PD-AAA-467-A1
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Proj. 596-0022
596-031

ECONOMIC EVALUATION OF THREE INTEGRATION ROADS

FINANCED WITH ROCAP/CABEI FUNDS

A ROCAP REPORT

596-031
596-022

A.I.D.
Reference Center
Room 1656 NS

July 20, 1977

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1. Introduction:

In the 1960's, AID funded [redacted] twenty-six highway projects throughout Central America. These projects were selected using development and integration criteria. Now that these highways have been completed and in use for several years, ROCAP decided that a post facto evaluation of the justification for these highways was appropriate.

In mid 1976, Mr. Lawrence Harrison, ROCAP Director, appointed a ROCAP team consisting of two economists and two engineers to prepare an economic evaluation of three roads financed by ROCAP (with a smaller counterpart contribution from CABEI) to determine: (a) whether a benefit-cost analysis undertaken several years after the roads went into operation confirmed that the three projects were economically justified; and (b) how these ex-post benefit-cost analyses compared with those found in the feasibility studies or CABEI decrees on the basis of which the decisions to construct were made.

The team consisted of Clark Joel, Regional Economic Advisor and Project Coordinator; Rebecca Grant Ascoli, Engineer; Victor Dardón, Engineer; and Gustavo Ruiz, Economist.

The roads were selected on the basis of the following criteria:

1. They had to be completed before 1974 to allow sufficient time for the benefits to materialize.

2. They had to be major projects financed mainly by ROCAP.

3. At least two of the three roads had to have new development as one of its major purposes.

Of the three roads, two are in Honduras and one in Costa Rica. All were completed in 1972. The basic facts about them are as follows:

Road	Length Km.	Total Cost 1/ C.A. Pesos	RCCAP's Share C.A. Pesos	CABEI's Share C.A. Pesos	C.A. Government 2/
Tela-La Ceiba, Honduras	100	11,868,327	9,181,600	2,295,400	391,327
Choluteca-Guasaule (Nicaragua Border), Honduras	45	3,692,233	2,770,833	662,167	259,233
El Coco-San Ramón, Costa Rica	41	16,319,007	11,594,800	2,461,200	2,263,007

1/ Including construction, supervision and consultants, but excluding right of way.

2/ Calculated as a residual.

Maps of the roads are attached (Annex I). All three were completed and operative by 1972, and all are practically new. In the case of the two Honduran roads, there were no all-weather roads in these areas, so that both had an important developmental impact. The El Coco-San Ramón road in Costa Rica, while also a new road, probably had a lesser developmental impact because it parallels an older road servicing the same area and connecting the same major points. However, the older road is much narrower (only 1½ lanes), runs through a large number of villages and has deep slopes and poor alignment. While the user-cost savings on the El Coco-San Ramón road are substantial, the developmental impact in this case is much more difficult to ascertain.

The conclusions of the benefit-cost calculations are summarized in Section 4.

2. Sources of Information

Our initial decision was to use the data from the new ECAT Study (Estudio Centroamericano de Transportes), a comprehensive overview of the whole C.A. highway system, which was nearing

completion at the time we started our study in mid-1976. We were compelled to shift to alternative sources of information. Continuing delays were encountered in obtaining the results of the ECAT survey, and even to date, a final copy is not in our hands. While ECAT personnel were very cooperative, the data they provided were frequently inconsistent.

For the two Honduran roads, we used traffic counts made by TAMS (Tippets-Abbett-McCarthy-Stratton), the Ministry of Public Works and Transportation, Brown and Root, the 1964 ECAT transportation study and the "dictámenes" (resolutions) issued by CABEI. Vehicle operating costs were supplied by TAMS. For the El Coco-San Ramón road, all information came from the Ministry of Public Works and Transport of the Government of Costa Rica.

In addition, Mrs. Ascoli, and Messrs. Dardon and Ruiz visited all three roads to assess their condition, collect agricultural production data from the local authorities that would provide some idea of the development of the area of influence after the roads were completed, and query the local authorities about the likely impact of the roads on the local economy.

3. Methodology

Before describing the general methodology applied, the key concepts used will be defined:

1. User cost savings: This is the reduction in operating costs of vehicles as a result of the construction of the new road. It is calculated as the difference between operating the vehicles on the new road and either on an alternative road, or on the same road before it was improved, whichever difference is lower. It may or may not include the value of time saved for drivers and passengers as a result of the new road. We will use both concepts - one including, the other excluding the value of time of drivers and passengers of commercial vehicles.1/

2. "Diverted traffic" is the traffic diverted to the new facility from other roads or forms of transportation.

3. "Normal growth traffic" is traffic that would develop naturally as a result of expected growth trends in population,

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1/ The value of time of occupants of cars and pick-ups was excluded from all calculations.

national income, regional growth, etc. It is a growth that would have materialized even if the new road had not been built.

4. "Generated traffic" is traffic that comes into being because the new facility is available. People who did not find it convenient to make the trip on the old road, find it worthwhile to do so on the new one. Such traffic, however, does not result from the opening up of new lands or the establishment of new farms or enterprises (the latter is "development traffic" which is considered separately). Generated traffic is generally valued at only half the rate of normal growth and diverted traffic for reasons explained in Annex II.

5. "Development traffic" is traffic that results because of opening up of new land, intensification of land use, shifts of land to other crops or uses, establishment of new farms, settlements or other enterprises. This concept is used in estimating the contribution of the road to value added or GNP.

Our evaluation uses three approaches: (a) a calculation of the benefit-cost ratios for the three roads in terms of user benefits alone; (b) for the two Honduran roads, a calculation of the benefit-cost ratios that allows for the roads' estimated contribution to GNP; (c) a descriptive narrative summarizing the development benefits observed and described by the local officials interviewed, along with supporting data on trends in agricultural production in the areas of influence. No attempt was made to integrate these production data into the benefit-cost calculations as the data base was not sufficient to permit separation of the economic impact of the roads from other growth-inducing factors.

The following section describes the first two approaches in detail.

a. Benefit-Cost Ratios Based on User Cost Savings

This is the standard method used when there is an existing highway system. It assumes that the benefits from a road will be realized primarily as user savings, and ascribes no significant economic development to the road project. Where substantial developmental benefits have in fact occurred (as in the case of the two Honduran roads), this methodology will yield a benefit-cost ratio that is far too conservative. Nevertheless, we have applied this traditional technique to all three roads under this first approach. We will describe in some detail the methodology used in estimating the benefit-cost ratio for the Tela-La Ceiba Road (see Table 1 for the calculation):

TABLE 1

BENEFIT-COST CALCULATION FOR TELA-LA CEIBA ROAD; USER COST SAVINGS APPROACH

	3	4			5	6	7	8	9	10		11	12	13
	Traffic Projection (Per Year)				50% User Cost Savings (Thousands of 1971 CA$)				Costs (Thousands of 1971 CA$)				Total Savings Discounted at 8%	Total Costs Discounted at 8%
	(1) Cars & Pick Ups	(2) Buses	(3) Trucks	Total	(1) $1.07	(2) $4.265	(3) $7.725	Total	Construction	Annual Maintenance		Total		
1971	336530	59130	59130	454790	629.3	252.2	456.8	1338.3	13585.7	65.0		13650.7	1338.3	13650.7
72	370183	65043	65043	500269	692.2	277.4	502.5	1472.1		65.0		65.0	1363.1	60.2
73	407201	71547	71547	550296	761.5	305.1	552.7	1619.3		65.0		65.0	1388.3	55.7
74	447921	78702	78702	605325	837.6	335.7	608.0	1781.3		65.0		65.0	1414.1	51.6
10% 75	492713	86572	86572	665850	921.4	369.2	668.8	1959.4		65.0		65.0	1440.2	47.8
76	541985	95229	95229	732444	1013.5	406.2	735.6	2155.3		65.0		65.0	1466.9	44.2
77	596183	104752	104752	805680	1114.9	446.8	809.2	2370.9		65.0	+1150.0*	1215.0	1494.1	765.6
78	655802	115228	115228	886257	1226.3	491.4	890.1	2607.8		65.0		65.0	1521.6	37.9
79	721382	126750	126750	974883	1349.0	540.6	979.1	2868.7		65.0		65.0	1549.7	35.1
80	793520	139425	139425	1072370	1483.9	594.6	1077.1	3155.6		65.0		65.0	1578.6	32.5
1981	849066	149185	149185	1147436	1587.8	636.3	1152.5	3376.6		130.0		130.0	1564.0	60.2
82	908501	159628	159628	1227756	1699.0	680.8	1233.1	3612.9		130.0		130.0	1549.5	55.8
83	972096	170802	170802	1313699	1817.8	728.5	1319.4	3865.7		130.0		130.0	1535.1	51.6
84	1040143	182758	182758	1405659	1945.1	779.5	1411.8	4136.4		130.0		130.0	1520.9	47.8
7% 85	1112953	195550	195550	1504054	2081.2	834.0	1510.6	4425.8		130.0		130.0	1506.8	44.3
86	1190860	209239	209239	1609330	2226.9	892.4	1616.4	4735.7		130.0		130.0	1492.9	41.0
87	1274220	223886	223886	1721992	2382.8	954.9	1729.5	5067.2		130.0		130.0	1479.1	37.9
88	1363415	239558	239558	1842531	2549.6	1021.7	1850.6	5421.9		130.0		130.0	1465.4	35.1
89	1458854	256327	256327	1971508	2728.1	1093.2	1980.1	5801.4		130.0		130.0	1451.8	32.5
90	1560974	274270	274270	2109514	2919.0	1169.8	2118.7	6207.5		130.0		130.0	1438.4	30.1
1991	1654632	290726	290726	2236005	3094.2	1239.9	2245.9	6580.0		130.0		130.0	1411.7	27.9
92	1753910	308170	308170	2370250	3279.8	1314.3	2380.6	6974.7		130.0		130.0	1385.6	25.8
93	1859145	326660	326660	2512465	3476.6	1393.2	2523.4	7393.2		130.0		130.0	1359.9	23.9
94	1970694	346260	346260	2663213	3685.2	1476.8	2674.9	7836.9		130.0		130.0	1334.7	22.1
95	2088935	367035	367035	2823005	3906.3	1565.4	2835.3	8307.0		130.0		130.0	1310.0	20.5
6% 96	2214271	389057	389057	2992386	4140.7	1659.3	3005.5	8805.5		130.0		130.0	1285.8	19.0
97	2347128	412400	412400	3171929	4389.1	1758.9	3185.8	9333.8		130.0		130.0	1261.9	17.6
98	2487955	437145	437145	3362245	4652.5	1864.4	3376.9	9893.8		130.0		130.0	1238.6	16.3
99	2637233	463373	463373	3563900	4931.6	1976.3	3579.6	10487.5		130.0		130.0	1215.6	15.1
2000	2795466	491176	491176	3777818	5227.5	2094.9	3794.3	11116.7		130.0		130.0	1193.1	14.0
			Without Time Saving		72750.4	29153.7	52804.8	154708.9					42555.7	
			Time Factor **		0	2.95	1.17	1.425					1.425	15419.8
			With Time Saving		72750.4	86003.4	61701.6	220535.4					60641.9	

Benefit- Cost Ratio; Without Time Saving = $\frac{42555.7}{15419.8} = 2.76$

With Time Saving = $\frac{60641.9}{15419.8} = 3.93$

* The Government will invest $1660 thousands in 1977 to improve the road (drainage and erosion control, terrace, repair of pavement and base).

** Factor by which user cost savings (exclusive of time savings) must be multiplied to obtain user cost savings with time savings.

Step 1: Analysis of actual data on traffic broken down by cars and pick-ups, buses and trucks, for the period 1971-77, indicates an average annual compound growth rate of 11.8%.[1] Traffic was projected to increase at an average annual compound rate of 10% over 1971-80, then to decline sharply to 7% during the decade of the 80s, and to 6% during the 90s. A 6% growth rate would be equal to, or slightly above, the growth rate of the real Gross Domestic Product, a very conservative assumption in light of past experience. Generally, the growth of vehicle traffic in a developing country runs significantly ahead of the growth rate of real GDP.[2]

Step 2: Estimate savings in user costs. TAMS provides operating costs per kilometer for cars/pick-ups, buses and trucks, broken down by type of road surface (paved, gravel and dirt), grade and vehicle velocity. Selecting an average grade appropriate for each road and an average velocity appropriate to each type of vehicle and road condition, we calculated the cost of operating each category of vehicle on the old dirt road as compared with the new paved road. The cost saving in 1976 for a trip between Tela and La Ceiba was C.A. $5.20[3] per car and pick-up, CA$ 11.85 per bus and CA$ 21.48 per truck.

In this analysis, we made the simplifying (and very conservative) assumption that all of the additional traffic on this road is "generated traffic", i.e. traffic that has come about as a result of the reduction in user costs and that would not have come about without the new road. For reasons explained in Annex II, the benefits resulting from "generated traffic" are valued at only half the saving in user costs. The user cost savings were therefore divided by two for all vehicle categories.

Step 3: Adjust for inflation. Since operating costs were calculated for 1976 and our benefit-cost calculation is based on the

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1/ See detailed description of data and methodology in Annex II, Section A.

2/ For example: during the period 1964-70, all freight moving by road among the C.A. countries increased at an average annual rate of 8.7%, compared with a real GDP growth rate of 5.5%. Source: SIECA Decade Study, Vol. 6 (Physical Integration), 1973, Table 1, page 13.

3/ One C.A. $ (Central American Peso) = One U.S. dollar.

year 1971 (the first year the road was in operation)[1/], we have deflated these savings for the inflation that occurred between 1971 and 1976 by using the official general consumer price index of the GOH. One half of user cost savings per trip, in terms of 1971 C.A. pesos, are CA$ 1.87 for cars and pick-ups, CA$ 4.265 for buses and CA$ 7.725 for trucks and trailers.

Step 4: To arrive at the total user benefit figures in column 5 through 8, 50% of the user cost savings for each type of vehicle were multiplied by the corresponding projection of vehicles shown in columns 1, 2 and 3. The total benefits for all vehicles appear in column 8 (which is the sum of columns 5, 6 and 7).

Step 5: Estimates of costs, including construction, supervision and consultants[2/], are presented in column 9, while annual maintenance costs are shown in column 11 (Table 1). Construction of the Tela-La Ceiba road took place during 1968-71. Actual costs incurred were expressed in 1971 prices by adjusting for the increase in the general consumer price index between the actual year when the costs were incurred and 1971. In addition, for costs incurred prior to 1971, interest at 8% a year was added to reflect the opportunity cost of capital.[3/]

Maintenance costs (in column 10) were assumed to rise from CA$ 65,000 a year through 1980 to CA$ 130,000 over 1981-2000. A substantial repair job is scheduled in 1977 which was entered separately. The maintenance cost allowance was made large enough to cover periodic re-surfacing, reconstruction of bridges destroyed by floods and other essential upkeep needed to maintain the road close to its original condition throughout the projection period. The total estimated cost appears in column 11.

Step 6: Discounting the projected stream of benefits and costs: All benefits and costs must now be discounted to obtain their "present" value, i.e. their value as of 1971. We have chosen to discount these streams at an annual rate of 8%. Since our

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1/ While the Tela-La Ceiba road was not completely terminated until May 1972, it was in fact already in use in 1971.

