VOLUME II

A REVIEW OF THE VIABILITY OF THE EL SALVADOR RAILWAY

DEVELOPMENT ASSOCIATES, INC.

MANAGEMENT AND GOVERNMENTAL CONSULTANTS

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I. EXECUTIVE SUMMARY

The railway of El Salvador, FENADESAL, is a 3-foot gauge railway built about 90 years ago. It was a profitable railway until about 20 years ago, but now is in generally poor condition made worse by over $10 million U.S. dollars worth of damage, extra costs, lost revenue and deferred maintenance resulting from the last six years of guerrilla attacks.

The railway is presently transporting annually about 350,000 tons of freight and two million passengers, and is receiving a subsidy of 12 million colones per year. This subsidy is not sufficient to maintain the railway on a normalized basis and therefore its overall condition continues to deteriorate. If the railway were back to its pre-1980 traffic levels and with its present methods and operation, maintaining it for indefinite operation on a normalized basis would require a subsidy of at least 150% of revenue.

For a railway to be viable it does not have to be profitable, for example, the Government may choose to subsidize a railway to avoid highway construction costs; however, the subsidy should not be greater than 20 to 30%.

El Salvador is a densely populated country of five million people, far more than agriculture can support. If the standard of living is to be improved, then the country must industrialize and depend heavily on imports and exports. With its close proximity to the large U.S. market it is likely that the country must specialize in manufacturing high labor content, high transportation cost products since it will not be able to compete with countries like China on low transportation cost products. If this is the case, then the need for transportation between the manufacturing centers and the ports will become a critical element in the development of the country.

An analysis was made of the three main routes of the railway to determine each route's potential viability. The method used was to determine the operating cost for various levels of traffic on each route, given an efficiently operated

well-maintained railway but without major investment. From this was determined what percentage of the traffic moving along the route the railway must carry to be viable.

In order for the San Salvador-Metapan line to be viable, the railway must carry 50% of the cement business, which is probably a high percentage, but if this is combined with a reopened line to the Atlantic coast Guatamela ports and 20% of that traffic is carried, then the railway would be profitable at 40% of the cement traffic. The port traffic being a long distance the railway could possibly obtain 80% so the line could be quite profitable.

The San Salvador-Acajutla line would require the railway to carry at least 350,000 tons for breakeven. This is 22% of the projected traffic through the port. Depending on the cost of delivery in San Salvador, it could have to carry at least 500,000 to be viable from an economic standpoint. From a national transportation view, this line could be subsidized by the Metapan line to decrease the amount of highway traffic. This would be of particular importance since this port is likely to be the country's primary port.

The San Salvador-La Union line would require a significant increase in projected traffic to be viable. Since the line runs the length of the country, the line should not be abandoned until there is an overall transportation plan.

The Santa Ana branch lines could be connected to enable 92 km of the Metapan line to be abandoned. However, this line would be much more expensive to operate because of the gradients and the construction of the connection should not be undertaken except for military reasons before a more detailed engineering study is made.

At the present traffic levels the railway is not really a viable transportation method. However, with freedom to operate without fear of attack, and aggressive marketing (it presently does not have a marketing department) the railway could carry sufficient freight to make it an economic transportation mode. If these increases in traffic are coupled with a corresponding increase in operating efficiency, then at least two of the rail lines will be viable, to the point of actually being profitable.

The viability of these lines depends on a significant improvement in the operations and methods of marketing and maintenance of the railway and reduction in manpower of at least 50%.

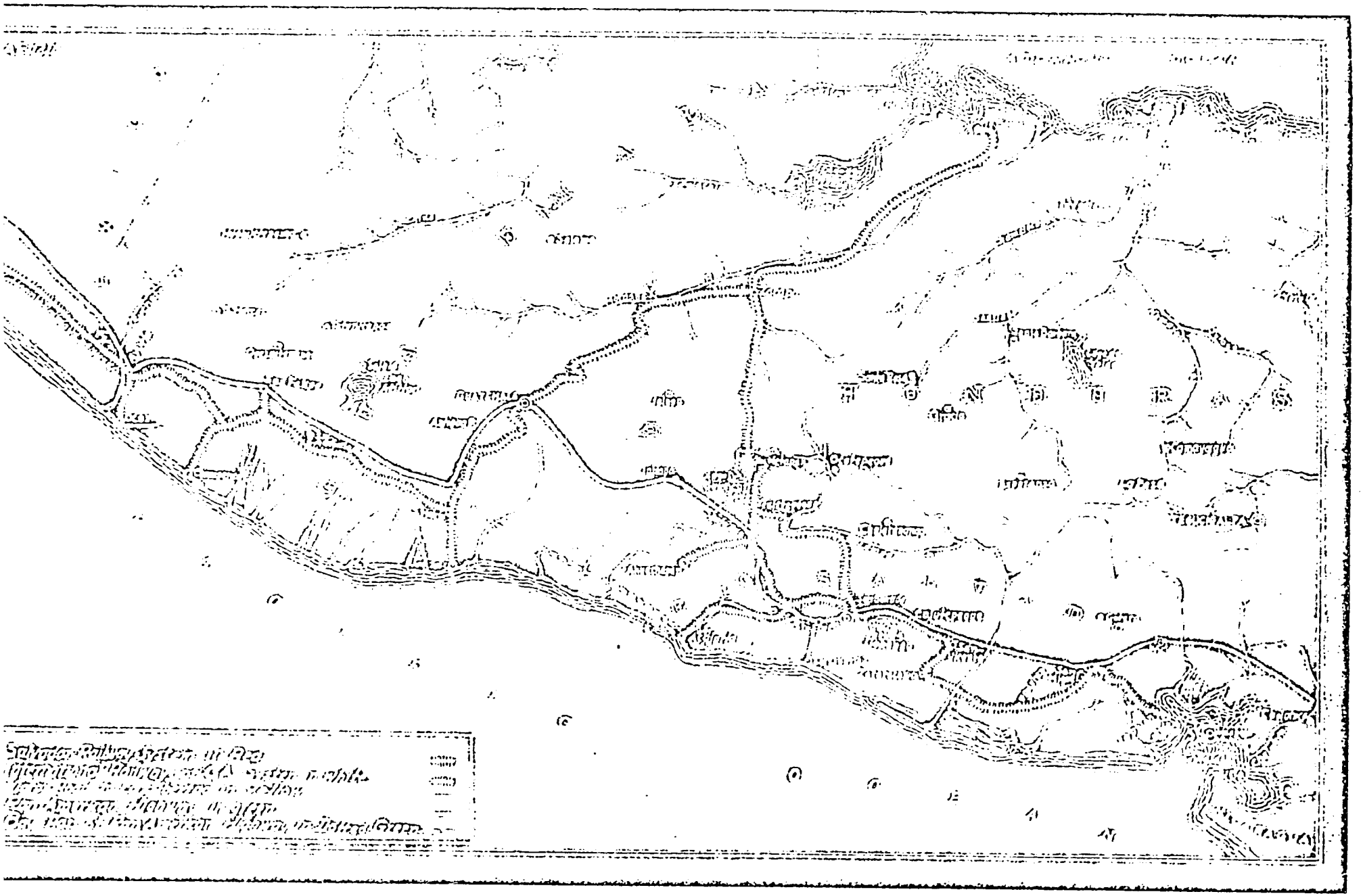
At present the railway requires no major investment except maybe two container forklift trucks. What it needs is technical assistance and especially the opportunity for its management employees to see how well managed railways of a similar type and size operate.

The railway should receive about 18 months of technical assistance on the understanding that if at the end of this time they have shown an ability to become an efficient railway, then it will be worth the investment. If, on the other hand, there are no major improvements, serious consideration should be given to closing the railway.

The Government of El Salvador is unlikely, for political reasons, to close the railway, and logically should not without a national transportation plan. It is, therefore, important to attempt to reduce the subsidy as much as possible, by marketing the railway services and increased operating efficiency.

In the short term, partial closing of the La Union line will save 900 soldiers providing security. It will also save the railway about 600,000 colones per year. The line should not be abandoned until a national transportation policy is formulated; it should be closed but occasionally travelled to make sure squatters do not take over the track and the material is not stolen. The construction of the connection, an investment of 8.6 million colones, would save an additional 500 soldiers.

Passenger service, with the exception of a San Salvador urban service, is never likely to be viable without major investment because of the short distance involved, lack of large population centers, and the extreme density of curves and narrow gauge preventing fast enough travel to be competitive with buses and automobiles.



MAP SHOWING ROUTES OF RAILWAYS IN EL SALVADOR AND GUATEMALA

II. ORIGIN OF THE RAILROAD OF EL SALVADOR (FENADESAL)

The railroad system in El Salvador was established primarily under authorization of the El Salvador Government to foreign companies, as follows:

1. The origin of the railroad goes back to 1881, under a government contract for the construction of a 20 kilometers section from Sonsonate to the Port of Acajutla. It was inaugurated on June 1881.

2. In April 1894, the construction of the railroad track between Sonsonate and Santa Ana was initiated, and was finished in 1902 by the "Salvador Railway Company, Ltd."

3. In 1895, the government started the construction of another railway starting from the Port of Cutuco (La Union) through San Salvador to the western part of the country. This construction was completed by the "International Railway of Central America" (IRCA) Company through a contract for the construction and operation of the railroad between La Union and Metapan with connections across the frontier to Guatemala.

A. Changes in the Railroad Administration

1. Due to increasing competition from highway traffic, in 1961 the Salvador Railway Company, Ltd., was no longer profitable, causing it to break clauses of the original contract with the government. As a result, in 1962, the El Salvador Railroad Administration (FES) was established by the government and took over the administration of the company. In May 1966, the administration was passed on to the Comision Ejecutiva Portuaria Autonoma (CEPA).

2. By 1972 IRCA was no longer profitable and failing to meet the terms of its contract. In 1972, the government took over the administration of the railway. In 1974, this administration was passed on to the Port

Authority, CEPA, and a new organization called "Ferrocarril Nacional de El Salvador" (FENADESAL) was formed.

3. In May 1975, the two firms FES and FENADESAL were united into one state railroad-port company (including the Port of Cutuco), called FERROCARRILES NACIONALES DE EL SALVADOR, FENADESAL, which is administrated by CEPA. This organization operates a railway approximately 600 km long with a 1,000 railway and 300 port employees.

The railway has suffered from a lack of investment funds and has been operating continuously at a loss since its formation in 1975. Beginning in 1980, the railroad operations have been greatly affected by the destruction of railroad equipment: locomotives and wagons, bridges, tracks and maintenance equipment by the guerrilla attacks. These actions, coupled with its previous poor condition, have reduced to the minimum the transportation of freight and virtually eliminated passenger transportation.

Of a total of 20 locomotives operating in 1980, there are only 11 operating at this time, three more will be rebuilt shortly as a result of AID's purchase of spare parts.

B. Present Condition and Operations

The railway is 3-foot gauge. One of the main reasons that this gauge was used was that railways could be built very quickly and cheaply since it could be built without major earthworks. Unfortunately, this requires tight curvature and steep gradients. This has a serious negative impact on operating costs, but since traffic was not expected to be heavy, this did not matter. On the positive side, for an unknown reason, when the railway's bridges were built they were constructed to a relatively heavy axle load capacity which goes a long way to negating the economic impact of the tight curvature and steep gradients. Also today with modern earth moving machines, major improvements in track alignment are possible at a relatively inexpensive cost. Thus, while the railway is narrow gauge its carrying capacity curve is relatively good and probably could be significantly improved at minimum cost.

Physically, the railway is in poor condition. The wagons are old and most are obsolete. While the locomotives are well suited to the type of service they are used for and are relatively not that old, they have all been seriously damaged at least once and in some cases three times. The track is also in poor condition, although it is probably satisfactory for the tonnage and present axle loading. However, if the railway is to play a viable role the track will have to be improved.

The railway management is generally young and is very progressive in its thinking. The railway has been operating unit container trains for about three years, considerably in advance of most similar railways. However, the management is very much cut off from railway technology having little opportunity to observe other appropriate railway operations and methods. Therefore, they are very much in need of some form of technical assistance.

At the present time the railway is receiving about 180% of revenue subsidy. However, if normalized maintenance and replacement accruals were being funded, this figure would probably rise to about 300%. In sum, if there were no security problems and traffic levels went back to the 1979 level, the railway would still require at least a 150% subsidy.

In 1980 the railway was handling about 4,722,604 Ton/Km and 31,000,000 passenger km. This has been reduced because of the conflict by about 50% and 85%, respectively. The remaining freight traffic could probably be handled by 60, 10-ton tracks which would not have a significant impact on the highway. However, it is the potential of the railway that must be examined and not its present role.

III. COSTING LOGIC USED IN ANALYSIS

The commonly used approach for railway costing of dividing the total revenue by the Ton Km is of little use, and definitely would be very misleading for this analysis for at least the following reasons:

- assumes no deferred maintenance -- the railway is in poor condition;
- assumes normalized maintenance and replacement levels -- the equipment is very old and no accruals for replacement are being funded;
- no excess manpower -- the railway with the present traffic level, equipment and with a minor improvement in methods probably has 500 more people than it needs; and
- does not take into consideration efficiency of resource utilization.

