116-1	Puerto Morazán	Rancherias	CP-II	7.00	19.80	V	d	0.00	19.1 %	
A-107-1	Estelí	El Sauce	CP-II	7.00	44.60	V	d	0.00	2.5 %	
A-107-2	El Sauce-Achuapa	La Sirena	CP-II	7.00	73.00	V	d	0.00	2.5 %	
A-107-3	Yali	Condega	CP-II	7.00	42.40	III	d	0.00	2.5 %	
A-107-4	Condega-P.Nuevo	Somoto	CP-II	7.00	34.50	IV	d	0.00	2.5 %	NONE
A-107-5	Palacaguina	Wiwilí	CP-II	7.00	107.70	IV	d	0.00	2.5 %	
A-107-6	La Reforma	Jalapa	CP-II	7.00	55.10	IV	d	0.00	2.5 %	
B-110-1	Int.Telica	Larreynaga	CP-II	7.00	6.40	III	d	0.00	8.7 %	
D-103	La Gateada	Nueva Guinea	CP-II	7.00	62.50	III	d	0.00	-3.0 %	
D-104	*Nueva Guinea*	*Blufields*	*CP-II*	*7.00*	*95.20*	-	c	*0.00*	-3.0 %	
D-101-1	San Francisco	Camoapa	CP-II	7.00	21.00	III	d	0.00	-3.0 %	
D-101-2	Las Lajitas	San Pedro	CP-II	7.00	15.30	III	d	0.00	-3.0 %	
D-102-1	Santo Tomás	Santo Domingo	CP-II	7.00	37.20	III	d	0.00	-3.0 %	
A-104-2	Ciudad Dario	Mulukuku	CP-II	7.00	192.90	III	d	0.00	-11.3 %	
A-105-3	Puerto Cabezas	Waspan	CP-II	9.00	137.50	V	c	0.00	-11.3 %	
A-104-3	San Dionisio	San Ramón	CP-II	7.00	24.30	III	d	0.00	-11.3 %	
A-103	San Marcos	Jinotepe	TS-I	10.00	6.20	III	d	0.36	28.1 %	
D- 1	San Benito	Las Banderas	TP-II	10.00	11.70	III	b	0.49	-3.0 %	
A- 6	San Benito	Puertas Viejas	TP-I	12.00	36.70	III	a	0.50	2.5 %	
B-102	La Virgen	San Juan del Sur	TS-I	10.00	18.30	II	c	0.55	25.7 %	
D-101	Monte Grande	Boaco	TP-II	10.00	14.00	V	d	0.59	-3.0 %	
B- 8	Managua	Nejapa-Izapa	TP-I	12.00	66.40	I	a	0.74	19.1 %	
A-107	Estelí	Yali	*TS-II*	*9.00*	60.70	V	d	*0.85*	4.6 %	
A-106	Matagalpa	Yali	TS-II	9.00	76.60	V	d	0.85	2.5 %	
D- 3	San Francisco	Lovago	TP-II	10.00	72.00	IV	b	0.90	-3.0 %	
A- 4	Masaya	Tipitapa	TP-I	12.00	22.10	IV	a	0.99	28.1 %	
D- 2	Las Banderas	San Francisco	TP-II	10.00	50.70	V	b	1.00	-3.0 %	
D- 4	Lovago	La Gateada	TS-I	10.00	54.00	IV	b	1.01	-3.0 %	
D- 5	La Gateada	El Rama	TS-I	10.00	71.70	IV	b	1.01	-3.0 %	LOW
D- 102	Lovago	Los Chiles	TS-II	9.00	134.30	V	c	1.06	-3.0 %	
A- 8	Sébaco	San Isidro	TP-I	12.00	13.60	III	a	1.15	2.5 %	
B-107	Izapa	Puerto Sandino	TP-II	10.00	9.60	III	c	1.16	23.0 %	
A-101	Guanacaste	Granada	TP-II	10.00	10.80	III	c	1.21	28.1 %	
A- 9	San Isidro	Estelí	TP-I	12.00	31.30	III	a	1.24	2.5 %	
A-102	Masatepe-S.Marcos	Las Esquinas	TS-I	10.00	19.60	IV	d	1.24	28.1 %	
A- 7	*Puertas Viejas*	*Sébaco*	*TP-I*	*12.00*	*32.40*	*III*	a	*1.24*	2.5 %	
A- 11	Somoto	El Espino	TP-I	12.00	21.60	III	a	1.24	2.5 %	
B- 0	Peñas Blancas	Sapoa	TP-I	12.00	4.00	II	a	1.34	25.7 %	
B-114	Chinandega	Corinto	TP-II	10.00	20.00	IV	c	1.35	19.1 %	