2/ Excluding only cost of right of way. The cost of right of way was excluded for all roads as a figure could not be obtained for the two Honduran roads since the land belonged to the government.

2/ The choise of this rate will be justified below.

calculations is in real terms -- i.e. in constant 1971 prices -- an 8% real interest rate would mean a 12 to 14 percent nominal rate if we assume an average annual inflation rate of 4 to 6 percent. A 12 to 14 percent nominal interest rate definitely is on the high side for a road project since the latter entails a much smaller degree of risk than a business investment project. In fact, the C.A. governments can currently borrow from the World Bank and the IDB all the non-concessionary funds they wish at a market interest rate ranging from 6½ to 8 percent. Thus, a real discount rate above 8% would not be appropriate for these projects.

Step 7: Summing up the total discounted stream of benefits and costs, we get CA$ 42,555,700 and CA$ 15,419,800, respectively. This yields a benefit cost ratio of 2.76.1/

Step 8: Allowance for time saving factor: The above calculation excludes the value of the time saving realized by drivers and passengers, which is particularly important in the case of buses. Theoretically, the case for including an allowance for the time value of drivers of trucks and buses and for bus passengers, is very strong. The only justification for leaving it out is the difficulty of calculating the value of this time saving factor and the need to base any calculation on somewhat arbitrary assumptions. We have therefore made an alternative calculation that allows for the time saving factor. The adjustment is based on the following estimates by the Ministry of Public Works and Transport of the Government of Costa Rica:2/

1/ For interpretation of the significance of benefit-cost ratios, see Section 4, point 1 (page 12).

2/ The time savings estimates for Costa Rica were applied to all three roads as the Costa Rican estimates were much more conservative than those suggested by the government of Honduras. We have consistently opted for assumptions yielding the most conservative estimates of user benefits. The Costa Rican time saving estimates are based on the following assumptions:

a. The average number of passengers are 25 per bus and 1.2 for trucks and trailers.

b. The value of passenger time is 25% of the national per capita income (to allow for leisure time and people not gainfully employed, for whom the opportunity cost of time is zero).

c. The wage of drivers is about CA$ 0.45 to CA$ 0.58 per hour

Buses C.A. $ 4.54 per hour

Trucks C.A. $ 0.64 per hour

Trailers C.A. $ 0.78 per hour

The time value of drivers and passengers of light vehicles (cars and pick-ups) was excluded from our calculations as the use of such vehicles involves a substantial amount of leisure driving. Its economic value is therefore questionable. The value of the time saving of drivers of commercial vehicles plus 25% of the time value saved by bus passengers1/ was calculated as a percentage of savings of normal vehicle operating costs, and was added to the latter in the alternative calculation shown in the bottom line of Table 1. Note that addition of the time saving factor raises total benefits to CA$ 60,641,900 and the benefit-cost ratio to 3.93

b. Benefit-Cost Ratio Based on Value Added

The value added concept, as opposed to the user cost savings concept of highway evaluation, measures the economic development that occurs in the area of influence of the road. The justification for this approach is that when a highway is built in an area that was not previously linked to markets and sources of supply, new production results which contributes to the Gross National Product. The market value of the new production may be written as follows:

Market value = production cost + transportation cost + profit

The provision of transportation is a sine qua non condition for the realization of the increased production. Nonetheless, it would be wrong to claim the total market value of the additional production as a benefit due to the highway since other inputs (e.g. labor) were also essential to achieve the additional output. It can be claimed, however, that the road has contributed, as a minimum, the value added by the transportation service to the total market value of the new output. Value added by transportation is estimated to be equal to total motor vehicle operating costs.2/

1/ See point b of preceding footnote.

2/ For a more detailed explanation of the rationale underlying this approach, see Roy Jorgensen Associates, Inc., Highway Planning Manual, AID/OTr. C/1420, pages 32-36.

In the case where the road has a substantial developmental impact, the problem is to separate this "development traffic" (which results from the opening up of new land, establishment of new farms and enterprises, etc.) from "diverted", "generated" and "normal growth" traffic. The data at our disposal does not permit a meaningful separation of these various traffic types. For the Tela-La Ceiba road in Honduras, neither "normal growth" traffic nor traffic diversion seems to be very important as the previously existing road was a dirt road carrying only very light traffic and no alternative road was available. The major components of the traffic on the new road are, therefore, "generated" and "development" traffic. Since we have no way of breaking down the traffic data into these two components, we have assumed that development traffic consists of no more than one half of the total traffic projected during the period 1971-2000. We believe that this assumption is conservative as development traffic may well be considerably greater than 50% of the traffic projected.

Thus, under this second approach, we have assigned to 50% of the traffic (i.e. the "development" traffic) a value equal to the full amount of the vehicle operating costs (excluding the time saving factor for drivers and passengers); while to the other 50% (which comprises all other types of traffic), we have applied half of the user cost savings estimate calculated under the first approach.

This approach is illustrated in Table 2 for the Tela-La Ceiba road. The first three columns show 50% of the traffic projections for cars and pick-ups, buses and trucks, respectively. Columns 4, 5 and 6 show the product of these traffic projections multiplied by 50% of user cost savings. They represent the benefits derived by "generated" traffic. In columns 7, 8 and 9, we have the product of the other 50% of the traffic multiplied by vehicle operating costs to reflect the contribution of "development" traffic to the benefit stream. Total benefits (summed in column 10) are then discounted at 8% a year over the 30-year period (column 11). Construction and maintenance costs remain the same as under Approach a. The benefit-cost ratio becomes 3.5 without the time saving factor and 4.1 with time savings included (calculation at bottom of Table 2).

TABLE 2

BENEFIT-COST CALCULATION FOR TELA-LA CEIBA ROAD, COMBINING USER COST SAVINGS APPROACH WITH VALUE ADDED APPROACH

		2	3	4	5	6	7	8	9	10	11
	0% of Total Traffic Projection (Per Year)			50% of Traffic x 50% of User Cost Savings (Thousands of 1971 CA$)			50% of Traffic x Operating Costs (Thousands of 1971 CA$)			Total Benefits Sum of Columns 4 to 9	Sum Discounted at 8% (Ths. of CA$)
	Cars & Pick Ups	Buses	Trucks	Cars & Picks Ups	Buses	Trucks	Cars & Pick Ups	Buses	Trucks		
				$1.07 x Col.1	$4.265 x Col.2	$7.725 x Col.3	$3.50 x Col.1	$5.83 x Col.2	$9.54 x Col.3		
1971	160265	29565	29565	314.7	126.1	228.4	500.9	172.4	282.0	1712.5	1712.5
72	185091	32521	32521	346.1	138.7	251.2	647.8	189.6	310.3	1883.7	1744.2
73	203601	35774	35774	389.7	152.6	276.4	712.6	208.6	341.3	2072.2	1776.6
74	223961	39351	39351	418.8	167.8	304.0	783.9	229.4	375.4	2279.3	1809.4
0% 75	246357	43286	43286	460.7	184.6	334.4	862.2	252.4	412.9	2507.2	1842.9
76	270992	47615	47615	506.8	203.1	367.8	948.5	277.6	454.2	2758.0	1877.8
77	290092	52376	52376	557.4	223.4	404.6	1043.3	305.4	499.7	3033.8	1911.8
78	327901	57614	57614	613.2	245.7	445.1	1147.7	335.9	549.6	3337.2	1947.2
79	360691	63375	63375	674.5	270.3	489.6	1262.4	369.5	604.6	3670.9	1983.3
1980	396760	69713	69713	741.9	297.3	538.5	1388.7	406.4	665.1	4037.9	2020.0
1981	424533	74593	74593	793.9	318.1	576.2	1485.9	434.9	711.6	4320.6	2081.3
82	454251	79814	79814	849.4	340.4	616.6	1589.9	465.3	761.4	4623.0	1982.7
83	486040	85401	85401	908.9	364.2	659.7	1701.2	497.9	814.7	4946.6	1964.4
84	520071	91379	91379	972.5	389.7	705.9	1820.2	532.7	871.8	5292.8	1946.2
85	556476	97776	97776	1040.6	417.0	755.3	1947.7	570.0	932.8	5663.4	1928.2
7% 86	595430	104620	104620	1113.5	446.2	808.2	2084.0	609.9	998.1	6059.9	1910.3
87	637110	111943	111943	1191.4	477.4	864.8	2229.9	652.6	1067.9	6484.0	1892.6
88	681708	119779	119779	1274.8	510.9	925.3	2386.0	698.3	1142.7	6938.8	1875.1
89	729427	128164	128164	1364.0	546.6	990.1	2553.0	747.2	1222.7	7423.6	1857.7
1990	780407	137135	137135	1459.5	584.9	1059.4	2731.7	799.5	1308.3	7943.3	1840.6
1991	827316	145363	145363	1547.1	620.0	1122.9	2895.6	847.5	1386.8	8419.9	1806.5
92	876955	154085	154085	1639.9	657.2	1190.3	3069.3	898.3	1470.0	8925.0	1773.0
93	929572	163330	163330	1738.3	696.6	1261.7	3253.5	952.2	1558.2	9460.5	1740.2
94	985347	173130	173130	1842.6	738.4	1337.4	3448.7	1009.3	1651.7	10028.1	1707.9
95	1044467	183517	183517	1953.2	782.7	1417.7	3655.6	1069.9	1750.8	10629.9	1676.3
6% 96	1107135	194528	194528	2070.3	829.7	1502.7	3875.0	1134.1	1855.8	11267.6	1645.3
97	1173564	206200	206200	2194.6	879.4	1592.9	4107.5	1202.1	1967.1	11943.6	1614.8
98	1243977	218572	218572	2326.2	932.2	1688.5	4353.9	1274.3	2085.2	12660.3	1584.9
99	1318616	231687	231687	2465.8	988.1	1789.8	4615.2	1350.7	2210.3	13419.9	1555.6
2000	1397733	245588	245588	2613.8	1047.4	1897.2	4892.1	1431.8	2342.9	14225.2	1526.8
		Savings	Without Time	36375.1 +	14576.7 +	26402.6 +	60881.9 +	19925.7 +	32605.9 =	197967.9	54455.3
			Time Factor	0	2.95	1.17	0	0	0	1.166	1.166
		Savings	With Time	36375.1 +	43001.3 +	30891.0 +	60881.9 +	19925.7 +	32605.9 =	230880.9	63494.9

Benefit/Cost Ratio: Without Time = 54455.3 / Saving 15419.8 = 3.53

With Time = 63494.9 / Saving 15419.8 = 4.12

* The Government will invest $1660 thousands in 1977 to improve the road (drainage and erosion control, terrace; repair of pavement and base).

** Factor by which user cost savings (exclusive of time savings) must be multiplied to obtain user cost savings with time savings.

A somewhat more complex approach was applied to the Choluteca Guasaule road which involves "generated", "diverted" and "development" traffic. These three traffic components were separated by assumption.[1/] The full value of savings in user costs was applied to "diverted" traffic; "generated" traffic was valued at half of user cost savings; while "development" traffic was valued at full vehicle operating costs.

In the case of the El Coco-San Ramón road, all traffic was treated as "generated" and "diverted" because an alternative paved road was in existence before the new road was built. Development benefits to the area of influence appear to be of lesser significance in this case and were conservatively assumed at zero in the analysis. Only the user cost savings approach was applied in this case.

In Annex III, the methodology and assumptions underlying the calculation of the benefit-cost ratios for all three roads are presented in detail.

4. Results of Benefit-Cost Calculations

The results obtained by our benefit-cost calculations in comparison with the initial projections in the feasibility studies that served to justify the three road projects are summarized in Table 3. Note the following:

1. Any benefit-cost ratio in excess of 1.0 means that the project entails a net rate of return in excess of the discount rate (here, 8% per annum). For example, a benefit-cost ratio of 2.0 means that the actual net rate of return is substantially above

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For the Choluteca Guasaule road it was assumed in the second (value added) approach that ¼ of the traffic was "diverted", ¼ "generated" and ½ "developed". As in the case of the Tela-La Ceiba road, it is believed that the value added approach gives more meaningful results than the straight use cost savings approach because of the importance of the development dimension which the user cost savings approach does not adequately reflect.

(possibly close to double)[1/] the actual discount rate used.

2. All benefit-cost ratios are substantially in excess of 1.0. This is significant since they are based on very conservative assumptions, e.g. that a substantial proportion of the traffic is "generated" and is therefore valued at only half the amount of user cost savings; that no more than half of the increase in traffic consists of "development traffic"; and that 8% is the appropriate discount rate. Since the analysis is in real terms, the nominal interest rate would be much higher. The assumption of a lower discount rate would have resulted in even higher benefit-cost ratios.[2/]

3. Approach b. (which makes allowance for "development" traffic) yields more significant results than the straight user cost savings approach owing to the importance of the development dimension in the case of the two Honduran roads. The benefit-cost ratios resulting from approach b. are high: 3.5 for the Tela-La Ceiba road and 2.5 for Choluteca- Guasaule. The ratios would be higher still if the time saving factor were included.

4. Allowance for the time saving factor raises the benefit-cost ratio significantly. We think that there is a strong case for including it, and that our allowance for that factor was very conservative because we excluded all time savings realized by drivers and passengers of automobiles and pick-ups.

1/ Its exact value will depend on when the benefits accrue and the costs are incurred. The benefits are spread over a long period of time and increase at a compound rate, while most of the costs are incurred at the beginning of the period.

2/ Since the discounting process lowers expected benefits (which are in the future) much more than costs (mostly incurred in the past).

Table 3

Benefit-Cost Ratios

Current Estimates in Comparison with Those in Feasibility Studies Executed Ex Ante

	Tela-La Ceiba	Choluteca-Guasaule	El Coco-San Ramón
Ex-Ante Feasibility Studies	SRI : 1.1 - 1.6 1/ ECAT/CABEI { 2.8 (for 1974) 2/ 6.3 (for 1984) 2/	1.2 3/	3.3 4/
Current Estimates (Discount rate of 8%			
a. User Cost Savings Approach			
(i) Excluding time saving factor	2.8 5/	1.3 8/	1.6 10/
(ii) Including time saving factor	3.9 6/	1.5 6/	1.9 6/
b. Combination User Cost Saving and Value Added Approach (excluding time saving factor)	3.5 7/	2.5 9/	-

1/ Estimated by Stanford Research Institute using a 4% annual discount rate. Maintenance costs were excluded.

2/ Estimated by CABEI on the basis of the ECAT study but using somewhat different user cost estimates and an annual discount rate of 3.5%. CABEI calculated two benefit-cost ratios -- for 1974 (2.8) and 1984 (6.3).

3/ Calculated by Brown and Root over a period of 20 years and discounted at 8%.

4/ Calculated by Government of Costa Rica in 1965 on the following assumptions: An average annual traffic growth rate of 7%; a 6% annual discount rate; a 40 year useful life of structure and 20 year for the life of the pavement.

(Cont'd next page.)

Continuation Footnotes Table 3

5/ On the very conservative assumption that all traffic is "generated" and thus valued at only half of user cost savings. User cost savings were calculated as the difference between vehicle operating costs in the new road and on the old dirt road (as there is no alternative road in existance).

6/ For drivers of commercial vehicles and bus passengers only. The time value of bus passengers was valued at only 25% of national per capita income.