The approach used in this analysis is to determine where possible normalized costs, or, to adapt from other sources costs to be able to determine the operating cost of an efficiently run El Salvador railway. This costing approach makes the following major assumptions:

- no change in track location, gradients or gauge;
- using present locomotives;
- new wagons, since most wagons are at least 40 years old and not really suited to modern operation;
- no major investment in track maintenance equipment; and
- minor operating changes, such as one less train crew and no caboose.

Using this logic the normalized track maintenance cost was calculated for annual traffic of approximately 300,000 net tons and for zero traffic (the zero traffic figure is required for developing a short-term plan, see Table 1). From this data, a graph was plotted showing track maintenance cost with traffic density. (See also Graph I.)

Using this data and data available from other sources, TonKm transportation costs were calculated for the two most important rail lines for various traffic level, (Tables 2 and 3). The calculated costs are long-term fully allocated, without profit or subsidy.

Truck costs were obtained from two trucking companies and from the cement company. These costs were used to determine what is the ceiling price level for railway services.

Transportation policy of the government is not to charge trucks the fully allocated cost of the highway. It is, therefore, logical to expect to subsidize the railway. It is also appropriate to make railway transportation tariffs low to attract business to the railway to avoid or postpone highway construction. For a balanced and realistic transportation economy, the subsidy to the railway should not normally exceed 20 to 30% of revenue. For industrial development reasons, for example, subsidies higher than this can be appropriate.

TABLE 1

TRACK MAINTENANCE COST PER KM.

(All Costs in Colones)

	COST/KM/YEAR	
Net Tons per year	300.000	0
Ties - 15 year life, 1750 ties/Km., ₡15.00/tie	1.750	2333(1)
Rail repair or replacement ₡1000/rail 3 rails/Km/year.....	3.000	
Switch repair 30 year life ₡75.000/switch or ₡2500/switch/year (2)....	250	
Grade crossing 15 year life ₡20.000/crossing or ₡1330/crossing/year 0.6 crossing/Km	800	
Weed control 3 times/year	100	100
Surfacing and maintenance 1 man /2 Km ₡1000/month	6.000	1200(3)
Telegraph maintenance 12 man /₡1200/month x 1.2(for material)-600 Km	345	345
Bridges ₡100/meter/year average 8 m long 0.3 bridges/km	266	
Ballast 5 cubic meters/Km/year, Material cost ₡15 transportation ₡6/cubic meter to load, total ₡21/cubic meter	105	
Total cost ₡/Km/year	12.616	3978

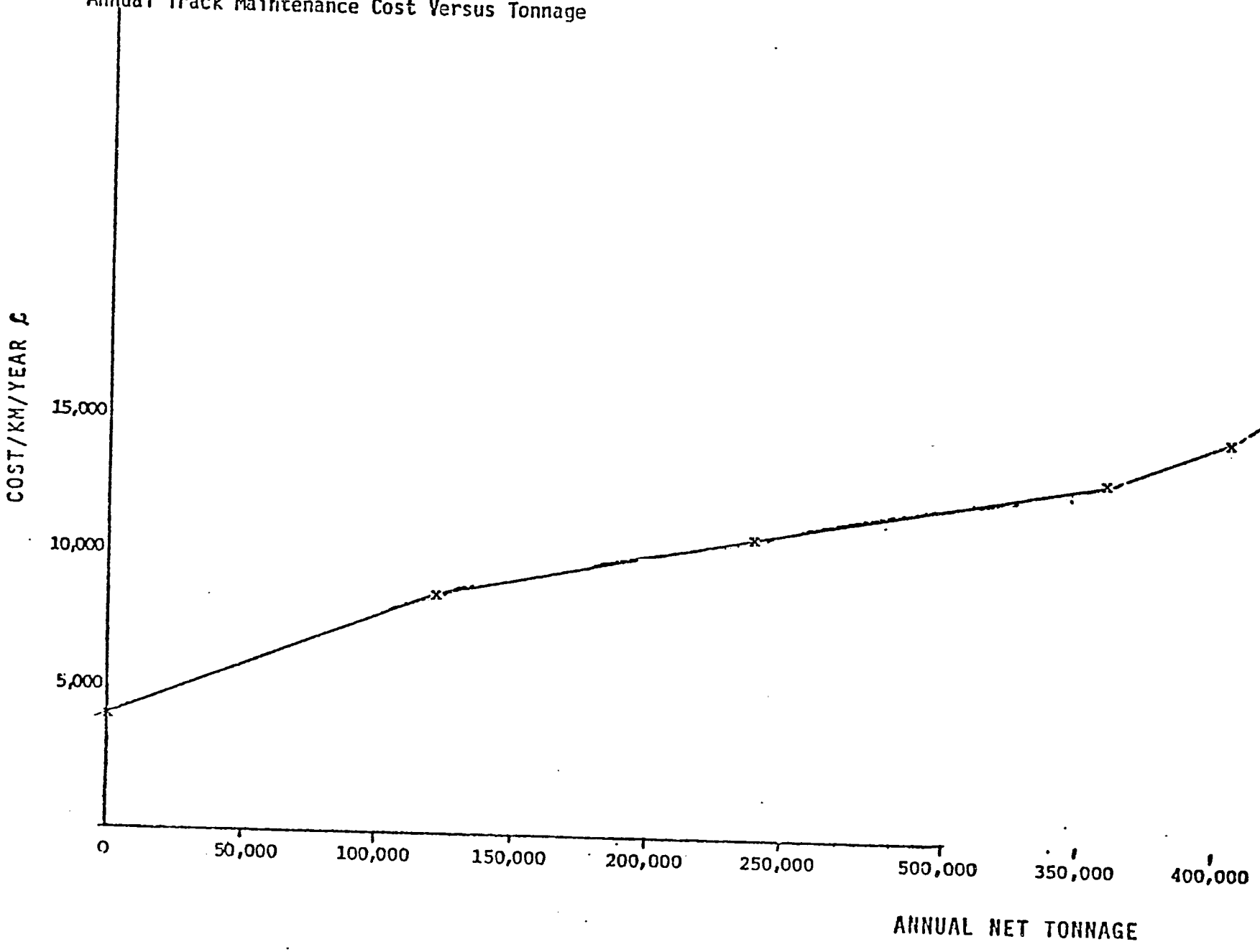
(1) Includes cost of installation

(2) 1 switch/10 Kms of track

(3) Minimal maintenance

RAILROAD CHART - 1

Annual Track Maintenance Cost Versus Tonnage



GRAPH I

IV. ANALYSIS OF RAILWAY LINES

A. San Salvador - Metapan Line

The San Salvador-Metapan line originally was part of a line through Guatemala to the Port of Barrios and Sto. Tomas de Castilla. Since 1968, when the railroad was nationalized, there has been no cross border traffic. The line from the border to the junction with the trans-Guatemala railroad line at Zacapa still exists but is in bad condition.

Presently, virtually the only traffic on this line is cement from the Metapan area, 75% of which goes to the San Salvador area, 15% goes west and the remaining 10% east. The distance from Metapan to San Salvador is 135 km. This is short enough that a locomotive could make three round trips in one day and the maximum capacity for a 800 HP locomotive on this line is 400 tons. Table 3 indicates what the cost could be for 1, 2 or 3 trips/day and is summarized below.

Trip/Day	Tons/Year	Cost/TonKm
1	120,000	¢ 0.225
2	240,000	¢ 0.136
3	360,000	¢ 0.105

At the present time 8 ton capacity trucks charge ¢0.218/TonKm with door-to-door service. The cost of providing train-to-door service in San Salvador is equivalent to about ¢0.082/TonKm, so the railway could charge ¢0.136/TonKm (it presently charges ¢0.105/TonKm and is probably costing ¢0.30/TonKm). However, as 8 ton trucks are replaced with those of higher capacity, the railroad cost will have to be about ¢0.10/TonKm to remain competitive. It is possible for the railroad to improve its delivery cost by bulk handling or paletization so the railroad cost charge could be about ¢0.12/TonKm. If this is the case, the railroad will have to handle about 300,000 to 360,000 tons/year. This is 50% of the entire output of the cement plants.

At present, the railway ha[illegible] tons/year, but before the unrest it handled 250,000 tons. The [illegible] that can be drawn is that in the long term, with very efficient [illegible] this line could be marginally viable with just cement.

El Salvador's primary acces[illegible]tic coast ports is through Port Barrios and Sto. Tomas de Castilla. [illegible]esent time there is an export traffic of 50,000 tons per year and im[illegible],000 per year through Sto. Tomas de Castilla (data for Port Barr[illegible] available). Assuming similar long-term traffic increases as projecte[illegible] Port of Acajutla, then this traffic could easily increase to 500,[illegible] for Sto. Tomas De Castilla alone within the next three or four years. [illegible]ance from San Salvador to the port by road is 407 km. The road is [illegible] in poor condition. The present tariff by road for a 22-ton container [illegible]/TonKm. Even allowing for a ¢250 truck train transfer cost at each [illegible]lway could charge ¢0.169/TonKm. with the added advantage of tr[illegible]nd through Guatemala and, if required, to the duty free zone.

The railway being ideally [illegible]is distance and type of cargo movements could possibly get 80% or [illegible] of the traffic. However, if only a small portion of the port [illegible]oximately 20%) is added to the cement traffic, this line could be [illegible]

The traffic to the port would [illegible]bout 7.80¢ per ton in track user charge revenue to the Guatemala rail[illegible]

In summary, it is unlikely th[illegible]e could be viable on the cement traffic alone; however, if the port tr[illegible] added to this line it would be quite profitable.

B. San Salvador - Acajutla Line

The San Salvador-Acajutla lin[illegible] the country's primary port to the capital. The line is 103 km [illegible] miles) and has a branch line to Santa Ana. Most of this rail line's [illegible] is the movement of freight between the San Salvador area and Santa [illegible] port.

TABLE 2

MOVEMENT OF CEMENT BETWEEN METAPAN AND SAN SALVADOR

(All Costs in US$ unless otherwise stated)

	1 trip/day	2 trips/day	3 trips/day
Locomotive (1)	400	420	440
Wagons (2) 11 wagons/set 3 sets $35,000-$10/day	330	330	330
Fuel 6 hours and 800 HP 0.75 full load, $ 1 per gallon	200	400	600
Crew	60	120	180
	990	1270	1550
Track cost (135 Km x graph I cost)	810	990	1170
Operating and Track Cost	1810	2260	2720
Overhead 35%, 30% and 25%	630	678	680
	2440	2938	3400
Total Net tons/per year (3)	120,000	240,000	360,000
Cost/ton	6.08	3.68	2.83
Cost/ton Km $	0.045	0.027	0.021
Cost/ton Km ¢	0.225	0.136	0.105

Present truck cost with 8 ton trucks	¢0.218/ton Km. (includes delivery)
Present railway charge	¢0.105/ton Km.
Present railway cost approx.	¢0.30/ton Km.

(1) Based on new $ 1 million locomotive, 20 year life, 300 days/year, amortization and maintenance.

(2) Each train 10, 40 ton wagon and 1 spare for maintenance and repair, 20 year life amortization and maintenance.

(3) 300 tons one way, empty return.

TABLE 3

MOVEMENT OF CONTAINERS BETWEEN SAN SALVADOR AND ACAJUTLA

(All costs in US$ unless otherwise stated)

Cost Component	1 trip/day	2 trips/day	3 trips/day
Locomotive (1)	$ 400/day	420	440
Wagons (2) 16 at $40,000 each or $12/day/wagon	192	192	576
Fuel 800 HP at 4 hours/round trip at .75% full load $1 per gallon	133	266	399
Crew 4 man at ₡1500/month	60	120	180
	$ 785/trip	998	1595
Track cost (103 Km x graph I costs)	$ 618	824	1030
Operation and track cost	1403	1822	2625
Overhead 35% , 30% and 25%	491	547	656
Total cost per day	1894	2369	3281
Total Net tons/per year (3)	135,000	270,000	405,000
Cost/ton	4.21	2.63	2.43
Cost/ton Km $	0.041	0.026	0.024
Cost/ton Km ₡	0.205	0.128	0.118
Cost/22 ton container ₡	464.53	290.05	267.39
Delivery cost ₡125	125.00	125.00	125.00
Transfer cost using to $350,000 container cranes	65.12	32.56	21.71
Total transportation and delivery cost	654.65	447.61	414.10
Truck charge		448.05	

(1) Based on a new $ 1 million locomotive, 20 year life, 300 days/year, amortization and maintenance.

(2) Each train would require 15 wagons, 1 would be spare, 20 yrs. life, 300 days/year amortization and maintenance.

(3) Assumed 300 tons of freight import and 150 tons export on return trip.

At the present time the railway handles about 22% of the total port traffic, or about 79,000 tons, but last year traffic through the port was at a very depressed level of 360,000 tons. With solution of the present crisis, it is expected that the port traffic will return to its pre-1979 level of around 1.2 million tons with a growth rate of about 4% per year.

A unit container train could make 3 round trips per day, requiring one locomotive and one set of wagons for 1 or 2 trips but three sets would be required for 3 round trips. A fully allocated cost analysis has been made for 1, 2 or 3 trips per day and is shown as Table 3.