Table 10-19 Priority Level (2)

Section	Route		Improvement		Distance	Service Condition	Basic Function	Priority Value	Economic Evaluation	Priority Level
	from: A	to: B	Level (Class)	Width (m) W	(km) L	1993		Pr	IRR	
B- 3	Rivas	Nandaime	TP-I	12.00	44.10	III	a	1.42	25.7 %	
B-105	El Crucero	Masachapa	TS-I	10.00	21.30	III	c	1.54	28.1 %	
B- 4	Nandaime	Jinotepe	TP-I	12.00	18.00	III	a	1.55	28.1 %	
C-101	Esquipulas	Masatepe	TS-I	10.00	31.50	V	d	1.56	28.1 %	
B- 10	León	Chinandega	TP-I	12.00	40.00	IV	b	1.57	19.1 %	
C- 1	Granada	Masaya	TP-I	12.00	18.00	III	c	1.62	28.1 %	
B- 9	Izapa	León	TP-I	12.00	25.50	IV	a	1.67	19.1 %	MIDDLE
B- 11	Chinandega	Somotillo	TP-I	12.00	68.50	IV	a	1.76	19.1 %	
A- 5	Tipitapa	San Benito	TP-I	12.00	13.30	III	a	1.86	28.1 %	
B- 5	Jinotepe	Las Esquinas	TP-I	12.00	9.50	III	a	1.86	28.1 %	
B-106	Nejapa-Mateare	Izapa	TP-II	10.00	60.10	IV	c	1.91	19.1 %	
B- 6	Las Esquinas	El Crucero	TP-I	12.00	13.00	III	a	1.99	28.1 %	
A-104-1	Managua	Tipitapa	TP-I	12.00	21.00	III	a	1.99	28.1 %	
A- 1	Nandaime	Guanacaste	TP-I	12.00	9.10	IV	a	2.05	28.1 %	
B- 7	El Crucero	Nejapa	TP-I	12.00	15.40	IV	a	2.11	28.1 %	
B- 12	Somotillo	Guasaule	TP-I	12.00	6.10	III	a	2.35	19.1 %	
A-105-1	Matagalpa	Siuna	TS-II	9.00	115.70	V	b	2.37	-11.3 %	
B-115	Chinandega	El Viejo	TS-I	10.00	7.00	III	c	2.50	19.1 %	
A-108	Somoto-Yalaguina	Ocotal	TP-II	10.00	29.20	III	c	2.59	2.5 %	MIDDLE
A-109	Ocotal	Las Manos	TP-II	10.00	24.00	III	c	2.59	2.5 %	TO
A-105-2	Siuna	Puerto Cabezas	TS-II	9.00	218.50	V	b	2.63	-11.3 %	HIGH
A- 10	Estelí	Somoto	TP-I	12.00	67.80	III	a	2.75	2.5 %	
A- 2	Guanacaste	Catarina	TP-I	12.00	8.90	IV	a	2.85	28.1 %	
A- 3	Catarina	Masaya	TP-I	12.00	9.10	IV	a	2.91	28.1 %	
B- 2	La Virgen	Rivas	TP-I	12.00	11.10	III	a	3.29	25.7 %	
B-103	Rivas	Tola	TS-I	10.00	13.10	III	c	3.34	25.7 %	HIGH
B-110	Telica	La Cruz de la India	TS-I	10.00	73.70	IV	b	3.93	8.7 %	
C- 2	Masaya	Managua	TP-I(s)	21.00	29.00	V	a	5.03	28.1 %	VERY
B- 1	Sapoa	La Virgen	TP-I	12.00	20.80	IV	a	5.05	25.7 %	HIGH-1
B-111	La Cruz de la India	Int.San Isidro	TS-I	10.00	23.10	IV	b	5.40	8.7 %	VERY
A-105	Sébaco	Matagalpa	TP-II	10.00	26.90	IV	b	5.66	8.7 %	HIGH-2