7/ Assuming that 50% of the traffic is "generated" and 50% "development". The former was valued at one half of user cost savings, the latter at vehicle operating costs.

8/ Assumes that one half of the traffic is "diverted" (and valued at user cost savings) and half generated (valued at half of user cost savings). User cost savings were calculated as the difference between operating costs on the new road in comparison with the Pan American Highway (CA-1) which was already in existence.

9/ Calculated on the assumption that the composition of the traffic is as follows: ¼ "diverted", ¼ "generated" and ½ "development".

10/ Assumes that all traffic is "generated" and "diverted". For the methodology used to separate "diverted" and "generated" traffic, see Annex III-C, Section 4.

4. With respect to the relationship of our current ex-post benefit-cost ratios with the ex-ante ones projected in the feasibility studies, conclusions are as follows:

a. For the Tela-La Ceiba road, the estimate made by Stanford Research Institute (1.1 to 1.6) erred on the conservative side. Our calculations show a range of 2.8 to 3.9. CABEI's estimates modifying an earlier ECAT Study came fairly close to the mark (range 2.8 to 6.3).

b. For the Choluteca-Guasaule road, the Brown and Root estimate of 1.2 was also close, high somewhat on the conservative side. Our ex-post analysis suggests a a range of 1.3 to 2.5.

c. For the El Coco-San Ramón road, the benefit-cost calculation made by the Government of Costa Rica (3.3) may have been somewhat optimistic. Our analysis indicates a range of 1.6 to 1.9. The reason for the difference may be that the original (Government of Costa Rica) estimate did not consider the construction of the San José-Calderas road which the GOCR now assumes will divert 50% of the traffic, beginning in 1983.

5. History, Description and Development Benefits

The information on the history and description of the three roads provided here is very brief and is designed only to serve as background and introduction to the description of development benefits. A detailed account of the history and description of all 3 roads is presented in Annex III.

a. Tela-La Ceiba Road

History & Description

The Tela-La Ceiba road is a 100 km. section of the littoral highway which eventually will run from the Atlantic Highway in Guatemala in the west through Puerto Cortéz and up to Puerto Castilla in the east. Prior to the completion in May 1972 of the paved road linking Tela and La Ceiba, the cities were only connected by railroad (built by the banana company to carry the fruit to port) and a dirt road. The latter was merely a trail without bridges or drainage and could not be used during the rainy season. During that period, La Ceiba was effectively isolated from the rest of Honduras, with the ocean remaining as the only means of access.

The road was designed to be both an integration and a development road. It will be an integration road when the littoral highway is completed; it is a development road because it contributes to the development of an area endowed with good agricultural and tourism potential. Much of its importance is derived from the fact that it links the cities of Tela and La Ceiba with the country's industrial and commercial center at San Pedro Sula.1/

Development Benefits

The observations in this section are based on interviews with officials at La Ceiba, La Masica, and Tela. The data presented in Table 4 are based on official agricultural production data obtained in Tegucigalpa for the Municipalities of La Ceiba, El Porvenir, La Masica, San Francisco and Tela, all part of the direct zone of influence of the road. The trip reports of the Team providing detailed information on development benefits for all three roads are included in Annex IV.

Interviewees pointed to substantial increases in the production of agricultural and livestock products in the area of influence, particularly in the production of corn, cacao, milk, palm oil, rice and cattle. Important industries believed to have benefited as a result of the road include tourism (particularly visitors to La Ceiba owing to its proximity to fine beaches and the Bay Islands); the dairy industry (particularly in La Ceiba where a plant has been established with a capacity of 30,000 liters per day), an oil processing plant (from african palm nuts); and a French plywood factory at Tela. A small furniture manufacturing business has been started at Tela, while the construction of a meat processing plant is projected at La Ceiba for later this year.

Data on agricultural production for 1965-66 and 1973/74 2/ (based on census data) are summarized in Tables 4 and 5. Note the sharp increases in the production of corn, beans, rice, melons and cabbage; while a number of new crops have been developed during this eight-year period. These include tomatoes, sugar-cane, pineapple, oranges, grapefruit, coconut and cacao. On the other hand, sharp cutbacks in production were registed in bananas and plantains. The

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1/ For further data relating to history and description of the road, see Annex III-A.

2/ Crop year starting May 1. No production data are available after 1973/74.

Table 4

PLANTED AREA AND PRODUCTION OF SELECTED PRODUCTS ON THE TELA-LA CEIBA HIGHWAY'S AREA OF INFLUENCE[1/]

- Area in Manzanas and Production in Quintales[2/]

		1965/66	1973/74	Percent Change
Basic Grains				
Corn	Area	14,772	21,318	44.3
	Production	298,683	440,260	47.4
Beans	Area	1,046	2,183	108.7
	Production	12,304	28,896	134.9
Sorghum	Area	14	49	250.0
	Production	359	590	64.4
Rice	Area	993	2,780	180.0
	Production	21,629	71,874	232.3
Total Basic Grains	Area	16,825	26,330	56.5
	Production	332,975	541,620	62.7
Other Annual Crops				
Yucca	Area	418	824	97.1
	Production	49,551	54,758	10.5
Water Melons	Area	7	125	1,685.7
	Production	430	5,324	1,138.1
Tomato	Area	-	33	
	Production	-	682	
Cabagge	Area	4	6	50.0
	Production	448	10,472	2,237.5
Total Other Annual Crops	Area	429	988	130.3
	Production	50,429	71,236	41.3
Permanent Crops				
Coffee	Area	1,177	1,453	23.5
	Production	6,086	7,672	26.1
Sugar-Cane	Area	-	233	
	Production	-	34,144	
Pineapple	Area	-	1,014	
	Production	-	242,464	
Oranges	Area	-	403	
	Production	-	16,236	
Grapefruits	Area	-	985	
	Production	-	107,521	
Coconuts	Area	-	4,058	
	Production	-	96,385	
Cacao	Area	-	330	
	Production	-	2,376	
Bananas and Plantains	Area	1,960	1,839	-6.2
	Production	845,622	153,692	-81.8
Total Permanent Crops				
A. Including Bananas & Plantains	Area	3,137	10,315	228.8
	Production	851,708	660,490	-22.5
B. Excluding Bananas & Plantains	Area	1,177	8,476	620.1
	Production	6,086	506,798	8,227.3

1/ Includes the following municipalities: La Ceiba, El Porvenir, Esparta, La Masica, San Francisco and Tela.

2/ One quintal = one cwt.

SOURCE: D. G. Estadistica y Censos, Honduras.

Table 5

TOTAL PLANTED AREA AND PRODUCTION ON THE TELA-LA CEIBA HIGHWAY'S AREA OF INFLUENCE

	1965/66	1973/74	Percent Change	
			Total	Annual Growth Rate
Annual Crops 1/				
Total manzanas	17,299	27,336	58.0	5.9
Total quintales (cwts)	385,763	613,538	59.0	6.0
Basic Grains Only				
Total manzanas	16,825	26,330	56.5	5.8
Total quintales	332,975	541,620	62.7	6.3
Permanent Crops 2/				
Total manzanas	3,137	10,553	236.4	16.4
Total quintales	851,708	664,978	-21.9	-3.0
Excluding Bananas & Plantains 3/				
Total manzanas	1,177	8,714	640.4	28
Total quintales	6,086	511,286	8,301.0	73

Note: Totals do not equal the sum of the individual products listed in Table 4 because that table shows major products only.

1/ Include corn, beans, sorghum, rice, potatoes, yucca, sweet potatoes, watermelons and cabbage.

2/ Include coffee, sugar-cane, pineapple, bananas, plaintains, oranges, grapefruits, mangoes, avocados, sapotas, cashew, papaya, african palm and cacao.

3/ Bananas and plantains are excluded on the ground that the road did not affect their production.

SOURCE: D. G. Estadística y Censos, Honduras.

reduction in banana production is attributable to a number of factors unrelated to the road: the onslaught of disease on the banana plantations in the Tela region which caused the fruit companies to gradually shift their operations west; hurricane Fifi which damaged extensively the banana plantations in the fall of 1974; the dispute between the fruit companies[1] and the government over the banana tax; and the competition in banana production provided by Ecuador.[2] Tela was a company town whose importance declined following the shift of banana production to other areas. In measuring the impact of the road on the region's agricultural production, the performance of the banana sector must be excluded.

Note that between 1965/66 and 1973/74, the production of basic grains increased at an average annual rate of 6.3%; all annual crops increased at 6.0%; and all permanent crops[3] (excluding bananas and plantains) at the dramatic average annual rate of 73% (Table 5).

In Conclusion: The evidence indicates that the road has brought substantial benefits to La Ceiba and to other communities as they are now connected to the rest of the country by an all-weather road. Substantial benefits were derived in agricultural and livestock production, tourism and manufacturing. Tela has experienced fewer benefits since it was previously connected with the main economic centers of the country and since that city suffered seriously as a result of the decline of banana production in the Tela region. Statistics for 1977 and later years should reflect this growth to a much greater extent than those for 1973/74, a year that is too close to the time of completion of the road project.

b. Choluteca-Guasaule Road

Description and History

This road, 44.6 kilometers in length, joins the river Guasaule, which marks the border between Honduras and Nicaragua,

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1/ The Tela Railroad Company and Standard Fruit.

2/ The latter two factors discouraged the fruit companies from making the heavy investment required to rebuild the banana plantation destroyed by the hurricane and ravaged by disease.

3/ These include coffee, sugar-cane, pineapple, oranges, grapefruit, mangoes, aguacates, sapotas, coconuts, cashew nuts, papaya, african palm and cacao.

with the City of Choluteca, Honduras, on the Central American Highway (CA-1). It passes by the towns of El Triunfo and Namasigüe. This stretch is part of an integration road (CA-3) which connects Choluteca with Puente Real and Chinandega in Nicaragua (see map in Annex I). The new road reduces the distance from Choluteca to Managua by about 77 kilometers (in comparison with the Pan American Highway) and opens up for agricultural development the land that it traverses.

Prior to the construction of the new highway, there was a dirt road which joined Choluteca with Namasigüe and El Triunfo. The road between Choluteca and Namasigüe existed for some years while the road between Namasigüe and El Triunfo was changed during 1960-64 from an old bridle trail to a narrow road. Between El Triunfo and the Nicaraguan border there was only a primitive road that could only be used during the dry season.1/

Development Benefits

Interviews were conducted by the members of the team in Choluteca, El Triunfo and at the customs house at Guasaule. The main observations of the interviewees2/ are as follows:

At Choluteca:

1. The existence of the road has stimulated expansion of agricultural activity. Areas devoted to the cultivation of traditional crops (corn, cotton and beans) expanded while yields increased substantially. A number of new crops have been planted, including sesame, water melons and rice. The mayor of Choluteca estimated that the area under cultivation may have doubled as a direct result of the road and of the new land reform which allows the government to expropriate non-cultivated land. He believes that yields may have increased by as much as 30% owing to the availability of fertilizers and insecticides (shipped mainly from Nicaragua) and to the technical assistance provided by the government. There has also been expansion of livestock activity.

1/ For further information on history and description, see Annex III-B.

2/ For a detailed account of the interviews, see trip report in Annex IV.

2. Some industrial enterprises (mostly agro-industries) were established near the city after the inauguration of the road. These include a meat packing plant for export to U.S. markets, a rice mill and a barbed wire plant. Other enterprises, including a sesame decorticator, a dairy and an export packing plant for melons are under construction.

3. There has been a substantial increase in trade with and tourism from Nicaragua. Tourists from Nicaragua consist in part of week-end and holiday visitors passing through to the beaches on the Gulf of Fonseca. Others are long distance travelers stopping overnight. A new hotel was built as a direct consequence of this increased demand. The commercial relations of Choluteca are greater with Nicaraguan cities than with Tegucigalpa.

4. There has been a substantial increase in municipal revenues as a result of the new activity. The price of land increased from L/0.50 to L/3 to 4[1/] per square meter on property adjacent to the road.

At El Triunfo:

The mayor of El Triunfo generally made the same observations as the mayor of Choluteca: trade with Nicaraguan towns and tourism has substantially increased; work opportunities in Nicaragua have been opened to the population of El Triunfo as they can now easily reach Nicaraguan farms and industries; the price of land has increased by up to 10 times; while the municipal budget increased from only L/20,000 in 1974 to L/120,000 in 1976 owing to better management, higher prices of land and activity related to the road.

Available data on agricultural production for the three districts in the area of influence (Choluteca, Namasigüe and El Triunfo) are presented in Tables 6 and 7. Note that there is no significant increase between 1965/66 and 1973/74 in the production of basic grains; there is a very sharp reduction in the area planted to cotton and in cotton production (from 290,000 quintales to only 58,000 quintales). Coffee production also declined sharply. On the other hand, a number of significant new crops have been developed. These include tobacco, melons, cantaloupes, cabbage, oranges, mangoes, and particularly sugar-cane (up from zero to 53,000

1/ Two Lempiras (L) are equal to one dollar.

Table 6

PLANTED AREA AND PRODUCTION OF SELECTED PRODUCTS ON THE CHOLUTECA-GUASAULE HIGHWAY'S AREA OF INFLUENCE[1]

- Area in Manzanas and Production in Quintales[2] -

		1965/66	1973/74	Percent of Change
Basic Grains				
Corn	Area	11,056	12,004	8.6
	Production	104,941	106,237	1.2
Beans	Area	682	447	-34.5
	Production	4,643	1,785	-61.6
Sorghum	Area	4,870	5,078	4.3
	Production	56,423	49,750	-12.4
Rice	Area	53	640	1,107.5
	Production	895	20,988	2,245.0
Total Basic Grains	Area	16,661	18,169	9.1
	Production	166,902	178,760	6.9
Other Annual Crops				
Sesame	Area	32	940	2,837.5
	Production	373	5,434	1,356.8
Cotton	Area	8,680	1,939	-77.7
	Production	290,221	58,058	-80.0
Cantaloupes	Area	11	502	4,463.6
	Production	154	11,990	7,685.7
Melons	Area	1	78	7,700.0
	Production	12	2,552	21,166.7
Watermelons	Area	15	132	780.0
	Production	900	7,524	736.0
Total Other Annual Crops	Area	8,739	3,591	-58.9
	Production	291,660	85,558	-70.7
Permanent Crops				
Coffee	Area	926	275	-70.3
	Production	4,878	695	-85.7
Sugar-Cane	Area	-	612	
	Production	-	53,042	
Oranges	Area	-	122	
	Production	-	6,534	
Mangoes	Area	-	68	
	Production	-	2,794	
Total Permanent Crops	Area	926	1,077	16.3
	Production	4,878	63,065	1,192.8

1/ Includes the following Municipiums: Choluteca, Namasigüe and El Triunfo.

2/ One quintal = One cwt.

SOURCE: D.G. Estadística y Censos, Honduras

Table 7

TOTAL PLANTED AREA AND PRODUCTION ON THE CHOLUTECA-GUASAULE HIGHWAY'S AREA OF INFLUENCE

	1965/66	1973/74	Percent of Change
Annual Crops 1/			
Total manzanas	25,459	21,788	-14.2
Total quintales (cwts)	464,733	268,190	-42.3
Basic Grains Only			
Total manzanas	16,661	18,169	9.1
Total quintales	166,902	178,760	7.1
Permanent Crops 2/			
Total manzanas	1,170	1,246	6.5
Total quintales	39,450	68,356	73.3
Excluding Bananas & Plantains			
Total manzanas	1,117	1,227	9.8
total quintales	27,734	67,410	143.1

Note: Totals do not equal the sum of the individual products listed in table 6 because that table shows major products only.