At the present time the truck charge for a 22-ton 40-foot container is ¢0.198/TonKm. There are proposals for the construction of a new container terminal at the port, which if constructed with rail transportation in mind, should minimize the handling costs. To break even, the railway will have to transport about at least 350,000 tons per year since the highway cost is between ¢380 and ¢440 depending upon where the delivery is in San Salvador.

The highway movement of the 40-foot containers that are becoming the international shipping standard requires a substantial, well maintained highway and, therefore, the government may wish to avoid highway costs by subsidizing the railway. So the break-even point, assuming a rational subsidy policy of 20 to 30%, may be around 220,000 tons for the railway. Transportation in bond will be an added advantage that should also be considered.

In summary, the need for this rail line is the movement to and from the port. If the forecast growth is correct then the line is warranted if the railway can maintain its present percentage (22%) of the traffic through the port. It should, however, be noted that the transportation distance is short and the only way this line will be viable is with a very efficient overall operation.

C. San Salvador - La Union Line

The San Salvador-La Union line is the longest line of the railway, 251.8 km (157.4 miles) which while it serves all major cities in the eastern section of the country it is 68 km longer than the highway. (The highway does not serve

all major cities.) The Port of Cutuco near La Union is the country's major southern port. Last year the traffic through the port was 120,000 tons of which the railway handled about 30%, primarily fertilizer.

To operate this line with a degree of viability will require considerably more traffic than the other lines because it is 27% longer than the highway, and will probably require an average of at least 350,000 tons per year. At the present time the total traffic is 85,000 tons with an average of around 50,000 tons.

It could, therefore, be argued that this line has limited possibility to become viable. However, it is a geographically important line in that it runs the length of the country and therefore should not be abandoned without a comprehensive transportation study. In the short term, to minimize its losses, the line should be kept open with only operation on the sections San Salvador-Cojutepeque and San Miguel-Cutuco. See Chapter VII. on the Analysis of Lines - Short Term.

D. Santa Ana Branch Lines

There are two branch lines to Santa Ana, one connecting to the line to Guatemala, 20.2 km, that has minimal traffic and the other that connects to the San Salvador-Acajutla line, 40 km. This line has carried large quantities of coffee but recently most of the coffee production has moved by truck. These two lines were built by different companies and are separated in Santa Ana by 5 km.

These two branch lines, if connected, could eliminate the need for 92.9 km of track on the San Salvador-Metapan line. This may be a logical undertaking since there are several cities on the Santa Ana route while the other route has virtually no traffic generating potential. The main drawback to this concept is that this line would, because of elevation differences and curvature, be more expensive to operate. A brief comparison analysis of these two routes was made and is shown as Table 4. A summary of the analysis on Table 4 is that it would cost about ¢5/ton more to transport freight via Santa Ana than along the river route. If the maintenance savings and the future investment savings are

TABLE 4

COMPARISON OF ROUTES BETWEEN SAN SALVADOR AND METAPAN

	ROUTE	SANTA ANA	RIVER
1)	Length(Km) (1)	141.75	136.3
2)	Length (miles)	88.1	84.7
3)	Total gradiant (ft)	2111	1024
4)	Equivalent track length for gradiant (2)	133.6	64.8
5)	Degrees of central angle of curvative	3283	2040
6)	Equivalent track length of curvature (3)	6.2	3.9
7)	Total Equivalent track miles (2+4+6)	227.9	153.4
8)	Difference in track miles	3.4 (5.4)	
9)	Difference in equivalent miles	74.5 (119.2 Km)	
10)	Maximum gradiant	3 %	2 %
11)	Maximum load for 800 HP locomotive (tons)	300	400
12)	Additional fuel cost (0.08¢/ton Km)	¢5.96/ton (4)	
13)	Track Km that can be closed		92.9
14)	track maintenance cost savings 10,000¢ /Km (5)		929,000 ¢/year
15)	Traffic that will negate maintenance savings (tons/year)	(14/12)	155,872
16)	Construction cost ¢ (6)	8.6 million	14.0 million
17)	Salvage value ¢	?	5.4 million
18)	Net cost difference (8.6-5.4+14.0 ¢)	17.2 million	
19)	Present worth at 10%	2.06 million/year	
20)	Traffic that will negate investment (tons/year)		346,000
21)	Total traffic that will make river line cheaper [tons/years (15+20)]		500,000

(1) Includes 4.75 Km for connection
(2) Assuming 25 MPH operation, 6 lb/ton resistance on tangent level track or 15.8 ft rise equals one mile.
(3) 528º of central angle of curvature equals one mile of tangent track
(4) The equivalent miles difference is assumed to be primarily in fuel cost, there is additional track maintenance cost since curves and gradients are more expensive to maintain, this since the tonnage is relatively low has been ignored.
(5) 10,000 ¢ /Km used since the traffic shared between the two lines.
(6) Santa Ana connection would cost 8.6¢ million which would be offset by 5.4 million salvage and a 14¢ million investment that would be required in near future to overcome an errosion problem on the river line. The Santa Ana line will need track improvements which are not considered in this analysis.

combined, it will be cheaper to operate the Santa Ana connection if the traffic is less than 500,000 tons. It is unlikely that the traffic will be greater than this in the foreseeable future.

Short-term considerations (see Chapter VII.) may make the construction of this connection a matter of urgency. It is recommended, however, that a detailed analysis be made of these two routes to determine the exact investment and what can be logically done to improve the route of the Santa Ana line.

E. Passenger Services

Most passenger services (about 85% of passenger km) were eliminated in the last six years because of danger to the passengers. All services were operated as mixed trains, combined freight and passenger coaches. Based on the present schedule, most services took twice as long as by bus and at most there were two trains per day in each direction with the exception of a local service between Acajutla and Sonsonate, which had six trains per day. Most of the coaches were at least 40 years old although they had been rebuilt in some cases in the late 1970's.

The fundamentals for passenger trains, with the exception of urban or commuter, do not appear to exist in El Salvador. While the distances are well within passenger train distances, the next largest city after San Salvador is less than 100,000 people.

The track is not designed for high speed, a requirement when competing with buses or automobiles. So to make a competitive service would require a large investment and even then it is doubtful there is sufficient population to justify the expenditure.

Passenger service might be justified using the remaining life of the rail buses, but it would be very difficult to justify investment in new equipment. The only location where there could be a viable passenger service is the San Salvador urban area.

V. LONG-TERM DEVELOPMENT PLAN

There is indication from the analysis of the rail lines that at least two are viable, the third very much depends on the future of the Port of Cutuco. El Salvador has no national transportation plan; therefore, no line abandomants should be made at least until such a plan is developed. In the long term, to be viable, the railway must significantly reduce its cost and increase its revenue. To be able to do this, the railway staff must improve its management structure and its methods of operation.

To achieve viability at least the following must be undertaken:

- Planning Department -- at least two engineers must be trained in railway operations and coordinate the planning of the necessary improvements.
- Marketing and Sales Department -- the railway must immediately set up a freight marketing and sales department staffed by at least three people -- one for marketing, development of new shippers and shipping methods; one for international development; and one for managing the sales.
- Development of a comprehensive realistic rolling five-year modernization plan to be developed jointly by the railway and an independent consultant or consulting company. The plan should be developed for two situations: (1) with hostilities and the inability to operate at night, and (2) under normal conditions.
- Negotiations with the Guatemala railway for the reopening of the line to the ports.
- Rationalization of workshops -- the number of workshops and their size should be reduced and probably consolidated into one shop.
- Set up Central Train Dispatching -- the radios purchased for security purposes will permit the railroad to operate the railway from a central location and eliminate most of its station adjacent staff.
- Develop costing systems which will identify the cost of a specific service, for the pricing and subsidy identification.

To assist the railway in its modernization and to minimize the use of its assets, it is recommended that technical assistance be provided. Areas for technical assistance should be identified and assistance be provided primarily in the form of training. The training should include the following:

- Short visit by expatriate experts of two to six weeks depending on the task or field to assess present situation, devise solutions in collaboration with FENADESAL staff concerned, assist the railway management in identifying candidates for overseas training and in assessing appropriate staffing needs for each task.

- Overseas training should be arranged. A portion of the overseas training should, if possible, be in the expatriate expert's own office or department. Experts should work with the trainee(s) to set up objectives and work programs for the next 6 to 12 months depending on the task.

- The expert should pay periodic visits to the railway of two weeks to six weeks during the remainder of the total technical assistance period of probably 18 months to review progress, for further on-the-job training of railway staff, and to assist the trainee(s) in setting further goals and devising means of achieving them.

This training should be in at least one of the following areas: marketing and sales, accounting, manpower planning, track, locomotive and wagon maintenance, costing and economic analysis, and train operations. If one consultant were to be full-time as coordinator and develop the overall plan, this technical assistance program would consist of approximately the following:

1 full-time consultant	18 man months
7 part-time consultants	21 man months
Overseas training - 18 people average 2 months - total 36 months	

The total cost of this technical assistance would be about $0.5 million U.S. dollars.

VI. LONG-TERM CONCLUSIONS

El Salvador is a small country fairly densely populated. At the present time the country is primarily an agricultural society but it is attempting to industrialize. Emphasis on industrialization has been primarily in small, high labor content manufacture and assembly, much of which is exported by air. This is unlikely to be a long-term solution to the economic growth problem since there are many other countries developing the same type of industry. With its close proximity to the United States it would appear that El Salvador should look for high labor content products that also have a high transportation cost. If this approach is developed, then the movement of shipping containers between the ports and the population centers become very important and is likely to increase substantially.

The railway can offer significant advantages over the highway:

- By operating unit container trains from the port either to an inland customs yard or to the duty free industrial zone, it can offer a service that cannot easily be performed by a truck.
- The railway being the largest single transportation company can offer single way bill from origin to destination in foreign countries.
- Reduce the investments needed for highway construction.
- Reduce congestion and highway damage.
- Can reduce congestion at the port.

If the railway is efficient and has an aggressive marketing department, there appears to be a long-term role on at least two of the lines. With the possible exception of container handling equipment there appear to be no immediate equipment needs.

The present need is for technical assistance in how to operate the railway efficiently, agressive marketing and developing a long-term plan. If at the end of the technical assistance period, the railway has demonstrated its ability to become a very efficient organization then investment in track, rolling stock, and workshop equipment will be warranted. On the other hand, if there continues to be no marketing, and the present inefficiencies continue, eventually the subsidy required will be so large that the government will arbitrarily close the railway.

Finally, the Santa Ana connection should not be undertaken without a comprehensive engineering analysis unless it can be justified on security grounds.

VII. ANALYSIS OF LINES - SHORT TERM - TRAFFIC AND SECURITY

A. Overall Problem

There is at present a determined effort to disrupt the economy of the country. While the railway is not playing that important role, it is probably regarded as an economic symbol and as such has been repeatedly attacked. There has, however, not been a successful attack for six months.

As a result of the danger on the railway, the trains do not operate without military permission and security. The military is only involved when the trains operate and the size of force involved is:

San Salvador - Metapan	600 men
San Salvador - Acajutla	200 men
San Salvador - La Union	1,000 men

Also as a result of the danger and erratic timetable for delivery the railway has lost 50% of its freight business.

It is more likely that if the railway were to close for the short term, it would be very difficult to restart because squatters will take over the land, people will steal the materials and the very skilled labor force would be lost. The recommendations as to a short-term plan must be addressed by line or route.

B. San Salvador - Acajutla

This line requires very limited protection, especially as a result of recent military action, and should be operated without much change.

C. San Salvador - Metapan

The railway is losing about 100,000 tons of traffic a year with a revenue of ¢1.5 million as a result of being unable to operate a dependable service on this line. In fact with good service and marketing this figure could probably

be raised to 175,000 tons and a revenue of ¢2.6 million. To operate this line requires protection from 600 soldiers and there are two large bridges, the loss of which could easily disrupt traffic for a long time (the last time was 32 months).

A solution to this problem would be the construction of the Santa Ana connection. While it would be more expensive to operate, it could operate more reliably and would only require 200 soldiers for security.

The retirement of the river route should only be considered after a more detailed analysis has been made of the comparison between the two routes.

D. San Salvador - La Union

The line between San Salvador and Cojutepeque can be operated without security. While there is very little freight on this section, it is the most promising urban passenger urban route. There appears to be no reason why this passenger service could not be started as soon as possible.

Between San Miguel and La Union requires only 100 to 150 soldiers for security (and then not always). Twenty percent of the traffic on this line is between these points and if cotton instead of being trucked to Usulutan is trucked to San Miguel the railway could move about 25% of the total traffic on this line. This could be even higher if cement going to San Miguel is transfered to trucks at Cojutepeque.

If the remainder of the route is closed for regular traffic (except the occasional transfer of a locomotive from San Miguel to San Salvador for maintenance once every three months), the results would be as follows:

• Security savings	900 men	
• Lost revenue 55,000 tons at ¢15 ton		¢825,000
• Track maintenance savings -- track only maintained to basic minimum to prevent squatters and theft of material -- 153 km at ¢4,000/km instead of ¢12,500/km (approximately 80 employees) savings		¢535,500

- Elimination of approximately 50 additional personnel -- station staff, etc., saving ¢600,000

The railway would actually be about ¢600,000 better off. In the next 12 months there will be about 140 retirements on the railway so the displaced personnel can be transfered to other jobs.