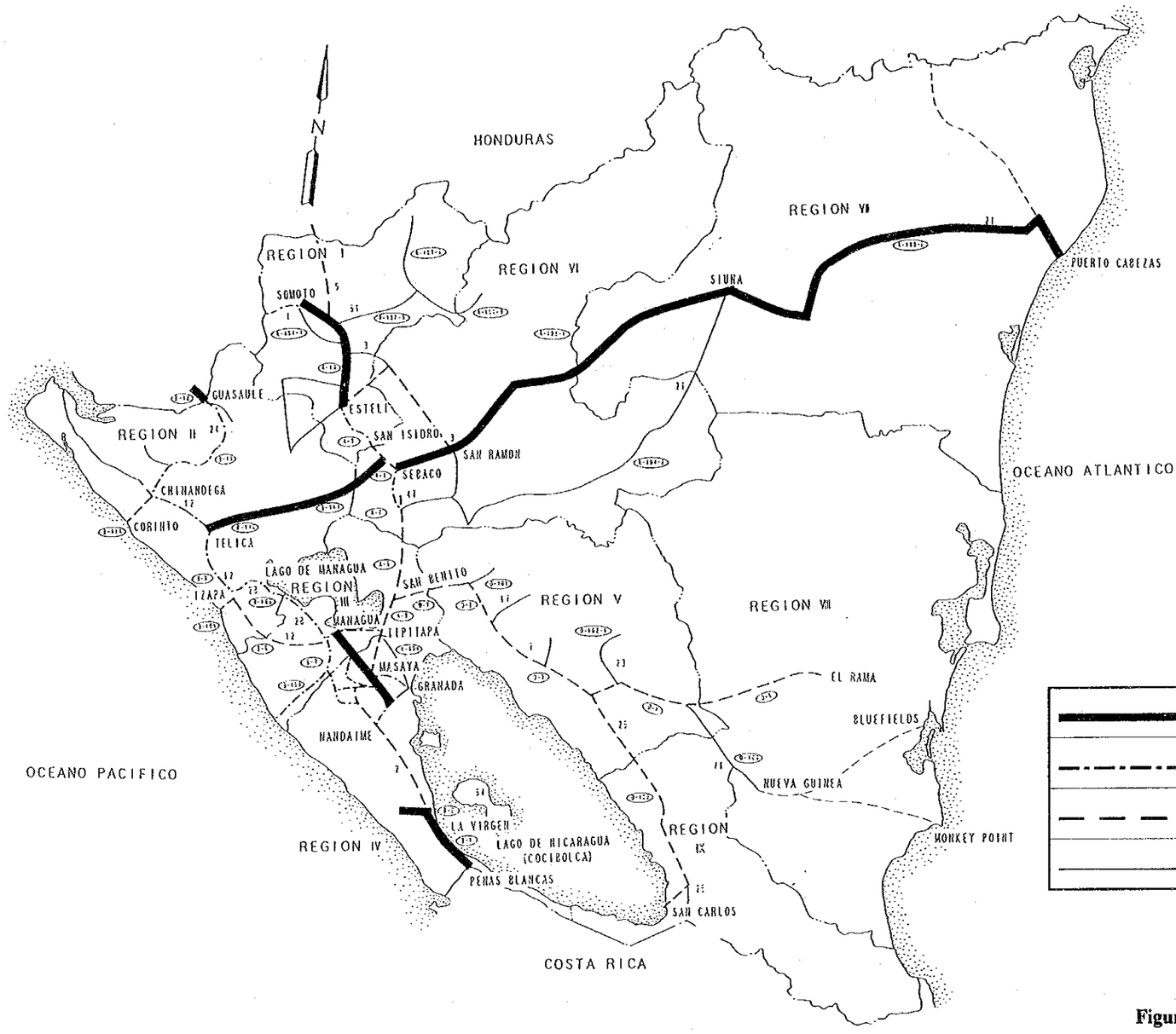


Figure 10-9 Road Sections by Priority Level

10.7 FORMULATION OF THE MASTER PLAN

Based on the examination of the priority value assigned to each road section in Table 10-19, the road improvement Master Plan was formulated. In this case, any road section, which was assigned a priority level of "None", is deemed as not requiring urgent improvement.