1/ Includes: corn, beans, sorghum, rice, sesame, soybean, yucca, cotton, tobacco, melons, watermelons, tomatoes and cabbage.

2/ Includes: Coffee, sugar-cane, pineapple, bananas, plantains, oranges, grapefruits, citrus, mangoes, avocados, sapotas, coconuts, cashew and sisal.

SOURCE: D. G. Estadística y Censos, Honduras.

quintales - Table 6). Between 1965/66 and 1973/74 total production of permanent crops (excluding bananas and plantains) increased from 27,700 quintales to 67,400 quintales, or by 2.4 times (Table 7).

The picture presented by the data on agricultural production is thus spotty: basic grains are essentially unchanged, cotton and coffee suffered a sharp decline, while permanent crops, particularly sugar, flourished. The main reason given for the poor performance of basic grains, cotton and coffee, is the impact of the El Salvador-Honduras dispute. Large numbers of Salvadorans were tending the fields in the area of influence. Cotton was particularly hard hit by the conflict which disrupted production as a result of the expulsion of Salvadorans working in the fields.

In Conclusion: While the net impact of the road on the economic development of the area of influence was definitely positive as indicated by our interviews, the agricultural data through 1973/74 do not support this conclusion unequivocally owing to the negative impact of factors unrelated to the road and to the absence of more recent statistics.

c. El Coco-San Ramón Road

Description and History

There was a narrow paved road joining the airport of El Coco with the City of San Ramón before the present road was built. That road was built in the thirties and is quite inadequate to carry current traffic. It had slopes exceeding 10 degrees, many curves, single lane, bridges unable to support heavy trailers, a width of less than 6 meters, practically no shoulders, etc. On the other hand, highway studies carried out by the Ministry of Transport have demonstrated that the road was one of highest traffic demand within the national highway system and that congestion occurred along the greater part of its length.

The new road measures 41 kilometers. It is a limited access toll road. It has a special passing lane in sections where grades are steep. It has shortened the trip between El Coco and San Ramón by 1 to 1½ hours.[1/]

The road is not a "development road" as it does not open up virgin lands as in the case of the two Honduran roads. There is no

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1/ For further information on the history and description of the road, see Annex III-C.

major agricultural development that can be attributed to the road. However, this does not mean that the road has had no development impact. It is believed to have had some development in two respects:

1. Development of new industrial parks outside San José: Several industrial parks were planned by the government outside the San José area to reduce unemployment, take advantage of local sources of raw materials, decentralize industry and accelerate the development of surrounding towns. While the road was not a factor in locating these parks, it is expected to be beneficial to the development of the San Carlos Industrial Park which is located in its vicinity.

2. The road is stimulating tourism by facilitating access of visitors to the beaches at Puntarenas and Guanacaste, two favorite tourist sites. These can be reached more rapidly from San José owing to the road.

In spite of the benefits described above, it is believed that most of the benefits from the road take the form of user cost savings. Therefore, the value added approach was not applied to this road in calculating the benefit-cost ratio.

A N N E X I

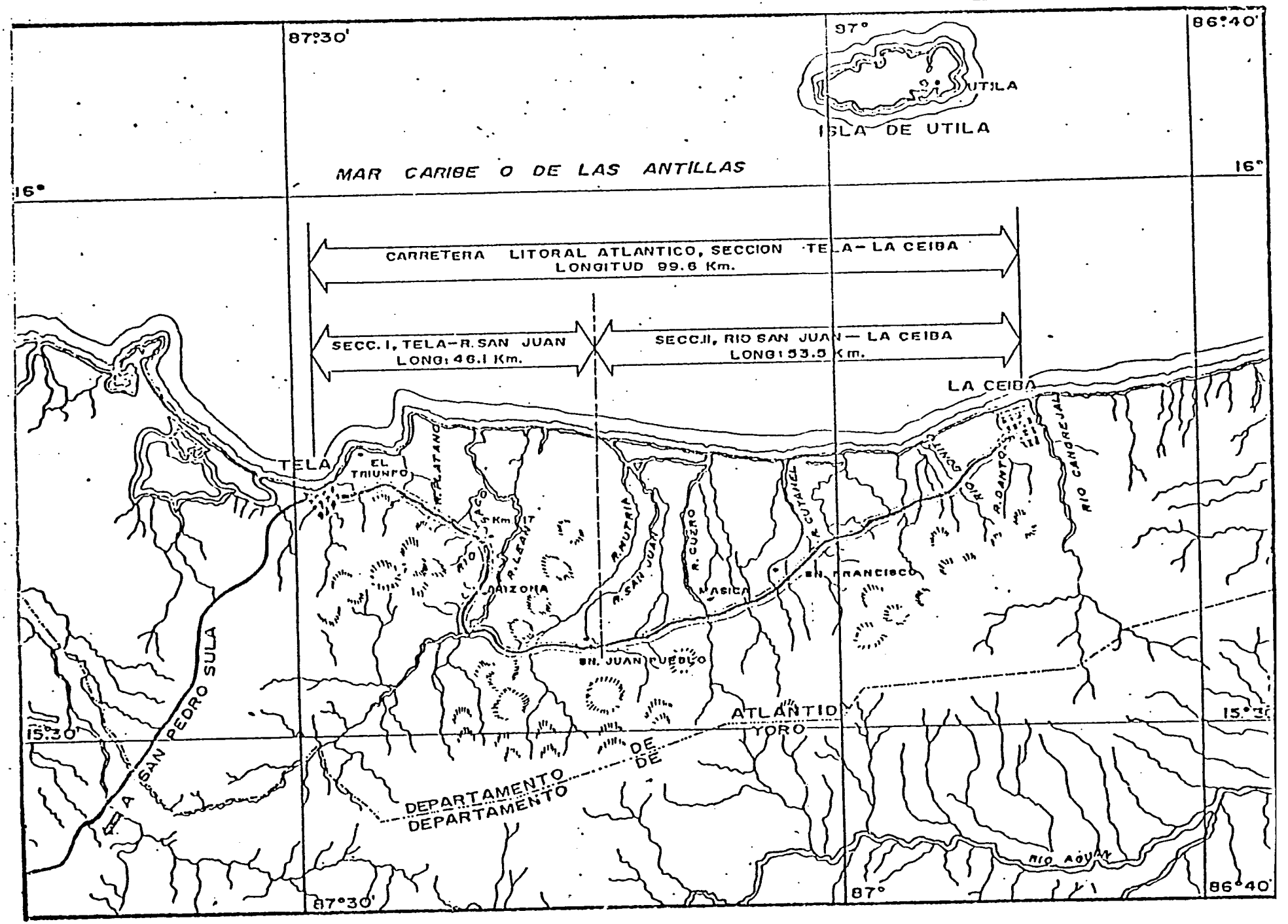
Maps of Roads and Areas of Influence

A. Tela-La Ceiba

B. Choluteca-Guasaule

C. El Coco San Ramón

Annex I-A


87°30'
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UTILA
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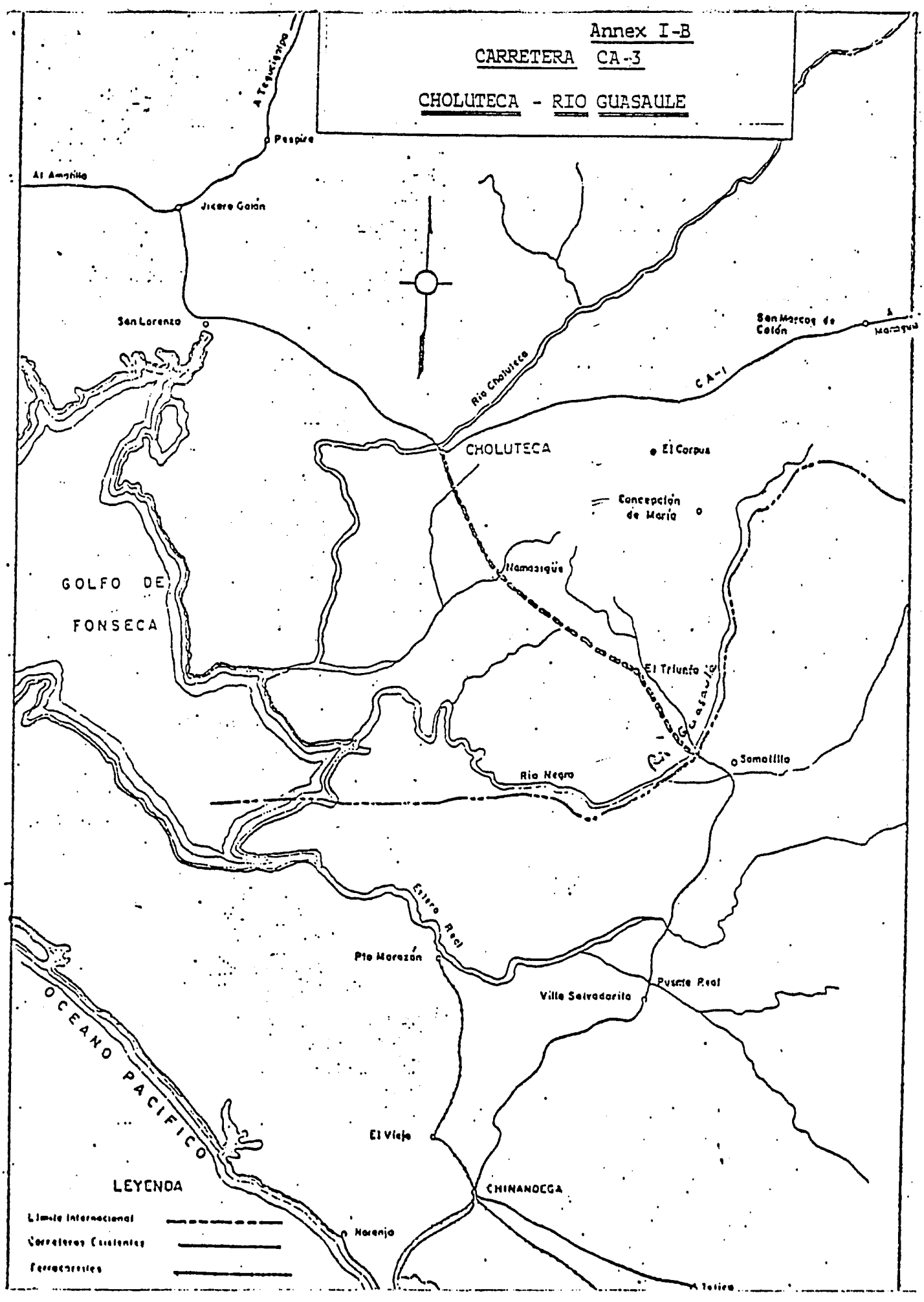
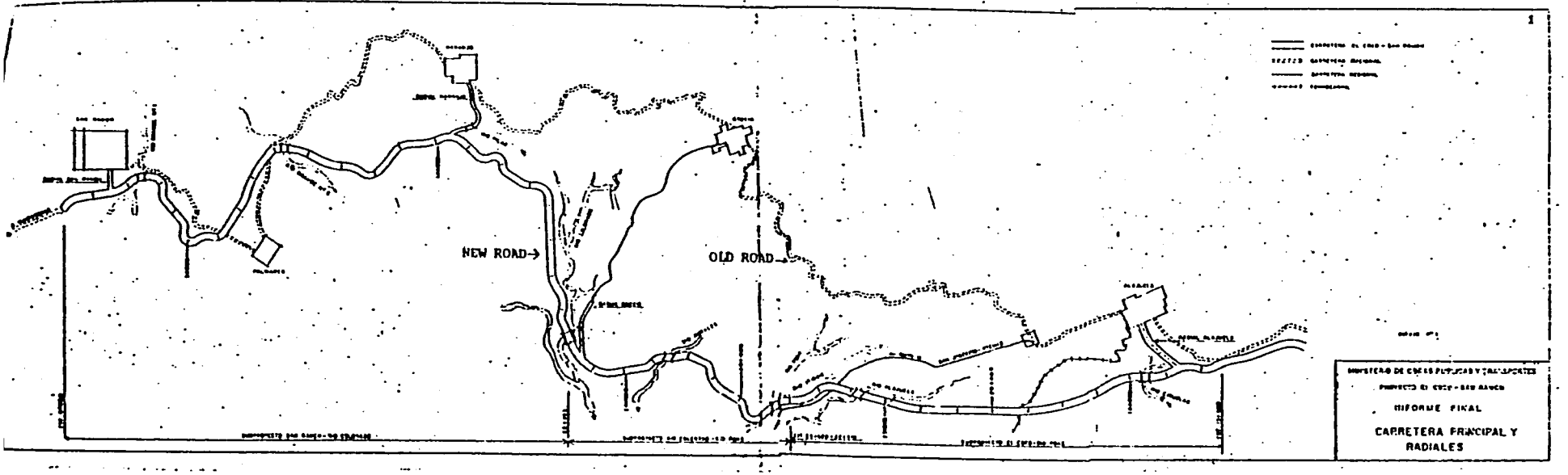
MAR CARIBE O DE LAS ANTILLAS
CARRETERA LITORAL ATLANTICO, SECCION TELA- LA CEIBA
LONGITUD 99.6 Km.
SECC. I, TELA-R. SAN JUAN
LONG: 46.1 Km.
SECC.II, RIO SAN JUAN — LA CEIBA
LONG: 53.5 Km.
LA CEIBA
TELA
EL TRIUNFO
R. PLATANO
R. MURIA
R. SAN JUAN
R. CUERO
R. CUYAMEL
R. CANTO
RIO CANDELARIA
RIO
MASICA
SN. FRANCISCO
SN. JUAN PUEBLO
ATLANTIDA
YORO
DEPARTAMENTO DE
DEPARTAMENTO DE
A SAN PEDRO SULA
RIO AGUAN


Annex I-B
CARRETERA CA-3
CHOLUTECA - RIO GUASAULE
A Tegucigalpa
Pespire
Al Amarillo
Jicaro Galán
San Lorenzo
San Marcos de Colón
A Managua
CA-1
Rio Choluteca
CHOLUTECA
El Corpus
Concepción de María
Namasigüe
GOLFO DE FONSECA
El Triunfo
Rio Guasaule
Somotillo
Rio Negro
Estero Real
Pto Morazán
Puente Real
Villa Salvadorita
OCEANO PACIFICO
El Viejo
CHINANDEGA
Naranjo
Telica
LEYENDA
Limite Internacional
Carreteras Existentes
Ferrocarriles