Since the future of this line depends heavily on the plans for the Port of Cutuco, the complete abandonment of this line before a national transportation policy is developed is not recommended.

E. Passenger Services

There appears to be no logical reason to restart any passenger service especially in the short term when the service may be dangerous and unreliable. The exception to this would be an urban service in the vicinity of San Salvador which considering the density of population could well be justifiable. However, no significant investment (more than ¢75,000) should be made in this service without a detailed study of its overall impact and economics.

VIII. SHORT-TERM CONCLUSIONS

By partly closing the La Union line the military will save about 900 men and the railway will save about ¢600,000 per year. If the Santa Ana connection is built, an additional 500 to 600 soldiers will be relieved of guard duty. This will reduce the security needs by about 80%.

Unfortunately it is not possible to say if the Santa Ana connection is a sound economic source without additional analysis. The timetable of this alternative is: if immediate urgent construction, about six months, or, if a detailed study were made, eight to nine months. Thus, it depends on the degree of urgency which alternative should be taken. If immediate construction is undertaken, however, the river line should not be abandoned, before a detailed comparison study is made.

VOLUME I

PUBLIC SERVICES INFRASTRUCTURE

DAMAGE ASSESSMENT

REPORT

TABLES IN ENGLISH IN US$

TABLE I

SUMMARY OF DIRECT COST OF DAMAGES TO INSTALLATIONS OF PUBLIC SERVICE INFRASTRUCTURE (IN US$000).-

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
ELECTRIC POWER-National Company	-	763.0	2,835.0	4,036.4	3,151.8	5,449.2	4,498.2	20,733.6
ELECTRIC POWER DISTRIBUTION	1,228.2	294.8	1,885.2	3,566.4	1,170.2	839.4	803.2	9,787.4
TELECOMMUNICATIONS - ANTEL -	528.4	1,446.2	886.0	1,027.0	2,866.2	324.8	881.0	7,959.6
WATER SERVICE - ANDA	387.0	668.0	248.0	467.7	309.4	113.5	138.6	2,332.2
RAILROAD	-	2,582.4	2,636.4	2,900.8	2,334.8	3,018.0	279.2	13,751.6
HIGHWAYS - MOP	44.4	819.8	27,282.6	4,179.1	7,481.2	11,105.6	350.3	51,263.0
TOTAL	2,188.0	6,574.2	35,773.2	16,177.4	17,313.6	20,850.5	6,950.5	105,827.4

TABLE 2

SUMMARY OF INDIRECT COSTS OF DAMAGES TO INSTALLATIONS OF PUBLIC SERVICE INFRASTRUCTURE (IN US$ 000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
ELECTRIC POWER NATIONAL COMPANY	1,261.8	9,506.8	24,028.3	33,933.9	36,561.5	29,007.4	33,245.8	167,545.5
ELECTRIC POWER DISTRIBUTION	362.0	1,064.8	2,026.8	3,234.4	2,959.1	3,519.1	3,568.0	16,734.2
TELECOMMUNICATIONS - ANTEL -	73.6	785.1	1,055.6	1,319.0	1,633.3	956.8	1,031.5	6,854.9
RAILROAD	-	363.2	1,375.6	1,306.4	189.2	357.6	440.4	4,032.4
WATER SERVICE - ANDA -	1,274.8	2,261.2	3,214.3	4,247.5	4,911.3	6,827.1	12,200.2	34,936.4
HIGHWAYS - MOP -	(1,636.0)	12,194.4	17,459.2	36,858.1	51,378.4	62,207.5	66,699.0	245,160.6
TOTAL	1,336.2	26,175.5	49,159.8	80,899.3	97,632.8	102,875.5	117,184.9	475,264.0

TABLE E.P. 1

SUMMARY OF DIRECT COSTS OF DAMAGES TO INSTALLATIONS OF THE ELECTRIC POWER SYSTEM (IN US$ 000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
CEL	–	763.0	2,834.9	4,036.4	3,151.8	5,449.2	4,498.2	20,733.5
CAESS	1,228.2	277.1	528.1	1,009.1	894.6	665.7	620.4	5,223.2
CLESA	–	10.1	420.0	161.7	90.7	135.2	47.2	864.9
CLES		NO DIRECT DAMAGES SUFFERED						
CLEA	–	–	–	–	8.4	–	–	8.4
DEUSEM	–	7.6	916.4	2,377.4	110.0	38.4	135.7	3,585.5
DESSEM	–	–	20.8	18.2	66.4	–	–	105.4
TOTAL	1,228.2	1,057.8	4,720.2	7,602.8	4,321.9	6,288.5	5,301.5	30,520.9
Damages reported 1986 CEL, DEUSEM								500.8
Damages to Feb.28/86								31,021.7

Damages to Dec.31, 1985 @ ¢ 2.50 = US$1.00 $ 30,520.9
Damages Jan.-Feb.1986 @ ¢ 5.00 = US$1.00 $ 500.8
TOTAL IN US$ $ 31,021.7

TABLE E. P. 2

SUMMARY OF DIRECT COSTS OF DAMAGES TO INSTALLATIONS OF CEL 1980-1985 (IN US$ 000)

DESCRIPTION	1979	1980*	1981	1982	1983	1984	1985	TOTAL
1. TOWERS AND STRUCTURES	-	587.9	2,770.3	2,831.0	2,456.2	3,911.6	4,394.8	16,951.8
2. OTHER INSTALLATIONS	-	175.2	64.6	925.8	651.6	1,537.6	103.4	3,458.2
3. VEHICLES	-	-	-	279.6 **	44.0	-	-	323.6
TOTAL	-	763.1	2,834.9	4,036.4	3,151.8	5,449.2	4,498.2	20,733.6
TOWERS OF 115kv DAMAGED	-	-	166	84	80	76	56	462
NUMBER OF ATTACKS	-	-	240	197	179	220	372	1,208

* Data from August 1980

** Accumulated data upto December 29 1980

TABLE E.P. 3

SUMMARY OF DIRECT COSTS OF DAMAGES TO INSTALLATIONS OF CAESS (IN US$ 000)

DESCRIPTION	1979 (*)	1980	1981	1982	1983	1984	1985	TOTAL
BUILDINGS AND INSTALLATIONS								
COST OF REPAIR	496.0	81.6	127.3	249.6	197.6	132.7	122.9	1,407.7
COST OF REPLACEMENT	707.5	169.0	392.3	624.4	696.8	390.4	485.4	3,465.8
TOTAL COST	1,203.5	250.6	519.6	874.0	894.4	523.1	608.3	4,873.5
HEAVY EQUIPMENT								
COST OF REPAIR	-	-	-	-	-	-	-	-
COST OF REPLACEMENT	-	-	-	-	-	135.6	-	135.6
TOTAL COST	-	-	-	-	-	135.6	-	135.6
LIGHT EQUIPMENT AND TOOLS								
COST OF REPAIR	4.8	4.8	2.5	55.2	-	1.1	12.0	80.4
COST OF REPLACEMENT	20.0	20.0	-	76.0	-	-	-	116.0
TOTAL COST	24.8	24.8	2.5	131.2	-	1.1	12.0	196.4
OTHERS (**)								
COST OF REPAIR	-	-	-	-	-	-	-	-
COST OF REPLACEMENT	-	1.7	6.0	4.0	-	5.9	-	17.6
TOTAL COST	-	1.7	6.0	4.0	-	5.9	-	17.6
GRAND TOTAL	1,228.3	277.1	528.1	1,009.2	894.4	665.7	620.3	5,223.1

(*) Includes US$ 94,200 of damages occured on 11/17/78. This was the first data.

(**) Includes stolen portable radios, movable radios, binocularS, assaults and robbery to agencies.

TABLE E.P.-4

SUMMARY OF DIRECT COSTS OF DAMAGES TO INSTALLATIONS OF CLESA - ELECTRIC LIGHT COMPANY OF SANTA ANA -(IN US$000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
INSTALLATIONS	-	-	420,000	74,000	-	120,000	-	614,000
TRANSFORMERS	-	8,312	-	80,505	83,473	14,524	40,530	227,344
STEEL AND CONCRETE POSTS	-	-	-	7,200	7,228	720	6,620	21,768
STREET LAMPS	-	1,800	-	-	-	-	-	1,800
TOTAL	-	10,112	420,000	161,705	90,701	135,244	47,150	864,912

ELECTRIC DISTRIBUTOR OF USULUTAN, MIXED ECONOMY SOCIATY - DIRECT COST OF DAMAGE (IN US$)

TABLE E.P. 5

SUMMARY OF TABLE No.1

	ACTUAL COSTS	COST OF REPAIR	TOTALS
TRANSFORMERS	216.800	25.588	242.388
SUB-STATIONS	420.000	-	420.000
ELECTRIC SYSTEM (TOTAL DESTRUCTION)	2,439.600	307.400	2,747.000
BROKEN LINES	6.320	3.830	10.150
RECLOSER	49.400	13.200	62.600
CONSTRUCTIONS	40.000	40.000	80.000
CAPACITATORS	4.000	400	4.400
POSTS	30.540	-	30.540
CABLES (LOST FROM LINES)	2.286	-	2.286
CIRCUIT BREAKER	1.200	-	1.200
INSULATORS	640	-	640
LIGHTING CONDUCTOR	540	-	540
	3,211.326	390.418	3,601.744
1979			
1980	6.200	1.380	7.580
1981	870.200	46.200	916.400
1982	2,074.200	303.160	2,377.360
1983	82.880	27.150	110.030
1984	32.086	6.372	38.458
1985	130.180	5.556	135.736
1986	15.580	600	16.180
	3,211.326	390.418	3,601.744

TABLE E.P.-6

ELECTRIC LIGHT COMPANY OF AHUACHAPAN, A.S.

DIRECT COST OF DAMAGES IN U.S. DOLLARS

QTY	STRUCTURE, DAMAGED EQUIPMENT	DATE OF OCCURRENCE	ACTUAL COST	BASES OF ACTUAL COST	COTS OF REPAIR	FINAL CONDITION	CONSIDERATIONS
1	MONOPHASE TRANSFORMER OF 37.5 KVA	JUNE/83	$2,000.00	COST OF REPLACE	NON-REPAIRABLE	REPLACED	IT WAS REPLACED BY A NEW ONE FOR BEING IRREPARABLE
1	MONOPHASE TRANSFORMER OF 37.5 KVA	JUNE/83	$2,000.00	REPLACED COST	$200.00	REPAIRED IN SERVICE	TOTAL OF EVENT $2,200.00
1	MONOPHASE TRANSFORMER OF 37.5 KVA	JUNE/83	$2,000.00	REPLACED COST	$200.00	REPAIRED IN SERVICE	TOTAL OF EVENT $2,200.00
1	MONOPHASE TRANSFORMER OF 37.5 KVA	JUNE/83	$2,000.00	REPLACED COST	$200.00	REPAIRED IN SERVICE	TOTAL OF EVENT $2,200.00

TABLE E.P. 7

SUMMARY OF DIRECT COST OF DAMAGES TO INSTALLATIONS OF DESSEM -SENSUNTEPEQUE- (IN US$ 000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTA
CONCRETE AND WOOD POSTS	-	-	5,246.8	2,428.8	5,124.8	-	-	12,800.4
TRANSFORMERS	-	-	9,440.0	4,720.0	28,400.0	-	-	42,560.0
OTHER ELECTRICAL EQUIPMENT	-	-	6,073.2	11,051.2	32,835.2	-	-	49,959.6
TOTAL	-	-	20,760.0	18,200.0	66,360.0	-	-	105,320.0

TABLE E.P. 8

ELECTRIC POWER - GENERATION, TRANSMISSION, DISTRIBUTION - INDIRECT COSTS OF CIVIL VIOLENCE (IN US$000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTA
CEL	1,261.8	9,506.8	24,028.3	33,933.9	36,561.5	29,007.4	33,245.8	167,545.5
ELECTRIC LIGHT POWER - SONSONATE	-	-	58.3	58.1	60.4	341.0	247.1	764.9
ELECTRIC LIGHT POWER - AHUACHAPAN	73.2	59.8	54.3	34.3	48.9	117.2	57.0	444.7
GLESA - SANTA ANA	44.9	68.9	157.8	550.5	608.7	749.1	804.5	2,984.4
CAESS - SAN SALVADOR	242.0	765.9	1,519.7	1,768.3	1,775.3	1,988.7	1,716.5	9,776.4
ELECTRIC LIGHT POWER-SENSUNTEPEQUE	-	-	9.0	10.7	11.9	13.3	15.2	60.1
DEUSEM - USULUTAN	1.9	170.2	227.7	812.5	453.8	309.9	727.6	2,703.6
TOTAL	1,623.8	10,571.6	26,055.1	37,168.3	39,520.5	32,526.6	36,813.7	184,279.6