In this Master Plan Study, the following understanding of the relationship between the priority level and the implementation program was adopted.

(1) *Short Term (Urgent) Plan*

Improvement and/or rehabilitation of road sections with a priority level higher than "Middle-High" must be implemented as soon as possible (See Table 10-19).

(2) Medium Term Plan

Implementation of improvement and/or rehabilitation of sections with a priority level of "Middle" should be completed by the year 2000 (See Table 10-19).

(3) Long Term Plan

Adequate measures for sections with a priority level of "Low" must be taken by the year 2010 (See Table 10-19).

The total length of the road sections and implementation costs required for the above program are as follows. Total cost was estimated at about 2,947 million Córdobas.

Table 10-20 Total Cost of the Road Improvement Master Plan

Program	Distance (km)	Cost (1000 Córdobas)	Cost/km (1000 Córdobas)
Short Term	708.5	1,209,264	1,707
Medium Term	383.8	480,408	1,252
Long Term	858.3	1,256,979	1,464
Total	1,950.6	2,946,651	1,511

10.8 SELECTION OF PROJECTS FOR THE FEASIBILITY STUDY

The JICA Study Team conducted a Feasibility Study on some of the projects included under the Short Term (Urgent) Plan following this Master Plan Study in order to ensure satisfactory implementation of the Master Plan

The objective sections of the Feasibility Study were selected after considering the following aims:

① To exclude committed projects by international lending agencies and foreign countries
② To exclude projects in off-limit areas
③ To give priority to trunk roads

After considering ① and ② above, the following eight sections shown in Table 10-21 were selected.

Table 10-21 Projects Selected for the Feasibility Study

Road Section	Section No.
1) Nandaime - Guanacaste	A- 1
2) Guanacaste - Catarina	A- 2
3) Catarina - Masaya	A- 3
4) Masaya - Managua	C- 2
5) Rivas - Tola	B-103
6) Telica - La Cruz de la India	B-110
7) La Cruz de la India - San Isidro	B-111
8) Chinandega - El Viejo	B-115

After considering ③ above, road sections 5) and 8) were eliminated because they are apparently secondary roads. As a result, road sections 1), 2), 3), 4), 6) and 7) were recommended as Feasibility Study projects.

Nevertheless, in connection with the above selected road sections, the following road sections should also be improved at the same time given the need to ensure continuity of the trunk road (Central American Highway or NIC-1), although their priority level is lower than "Middle-High";

① Tipitapa-Int. San Cristóbal (Two-lane section from Tipitapa to Managua)
② Masaya - Tipitapa
③ Tipitapa - San Benito

In the case of the Tipitapa-Managua road section, the four-lane section (Managua-Int. San Cristóbal) is excluded, since its acts primarily as an intra-urban road, rather than as an inter-urban road. (According to the results of the traffic survey conducted by the JICA Study Team, the traffic volume on this four- lane section was about 11,000 vehicle/day; however, inter-urban traffic volume accounted for only about 4,700 vehicle/day, which means that this four-lane road primarily serves intra-urban traffic.) Therefore, it is recommended that this four-lane section be improved under another study.

The above selection process is shown in Table 10-22.