EL COCO - SAN RAMON

Annex I-C

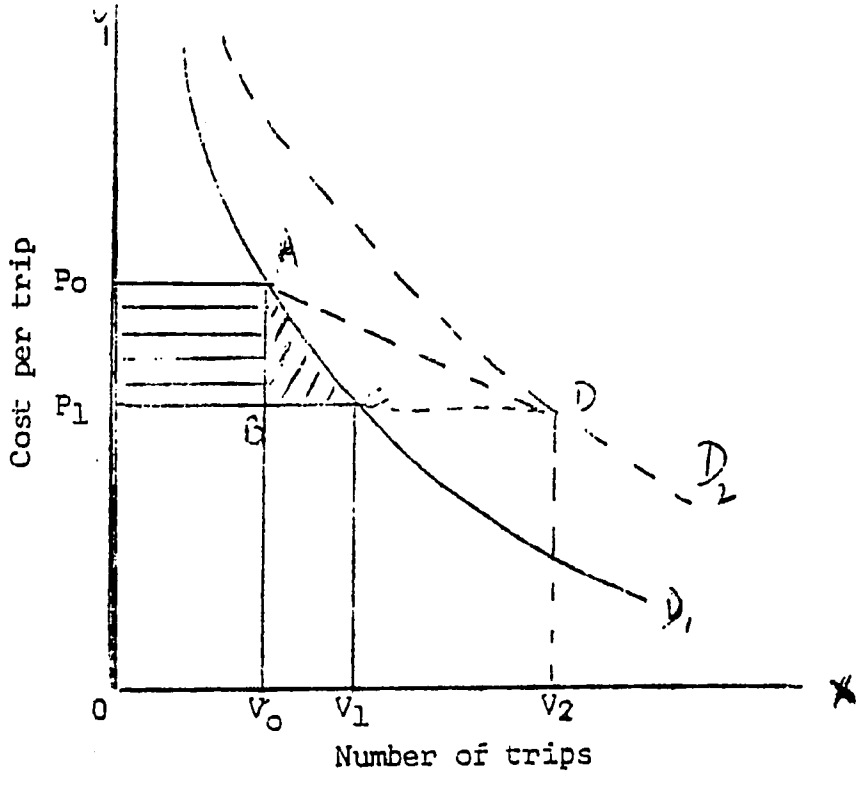


A N N E X II

Relationship Between the Valuation of "Existing/Diverted" Traffic and "Generated/Development" Traffic in User Cost Saving Approach

In the standard user cost savings approach, "generated/development" traffic is valued at half the rate applied to "existing", "normal growth" and "diverted" traffic. This annex will explain why.1/

In the diagram below, the cost per trip is shown on the Y axis and the number of trips on the X axis. D_1 is the demand for trips at various costs per trip.



1/ This section is based on the lucid presentation provided by Clarkson H. Oglesby in Highway Engineering, Third Edition, John Wiley & Sons, New York, 1975, pages 116-119.

Assume that before the road is improved, the cost of making a trip is measured by OP_o and that OV_o trips are made. After the road improvement, assume that the cost per trip declines to OP_1 and that OV_1 trips are now made.

The travelers who made the trip before, and/or those who travelled on an alternate road, are now getting a windfall, i.e. a net benefit or "consumer surplus" equal to P_1 P_o per trip. The total windfall of these travelers is equal to the shaded rectangle P_1 P_o A B. On the other hand, new travelers who are now induced to make the trip as a result of lower costs get a smaller windfall. Specifically, some new travelers are willing to pay close to AV_o (equal to OP_o) per trip. However, as we move toward the position V_1, additional travelers are prepared to pay progressively smaller amounts, until we get to the marginal traveler (V_1) who is willing to pay no more than CV_1 (equal to OP_1) per trip and has no windfall at all. The windfall or net benefit accruing to these additional travelers is thus measured by the triangular area ABC. Thus, each new traveler receives a net benefit equal to, on the average, only half the amount of the old travelers (or those who used an alternate road). In the standard user cost savings approach, "development" traffic is treated in the same manner as "generated" traffic. Both are valued at only half the amount of the user cost savings realized by those who used the old (unimproved) road or an alternate road.

Allowance may have to be made for the fact that the improved road may provide an entirely different kind of service which will cause the demand to shift from D_1 to D_2. This will greatly expand the number of trips demanded, but not the rate at which each trip is valued. If the demand shifts to D_2, the number of new trips is measured by the distance V_o V_2, and the additional amount of generated/development traffic by the triangle ABD. Note that, here again, new traffic (either "generated" or "development") is still valued at only half the rate of existing traffic. On the other hand, "diverted" traffic should be valued at full user cost savings since travelers on alternate roads were willing to pay the full amount of the vehicle operating costs as they were before the new road (or the improvement) became available.

The standard user cost approach outlined above has primary application in situations where access by motor vehicle already existed. Comparisons are related to the effects on costs of various levels of improvement. It is recognized that this method is not well suited to developing nations in situations where access to an area is provided for the first time, possibly in conjunction with agricultural or other resource development. The user cost saving approach is likely to substantially undervalue actual economic benefits in this case. Ideally, the analysis should evaluate the entire investment, with transportation as only one of the cost elements.1/

1/ Ibid., page 118.

In view of the limitations of the user cost saving approach in LDCs, we have also used an alternative (value added) evaluation approach in the case of the two Honduran roads which were designed, in large part, to open up new regions for development. This alternative approach assumes that half the traffic (recorded and projected) is "development" traffic resulting from the exploitation of resources that would have remained idle, or at least would have been far less efficiently utilized, in the absence of the new road. The road was instrumental in producing additional value added (i.e. contribution to GNP). Its contribution to this value added is, as a minimum, equal to the value contributed by transporting the new product to market.[1/] This approach was explained in the methodology section of the report, and is treated in greater detail in the Highway Planning Manual of Roy Jorgensen Associates.[2/]

1/ As measured by vehicle operating costs.

2/ Highway Manual AID/OTr. C-1420, prepared for the United States Agency for International Development, September 1975, pages 32-36.

A N N E X III

History, Description and Methodology Applied in Benefit-Cost Calculations of the Three Roads

ANNEX III-A

History, Description and Methodology Used in the Benefit-Cost Calculations of the Tela-La Ceiba Section of the Atlantic Littoral Highway, Honduras

1. History of the Project:

In October, 1965, the Government of Honduras solicited a loan from CABEI to finance the construction of the littoral highway from Tela to La Ceiba. The existing road between these two ports was merely a trail without bridges or drainage, and consequently was passable only a few months of the year. La Ceiba was effectively isolated from the rest of Honduras; the only permanent access was by ocean.

A loan of $8,774,000 was approved in July, 1966, using funds from AID Loan No. 596-L-006. This was later increased by $2,000,000 in June, 1970, with funds from AID Loan No. 596-L-008, and again by $703,000 in August, 1972.

Brown & Root Overseas prepared the feasibility study and the preliminary construction plans for the highway. In January, 1967, the GOH signed a contract with a consortium of Frederick R. Harris Engineering Corp. and Ing. Roberto E. Midence to complete the plans, specifications and bidding documents and to supervise the construction.

The construction of the road was divided into two contracts. The first contract for the section from Río San Juan to La Ceiba (53.5 km.) was signed with the contractor ICCA DEL E. WEBB DE HONDURAS in June, 1968. The same contractor was awarded the bid for the second section from Tela to Río San Juan (46.1 km.) in April, 1969.

Construction of the first section was completed in February, 1972, and of the second section in May, 1972. However, the highway was open for use by the public during 1971.

2. Description of the Completed Highway:

The Tela-La Ceiba section of the littoral highway consists of a 99.6 km. double surface treated two lane road. The portion of the road from Tela to Río San Juan is in rolling terrain, whereas the continuation to La Ceiba crosses flat coastal plains.

The geometric standards of the highway are:

	Mountainous	Rolling	Flat
Design speed (kph)	50	80	100
Minimum radius (m)	70	190	380
Minimum stopping distance (m)	65	100	150
Maximum grade	7%	6%	5%
Total width		10.30 m	
Pavement width		6.70 m	
Width of shoulders		1.80 m	
Width of bridges		7.92 m	

3. Cost of Project:

The Brown & Root Report on the Northern Littoral Highway between San Pedro Sula and La Ceiba, 1964, gave a cost estimate for the construction of the highway. This estimate was checked by CABEI and was used in the dictamen dated January, 1966.

Estimated and Actual
Construction Costs: Tela-La Ceiba Highway

	Estimated	Bid	Actual
Construction	$7,853,511.00	$9,288,711.00	$10,630,989.00
Engineering & Supervision	797,651.00		1,237,338.00
Total	$8,651,162.00		$11,868,327.00

The construction bid prices obtained in 1968 and 1969 were 18% above the estimate. Since approximately 9% inflation occurred in Honduras between 1964 and 1968, inflation accounts for half the difference between estimated and bid prices.

The final construction cost exceeded the bid prices by approximately $1,340,000 or 14%. The cost overruns were due to additional work,

primarily excavation of non-classified material, slide removal, changes of alignment, increased channelling in riverbeds and changes of bridge design.

The engineering costs also overran the estimated 10% of construction costs. The increase was primarily due to delays in the construction which necessitated extension of the consultant's contract, although some of the increase was caused by design changes.

4. Traffic:

The following table lists predictions made by various institutions of the future traffic on the Tela-La Ceiba highway. Also shown are the results of several subsequent traffic counts. The underestimation of the traffic growth due to the opening of the highway is obvious. The growth is even more impressive considering the damage done to the road and the entire region by hurricane "FIFI" in 1974 and the severe flooding in 1975.

Agency Making Prediction or Measurement	Year for Which Prediction was made or Traffic Count Taken	Average Daily Traffic (Vehicles per day)	
		Prediction	Actual
SRI 1/	1961		30
SRI 1/	1962		50
Brown & Root 2/	1971		1246
SRI 1/	1972	156 (min) 189 (max)	
ECAT, 1964-65 3/	1974	270	
ECAT, 1975-76 4/	1975		1098
GOH (counts cover only 19 hrs/day) 5/	Sept. '75 to May '76		1724
TAMS 6/	1977		2435
ECAT, 1964-65 3/	1984	630	
ECAT, 1975-76 4/	1990	2033	

Sources:
1/ Stanford Research Institute, "A Ten Year Highway Program for Honduras", 1962.
2/ Brown & Root, "Volúmen de Tránsito en las Carreteras de Honduras", 1971.
3/ Central American Transport Study, 1964-65.
4/ Central American Transport Study, 1975-76.
5/ Government of Honduras, traffic counts made in La Ceiba.
6/ Tippetts-Abbott-McCarthy-Stratton, verbal communication.

In calculating the historical growth of traffic, we used the Brown and Root count for 1971 and the average of the GOH traffic counts taken over the period September 1975 to May 1976. The GOH traffic counts conflict with ECAT's. The ECAT count was not used since: (a) it did not follow the pattern of the other counts, and (b) the GOH count represents an average taken over a nine-month period.

Historical and projected growth rates are as follows:

Year	Actual Data		Minimum Estimate		Best Estimate	
	ADT*	Annual Growth Rate, %	ADT	Annual Growth Rate, %	ADT	Annual Growth Rate, %
1971	1246	8%	1246		1246	
1975	1724	12%	1824	10%	1824	10%
1977	2435	19%	2207		2207	
1980	-		2398		2398	
1990	-		5780	7%	6342	8%
2000	-		10351	6%	12477	7%

* ADT = Average Daily Traffic

Three independent reports of the traffic distribution were obtained. These are shown in the following table, along with the distribution assumed by ROCAP for its benefit-cost study.

Source	Traffic Distribution			
	Cars	Pick-Ups	Buses	Trucks
ECAT, 1975-76	51.0%	31.8%	15.3%	1.9%
GOH, 1975-76	32.3%	41.4%	13.0%	13.3%
TAMS, 1977	← 77% →		12%	11%
ROCAP Estimate	← 74% →		13%	13%

Because the GON distribution was based on nine months of counting, we felt it to be the most reliable information.

5. User Costs

The original user cost estimates made in the early '60's were based on the cost per ton-km and passenger-km. In its 1966 Dictamen

for the Tela-La Ceiba highway, CABEI used the Stanford Research Institute estimates:

Old dirt trail	- $0.034 per passenger-km - $0.190 per ton-km
New paved highway	- $0.020 per passenger-km - $0.053 per ton-km

No indication is given in the Dictamen with respect to how these costs were determined.

These costs, after being inflated to 1976 prices and adjusted to show cost per km for various vehicle types, appear very high. The inflation factor based on the General Price Index to the Consumer in Tegucigalpa is approximately 1.5. ECAT 1975-76 reported the following average cargo per vehicle type:

Car	- 2.7 passengers
Bus	- 14.0 passengers
Light Trucks	- 3.09 tons
Heavy Trucks	- 12.52 tons

The following table compares the recalculated 1966 CABEI user cost data with data supplied by ECAT 1975-76 and TAMS.

Type of Vehicle	User Costs 1976 (U.S. Dollars per Kilometer)				
	1966 CABEI Dictamen		ECAT 1975-76	TAMS 1976	
	Dirt	Paved	Paved	Dirt	Paved
Car	.138	.081	.058	.092	.049
Pick-up	.881	.246	.108	.092	.049
Bus	.714	.420	.165	.182	.082
Truck	3.568	.995	.151	.316	.133

The CABEI data when viewed in this context of cost per km for each type are unreasonably high. Also the savings calculated from the CABEI data are excessive; for example, a truck has a saving of $2.57 per km.

For the ROCAP benefit-cost analysis we chose to use the TAMS data since they compared more favorably with the accepted patterns of correlation between operating costs and velocity. To obtain the costs per km given in the above table, we assumed the average velocities shown in the following table for each type of vehicle.

Vehicle	Road Surface	Average Velocity	Cost per Km
Cars and Pick-Ups	Dirt	20	$0.0916
	Paved	72	0.0490
Buses	Dirt	16	0.1815
	Paved	56	0.0815
Trucks	Dirt	16	0.3161
	Paved	56	0.1334

These user cost figures were then multiplied by the length of the old (dirt) and new (paved) roads. The length of the original dirt trail was 110 km. while the new highway measures 99.6 km. The difference is the cost saving per trip. Results are as follows:

Vehicle	User Cost Savings	
	In 1976 Dollars	In 1971 Dollars
Car	$ 5.20	$ 3.74
Bus	11.85	8.53
Truck	21.48	15.45

The above figures do not include the value of time saved. Using Government of Costa Rica estimates of time value per vehicle/hour in 1976 dollars, and applying these estimates to the time saved in using the new road in comparison with the old one, results obtained are as follows:

	(1) Value of Savings Per Hour (GOCR Estimates)	(2) Time Saved By Using New Road (Hours)	(3) Value of Time Saved Per Vehicle/Trip (1) x (2)
Buses	$ 4.54	$ 5.10	$ 23.15
Trucks	.72*	5.10	3.67

* Weighted average of Costa Rican costs for trucks and trailers using TAMS' estimate of 40% trucks and 60% trailers.

The time value of drivers and passengers of light vehicles (cars and pick-ups) was excluded on the assumption that much of this driving is for leisure purposes. Its inclusion (which is defensible) would have nearly doubled the value of the time saving factor.

Allowance for the time saving factor for buses, trucks and trailers would raise total user cost savings as follows:

	In 1976 Dollars	Converted to 1971 Dollars
Buses	$ 35.00	$ 25.18
Trucks	25.15	18.09

6. Computation of the Original Benefit-Cost Ratios

The 1966 CABEI Dictamen cites benefit-cost calculations from two sources: Stanford Research Institute (SRI) and the Central American Transport Study (ECAT), 1964-65.