TABLE E.P. 9

EXECUTIVE HYDROELECTRIC COMMISSION OF LEMPA RIVER - C E L -

TABLE 2 PART II - INDIRECT COST OF DAMAGES TO INSTALLATIONS INCLUDED IN BUDGET (IN US$ 000)

CONSIDERED DAMAGES	1 9 7 9	1 9 8 0	1 9 8 1	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5	T O T A L
a. INCOME NOT RECEIVED	-	6,640.0	16,000.0	23,200.0	26,240.0	16,360.0	13,920.0	102,360.0
b. ENERGY COST -FOSSIL PRODUCTS-	335.8	1,016.9	4,635.9	6,528.7	5,098.4	5,863.1	10,709.6	34,188.4
c. SECURITY - PERSONNEL	51.5	207.8	575.2	927.5	1,296.5	1,627.0	2,039.4	6,724.9
d. SECURITY - INPUT	29.8	98.0	162.5	231.3	585.8	428.0	649.8	2,185.2
e. SERVICE RESTAURATION	402.6	825.1	1,612.5	1,871.0	1,855.6	2,438.8	3,104.3	12,109.9
f. OVERTIME	6.7	41.6	60.7	102.8	80.7	2.2	5.9	300.6
g. PERSONNEL TRAINING	-	-	-	-	-	-	-	-
h. ADDITIONAL AIR TRANSPORTATION C.	-	-	-	77.7	87.0	81.0	136.3	382.6
i. ADDITIONAL LAND TRANSPORTATION C.	-	-	-	-	-	-	-	-
j. ADDITIONAL HEAVY EQUIPMENT COST	-	-	171.0	63.5	4.0	4.1	100.8	343.4
k. ADDITIONAL LIGHT EQUIPMENT COST	-	-	-	-	91.2	12.0	103.2	206.4
l. INDEMNIZATIONS - INSURANCE	1.2	8.8	5.2	1.2	1.2	3.2	2.0	22.8
m. SPECIAL SERVICES	434.3	668.6	805.3	930.3	1,221.1	2,187.3	2,474.3	8,721.2
T O T A L	1,261.8	9,506.8	24,028.3	33,933.9	36,561.5	29,007.4	33,245.8	167,545.5

TABLE E.P.-10

INDIRECT COST OF DAMAGES TO CLESA, INCLUDED IN BUDGET (IN US$000)

CALENDAR YEAR	DEC. 31	DEC. 31	DEC.31	DEC. 31	DEC. 31	DEC. 31	DEC. 31	
CONSIDERED DAMAGES	1 9 7 9	1 9 8 0	1 9 8 1	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5	CONSIDERATIONS
a. INCOME NOT RECEIVED	20.7	38.7	52.3	449.4	454.8	574.4	606.8	Stop of production, energy rationing.
b. SECURITY - PERSONNEL	–	–	–	–	–	–	–	–
c. SECURITY - INSTALLATIONS	6.0	6.0	7.2	7.2	11.2	12.0	12.0	Militar protect: to installation:
d. PERSONNEL INCREASE	–	–	67.2	43.2	86.4	99.6	144.4	Maintain job plant personnel.
e. OVERTIME	1.2	1.8	2.2	2.7	3.4	4.6	6.3	Extra payments for attention to damages.
f. PERSONNEL TRAINING	–	–	–	–	–	–	–	–
g. ADDITIONAL AIR TRANSPORTATION COST	–	–	–	–	–	–	–	–
h. ADDITIONAL LAND TRANSPORTATION COST	2.5	2.8	3.0	3.4	3.8	4.3	6.5	Additional petro consume.
i. ADDITIONAL ENERGY COST (ELECTRIC, COMBUSTIBLE, ETC.)	0.6	1.1	1.4	16.8	18.0	20.8	23.3	Payment to supplyer company fo: production stopp
j. ADDITIONAL HEAVY EQUIPMENT COST	–	–	–	–	–	–	–	–
k. ADDITIONAL LIGHT EQUIPMENT COST	11.4	17.0	22.6	25.6	28.6	30.7	32.4	Vehicles, parts, and work equipment.

TABLE E.P.-11

INDIRECT COSTS OF DAMAGES CAUSED BY ELECTRIC ENERGY CUTS IN SUPPLY (IN US$000)

CALENDAR YEAR	DEC. 31	DEC. 31	DEC. 31	DEC. 31	DEC. 31	DEC. 31	DEC. 31	
CONSIDERED DAMAGES	1 9 7 9	1 9 8 0	1 9 8 1	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5	T O T A L
a. INCOME NOT RECEIVED	-	-	163,908.0	96,400.0	188,945.2	235,049.2	507,181.2	1,191,483.6
b. SECURITY - PERSONNEL	-	-	-	-	-	-	-	-
c. SECURITY - INSTALLATIONS	-	-	-	-	-	-	-	-
d. PERSONNEL INCREASE	-	-	-	-	-	-	-	-
e. OVERTIME	-	-	33,501.2	65,570.0	60,962.8	93,620.0	153,849.2	407,503.2
f. PERSONNEL TRAINING	-	-	-	-	-	-	-	-
g. ADDITIONAL LAND TRANSPORTATION COST	-	-	-	-	-	-	2,400.0	2,400.0
h. ADDITIONAL ENERGY COST (ELECTRIC, COMBUSTIBLE, ETC.)	7,200.0	12,000.0	12,000.0	12,000.0	16,800.0	12,000.0	9,600.0	81,600.0
i. ADDITIONAL HEAVY EQUIPMENT COST	-	-	2,000.0	2,000.0	22,000.0	8,000.0	-	34,000.0
j. ADDITIONAL LIGHT EQUIPMENT COST	-	-	1,800.0	1,800.0	1,800.0	1,800.0	1,800.0	9,000.0
k. INDEMNITIES AND INSURANCES	-	-	-	-	-	-	-	-
T O T A L								1,725,986.8

TABLE E.P. 12

ELECTRIC LIGHT COMPANY OF AHUACHAPAN, S.A.

(IN US$000)

DETAIL	1 9 7 9	1 9 8 0	1 9 8 1	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5
a) INCOME NOT RECEIVED	71,432.8	55,460.8	44,029.6	14,941.2	31,101.2	92,305.2	21,769.6
b) COST INCREASES FROM CLOSED ATEHUESIA PLANT (OWN GENERATION)	1,775.6	4,306.0	10,284.0	19,337.2	17,838.4	24,856.0	35,235.2
T O T A L	73,208.4	59,766.8	54,313.6	34,278.4	48,939.6	117,161.2	57,004.8

ELECTRIC DISTRIBUTOR OF SENSUNTEPEQUE - MIXED ECONOMY SOCIATY

TABLE E.P. 13

Table-2 INDIRECT COSTS OF INSTITUTIONAL DAMAGES, INCLUDED IN BUDGET (IN US$000)

CALENDAR YEAR	DEC.31	DEC.31	DEC.31	DEC.31	DEC.31	DEC.31	DEC. 31	
CONSIDERED DAMAGES	1 9 7 9	1 9 8 0	1 9 8 1	1 9 8 2	1 9 8 3	1 9 8 4	1 9 8 5	Considera.
a. INCOME NOT RECEIVED	-	-	5,840.0	6,560.0	7,460.0	8,760.0	9,920.0	
b. SECURITY - PERSONNEL	-	-	-	-	-	-	-	
c. SECURITY - INSTALLATIONS	-	-	-	-	-	-	-	
d. PERSONNEL INCREASE	-	-	2,152.0	2,960.0	3,400.0	3,400.0	3,920.0	
e. OVERTIME	-	-	393.4	421.7	377.8	403.7	417.0	
f. PERSONNEL TRAINING	-	-	-	-	-	-	-	
g. ADDITIONAL AIR TRANSPORTATION COST	-	-	-	-	-	-	-	
h. ADDITIONAL LAND TRANSPORTATION COST	-	-	658.5	784.4	700.4	738.0	959.2	
i. ADDITIONAL ENERGY COST (ELECTRIC, COMBUSTIBLE, ETC.)	-	-	-	-	-	-	-	
j. ADDITIONAL HEAVY EQUIPMENT COST	-	-	-	-	-	-	-	
k. ADDITIONAL LIGHT EQUIPMENT COST	-	-	-	-	-	-	-	
l. INDEMNITIES AND INSURANCES	-	-	-	-	-	-	-	
m. OTHERS	-	-	-	-	-	-	-	
TOTAL	-	-	9,043.9	10,726.1	11,938.2	13,301.7	15,216.2	

TABLE E.P. 14

ELECTRIC DISTRIBUTOR OF USULUTAN, MIXED ECONOMY SOCIATY

RECONSTRUCTION OF BASIC INFRASTRUCTURE (IN US$)

	1 9 8 7	1 9 8 8	1 9 8 9	T O T A L	
REPAIR COST	81,336.8	78,083.6	74,330.0	234,250.4	Average 1980-1985 25%, 20% and 15%
DEFFERED INVESTMENTS	791,040.0	825,440.0	859,840.0	2,476,320.0	Calculation Based year 1985 15%, 20% and 15%
SERVICE RESTORATION COST	750,363.2	720,348.8	690,334.4	2,161,046.4	Average 1980-1985 25%, 15% and 20%
T O T A L	1,622,740.0	1,623,872.4	1,625,004.4	4,871,616.8	

TABLE E.P. 15

ELECTRIC LIGHT COMPANY OF AHUACHAPAN, S.A.

INDIRECT COSTS OF PRINCIPAL CLIENTS CAUSED BY ELECTRIC ENERGY SUSPENSION IN US DOLLARS

DETAIL	1979	1980	1981	1982	1983	1984	1985	TOTAL
INCOME NOT RECEIVED	27,722.4	103,389.2	13,660.0	6,004.8	16,410.0	113,054.4	116,856.0	397,096.8

EXECUTIVE HYDROELECTRIC COMMISSION

OF LEMPA RIVER

TABLE E.P.-16

FINANCIAL NEEDS FOR RECONSTRUCTION

OF BASIC INFRASTRUCTURE

(IN US$000)

	1987		1988		1989		1990		1991		1992		INVESTMENT		
	LM	EM	LM	EM	LM	EM	LM	EM	LM	EM	LM	EM	LM	EM	TOTAL
A) DAMAGE RESTORATION	2,599.2	7,984.4	3,366.0	7,872.8	4,375.8	8,416.	4,561.1	7,134.4	5,929.4	7,640.9	0.0	0.0	20,821.6	39,048.5	59,870.0
B) DIFFERED INVESTMENT	9,900.9	24,318.6	9,107.4	30,995.4	29,484.2	50,254.	68,673.7	83,098.3	67,808.6	62,640.4	20,913.0	15,965.0	205,996.9	269,172.0	475,068.9
C) SERVICE RESTORATION	348.8	1,042.8	453.4	1,113.8	589.5	1,190.							1,391.7	3,347.3	4,739.0
TOTAL	12,847.9	33,345.8	12,926.8	39,882.0	34,449.5	61,860.	73,234.8	90,232.7	73,738.1	70,281.3	20,913.0	15,965.0	228,110.2	311,567.8	539,677.9
FINANCING:															
OPL (OWN RESOURCES)			9,107.4		29,484.2		68,673.7		67,832.6		20,913.0		195,987.0	0.0	195,987.0
EXTERNAL FINANCING NEED	12,847.9	33,345.8	3,819.4	39,882.0	4,965.2	61,860.	4,561.1	90,232.7	5,929.4	70,281.3	0.0	15,965.0	32,123.2	311,567.8	343,691.0
TOTAL	12,847.9	33,345.8	12,926.8	39,882.0	34,449.5	61,860.	73,234.8	90,232.7	73,762.1	70,281.3	20,913.0	15,965.0	228,110.2	311,567.8	539,677.9

TABLE E.P. 17

ELECTRIC DISTRIBUTOR OF USULUTAN, MIXED ECONOMY SOCIATY

INDIRECT COSTS SUFFERED BY CLIENTS

LOCATION AND IDENTIFICATION	1979	1980	1981	1982	1983	1984	1985
• AGRICULTURE - Different Areas	-	-	1,000,000	1,500,000	1,400,000	-	1,940,000
• MANUFACTURING INDUSTRY (PROASAL) USULUTAN	-	-	220,000	192,000	236,000	7,800	302,400
• COTTON INDUSTRY - USULUTAN -	-	-	260,000	212,000	245,200	10,000	366,000
• CATTLE AND DIARY PRODUCTS Different Areas	-	-	318,000	392,000	-	-	940,000
• FISH INDUSTRY - EL TRIUNFO PORT -	-	-	1,120,000	1,[illegible]00,000	1,160,000	62,000	1,200,000
• "PANELA" PRODUCTION (*) EL VOLCAN VILLAGE	-	-	-	-	-	-	220,000
• COFFEE PROCESSOR CALIFORNIA - EL VOLCAN VILLAGE -	-	-	-	920,000	-	-	1,520,000
• WOOD INDUSTRY SAN JUAN DEL GOZO	-	-	-	1,100,000	-	-	-
• TRADE - Different Areas -	-	-	238,000	314,000	520,000	-	790,000
• RESIDENTIAL	-	-	120,000	180,000	220,000	-	300,000
TOTAL	-	-	3,276,000	5,810,000	3,781,200	79,800	7,578,400

