

P.N. AAY-124

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VOLUME I

"PUBLIC SERVICES INFRASTRUCTURE
DAMAGE ASSESSMENT REPORT"

Under Contract No. PDC-1096-I-04-4163-00
Work Order No. 4

DEVELOPMENT ASSOCIATES, INC.

MANAGEMENT AND GOVERNMENTAL CONSULTANTS

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VOLUME II - A Review of the Viability
of the El Salvador Railway

(Submitted under Separate Cover)

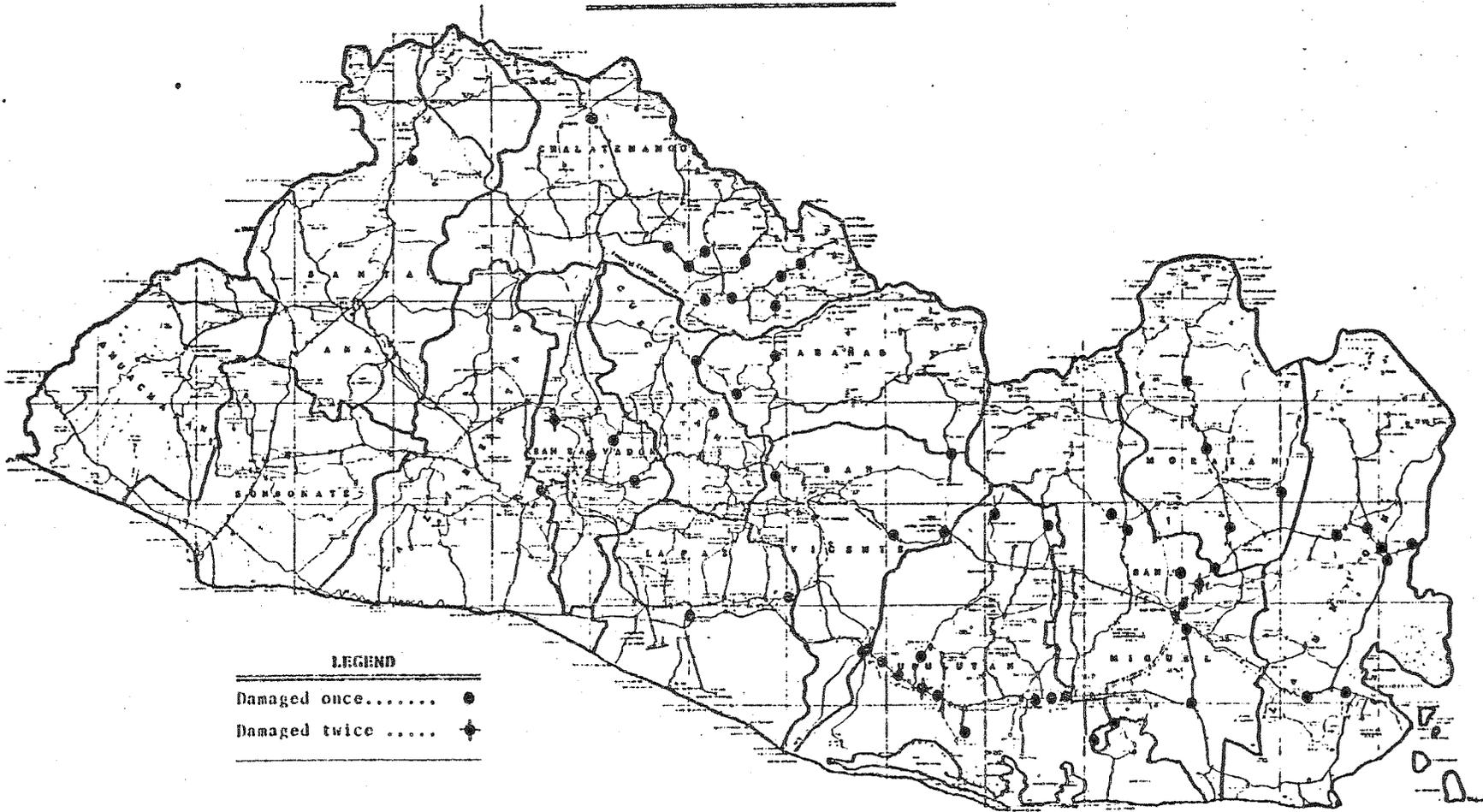
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INFRASTRUCTURE DAMAGE SITES