The SRI developed benefit-cost ratios for a ten-year period using its minimum and maximum traffic projections (see section 4), user costs very close to those of CABEI, and a 4% discount rate. CABEI revised the SRI results using the construction cost estimate made by Brown & Root (see section 3). The benefit-cost ratios thus obtained were 1.11 as a minimum and 1.60 as a maximum. No mention was made of maintenance costs.

ECAT (1964-65) calculated benefit-cost ratios for the years 1974 and 1984. These computations used an interest rate of 3½%, the ECAT traffic projections and an annual cost for the road based on a 100 year useful life of the right-of-way, 40 year useful life of the structures, 20 year useful life of the pavement and an annual maintenance cost of $700 per kilometer. CABEI recomputed the benefit-cost ratios incorporating the CABEI user cost estimates. The user savings computed for each of the years 1974 and 1984 were divided by the annual road cost. The resultant benefit-cost ratios are: 1974 2.83, and 1984 6.30.

7. Revised Benefit-Cost Ratio Evaluation

ROCAP recalculated the benefit-cost ratio for this highway using the actual data to the extent possible. The base year selected was 1971 since the road already was open to traffic in that year, although not entirely completed. A thirty year period was considered.

The user cost savings were calculated using traffic projections and user costs discussed in sections 4 and 5.

Actual construction and engineering costs are presented below. To convert these costs to 1971 dollars, the funds to cover them were assumed to have been disbursed at a constant rate throughout the 3½ year construction period starting in July 1968 and ending December 1971

Year	Fraction Paid	Amount Paid (Current Dollars)	Amount Paid In 1971 $	Plus Interest at 8% Per Annum
1968	1/7	$ 1,695,475	$ 1,815,284	$ 2,286,735
1969	2/7	3,390,951	3,569,422	4,163.374
1970	2/7	3,390,951	3,467,230	3,744.608
1971	2/7	3,390,951	3,390,951	3,390,951
Total	1	$11,868,327	$12,242,886	$13,585,668

The maintenance costs for this highway are high due to its vulnerability to periodic flooding. We estimated that one half of

the bridges would be destroyed during a thirty year period. Since the original cost of the bridges in 1971 dollars is $2,509,440, the annual bridge maintenance cost alone is estimated as $41,824.

The regular maintenance of the road until 1977 has been poor. However CABEI notified ROCAP in May, 1977, that the GOH is spending $1,660,000 during 1977 on emergency repair work such as drainage, erosion control, earthwork and reconstruction of road section destroyed by flooding (which amounts to $1,150,000 in 1971 dollars). In addition, we estimate that the annual road maintenance cost for the period 1971-1980 is $23,000. For the period 1971-80, total annual maintenance costs were estimated at $65,000 plus $1,150,000 in 1977.

For the period 1981-2000, we assumed that the GOH will maintain the road more regularly at the maintenance level specified by ECAT, 1975-76, which is, in 1971 dollars, $62,000 per year. Adding $42,000 for bridge repair and $26,000 for emergency work, the annual maintenance cost is estimated to be $130,000.

The final results of the benefit-cost computations were summarized in Table 3 of this report (page 14).

ANNEX III-B

History, Description and Methodology Used in Benefit-Cost Calculation for the Choluteca-Guasaule Section of CA-3, Honduras

1. History of Project:

In 1962, both the GOH and the GON solicited loans from CABEI to finance construction of CA-3. CABEI declared CA-3 eligible for financing in July, 1963.

In October, 1964, the GOH petitioned CABEI for financing of the engineering costs. CABEI assigned $70,350 for feasibility studies and design in April, 1965, and $733,000 for construction in May, 1966. In May, 1967, the GOH contracted Brown & Root as consultants.

The feasibility studies were submitted to CABEI in March, 1968. and CABEI authorized an additional loan of $2,200,000 in May, 1968. A final loan of $500,000 was approved in 1971 to cover cost overruns.

The GOH signed the construction contract for the road with Ingenieros Contratistas Centroamericanos, S. A. and Salinas y Cardona S. de R. L. Lempira in June, 1969. The construction was completed in April, 1972.

2. Description of the Completed Highway

The 44.6 km. long highway between Choluteca and Guasaule crosses relatively flat terrain, with elevation ranging from 25 to 120 m. above sea level, approximately 15 km. to the northeast of the Choluteca Gulf. This section of highway was constructed as an alternate to the existing Pan American highway since the latter no longer could be considered a first class highway. The new road reduces the distance from Choluteca to Managua by about 77 kms. in comparison with the Pan American Highway.

The geometric standards used by Brown & Root for the design of the highway are:

Design speed	90 kph
Horizontal curvature	2° 15'
Minimum stopping distance	125 m
Maximum grade	5%

Total width	10.50 m.	
Width of shoulders	1.90 m.	
Design load for structures	H20 - S16	
Design load for pavement	9.5 metric ton	(single axle)

3. Cost of Project:

The construction costs for this project were estimated by Brown & Root in 1968. These estimates were adopted by CABEI in their August, 1968 dictamen and are shown below.

Construction Costs: Choluteca-Guasaule Highway

	Estimated	Bid	Actual
Right of Way	$ 27,608		-
Construction	2,958,133	2,918,162	} 3,264,402
Traffic Services	27,608		
Engineering & Supervision	236,651		427,831
	$ 3,250,000		$ 3,692,233 1/

1/ Excluding right of way.

The final construction cost exceeded the bid price by 12%. The overruns were due to unexpectedly hard dubsoil conditions, additional drainage work, additional excavation of non-classified material (including slide removal), and an access road to El Triunfo.

4. Traffic Projection

Only two traffic counts were available. The first, undertaken by Brown and Root in 1971, indicates an average daily traffic (ADT) of 228 vehicles. The second, taken by Tippets-Abbett-McCarthy-Stratton (TAMS) in 1976 shows an ADT of 881 vehicles, which is reasonably close to the Ministry of Transport estimate of 800. We decided to accept the TAMS count. The Brown & Root and TAMS estimates for 1971 and 1976, respectively, indicate an average

annual compound growth rate of 31%. It should be noted, however, that the 1971 estimate precedes completion of the new road (which was not terminated until April 1972), so that this growth rate cannot be used for purposes of projection. Unfortunately, no traffic count is available between 1971 and 1976.

For the period 1977-82, we assumed an average annual compound growth rate of 10%. We reduced this growth rate to 8% over 1983-92 and to 6.5% over 1993-2002. While these rates are very conservative with regard to the actual traffic growth that has taken place in recent years, they are slightly above those assumed for the Tela-La Ceiba road owing to the fact that the Choluteca-Guasaule road already serves as an important international highway in addition to carrying development traffic.

On the basis of TAMS estimate and the recorded composition of traffic on the Pan American Highway, the following vehicle distribution was assumed:

Car and Pick-ups	63%
Buses	12%
Trucks	25%

This distribution was assumed to remain unchanged over the projection period.

5. User Cost Savings

Estimates of user cost savings were based on vehicle operating costs estimated by TAMS for Honduras. For the new road, total vehicle operating costs per km. were $ 0.049 for cars and pick-ups, $0.081 for buses, and $ 0.127 for trucks. The calculation is shown in the table on page 13.

In calculating user cost savings of diverted and generated traffic, we took as our point of comparison the vehicle operating costs on CA-1 which is an alternative road from Choluteca to Managua. Vehicle operating costs per kilometer on that road were estimated to be 10% higher than on the new road because of steeper grades and sharper curves. Moreover, the old CA-1 road to Managua is 77 kilometers longer than the newer road. In estimating user cost savings, our methodology was to estimate such savings per vehicle on the total length of the Choluteca-Managua road (304 kilometers for CA-1 and 227 kilometers for the new road being evaluated). Thus, average savings per vehicle/trip, expressed in 1973 dollars, came to $4.16 for cars and pick-ups, $6.93 for buses and $10.76 for trucks.

ESTIMATES OF USER COST SAVINGS ON CHOLUTECA-MANAGUA ROAD

	Cars and Pick-ups	Buses	Trucks
Vehicle operating costs on alternative road (CA-1 to Managua)	$.0538 x 304 km = $16.36	$.0896 x 304 km = $27.24	$.1393 x 304 km = $42.35
Vehicle operating costs on new road to Managua	$.0489 x 227 km = $11.10	$.0814 x 227 km = $18.48	$.1266 x 227 km = $28.74
Saving per trip (Choluteca-Managua)	5.26	8.76	13.61
Savings per trip in 1973 dollars	4.16	6.93	10.76
For Choluteca-Nicaragua Border Stretch:			
1/5 of above	.832	1.386	2.152

These user cost savings are for the whole length of the trip from Choluteca to Managua. Full credit for such savings obviously cannot be given for the Choluteca-Guasaule stretch being evaluated, as that covers only one fifth of the distance from Choluteca to Managua. We have therefore taken only one-fifth of the user cost savings cited above. Thus, user cost savings on diverted traffic were estimated to amount to only $0.83 on cars and pick-ups, $1.39 on buses and $2.15 on trucks (see calculation in table on page 13).

6. Benefit-Cost Calculations

Three benefit-cost calculations were made for the Choluteca-Guasaule road. The first two follow the standard user cost savings approach. Calculation 1 assumes that half the traffic projected on the new road is diverted from CA-1 and that half is generated. Generated traffic is valued at half the amount of user cost savings for reasons explained in Annex II. This approach results in a benefit-cost ratio of 1.3.

The second approach makes allowance for the time saving factor, using the same valuation for the time of drivers and passengers as for the Tela-La Ceiba road. Otherwise, the approach is the same as under calculation 1. Allowance for the time saving factor raises the benefit-cost ratio to 1.7.

The third calculation assumes that only one fourth of the traffic is diverted, one fourth generated and one half is development traffic. The latter is valued at the full value of vehicle operating costs for reasons explained in the methodology section of the report. Diverted and generated traffic are valued as under calculation 1. The value of time savings is excluded. This approach yields a benefit-cost ratio of 2.5.

ANNEX III-C

History, Description and Methodology Used in Benefit-Cost Calculation for the El Coco-San Ramón Section of the Pan American Highway, Costa Rica

1. History of the Project:

In December, 1962, the Government of Costa Rica solicited a loan from CABEI to finance the construction of a new highway from El Coco to San Ramón. CABEI approved the project in 1964. However, negotiations were delayed while the GOCR waited for the establishment of the Central American Fund for Economic Integration since more favorable terms could be obtained from this source.

In October, 1966, a loan of $4,700,000.00 was approved for the construction of the road from San Ramón to the Río Colorado, using funds from AID Loan No. 596-L-006. A second loan of $5,800,000.00 was approved in January, 1968, with funds from AID Loan No. 596-L-008; $1,500,000.00 of the loan was for the completion of the San Ramón-Río Colorado and the remainder was for the Río Colorado-El Coco section. A final loan of $3,556,000.00 was approved by CABEI in late 1969.

The GOCR did the preliminary planning and design work. In July, 1967, the GOCR signed a contract with Baltodano, Echandi, Lara, Ltda. for supervision of the construction work between Río Colorado and San Ramón. This contract was subsequently extended twice to include the entire highway, and amended to include T. Y. Lin International in consortium for supervision of the bridge construction.

The construction of the road was divided into four contracts. The first contract for the section from San Ramón to Río Colorado was signed with the Constructora Rawcon de Costa Rica, S. A. in November, 1969. The same contractor was awarded the bids for the sections El Coco to Río Poás and Río Colorado to Río Poás in January, 1969, and October, 1969 respectively. The construction of the three major bridges was awarded to the Constructora Carrez International in December, 1969.

The bridges were completed in March, 1972, and the three highway sections were finished in December, 1972.

2. Description of the Completed Highway:

The entire highway is in mountainous terrain. The geometric standards of the main highway are:

Minimum radius	200 m
Maximum grade	7%
Minimum stopping visibility	110 m
Total width	10.90 - 12.20 m
Pavement width	7.30 m
Width of shoulders	1.80 - 2.45 m
Width of climbing lane	3.05 m (with 1.00 m shoulders)
Total length of climbing lane	14 Km
Thickness of asphalt concrete on main road	7.5 - 10.0 cm.

The new road has a length of 41.1 km. as compared with 58.6 km. for the old road.

3. Cost of Project:

In 1962 the GOCR estimated that the project would cost $6,201,500, including right of way. This estimate was revised by the GOCR in 1965 to include the passing lane and various other geometric improvements which were added since the road was to be a toll road. The revised estimate is shown in the following table:

Construction Costs: El Coco-San Ramón

	Estimated	Bid	Actual
Right of way	$ 494,375		$ 1,096,413
Construction	9,759,231	$12,329,703	14,613,735
Supervision (MOPT)	887,203		1,249,336
Consultants	117,441		455,936
Total	11,258,250		17,415,420
Total cost without right of way	10,763,875		16,319,007

4. Traffic:

Traffic volumes vary considerably along both the new and old highways due to the many intersecting roads. For ease in computation, we have taken all counts and based all projections for the new highway on the traffic observed at the toll booth (the intersections with the San Josecito-Atenas highway). For the old highway a parallel location between Alajuela and Grecia was chosen. The following table gives the actual daily traffic counts for these locations. All of the counts were made by the GOCR.

Year	Old Road	New Highway	Total on Both Roads
1959	1370		1370
1961	1260		1260
1965	1635		1635
1969	2191		2191
1972	2600		2600
1973	-	2744	-
1974	883	3042	3925
1975	1032	3282	4314
1976	1072	3633	4705

Based on the actual traffic data, the following observations can be made:

1. The average growth rate before the construction of the new road was 6%. This was calculated using data from several counting stations along the old road. This is the historic growth rate of the normal traffic.

2. The total traffic on both the old and new roads increased sharply in the year after the new road opened. This is a common phenomenon due to generated traffic.

3. The traffic on the new highway is composed of diverted and generated traffic. The traffic on the old road is primarily normal traffic with a small amount of generated traffic due to its relatively uncongested state.

We made a prediction of the traffic volumes for the years 1973 to 1982 based on the assumptions listed below:

1. The traffic on the old road in 1973 is composed of normal traffic which is 30% of the previous normal traffic and generated traffic which is approximately 2% of the previous normal traffic.

2. The traffic on the new road in 1973 is composed of diverted traffic which is 70% of the previous normal traffic on the old road, and generated traffic which is 30% of the previous normal traffic.

Traffic Projection - New Highway

Year	Diverted ADT	Growth Rate, %	Generated ADT	Growth Rate, %	Total ADT	Growth Rate, %	Actual ADT	Growth Rate, %
1973	1929		826		2755		2744	
1974	2045		950		2995		3042	9.8%
1975	2168	6%	1092	15%	3260	9.4%	3282	
1976	2298		1256		3554		3633	
1982	3259		2906		6165			
1983	2125		1540		3665*			
1992	3590		2602		6192			
1993	4291		2758	6%	7049**	6%		
2002	7250		4660		11910			

* Sharp drop due to diversion of traffic to new San José-Calderas road.