Table 10-22 Process of Selecting Road Sections for the Feasibility Study

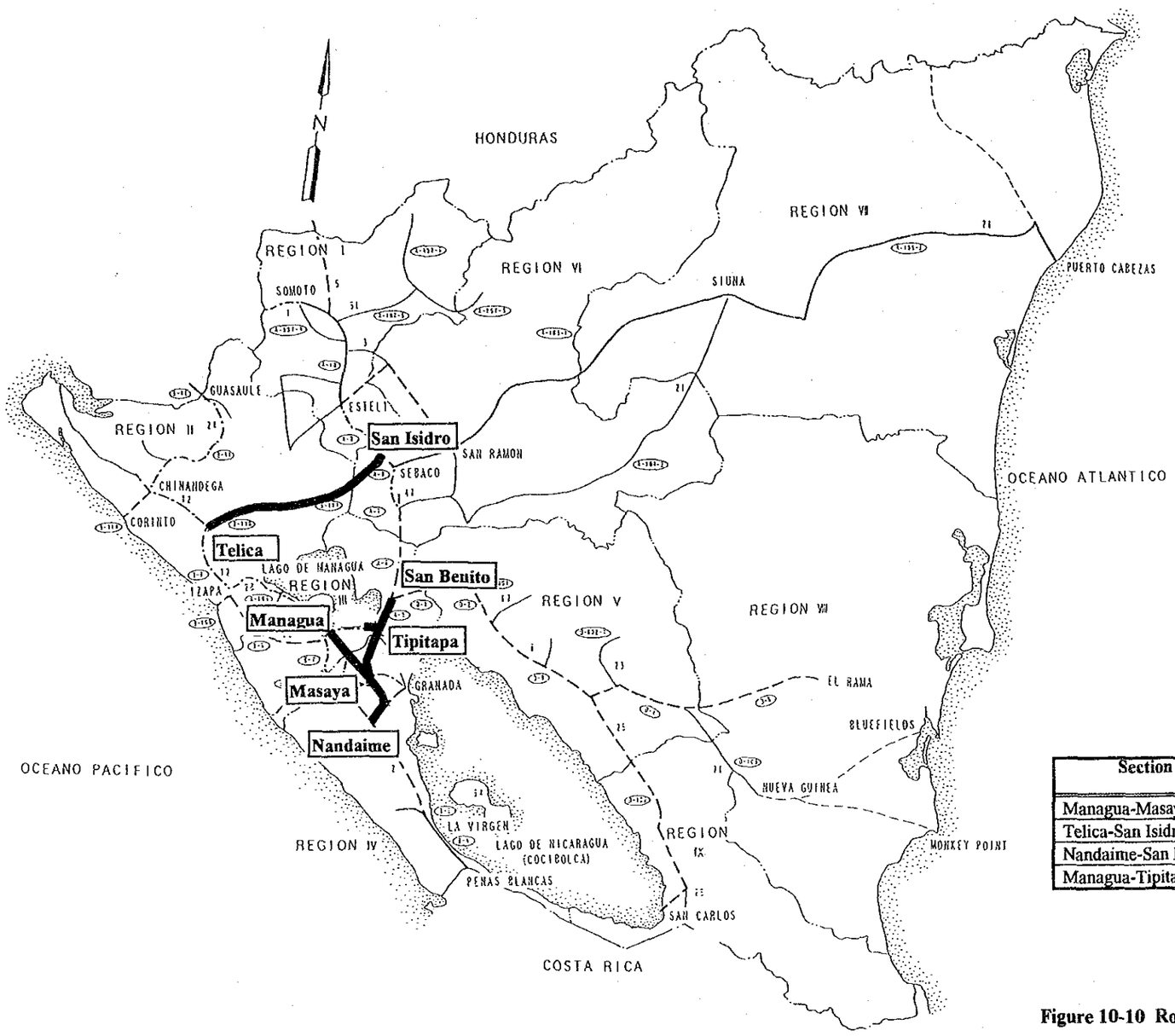
Road Section		Priority Level	Off-Limit Area	Committed Project	Continuity of Trunk Road
A-1	Nandaime - Guanacaste	Middle High			
A-2	Guanacaste - Catarina	Middle High			
A-3	Catarina - Masaya	Middle High			
A-10	Estelí - Somoto	Middle High	#		
B-1	Sapoa - La Virgen	Very High-1	#		
B-2	La Virgen - Rivas	High	#		
B-7	El Crucero - Nejapa	Middle High		#	
B-12	Somotillo - Guasaule	Middle High		#	
C-2	Masaya - Managua	Very High-1			
A-105	Sébaco - Matagalpa	Very High-2	#		
A-105-1	Matagalpa - Siuna	Middle High		#	
A-105-2	Siuna - Puerto Cabezas	Middle High		#	
A-108	Somoto - Yalaguina - Ocotal	Middle High	#		
A-109	Ocotal - Las Manos	Middle High	#		
B-103	Rivas - Tola	High			
B-110	Telica - La Cruz de la India	High			
B-111	La Cruz de la India - San Isidro	Very High-2			
B-115	Chinandega - El Viejo	Middle High			
A-104-1	Managua - Tipitapa	Middle			&
A-4	Masaya - Tipitapa	Low			&
A-5	Tipitapa - San Benito	Middle			&

Note : # - Excluded
& - Included

The following four projects (Table 10-23) were eventually recommended for the Feasibility Study. Figure 10-10 shows the location of these four projects.