(*) A SUGAR CANDY

ANTEL CHART I

NATIONAL ADMINISTRACION OF TELECOMMUNICATIONS

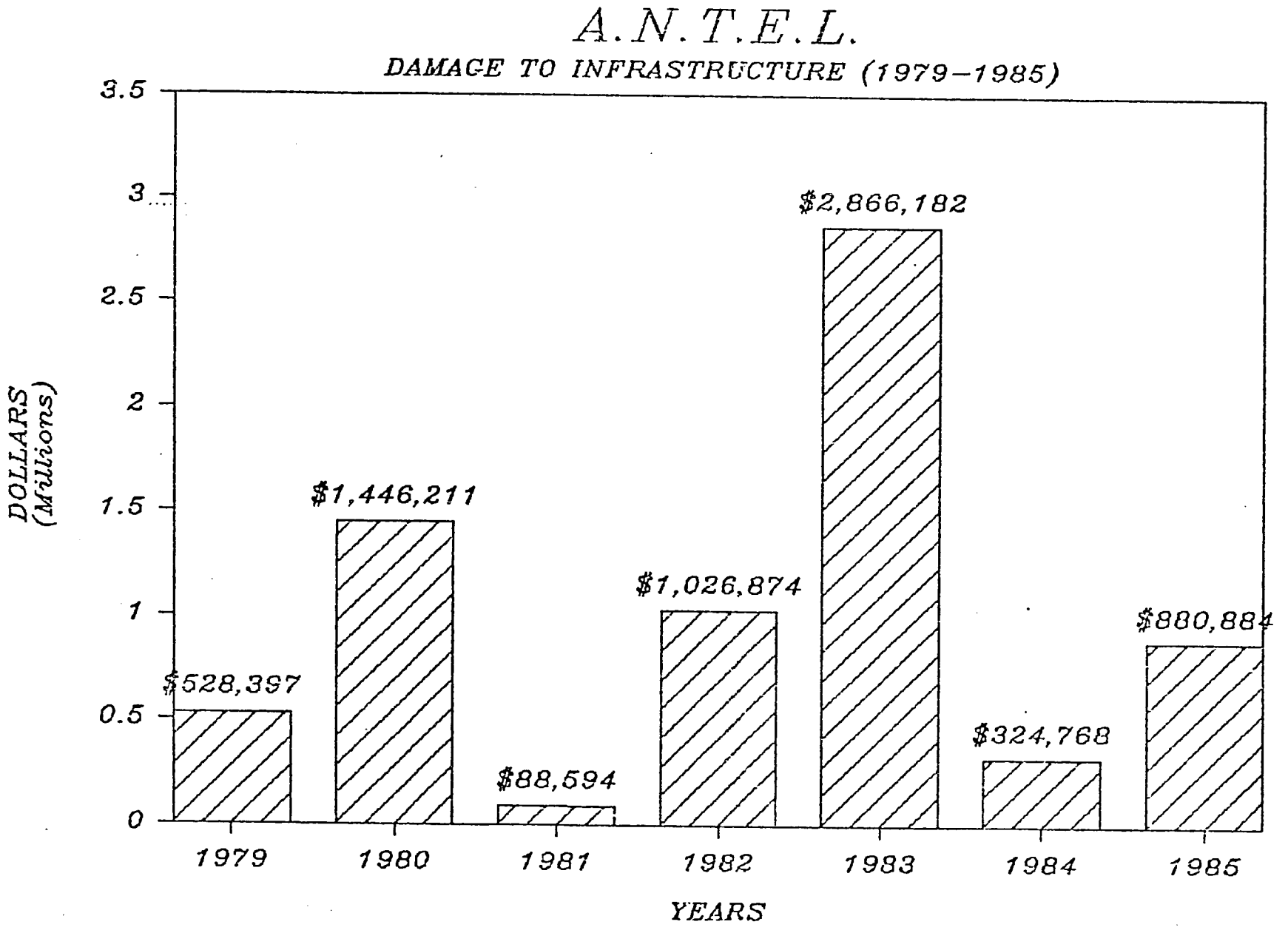
SUMMARY OF DIRECT COST OF DAMAGES TO INSTALLATIONS OF ANTEL FOR TERRORIST ACTIONS (IN US $ 000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. BUILDINGS AND INSTALLATIONS	497,445.2	1,113,652.8	839,522.4	834,425.6	2,663,506.0	310,868.8	711,484.0	6,970,904.8
2. HEAVY EQUIPMENT	-	290,000.0	-	160,856.0	128,200.0	-	120,000.0	699,056.0
3. LIGHT EQUIPMENT	17,200.0	30,187.2	34,026.4	19,200.0	40,000.0	13,299.2	38,400.0	192,312.8
4. OTHERS	13,752.0	12,392.8	12,395.2	12,392.8	34,480.0	600.0	11,000.0	97,012.8
TOTAL	528,397.2	1,446,232.8	885,944.0	1,026,874.4	2,866,186.0	324,768.0	880,884.0	7,959,286.4

ANTEL CHART II

SUMMARY OF DIRECT COST OF DAMAGES TO INSTALLATIONS OF ANTEL FOR TERRORIST ACTIONS (IN US$000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. BUILDINGS AND INSTALLATIONS								
1.1 BUILDINGS	-	387,040.0	153,600.0	58,907.6	125,400.0	11,400.0	121,040.0	857,387.6
1.2 FURNITURE AND EQUIPMENT	-	324,960.0	178,400.0	62,000.0	152,600.0	21,800.0	78,520.0	858,280.0
1.3 COMMUTATOR	9,848.0	68,936.0	88,632.0	59,088.0	59,088.0	20,096.0	20,912.0	326,600.0
1.4 CLOSETS	-	12,000.0	192,000.0	248,000.0	48,000.0	60,000.0	36,000.0	596,000.0
1.5 CABLE SEWAGE	-	-	-	154,000.0	-	-	-	154,000.0
1.6 TELEPHONE LINES	469,010.4	163,537.2	189,710.8	63,250.4	75,900.4	177,100.8	126,500.0	1,265,010.0
1.7 BOOSTER STATIONS	-	80,000.0	-	152,000.0	1,798,800.0	1,600.0	328,511.6	2,360,911.6
1.8 TELEPHONE PLANT	-	-	-	-	400,000.0	-	-	400,000.0
1.9 TELEPRINTER	-	-	-	-	-	4,000.0	-	4,000.0
1.10 CONNECTING CABLES	14,868.8	29,743.6	29,743.6	29,743.6	-	14,872.0	-	318,971.6
1.11 MISCELLANEOUS	3,718.0	7,436.0	7,436.0	7,436.0	3,717.6	-	-	29,743.6
SUB-TOTAL	497,445.2	1,113,652.8	839,522.4	834,425.6	2,663,506.0	310,868.8	711,484.0	6,970,904.8
2. HEAVY EQUIPMENT								
2.1 HEAVY VEHICLES	-	-	-	57,056.0	-	-	-	57,056.0
2.2 GENERATOR MOTORS	-	-	-	103,800.0	128,200.0	-	88,000.0	320,000.0
2.3 BATTERY BANKS	-	290,000.0	-	-	-	-	32,000.0	322,000.0
SUB-TOTAL	-	290,000.0	-	160,856.0	128,200.0	-	120,000.0	699,056.0
3. LIGHT EQUIPMENT								
3.1 LIGHT VEHICLES	17,200.0	30,187.2	34,026.4	19,200.0	40,000.0	13,299.2	38,400.0	192,312.8
SUB-TOTAL	17,200.0	30,187.2	34,026.4	19,200.0	40,000.0	13,299.2	38,400.0	192,312.8
4. OTHERS								
4.1 TELEPHONE EQUIPMENT	1,360.0	-	-	-	-	-	-	1,360.0
4.2 POSTS	7,436.0	7,436.0	7,436.0	7,436.0	2,000.0	2,000.0	600.0	34,344.0
4.3 PUBLIC TELEPHONES	4,956.0	4,956.8	4,959.2	4,956.8	32,480.0	-	-	52,308.3
SUB-TOTAL	13,752.0	12,392.8	12,395.2	12,392.8	34,480.0	2,000.0	600.0	88,012.8
GRAND-TOTAL	528,397.2	1,446,232.8	885,944.0	1,026,874.4	2,866,186.0	326,168.0	870,484.0	7,950,286.4


A.N.T.E.L.
DAMAGE TO INFRASTRUCTURE (1979–1985)
DOLLARS (Millions)
3.5
3
2.5
2
1.5
1
0.5
0
$528,397
$1,446,211
$88,594
$1,026,874
$2,866,182
$324,768
$880,884
1979
1980
1981
1982
1983
1984
1985
YEARS

INDIRECT COSTS OF CIVIL VIOLENCE

ANTEL CHART III

NATIONAL ADMINISTRATION OF TELECOMMUNICATIONS - ANTEL - (IN US$000)

COSTS INCURRED	1979	1980	1981	1982	1983	1984	1985	TOTAL
a. LOST REVENUES	35.2	1,682.0	9,580.8	17,515.2	24,882.0	29,334.8	38,802.8	121,932.8
b. SECURITY - PERSONNEL	-	-	-	-	-	-	-	-
c. SECURITY - INSTALLATIONS	-	237,911.2	356,866.4	75,822.4	594,778.0	356,866.0	356,866.0	1,979,110.0
d. ADDITIONAL PERSONNEL	-	180,663.2	270,994.8	361,326.4	451,658.0	270,994.8	270,994.8	1,806,632.0
e. OVERTIME	16,476.0	44,522.0	51,594.2	61,264.0	50,602.8	32,553.6	34,173.6	291,141.2
f. SPECIAL TRAINING COST	-	416.4	624.4	832.0	1,040.4	624.4	624.4	4,162.0
g. AIR TRANSPORT	-	686.0	1,029.2	1,548.0	15,223.2	7,184.8	7,720.8	33,392.0
h. LAND TRANSPORT	-	1,600.0	2,400.0	3,200.0	4,000.0	2,400.0	2,400.0	16,000.0
i. ADDITIONAL ENERGY, FUEL, ETC.	5,101.6	66,593.2	85,202.8	109,981.6	134,612.8	80,718.8	83,638.4	565,849.2
j. HEAVY EQUIPMENT	-	-	-	-	-	-	-	-
k. LIGHT EQUIPMENT	-	-	-	-	-	-	-	-
l. INSURANCE - INDEMNITIES	48,800.0	174,800.0	160,200.0	96,800.0	52,396.0	60,840.0	77,520.0	671,356.0
m. OTHERS	3,203.2	76,223.6	117,103.2	190,670.0	304,086.8	115,294.0	158,776.8	965,357.6
TOTAL	73,616.0	785,097.6	1,055,550.8	918,959.6	1,633,280.0	956,811.2	1,031,517.6	6,454,832.8

ANTEL CHART IV

NATIONAL ADMINISTRATION OF TELECOMMUNICATIONS

FINANCIAL NEEDS

RECONSTRUCTION OF BASIC INFRASTRUCTURE (IN US$)1/

DESCRIPTION	1987	1988	1989	TOTAL
DAMAGES RESTAURATION	6,110,720.0	-	-	6,110,720.0
DIFFERED APPLICATIONS 2/	400,000.0	400,000.0	20,000,000.0	20,400,000.0
SERVICE RESTAURATION	1,848,600.0	-	-	1,848,600.0
TOTAL	8,359,320.0	400,000.0	20,000,000.0	28,759,320.0

NOTES

1/ The rate used in this table is US$1.- = ¢2.50 according to note No.3513 dated November 15, 1985. Necessary financing for the equipment was requested at the prevailing rate at that time.-

2/ The differed expansions relate to project IV.-

ANDA CHART I

NATIONAL ADMINISTRATION OF AQUEDUCTS AND SEWAGES

SUMMARY OF DIRECT COST OF DAMAGES TO INSTALLATIONS OF 1979 - 1985 (IN US$ 000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. BUILDINGS AND INSTALLATIONS	1,760.8	42,744.8	102,090.8	157,256.4	18,269.6	26,724.8	69,024.0	417,871.2
2. HEAVY EQUIPMENT	336,231.6	26,000.0	-	38,400.0	60,000.0	-	-	460,631.6
3. LIGHT EQUIPMENT AND TOOLS	11,096.4	599,260.4	145,827.6	272,064.0	226,576.0	86,776.0	45,498.0	1387,098.4
4. OTHERS	37,968.0	-	-	-	4,558.0	-	24,118.4	66,644.4
	387,056.8	668,005.2	247,918.4	467,720.4	309,403.6	113,500.8	138,640.4	2332,245.6