** Assumed increase resulting from traffic diversion from old road.

Traffic Projection - Old Road

Year	Normal ADT	Growth Rate, %	Generated ADT	Growth Rate, %	Total ADT	Growth Rate, %	Actual ADT	Growth Rate, %
1973	826		50		876			
1974	876		55		931		883	
1975	928	6%	61	10%	989	6.3%	1032	10.2%
1976	985		67		1052		1072	
1982	1396		118		1514			
1983	1068		124		1192			
1992	1657	5%	192		1850	5%		
1993	1254		202	5%	1457			
2002	1946		313		2260			

3. The normal and diverted traffic on both roads grow at 6% per year between 1973 and 1983.

4. The generated traffic on the new road grows at 15% per year[1/] between 1973 and 1983. The generated traffic on the old road grows at 10% per year between 1973 and 1983.

Prediction of the traffic volumes after 1982 is complicated by the fact that the traffic will change drastically in 1983 due to the scheduled opening of a new road from San José to Calderas. Based on an origin-destination study, the Dirección General de Planificación of the Ministerio de Obras Públicas y Transportes estimates that 50% of the traffic on the new El Coco-San Ramón highway will divert to the new San José-Calderas highway.

For our projection we assumed that 50% of the traffic on the new El Coco-San Ramón highway would divert to the new San José-Calderas highway in 1983. Also we assumed that 25% of the traffic using the old El Coco-San Ramón highway would, in turn, divert to the now relatively empty new El Coco-San Ramón highway because the old road is becoming congested. The growth rate for both diverted and generated/developed traffic on the new highway between 1982 and 1992 is assumed to be 6%.

The traffic on the old El Coco-San Ramón road is assumed to grow at 5% annually from 1982 to 1992 except for the 25% loss to diversion in 1983.

For the years 1993 to 2002, the highways are expected to continue the same growth rates. In 1993, 25% of the traffic on the old road is assumed to divert to the new road due to the increasingly congested condition of the old road.

The traffic distribution used by ROCAP for its benefit-cost study was based on GOCR traffic counts made at two stations on the new road. The traffic spectrum was assumed not to change in the future.

1/ Obtained as the difference between the total increase in traffic projected (9.8% a year) and the increase in diverted traffic (6%). The first is based on actual experience over 1973-76; the latter is based on the historical growth rate of traffic on the old road.

Type of Vehicle	% of Total Traffic
Car	49.0
Pick-Up	23.5
Bus	7.5
Truck	15.5
T2-S2	4.5

This distribution is in line with the original GOCR estimate of 72% light vehicles and 28% heavy vehicles.

5. User Costs:

For the 1965 Economic Justification of the El Coco-San Ramón Highway, the GOCR used the user costs given in the following table. They have been converted to 1976 C.A. pesos to permit comparison with the latest estimates. Also shown are the user costs used in the ROCAP benefit-cost study; these latter were based on the manual "Operating Costs for Typical Motor Vehicles in Costa Rica", written by the Ministry of Public Works and Transport in November, 1976.

User Cost per Vehicle - Kilometer ($/Km)*

Road & Condition	GOCR 1965 Data		1977 ROCAP Data	
	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles
Old road before opening new highway	.1354	.3387	.0982	.2550
Old road after new highway in use	.0865	.2165	These costs are approx. the same as above.	
New Highway	.0915	.2288	.0823	.2113

* These figures do not include the value of time.

The table shows that the user cost figures for the new highway are essentially the same but that the cost estimates for the old road diverge considerably. No data are available to illustrate how the original user costs were calculated other than that the heavy vehicle user cost is 2.5 times that of a light vehicle.

The user costs for vehicles traveling on the old road after the construction of the new highway are approximately the same as before. The cost savings due to increased velocity are offset by the cost increases due to driving faster on tight curves and steep grades. Therefore we decided that savings to users of the old road due to decreases congestion are negligible, and we have not considered them in the total benefits.

User cost savings per km. as a result of the new highway are small[1/] - only $ .016 for light vehicles and $ .044 for heavy vehicles. However, user cost saving on the El Coco-San Ramón road as a whole are substantial owing to the much reduced length of the new road - 41.1 km. as against the old length of 58.61 km. The saving per average light and heavy vehicle is as follows:

	Operating Cost Per Km.		Length Km.		Total Operating Cost
Light Vehicle:					
On old road	$ .0982	X	58.61	=	$ 5.755
On new road	.0823	X	41.11	=	3.383
Saving per light vehicle					2.372
Veavy Vehicle					
On old road	.2550	X	58.61	=	14.946
On new road	.2113	X	41.11	=	8.687
Saving per heavy vehicle					6.259

Operating costs were calculated separately for five types of vehicles, taking account the grades and curvatures of the various sections of the road. The breakdown of user cost savings for five types of vehicles, based on 1976 Government of Costa Rica operating costs estimates, is as follows:

1/ On the basis of the "1977 ROCAP data".

User Cost Savings

Vehicle	1976 Dollars	Converted to 1973 Dollars
Car	2.8396	1.7830
Pick-Up	1.9079	1.1980
Bus	5.6722	3.5616
Truck	5.2539	3.2989
T2-S2	7.6994	4.8347

The above figures do not include the value of time saved. Using Government of Costa Rica estimates of time value per vehicle/hour, and applying these estimates to the time saved in using the new road in comparison with the old one, results obtained are as follows:

	(1) Value of Savings Per Hour (GOCR Estimates)	(2) Time Saved By Using New Road (Hours)	(3) Value of Time Saved Per Vehicle/Trip (1) x (2)
Buses	$ 4.56	1.41	6.43
Trucks	.64	1.24	.79
Trailers	.78	1.73	1.35

The time value of drivers and passengers of light vehicles (cars and pick-ups) was excluded on the assumption that much of this driving is for leisure purposes. Its inclusion (which is defensible) would have nearly doubled the value of the time saving factor.

Allowance for the time saving factor for buses, trucks and trailers would raise total user cost savings as follows:

	In 1976 Dollars	Converted to 1973 Dollars
Buses	12.102	7.599
Trucks	6.044	3.795
Trailers	9.049	5.682

6. Computation of the Original Benefit-Cost Ratio

In the 1965 Economic Justification, the GCCR calculated a benefit-cost ratio for an "average" year in the twenty year period from 1965 to 1984. These computations used a 6% interest rate, a 7% annual growth rate for the traffic based on 1959 counts, and the 1965 construction cost estimates given in Section 3. The annual cost of the road was based on 100 year useful life of the right-of-way, 40 year useful life of the structures, 20 useful life of the pavement, an annual maintenance cost of $124,400 for both roads and a toll booth operating cost of $90,000. The resulting benefit-cost ratios were:

a) for users of both roads: 3.66

b) for users of only the new highway: 2.97

If we substract the toll booth's operating cost from the latter,[1/] the ratio becomes 3.28.

7. Revised Benefit-Cost Ratio Evaluation

A revised benefit-cost ratio was calculated for this highway using traffic projections and user cost savings estimated in sections 4 and 5. The base year chosen was 1973 since that was the first year of full operation. A thirty year period was considered.

1/ Toll receipts and taxes are transfer payments from the economist's viewpoint. While they are costs to users, they result in offsetting receipts to the government. Both toll receipts and related costs were excluded from the economic analysis.

The calculation of construction costs is shown below. Payments for each contract were assumed to have been disbursed at a constant rate throughout the contract time. Allowance was made for inflation and interest charges (at 8% a year) between 1973 and the assumed time of disbursement.

Year	Amount Paid	Amount Paid in 1973 Dollars	Converted to 1973 at 8% p. a.
1968	$1,556,409	$2,079,207	$3,054,979
1969	2,582,221	3,360,244	4,571,612
1970	4,362,525	5,419,565	6,827,026
1971	4,362,525	5,256,843	6,131,582
1972	3,455,327	3,980,537	4,298,980
		Total	$24,884,179

The maintenance costs for this highway include a constant annual cost for repairs and for a resurfacing operation every ten years. During the first four years of operation the average annual maintenance cost has been $40,400, with expenditures increasing from $34,000 in 1973 to $52,000 in 1976 (all costs in constant 1973 dollars). ECAT (in 1975-76) estimated that the annual expenditure for this road should be $38,000. Based on the ECAT estimate and the actual data, we estimated the annual maintenance cost for the first ten years at $42,000. Since the traffic in the second ten-year period, 1983-1992, is approximately the same (owing to the sharp decline projected in 1983), the same annual maintenance cost is applied for that decade. However, traffic is expected to increase considerably from 1993 to 2002. We projected, therefore, average annual maintenance costs for that period to increase to $60,000.

The highway will require resurfacing in 1983 and again in 1993. The cost of a seal coat in 1976 was approximately $20,000 per km. (12,600 in 1973 dollars). To apply a seal coat to the entire highway will cost about $515,000 in 1973 dollars.

The results of the benefit-cost calculation were summarized in Table 3 (page 14) of the report.

A N N E X I V

Trip Reports

by Team Members

March 28, 1977

To: Mr. Larry Harrison, Director/ROCAP

Through: Mr. Dan F. Miller, Jr., Regional Chief Engineer
Mr. Clark Joel, Regional Economic Officer

From: Rebecca Grant Ascoli, General Engineer RGA
Gustavo Ruiz, Assistant Regional Economic Officer

Subject: Trip Report - San Pedro Sula-La Ceiba, Honduras
March 21-24, 1977

I. Persons Contacted

Sr. Salvador Morenero, Alcalde Interino, La Masica
Sr. Kanrel José, Secretario Municipal, La Ceiba
Sr. Juan Pineda, Gerente, Hotel París, La Ceiba
Sr. Arnulfo Centeno, Sub-Director Regional del Distrito Agrícola No. 4, La Ceiba
Sr. César Nastras B., Gerente, Productos Lácteos LEYDE, La Ceiba
Ing. Mario Sosa, Asesor, Fábrica La Blanquita, Santa Ana
Sr. César Bardales M., Alcalde, Tela

II. Purpose of Trip:

To evaluate the benefits to the population living in the influence area of the Tela-La Ceiba highway due to the construction of the highway.

III. Work Accomplished

We rented a car in San Pedro Sula Tuesday morning, March 22, and drove to the beginning of the highway in Tela where we started our observations.

A. Description of the Road

Before describing the interviews which we conducted in the influence area of the road, a brief description of the road is useful. Prior to the completion in 1972 of the paved road connecting Tela to La Ceiba, these cities were only connected by railroad and a dirt road, both of which were interrupted in the rainy season leaving La Ceiba isolated. Now with the new highway La Ceiba is accessible year round.

With respect to "strip development" along the highway, we observed very little. Around Tela, houses and low class restaurants have been built along the road side, but beyond Tela there were very few structures of any kind. The highway does not follow the alignment of the railroad and consequently by-passes all the small villages. We did not observe any migration of the villages to the road; rather narrow dirt roads connect the village centers to the highway. This impression of a high speed freeway by-passing all population centers was further emphasized by the fact that Tela does not have a paved road connecting the center of the city (which is paved) to the highway. The only paved exit is that to La Ceiba.

The present condition of the road is bad. The road was damaged by Hurricane Fifi in 1974 and again by the severe flooding which occurred last year. Several bridges were destroyed and in one section of the road the flood waters cut across the road embankment; one bridge and this latter cut have not yet been repaired. Also in the hilly section between Tela and the Río San Juan, there have been many landslides. In addition to these storm and slide damages, the maintenance of the pavement has been neglected until huge potholes crossing an entire lane have developed. The condition of the road surface between Río San Juan and Tela was notably worse than that between Río San Juan and La Ceiba. We did see maintenance crews working on the road so the "driveability" may improve in the near future.

B. Results of Interviews

In order to assess the development resulting from the construction of the highway we interviewed local officials and businessmen following a pre-established questionnaire. Our first interview was with the Alcalde (Mayor) of the Municipio of La Masica (similar to a county seat). We then spoke to the Secretario Municipal of La Ceiba. From these two interviews we gained an insight as to the kind of development which had occurred in the area around La Ceiba. After this we talked with several local businessmen whose commerce had been affected. Also we met the sub-director of the agricultural district including La Ceiba. Later on our return to San Pedro Sula we interviewed the Alcalde of Tela. These interviews are described in detail below:

1. Salvador Morenero, Alcalde Interino, La Masica:

- The population of this municipio is approximately 11,000, most of whom are farmers. Immigration to this area due to the road is not a major factor.

- The road has affected the agricultural production of the area. The only new agrobusiness is a nursery which exports plants and flowers. However the existing agricultural activities have expanded considerably due to the availability of transport. The corn production has been increased so that instead of being merely self-sufficient they now sell to the government. The cacao production has been expanded. Milk is now sold to a dairy in La Ceiba. The Municipio also intends to build a slaughterhouse late this year. (This area of Honduras is an important cattle region.) The plans are currently being reviewed in Tegucigalpa. (We assume they are asking for financing.)

- The road has provided this community with easy access to the major cities and several bus companies serve this route. The cost to go to La Ceiba is US$0.75 and to Tela, US$1.75.

- The finances of the municipio have improved due to increased production in the area. A proof of this was the new municipal building which had just been completed; it had cost US$18,000 and was completely paid for.

- The town was connected to the thermal electric plant in La Ceiba in August, 1976. The new power lines follow the road.

- The existence of the road also influenced the construction of a new night high school in La Masica which is attended by approximately 150 local farmers and workers. The Alcalde was very proud of this school.

- In general the Alcalde was very optimistic in his outlook for the region and the basis for his enthusiasm was the availability of easy access to external markets. He felt that the road has brought increased prosperity to the region and as another example he sited the increased numbers of vehicles and small business in the municipio.

2. Sr. Kanrel José, Secretario Municipal, La Ceiba:

- The population of La Ceiba is approximately 52,000. The city has not increased in size due to road related immigration.

- Prior to the construction of the road the city depended on the Standard Fruit Company as its sole source of employment outside of a few small businesses producing products for local consumption. With the advent of the road, the local businesses have expanded considerably to supply external markets. La Blanquita, an African Palm oil company, and LEYDE, a dairy, are examples of this expansion.

- A new agricultural experimental center was started in La Ceiba approximately 6 years ago.

- The number of national tourists visiting La Ceiba has jumped considerably. The town is anticipating an increasing number of tourists due to the beautiful beaches and the proximity of the Bay Islands. A new first class hotel, "La Ceiba", was constructed about 5 years ago and several small tourism oriented projects, Sea View and Vista Hermosa, are expanding.

- The road has provided La Ceiba with an alternate way to import merchandise other than by sea or rail. Currently all construction materials come by road.

- A new bus company formed in La Ceiba provides service to Tela and San Pedro Sula. Also a branch of a national car rental company is located in La Ceiba.

- The city finances have improved, and now the municipality is able to contract financing from additional sources. Land values in the area have about tripled.

- In conclusion, the Secretary stated that the road had had a tremendous social and economic impact on the city since it connected them to the rest of the country. The attitude of the community is optimistic.

3. Sr. Juan Pineda, Gerente, Hotel Paris, La Ceiba:

- The tourism which has come to La Ceiba is of a predominately national character and these tourists generally stay with friends/relatives. Other than major holidays such as Holy Week and Carnival the national tourists do not stay in first class hotels

- The first class hotel space in La Ceiba has increased considerably in the past 5 years, from 49 to a total of 134 now (89 rooms in Hotel Paris and 45 in Hotel La Ceiba).