Table 10-23 Road Sections Selected for the Feasibility Study

Road Section	Distance
Masaya - Managua	29.0 km
Telica - San Isidro	96.8 km
Nandaime - San Benito	62.5 km
Tipitapa - Managua (two-lane section)	4.5 km
Total	192.8 km



Section	Road Length (km)	Description	
		Class	No. of Lanes
Managua-Masaya	29.0	TS-I (S)	4
Telica-San Isidro	96.8	TS-I	2
Nandaime-San Benito	62.5	TP-I	2
Managua-Tipitapa	4.5	TP-I	2

Figure 10-10 Road Sections Selected for the Feasibility Study

10.9 EXISTING BRIDGES ON THE ROADS

To reiterate, the road improvement and/or rehabilitation projects selected in the previous clause are urgent. Moreover, existing bridges on these roads must also be taken into account, as they represent an important part of the results of the Master Plan Study.

Generally speaking, almost all existing bridges were constructed long ago, and some of them have been damaged considerably because the current traffic load and volume are much greater than what was expected when these bridges were designed.

Moreover, recently many bridges have become the sites of traffic bottlenecks because they are too narrow and do not easy vehicle access.

The bridges listed in Table 10-24 below are in urgent need of major repair or total reconstruction.

Table 10-24 Bridges Requiring Urgent Repair or Reconstruction

Route No.	Bridge Name	Width(m)	Length(m)	Structure
Group I				
NIC-4	La Morita	7.0	9.0	RC-slab
NIC-4	El Arroyo	7.0	24.3	PCI
NIC-4	Mayaris	7.4	20.4	Simple Steel H Beam
NIC-4	El Arroyo No.1	7.0	20.0	PCI
NIC-26	Estero Real	7.0	58.0	RCT
NIC-26	El Guarumo	7.0	60.0	Two RC Slab +Two Girder
Group II				
NIC-2	Ochomogo	7.4	54.0	Truss
NIC-2	Gil Gonzales	7.4	37.0	Variable RCT
NIC-2	Las Lajas	7.4	47.0	Truss
NIC-7	Las Banderas	6.3	119.0	Truss+Five RCT
NIC-7	La Tonga	6.1	87.0	Truss+Two Plate Girder
NIC-12	Río Leona	7.4	18.5	Simple RC Two Girder
NIC-12	Telica	8.9	25.5	Simple RC Two Girder
NIC-12	Las Lanos	7.4	29.5	Three RC Slab
NIC-12	Cinco Cruces	7.5	26.7	Two RC Slab
NIC-24	La Pavona	7.4	16.2	Simple Two Girder
NIC-24	Río Negro 1	7.4	64.6	Four RCT Beam
NIC-24	Río Negro 2	7.4	60.0	Three RCT Beam
Group III				
NIC-1	Las Maderas	6.0	30.0	Truss
NIC-1	Sébaco	6.0	37.2	Tied Arch
NIC-1	El Venado	9.5	72.3	Simple Three PCT Beam

Note : RCT - Reinforced Concret T Section
PCT - Prestressed Concrete T Section Beam
PCI - Prestressed Concrete I Section Beam

The Groups included in this table are defined as follows:

① Group I : Bridges included as part of the projects selected in the previous clause for the Feasibility Study carried out by the JICA Study Team. A preliminary engineering study of the measures required will be conducted during the Feasibility Study.

② Group II : Bridges located in road sections, which will be repaired with foreign funds.

③ Group III : Bridges located in the road network included in the Master Plan, not including those in Group I and II. More bridges will eventually be placed in this group when more detailed investigation is conducted. Only the bridges found at this stage of the Master Plan Study have been listed in Table 10-24. Not all bridges within the off-limit area were examined by the JICA Study Team.

Looking back on past road improvement or rehabilitation projects in Nicaragua financed by international agencies and foreign countries, it will be noted that work on bridges has often been excluded from projects because of limited funds.

When the projects related to the road sections that have bridges listed in Group II are formulated, other financial sources will be necessary since it will be possible to use limited funds more effectively.