ANDA CHART II

SUMMARY OF INDIRECT COST OF DAMAGES TO INSTALLATIONS OF ANDA INCLUDED IN BUDGET (IN US$ 000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. INCOME NOT RECEIVED	536.4	972.3	1,407.7	1,942.3	1,990.4	2,567.8	4,164.2	13,581.1
2. SECURITY - PERSONNEL	-	4.1	11.4	21.6	24.1	25.1	24.8	111.1
3. SECURITY - INSTALLATIONS	-	8.4	16.1	26.4	197.7	334.3	335.3	918.2
4. PERSONNEL INCREASE	35.4	38.0	39.4	38.7	32.0	24.4	3.9	211.8
5. OVERTIME	7.4	28.6	37.9	52.1	80.0	89.4	103.3	398.7
6. ADDITIONAL TRANSPORTATION COST	1.7	19.9	24.0	32.9	35.0	47.4	48.8	209.7
7. ADDITIONAL ENERGY COST	190.7	190.7	501.0	515.2	458.3	423.8	594.8	2,874.5
8. ADDITIONAL HEAVY EQUIPMENT COST	-	-	-	-	-	-	200.0	200.0
9. INDEMNITIES - INSURANCES	88.1	132.8	139.0	172.6	233.8	266.4	392.9	1,425.6
10. CLAIM INDEMNITIES	-	3.7	3.9	2.9	-	-	-	10.5
11. OTHERS	21.2	21.2	21.7	21.7	21.7	21.7	22.4	151.6
12. INTERESTS FOR DELAY - NOT PAID	-	-	-	18.2	350.2	1,149.0	1,272.2	2,789.6
13. SERVICES NOT BILLED	-	-	3.0	3.5	33.7	48.9	70.0	159.1
14. ADDITIONAL WORK	-	-	-	40.0	-	-	-	40.0
15. COSTS FOR DELAY	385.8	625.9	830.0	1,186.6	1,261.0	1,647.8	2,847.9	8,785.0
16. PROTECTION WORK	1.6	2.0	2.6	3.0	10.6	4.0	4.0	27.8
17. FALLEN SALARIES	6.5	213.5	176.6	169.7	182.9	177.0	2,115.9	3,042.1
TOTALS	1,274.8	2,261.1	3,214.3	4,247.4	4,911.4	6,827.0	12,200.4	34,936.4

ANDA CHART III

NATIONAL ADMINISTRATION OF AQUEDUCTS AND SEWAGE

FINANCIAL REQUIREMENTS

RECONSTRUCTION OF DAMAGED INFRASTRUCTURE (IN US$000)

DESCRIPTION	1987	1988	1989	TOTAL
a) DAMAGE RESTORATION	148,866.8	148,866.8	148,866.8	446,600.4
b) PLANNED EXPANSION	20,000.0	20,000.0	20,000.0	60,000.0
c) SERVICES RESTORATION	1,590,847.2	1,554,847.2	1,554,847.2	4,700,541.6
TOTAL	1,759,714.0	1,723,714.0	1,723,714.0	5,207,142.0
ANDA RESOURCES	-	-	-	-
FINANCIAL NEEDS	1,759,714.0	1,723,714.0	1,723,714.0	5,207,142.0

ANDA CHART IV

NATIONAL ADMINISTRATION OF AQUEDUCTS AND SEWAGES

DELAYED PAYMENTS OF CENTRAL GOVERNMENT, AUTONOMOUS INSTITUTIONS AND MUNICIPALITIES

PERIODS (1979 - 1985)

YEAR \ SECTOR	CENTRAL GOVERNMENT	AUTONOMOUS INSTITUTIONS	MUNICIPAL TOWN HALLS
1 9 7 9	US$ 19,657.31	US$ 5,534.42	US$ 329,964.31
1 9 8 0	" 24,253.54	" 6,081.38	" 512,498.18
1 9 8 1	" 13,976.65	" 35,078.64	" 644,997.41
1 9 8 2	" 352,472.34	" 80,451.34	" 567,442.99
1 9 8 3	" 430,133.40	" 94,058.88	" 564,864.62
1 9 8 4	" 783,845.44	" 88,750.99	" 554,601.99
1 9 8 5	" 1,361,320.80	" 451,044.32	" 713,356.38
T O T A L	US$ 2,985,659.48	US$ 760,999.97	US$ 3,887,725.88

TABLE A-8
AID PROJECT No. 519-0256
PUBLIC SECTOR EMPLOYMENT GENERATION
YEARLY INVESTMENT BY IMPLEMENTING AGENCY
(In U.S.$000)

	1980	1981	1982	1983	1984	1985	TOTAL
ANDA	513	478	1,973	2,960	4,950.60	3,360	14,234.6
DUA	6,689	5,970	9,110	2,300	2,400	1,200	27,660.0
CAMINOS	3,540	3,155	6,064	7,200	6,940	8,680	35,579.0
MAG	2,858	3,517	5,300	4,360	4,360	1,520	21,915.0
Private Sector						240	240.0
DIDECO						600	600.0
CEL						3,160	3,160.0
ORE/ADM	400	310	553	480	400	2,160	4,303.0
TOTAL	14,000	13,430	23,000	17,300	19,050.60	21,220	107,700.6

A - MINISTRY OF PUBLIC WORK

SUMMARY OF DIRECT COSTS (IN US$000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
A- PUBLIC WORK	-	-	-	-	-	-	-	-
A-1 ROADS AND HIGHWAYS	34.2	88.1	42.0	360.8	124.4	703.3	217.2	1,570.0
A-2 BRIDGES	-	482.1	27,160.4	3,665.0	7,270.4	10,340.0	-	48,917.9
A-3 D U A	10.2	154.8	33.3	138.7	86.4	-	59.2	482.6
A-4 C I G - Geotech.Invest.Center	-	62.0	23.7	0.2	-	3.1	12.6	101.6
A-5 I N G - Nation.Geo.Institution	-	28.8	23.2	14.4	-	-	-	66.4
A-6 PLANNING OFFICE	-	4.0	-	-	-	-	-	4.0
A-7 SPECIAL RESOURCE OFFICE	-	-	-	-	-	-	120.6	120.6
TOTAL	44.4	819.8	27,282.6	4,179.1	7,481.2	11,046.4	409.6	51,263.1

To the above should be added:

Further temporary bridge repair cost			¢ 11,100.000
Bridging material (Bailey) purchase and istallations...			¢ 9,375.000
			¢ 20,475.000
¢ 137,532.700 @ 2.5 : 1.-	Cost in US$	55,013.080	
¢ 11,100.000 @ 5.0 : 1.-	Cost in US$	2,220.000	
	Cost in US$	57,233.080	

A - MINISTRY OF PUBLIC WORK

A - 1 ROADS - DIRECT COSTS (IN US$)

DESCRIPTION	Year of Occurrence	Estimated Cost	Destruction Cost	Repair Cost	Final Cost	Estimated cost of Replacement
1. VEHICLES	1979		2,184	-	34,184	14,000
2. CONSTRUCTION EQUIPMENT			32,000	-		200,000
3. TOOLS			-	-		-
1. VEHICLES	1980		50,400	1,600	88,120	218,000
2. CONSTRUCTION EQUIPMENT			19,600	16,520		252,000
3. TOOLS			-	-		-
1. VEHICLES	1981		16,480	1,920	42,000	118,000
2. CONSTRUCTION EQUIPMENT			23,600	-		136,000
3. TOOLS			-	-		-
1. VEHICLES	1982		4,000	-	360,800	16,000
2. CONSTRUCTION EQUIPMENT			352,800	4,000		1,236,800
3. TOOLS			-	-		-
1. VEHICLES	1983		10,000	2,000	124,400	54,000
2. CONSTRUCTION EQUIPMENT			100,000	12,400		668,000
3. TOOLS			-	-		-
1. VEHICLES	1984		19,200	800	703,280	80,000
2. CONSTRUCTION EQUIPMENT			663,200	16,080		1,994,000
3. TOOLS			4,000	-		6,000
1. VEHICLES	1985		140,000	15,750	217,150	448,000
2. CONSTRUCTION EQUIPMENT			60,000	1,400		100,000
3. TOOLS			-	-		-
1. VEHICLES	TOTALS		242,264	22,070	1,569,934	5,540,800
2. CONSTRUCTION EQUIPMENT			1,251,200	50,400		
3. TOOLS			4,000	-		
	GRAND TOTAL		1,497,464	72,470		

This table is supported by tables A - 1.1 included in the support material.

A - MINISTRY OF PUBLIC WORK

A - 2 BRIDGES AND CULVERTS - DIRECT COSTS (IN US$000)

DESCRIPTION	Year of Occurrence	Estimated Cost	Destruction Cost	Repair Cost	Final Cost	Estimated cost of Replacement
BRIDGES AND CULVERTS	1979		NO ACTIVITY			
	1980		438.8	43.3	482.1	-
	1981		26,357.2	803.2	27,160.4	-
	1982		3,466.0	199.0	3,665.0	-
	1983		6,759.2	511.2	7,270.4	-
	1984		7,200.0	3,140.0	10,340.0	-
	1985		-	-	-	-
	TOTALS		44,221.2	4,696.7	48,917.9	-

This table is supported by tables A - 2.1 included in the support material.

A - MINISTRY OF PUBLIC WORK

A - 3 DUA - DIRECT COST (IN US$)

DESCRIPTION	Year of Occurrence	Estimated Cost	Destruction Cost	Repair Cost	Final Cost	Estimated cost of Replacement
1. VEHICLES	1979		10,200	-	10,200	-
2. CONSTRUCTION EQUIPMENT			-	-		-
3. TOOLS			-	-		-
1. VEHICLES	1980		98,858	-	154,856	-
2. CONSTRUCTION EQUIPMENT			7,600	38,720		-
3. TOOLS			9,678	-		-
1. VEHICLES	1981		15,360	-	33,318.8	-
2. CONSTRUCTION EQUIPMENT			3,640	-		-
3. TOOLS			14,318.8	-		-
1. VEHICLES	1982		69,734	-	138,682.4	-
2. CONSTRUCTION EQUIPMENT			3,640	-		-
3. TOOLS			65,308.4	-		-
1. VEHICLES	1983		40,500	-	86,398	-
2. CONSTRUCTION EQUIPMENT			34,680	-		-
3. TOOLS			11,218	-		-
1. VEHICLES	1984		-	-	-	-
2. CONSTRUCTION EQUIPMENT			-	-		-
3. TOOLS			-	-		-
1. VEHICLES	1985		-	-	59,200	-
2. CONSTRUCTION EQUIPMENT			59,200	-		-
3. TOOLS			-	-		-
1. VEHICLES	TOTALS		234,652	-	482,655.2	2,418,000
2. CONSTRUCTION EQUIPMENT			108,760	38,720		
3. TOOLS			100,523.2	-		

This table is supported by tables A -3 ,1 included in the support material.

A - MINISTRY OF PUBLIC WORK

A - 4 C I G - GEOTECHNICAL INVESTIGATION CENTER - DIRECT COSTS - (IN US$000)

DESCRIPTION	Year of occurrence	Estimated cost	Destruction cost	Repair cost	Final cost	Estimated cost of Replacement
1. VEHICLES 2. EQUIPMENT AND TOOLS	1 9 7 9		N O A C T I V I T Y			
1. VEHICLES 2. EQUIPMENT AND TOOLS	1 9 8 0	- 51.2	- 42.0	- 20.0	62.0	- 62.0
1. VEHICLES 2. EQUIPMENT AND TOOLS	1 9 8 1	23.6 8.0	17.7 6.0	- -	23.7	- 83.6
1. VEHICLES 2. EQUIPMENT AND TOOLS	1 9 8 2	- 0.1	- 0.2	- -	0.2	- 0.2
1. VEHICLES 2. EQUIPMENT AND TOOLS	1 9 8 3	- -	- -	- -	-	- -
1. VEHICLES 2. EQUIPMENT AND TOOLS	1 9 8 4	- 2.6	- 2.3	- 0.8	3.1	- 3.1
1. VEHICLES 2. EQUIPMENT AND TOOLS	1 9 8 5	- 10.6	- 12.6	- -	12.6	- 12.6
	T O T A L S	23.6 72.5	17.7 63.1	- 20.8	101.6	- 161.5

* This table is supported by tables A-4.1 included in the support material.

A - MINISTRY OF PUBLIC WORK

A - 5 ING - NATIONAL GEOGRAPHIC INSTITUTE - DIRECT COSTS (IN US$000)

DESCRIPTION	Year of Occurrence	Estimated Cost	Destruction Cost	Repair Cost	Final Cost	Estimated cost of Replacement
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1979		NO ACTIVITY			
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1980		28.8		28.8	72
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1981		23.2		23.2	56
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1982		14.4		14.4	36
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1983					
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1984					
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1985		40.0		40.0	128
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	TOTALS		106.4		106.4	292

This table is supported by tables A -5 .1 included in the support material.

A - MINISTRY OF PUBLIC WORK

A - 7 SPECIAL RESOURCE OFFICE - DIRECT COST - (IN US$000)

DESCRIPTION	Year of Occurrence	Estimated Cost	Destruction Cost	Repair Cost	Final Cost	Estimated cost of Replacement		
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1 9 7 9							
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1 9 8 0							
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1 9 8 1							
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1 9 8 2							
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1 9 8 3							
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1 9 8 4							
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	1 9 8 5	96,560 24,000	96,000 24,000	560	120,560	128,000		
1. VEHICLES 2. CONSTRUCTION EQUIPMENT 3. TOOLS	T O T A L S	120,560	120,000	560	120,560	128,000		

This table is supported by tables A - 7.1 included in the support material.