- The main business for the hotels is travelling businessmen. Although the road has increased their numbers, the majority are still associated with the fruit company and the hotel prosperity is highly dependent on their occupancy. The political problem last year concerning the banana taxes almost bankrupt the hotels. The occupancy is recovering, however.

- For Holy Week and Carnival the hotels are already fully booked with both national and international tourists.

4. Sr. Arnulfo Centeno, Sub-Director Regional del Distrito Agricola # 4, La Ceiba

- The highway has had a tremendous impact on the agricultural development of the area. Not only has the area of cultivated land been increased due to the expanded accessible market but also the productivity has been improved markedly by the availability of better fertilizers, seeds, technology, etc. The yield of basic grains has increased from 15 to 20 quintals per hectare to 60 to 80 quintals per hectare. The corn and rice production have increased 50 to 60%. The number of hectares of cacao has increased from about 300 in 1968 to 1340 in 1976. The cultivation of African Palm has also increased. INA has a project to plant 4,500 hectares at La Masica of cacao, citrus fruit, African Palm and basic grains. The area under cultivation for Standard Fruit has also increased due to the availability of easy transportation to the port by road. Also a local chemical industry is developing grape fruit plantations for industrial use.

- The cattle industry has also grown but Sr. Centeno was not positive to what extent. The road has provided a ready access to the market in San Pedro Sula whereas the cattle had previously gone by train, when in service, or by foot.

- The land prices in the area have at least tripled.

5. Sr. César Nasthas B., Gerente, Productos Lácteos Leyde, La Ceiba

- The dairy was started in 1973 due to the existence of the highway. The capacity of the plant is 30,000 liters per day. Prior to the floods in 1976, the production was up to 20,000 - 22,000 liters per day. After the floods the production dropped to 7,000 liters per day and now is back up to 14,000 liters per day.

- The milk consumption of the La Ceiba region is about 3,000 liters per day. The rest of the production is exported throughout the country. Currently the demand for the mik is greater than their production.

- The crude milk is purchased from farmers along the road between Tela and La Ceiba and brought to the dairy in trucks owned by the dairy.

- Later this year the dairy company intends to construct an associated meat processing plant.

6. Ing. Mario Sosa, Asesor, Fábrica La Blanquita, Santa Ana:

- The processing plant at Santa Ana only extracts the oil from the African Palm nuts; the capacity of this plant is 1.5 tons of oil per hour.

- The area of cultivated African Palm has been trebled since 1972 and now covers 3,000 acres. (Prior to visiting the Santa Ana plant we did not realize that the main processing plant for La Blanquita is in La Ceiba. Unfortunately we were then en route to Tela and did not have time to return to La Ceiba to talk to the La Blanquita personnel, since this does appear to be a thriving industry.)

7. Sr. César Bardales M., Alcalde, Tela:

- Tela has suffered a severe recession since the Tela Fruit Company has almost completely closed down its local operations to move to other regions (El Progreso and La Lima) and the town had no other established industries. Even the Tela port is now working at a very low capacity since the Company is using Puerto Cortés to export bananas.

- Several new industries have come to Tela in part due to the existence of the road. A French plywood factory, TIMSA, was started 17 Km outside Tela in 1970 and employs about 115 persons. A Coroza Palm oil factory was initiated but has not been successful. A small scale furniture manufacturing business has been started. Also a nursery was mentioned.

- There is not much trade between Tela and La Ceiba.

- Tourism in Tela consists primarily of national tourists. There is a considerable amount of visiting between Tela and La Ceiba. Tela is expecting more tourism but currently only has two (supposedly) first class hotels in town, Paradise and Hotel Rotario, with a total of 30 rooms. There is a project in planning to expand the "Paradise" to 200 rooms. The Tela beaches were included on the Tornasal tourist project.

- Several new bus lines have been established to serve the outlying villages and bring the people and their merchandise to the markets in Tela.

- The city finances have improved in the respect that outlying villages are now accessible and can contribute. The land value in the area has increased.

- In general, the attitude of the Alcalde was rather pessimistic. The road had brought some benefits but overall it was not an important factor. Tela is basically a company town, and without the company it now is waiting for the government to help it.

In conclusion, the road has brought very real benefits to La Ceiba and to the small communities in the influence area of the road since they now are connected to the rest of the country and can market their produce. Tela has experienced very minor benefits since it was connected previously with the main economic centers of the country.

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RGAscoli:mdp

April 27, 1977

TO: Mr. Lawrence E. Harrison, Director/ROCAP

THROUGH: Mr. Dan F. Miller, RCE
Mr. Clark Joel, REO

FROM: Víctor Dardón, GE V.D.
Gustavo Ruiz, AREO

SUBJECT: Trip Report - Tegucigalpa, Choluteca and Guasaule
April 20-22

I Persons Contacted:

Government of Honduras

Ing. José Cecilio Zelaya, Director de Transportes
Ing. Adán Benavides, Departamento de Construcciones, Dirección General de Caminos
Lic. Roberto Zúñiga, Central Bank
Mr. Juan Ramón Cruz, Dirección General Estadística y Censos
Mr. C. Dubón, Dirección General Estadística y Censos
Ing. Emily López de Alvarado, Dirección General de Recursos Naturales

CABEI

Ing. Armando Astorga, Chief of Construction & Supervision
Ing. Miguel A. de la Rocha, Supervisory Engineer
Ing. Edgardo Durón, Supervisory Engineer
Dr. Felix Keller, Dept. Agropecuario
Lic. Orlando Castro, Chief Economic & Financial Analysis
Lic. Carlos González, Economist
Lic. Luis Fernández, Economist

Influence Area

Mr. Ricardo Oliva Herrera, Mayor of Choluteca
Mr. Ernesto González Mejía, Administrator of Aduana Guasaule
Mr. Javier Midence Salazar, Mayor of El Triunfo
Mr. Gustavo Matamoros, Supervisor "Empacadora de Carnes CARNILANDIA", Choluteca
Ing. Willy Supeene, Manager of TREFICA S.A., Choluteca

TAMS

Ing. Charles Powers, Manager
Ing. Jeffrey Gutman.

II Purpose of Trip:

To evaluate the social and economic benefits to the population living in areas of influence of the Choloteca-Guasaule road due to the construction of the road, and gather relevant statistical information.

III Accomplishments:

On Thursday, April 21, Víctor Dardón, Gustavo Ruiz and Lic. Carlos González of CABEI visited the road, travelling in a car provided by CABEI.

We traveled on the project road up to the Nicaraguan border. The highway is in good conditions, proper preventive maintenance practice has been followed on the highway although the pavement will require a seal coat in the near future. (This is normal practice for surface treatment pavement of this age quality.) In that area we interviewed local authorities and local entrepreneurs, following a prepared previously questionnaire.

The results of interviews are the following:

1. Mr. Ricardo Oliva Herrero, Mayor of Choluteca

- The population of Choluteca is approximately 28,000, and has been increasing at a rate of 6.2% per annum. At least half of this increase is due to immigration as a result of the road

- The existence of the road stimulated expansion of agricultural activity. Some areas with traditional crops (corn, cotton and beans) have expanded and the yield has substantially increased. At present, new crops (sesame, melons, watermelons and rice) have been planted; livestock activity has also expanded. Mayor Oliva roughly estimated that areas under cultivation expanded at least 100% as a direct impact of the road and of the new land reform law which allows expropriation of non-cultivated land. On the yield side, Mr. Oliva estimated (based on his personal experience as farmer) a 30% increase due to the facility for transportation of insecticides and fertilizers which come mainly from Nicaragua and technical assistance from the government

- Some agro-industrial companies were established near the city after the inauguration of the road; these consist of a meat packing plant for exporting to U.S. markets, a rice mill and a barbed wire plant. Some other plants such as a sesame decorticator, a dairy and an export packing plant for melons are under construction.

- Business has substantially increased particularly with Nicaragua (both exports and imports) and tourists from Nicaragua go to the city on a regular basis during weekends and holidays. A new hotel was built as a direct consequence of this increased demand. The commercial relations of Choluteca are greater with Nicaraguan cities than with Tegucigalpa.

- An average of 200 buses and trucks leave Choluteca daily: some 30-40% of this total use the road. Due to the activity in transportation, the municipality is going to build a terminal outside the city, just 500 meters from the beginning of the road which is under evaluation.

- The municipal finances have also improved due to the new activity (transport, industry) and to the higher prices of land. This price increased from 0.50 to 3.00-4.00 Lempiras per square meter on properties adjacent to the road.

2. Mr. Ernesto Gonzalez Mejía, Administrator Aduana Guasaule

The average daily traffic including all types of vehicles crossing the border is 150-200. During the working days most of this traffic is trucks and businessmen while during the weekends it is tourism.

- Since the inauguration of the road, most of the vehicle users of the Panamerican Highway moved to the Guasaule road.

3. Mr. Javier Midence Salazar, Mayor of El Triunfo

The population in the city is approximately 4,000. More people live in agrarian "asentamientos" near the city. The main activity is agriculture and livestock. Besides the traditional crops (basic grains and cotton), new products (sesame, melons, watermelons and maguey) are under cultivation.

- Trade has substantially increased with Nicaraguan towns near the border (Chinandega, etc.); trucks from Nicaragua go directly to El Triunfo to transport local production of basic grains and different products available in town. As an example of the benefit of the road, the Mayor cited that as a result of the local festivity which lasts one week during February, local businessmen and producers earned some 700,000 Córdobas. Also, work opportunities in Nicaragua have been opened to the population of El Triunfo, since continuously trucks and buses loaded with workers from the area cross the border toward the Nicaraguans farms and industries.

- Local investors own some 30 buses which daily transport passengers to main cities in Honduras and to the Nicaraguan border.

- The price of land has increased up to 10 times according to quality and location with respect to the town and the road

- Finally, Mr. Midence said that the municipal finances have substantially increased after the construction of the road He proudly mentioned the increase of the municipal budget from 20,000 Lempiras in 1974 to 120,000 in 1976 due to better management, higher prices of land and other facts related to the road.

4. Mr. Gustavo Matamoros, Supervisor of the private company "Empacadora de Carnes CARNILANDIA" (slaughter house)

This company, which exports its total production to the U.S. market, started operations in 1973 with a daily capacity of 120 animals. At the present time it has doubled its capacity However, the road was not a major reason for the location of the plant near Choluteca since only 7% of the cattle come from that area and the company uses Puerto Cortez on the Atlantic ocean for its exports

- Mr. Matamoros explained, however, that another similar company named Industria Ganadera Hondureña also located at Choluteca and closer to the Guasaule road was more benefited from its opening. This other company started operations before 1970 but its new capacity (increased to 250 animals per day) is related to the road since most of the cattle come from farms located in the area of influence of the Choluteca-Guasaule road.

IV Comment:

The overall picture of this evaluation indicates considerable benefits for the cities connected by the Choluteca-Guasaule road and for the area of influence. Main facts are: increased production of traditional crops and cattle and of new agricultural production which will stimulate the development of agro-industries.

An important fact to be noted is the increase in both trade and tourism with Nicaragua for the cities along the highway, reflecting the road's favorable impact on intraregional trade.

DISTRIBUTION: Messrs. Sidman, Miller, Joel, Ascoli, Hechtman, Venezia, Flinner, Eisner, Dardon, Ruiz, C&R Files

May 25, 1977

To: Mr. Larry Harrison, Director

Through: Mr. Dan F. Miller, Jr., Regional Chief Engineer
Mr. Clark Joel, Regional Economic Advisor

From: Rebecca Grant Ascoli, General Engineer
Gustavo Ruiz, Asst. Regional Economic Advisor

Subject: Trip Report - San José, Costa Rica
May 17-20, 1977

I. Persons Contacted

AID Mission

Ing. Heriberto Rodríguez, GEN

Dirección General de Planificación, Ministerio de Obras Públicas y Transportes (MOPT) GOCR

Ing. José Vargas, Director
Sr. Mario Herrera (projections)
Ing. Edgar Domián (traffic counts)
Sr. Luis Camacho (user costs)

Louis Berger International, Inc.

Mr. Frank Ryan, Economist

Ministry of Economy, Industry and Commerce

Sr. Carlos Martín Alcalá (Industrial Parks Advisor)

II. Purpose of Trip

To begin evaluation of the benefits of the El Coco-San Ramón Highway (financed under AID Loan 596-L-008) by means of an on-site inspection and retrieval of pertinent data from the GOCR.

III. Work Accomplished

May 18, 1977: Ing. Heriberto Rodríguez accompanied Lic. Ruiz and Ing. Ascoli on an inspection of the El Coco-San Ramón Highway. This highway extends from the international airport in San José to San Ramón en route to Puntarenas; it is part of the Panamerican Highway. We followed the new road out and returned by the paralleling old road. The difference between these roads is impressive. The old road is very narrow - barely two lanes wide, has very steep slopes and passes through about six towns. The new road is a modern limited access two lane highway with a third passing lane for long steep grades. The traffic flow is smooth and uninterrupted.

The maintenance on both roads has been good; Ing. Rodriguez commented that the maintenance on the old road has improved considerably since the traffic disruption caused thereby is minimal now.

From the ride along the roads and our conversations with Ing. Rodríguez we concluded that the primary justification for the new highway is user savings. Developmental benefits along the highway are minimal. Since the new highway is limited access, no new industries have located along it. All of the industries along the old road were located there prior to the construction of the new highway.

In the afternoon we visited the Dirección General de Planificación of the MOPT. Ing. Vargas, the Director, referred us to the appropriate persons in his department. Sr. Mario Herrera gave us copies of pertinent sections of a report which he is currently writing. This report contained information on traffic counts, maintenance costs, income from tolls and future projections for the new El Coco-San Ramón Highway.

Ing. Edgar Domiań supplied us with detailed traffic counts for both the old and new roads. Sr. Luis Camacho briefly explained the user costs used by the MOPT and gave us a copy of the relevant material. In order to use these, detailed information regarding the grades and curvature of the two roads is necessary. Ing. Domián promised to supply us with these data on the following day.

In the afternoon we returned to the Dirección General de Planificación. Ing. Domián gave us the necessary grade and curvature data as promised. We also spoke with Mr. Frank Ryan who is an economist working with Louis Berger, International. (Berger currently is making feasibility studies for a highway to circle San José.) We asked Mr. Ryan what he thought of the GOCR user costs and he replied that he had checked them and found them satisfactory.

During Thursday, May 19, we visited Mr. Carlos Martín Alcalá, Special Advisor to the Ministry of Economy, Industry and Commerce to find out his views on the impact of the El Coco-San Ramón highway on the development of the influence area. (Mr. Alcalá is working with a special project to develop new industrial parks outside of San José.)

Mr. Alcalá was very clear in saying that the new road was not a major factor in planning the location of the "San Carlos" industrial park (the nearest project to the El Coco-San Ramón Highway). The main factors taken into consideration for the location of the park were unemployment, raw materials and towns which the government wanted to develop more rapidly Of course, he thinks that the operation of this modern road will be beneficial for the industrial park. He also mentioned the impact that the road is having on local tourism since Puntarenas and Guanacaste, two favorite sites for local tourists, are partially connected by this road.

In Mr. Alcalá's opinion, most of the benefit of the road will be on the savings side since most of the actual development along the road existed before its construction.