2A - MINISTRY OF PUBLIC WORK

SUMMARY OF INDIRECT COST OF DAMAGES TO INSTALLATIONS OF THE M O P

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
2A - 1 EQUIPMENT SERVICE LOSS	-	38,734	77,552	108,232	202,451	233,399	373,679	1,034,107
2A - 2 BUDGETARY DIFFERENCE	(1,636,000)	12,108,000	17,312,000	36,736,000	51,164,000	61,972,000	66,324,000	243,980,000
2A - 3 INDEMNITIES	-	47,680	69,680	13,840	12,000	2,080	1,360	146,640
TOTAL	(1,636,000)	12,194,414	17,459,232	36,858,132	51,378,451	62,207,479	66,699,039	245,160,747

* These tables are supported by tables 2A - 1, 2A - 2 (chart) and 2A - 3.

2A - 1 MINISTRY OF PUBLIC WORK - EQUIPMENT SERVICE LOSS SUMMARY

DESCRIPTION	1980	1981	1982	1983	1984	1985	TOTAL
A-1 DGC - (HIGHWAYS)							
1 - VEHICLES	14,836.8	26,532.8	47,332.8	79,972.8	94,132.8	103,252.8	366,060.8
2 - EQUIPMENT	-	-	-	42,240.0	49,840.0	155,440.0	247,520.0
A-2 BRIDGES							
1 - VEHICLES	-	-	-	-	-	-	-
2 - EQUIPMENT	-	-	-	-	-	-	-
A-3 DUA (URBAN DEVELOPMENT)							
1 - VEHICLES	9,737.6	24,883.6	31,502.8	43,118.4	46,930.4	46,930.4	203,103.2
2 - EQUIPMENT	-	1,848.0	2,248.0	9,912.0	9,912.0	21,752.0	45,672.0
A-4 CIG							
1 - VEHICLES	-	3,536.0	3,536.0	3,536.0	3,536.0	3,536.0	17,680.0
2 - EQUIPMENT	8,400.0	9,600.0	9,640.0	9,640.0	10,104.0	12,624.0	60,008.0
A-5 I N G (NATION.GEO.INSTITUTION)							
1 - VEHICLES	5,760	10,400.0	13,280.0	13,280.0	13,280.0	13,280.0	69,280.0
2 - EQUIPMENT	-	-	-	-	-	-	-
A-6 PLANNING DIRECTORATE							
1 - VEHICLES	-	752.0	752.0	752.0	752.0	752.0	3,760.0
2 - EQUIPMENT	-	-	-	-	-	-	-
A-7 SPECIAL RESOURCES OFFICE							
1 - VEHICLES	-	-	-	-	2,512.0	13,712.0	16,224.0
2 - EQUIPMENT	-	-	-	-	2,400.0	2,400.0	4,800.0
TOTAL	38,734.4	77,552.4	108,291.6	202,451.2	233,399.2	373,679.2	1,034,108.0

This table is supported by table 2A - 1.1

A - MINISTRY OF PUBLIC WORK

2A - 3 INDEMNITIES - BASED $80 OF MONTHLY INDEMNIZATION

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. HIGHWAYS	-	16,960	41,520	10,400	7,440	2,080	1,360	79,760
2. NATIONAL GEOGRAPHIC INSTITUTION	-	25,520	19,520	3,440	4,560	-	-	53,040
3. GEOTECHNICAL INVESTIGATION CEN.	-	-	4,160	-	-	-	-	4,160
4. PLANNING	-	5,200	-	-	-	-	-	5,200
5. D U A	-	-	4,480	-	-	-	-	4,480
TOTAL	-	47,680	69,680	13,840	12,000	2,080	1,360	146,640

* This table is supported by tables 2A - 3.1 included in the support material

TABLE RR I

SUMMARY OF DIRECT COSTS OF DAMAGES TO INSTALLATION OF RAILWAYS OF EL SALVADOR (IN US$000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
LOCOMOTIVES DESTROYED		1,500.0	750.0	-	-	750.0	-	3,000.0
WAGONS AND COACHES DESTROYED		-	-	180.0	280.0	560.0	-	1,020.0
OTHER EQUIPMENT DESTROYED		84.8	24.4	215.6	90.4	32.0	-	447.2
LOCOMOTIVES DAMAGED		532.4	1,327.2	1,378.8	1,088.0	1,265.2	71.2	5,662.8
WAGONS DAMAGED		195.6	350.4	660.4	276.4	303.2	161.6	1,947.6
OTHER EQUIPMENT DAMAGED		-	28.4	13.6	23.2	-	11.2	76.4
RERAILING COST		18.8	37.6	56.8	16.0	26.8	24.4	180.4
TRACK REPAIR COST		-	-	19.6	5.2	11.6	7.6	44.0
BRIDGES DAMAGED		247.2	-	195.2	500.4	28.4	-	971.2
STATIONS DAMAGED		2.4	8.0	34.0	4.0	-	-	48.4
TRACK EQUIPMENT DAMAGED		1.2	61.2	6.0	4.8	-	3.2	76.4
TELEPHONE AND TELEGRAPH DAMAGED		-	49.2	140.8	46.4	40.8	-	277.2
TOTAL		2,582.4	2,636.4	2,900.8	2,334.8	3,018.0	279.2	13,751.6

TABLE RR II

SUMMARY OF INDIRECT COSTS OR LOSSES INCURRED BY RAILWAY AND REFLECTED IN FINANCIAL RECORDS (IN US$000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
SECURITY COSTS								
TRACK INSPECTION BEFORE TRAINS		-	16.4	22.8	28.8	40.8	34.0	142.8
LOCOMOTIVE PROTECTION		-	-	31.6	-	-	-	31.6
WAGON PROTECTION		-	-	18.8	-	-	-	18.8
BRIDGE LIGHTING		-	-	-	-	188.4	125.2	313.6
SECURITY COORDINATION (1)		0.8	21.2	40.0	51.6	52.4	2.8	168.8
MECANICS ON TRAIN		-	-	-	-	-	20.0	20.0
INSTALLATIONS OF RADIOS (2)		-	-	-	-	-	250.0	250.0
LOST CONTRIBUTION TO OVERHEAD		362.4	1,338.0	1,193.2	108.8	76.0	8.4	3,086.8
TOTAL		363.2	1,375.6	1,306.4	189.2	357.6	440.4	4,032.4

(1) Coordination with army.

(2) Radios will not be installed until 1986. Other indirect costs already incurred in 1986 include bridges lighting $13,600, and security coordination $ 400.

TABLE RR III

SUMMARY OF INDIRECT COSTS OR LOSSES INCURRED BY RAILROAD NOT REFLECTED IN FINANCIAL RECORDS (IN US$000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
DEFERRED MAINTENANCE								
TRACK	–	–	68.4	26.4	224.8	124.4	182.4	626.4
LOCOMOTIVES	–	132.0	367.2	352.0	270.4	316.8	177.2	1,615.6
WAGONS	–	220.4	349.6	749.2	296.8	339.2	238.8	2,194.0
OTHER EQUIPMENT	–	–	12.4	6.0	10.4	–	4.8	33.6
CUTUCO PORT	–	–	60.0	60.0	60.0	60.0	80.0	320.0
TOTAL	–	352.4	857.6	1,193.6	862.4	840.4	683.2	4,789.6
DEFERRED INVESTMENT								
LOCOMOTIVES	Plans had been formulated in 1980 for these investment. They were iether cancelled or posponed. The effect of these investments on the economics of the railway would be very difficult to determine with a reasonable degree of accuracy.							
WAGONS								
CONTAINER HANDLING EQUIPMENT								
MATERIAL HANDLING EQUIPMENT								

TABLE RR IV

SUMMARY OF COSTS SUFFERED BY RAILWAY CUSTOMERS OR BY ECONOMY AS A WHOLE (IN US$ 000)

DESCRIPTION	1979	1980	1981	1982	1983	1984	1985	TOTAL
DAMAGE TO CARGO (1)		649.2	1,136.8	1,013.6	401.6	846.0	25.2	4,072.4
INCREASE TRANSPORTATION COST								
FREIGHT (2)		70.4	193.5	158.0	78.4	113.6	76.4	690.4
PASSENGER (3)		2.0	53.6	86.4	94.4	91.2	90.8	418.4
INCREASED SUBSIDY		614.4	1,964.8	1,833.6	1,026.0	1,424.0	1,227.6	8,090.4
TOTAL		1,336.0	3,348.8	3,091.6	1,600.4	2,474.8	1,420.0	13,271.6

(1) While normally cotton is insured, it, as well as all other products, is not insured for acts of violence.
(2) This is based on a 0.03¢ difference in cost between similar service for trucks and train, the actual figure is probably considerably more than this since if there is danger the truck freight tarrif can be four times the normal tarrif.
(3) Approximately 85% of the passangers km have been transfered to the highway, the bus is about 1 cent/km more expensive, but if there is danger the buses charge 3 or 4 times the normal fare.

TABLE No.3A-1

TPDA (DIARY ANNUAL TRAFFIC AVERAGE) 1985

PANAMERICAN ROADS			LITORAL ROADS		
TYPE OF TRAFFIC	No. OF VEHICLES	TRAFFIC %	TYPE OF TRAFFIC	No. OF VEHICLE	TRAFFIC %
LIGHT-PASSENGERS	1498	23	LIGHT-PASSENGERS	1161	50
LIGHT-LOAD	1953	30	LIGHT-LOAD	780	31
HEAVY-PASSENGERS	1693	26	HEAVY-PASSENGRES	116	5
HEAVY-LOAD	1367	21	HEAVY-LOAD	325	14
TOTAL	6511	100	TOTAL	2322	100
* HEAVY TRAFFIC DISTRIBUTION			* HEAVY TRAFFIC DISTRIBUTION		
LOAD C2	1285	94	LOAD C2	283	87
LOAD C3	41	3	LOAD C3	16	5
T3 S2	27	2	T3 S2	26	8
OTHERS	14	1	OTHERS	-	0
TOTAL	1367	100	TOTAL	325	100

* These values are porcentages of heavy load traffic

TABLE No.3A-2

DIFFERED MAINTENANCE COST - ROADS AND HIGHWAYS

	TOTAL LENGTH Kms	COST/Km $	TOTAL COST (000)	LIFE OF USE YEARS	LIFE COST 1 YEAR (000)	MAINT. COST 5 YEARS (000)
SPECIAL ROADS	107.24	1,014,192.8	108,476.4	25	4,339.2	21,695.2
PRIMARY ROADS	577.70	507,096.4	292,949.6	25	11,718.0	58,590.0
SECONDARY ROADS	1020.32	456,223.2	465,493.6	25	18,619.6	93,098.8
TERTIARY ROADS	1678.27	15,707.2	26,360.8	20	1,318.0	6,590.4
RURAL "A" ROADS	1742,37	13,089.2	22,806.4	20	1,140.4	5,701.6
RURAL "B" ROADS	4342.63	11,780.4	51,158.0	20	2,558.0	12,789.2
LOCAL ROADS	2695.00	4,436.0	11,955.2	20	597.6	2,988.8
T O T A L S	12163.53		979,200.0		40,290.8	201,454.0

TABLE 3 A-3

LENGTH OF ROAD NETWORK OF EL SALVADOR BY DEPARTMENT ACCORDING TO CLASSIFICATION - 1985

DEPARTMENT	TOTAL KM	SPECIAL (A)	PRIMARY (B)	SECONDARY (C)	TERTIARY (D)	RURAL "A" (E)	RURAL "B" (F)	LOCAL ROADS (G)
1. AHUACHAPAN	976.91	-	39.16	41.20	150.35	130.00	346.00	270.20
2. SANTA ANA	1,145.39	24.79	59.90	104.26	52.14	176.80	360.00	367.50
3. SONSONATE	879.22	-	87.80	72.30	97.82	91.00	210.40	319.90
4. LA LIBERTAD	876.35	35.00	104.00	38.00	172.00	89.40	184.45	253.50
5. CHALATENANGO	1,014.36	-	37.00	59.80	100.56	199.20	348.60	269.20
6. SAN SALVADOR	638.85	27.40	-	129.10	62.15	81.70	255.10	83.40
7. CUSCATLAN	732.42	-	-	51.70	83.65	79.43	377.33	140.31
8. CABANAS	844.28	-	-	42.52	177.66	82.9	364.80	236.40
9. SAN VICENTE	633.90	-	14.4	82.55	154.40	76.65	184.50	121.40
10. LA PAZ	967.81	20.05	36.00	70.42	124.24	130.60	494.60	91.90
11. USULUTAN	1,065.70	-	42.00	113.40	154.30	194.00	384.70	177.30
12. SAN MIGUEL	925.24	-	42.34	137.07	110.30	320.69	270.20	44.64
13. MORAZAN	519.80	-	14.00	58.20	125.50	22.90	230.85	68.35
14. LA UNION	943.30	-	101.10	19.80	173.20	67.10	331.1	251.00
TOTAL Kms.	12,163.53	107.24	577.70	1,020.32	1,678.27	1,742.37	4,342.63	2,695.00