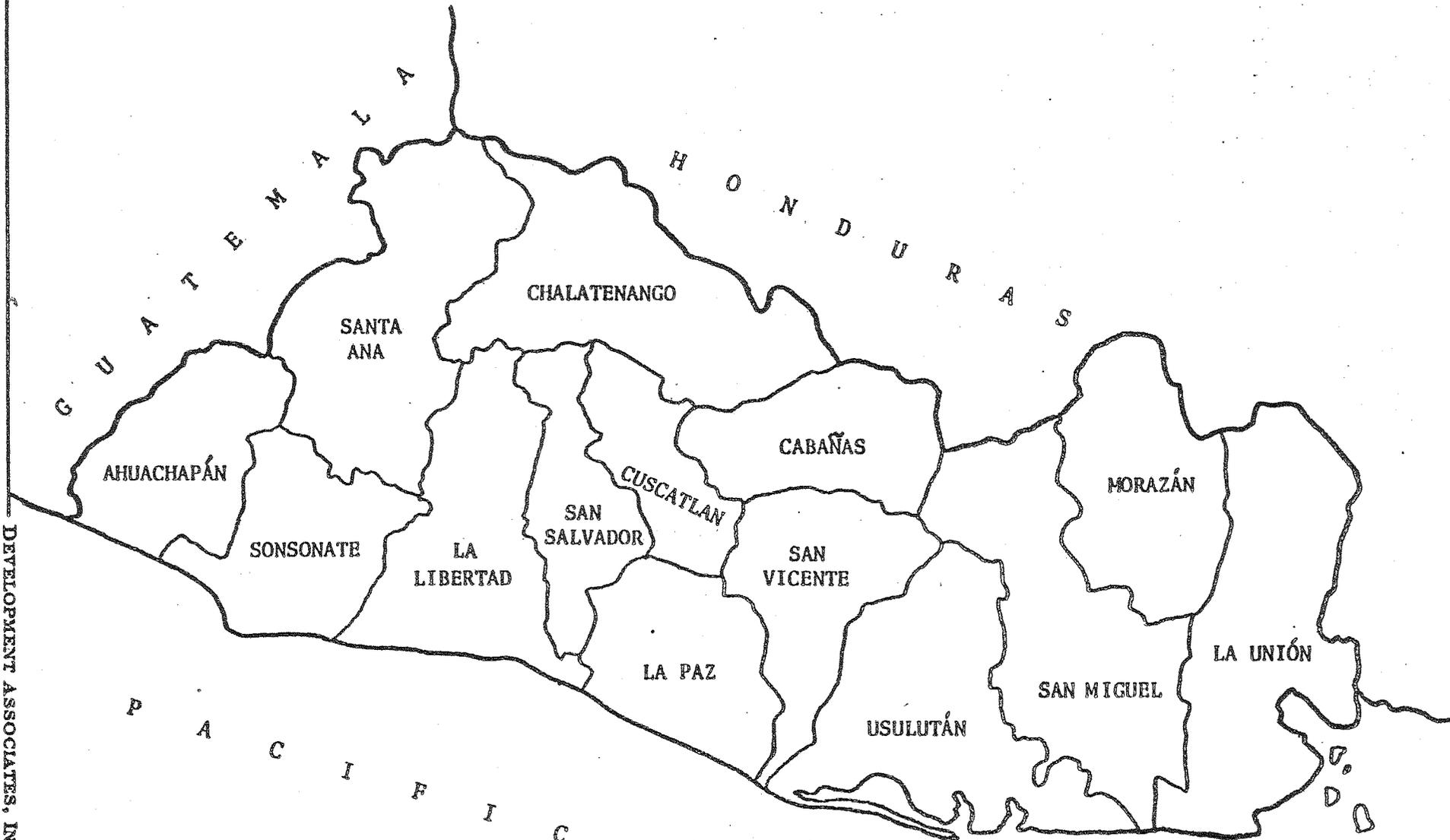
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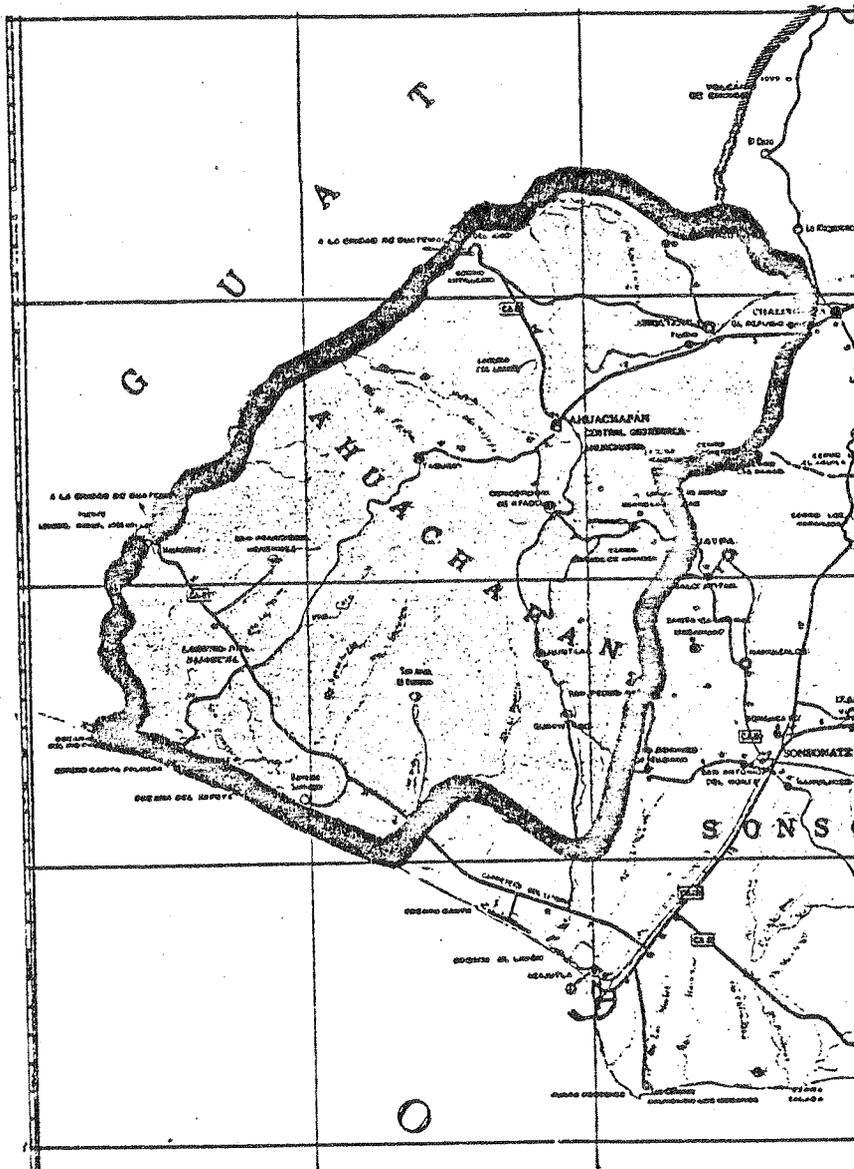
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EL SALVADOR'S 14 "DEPARTAMENTOS"



DEVELOPMENT ASSOCIATES, INC.

AHUACHAPÁN



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EXPLICACION

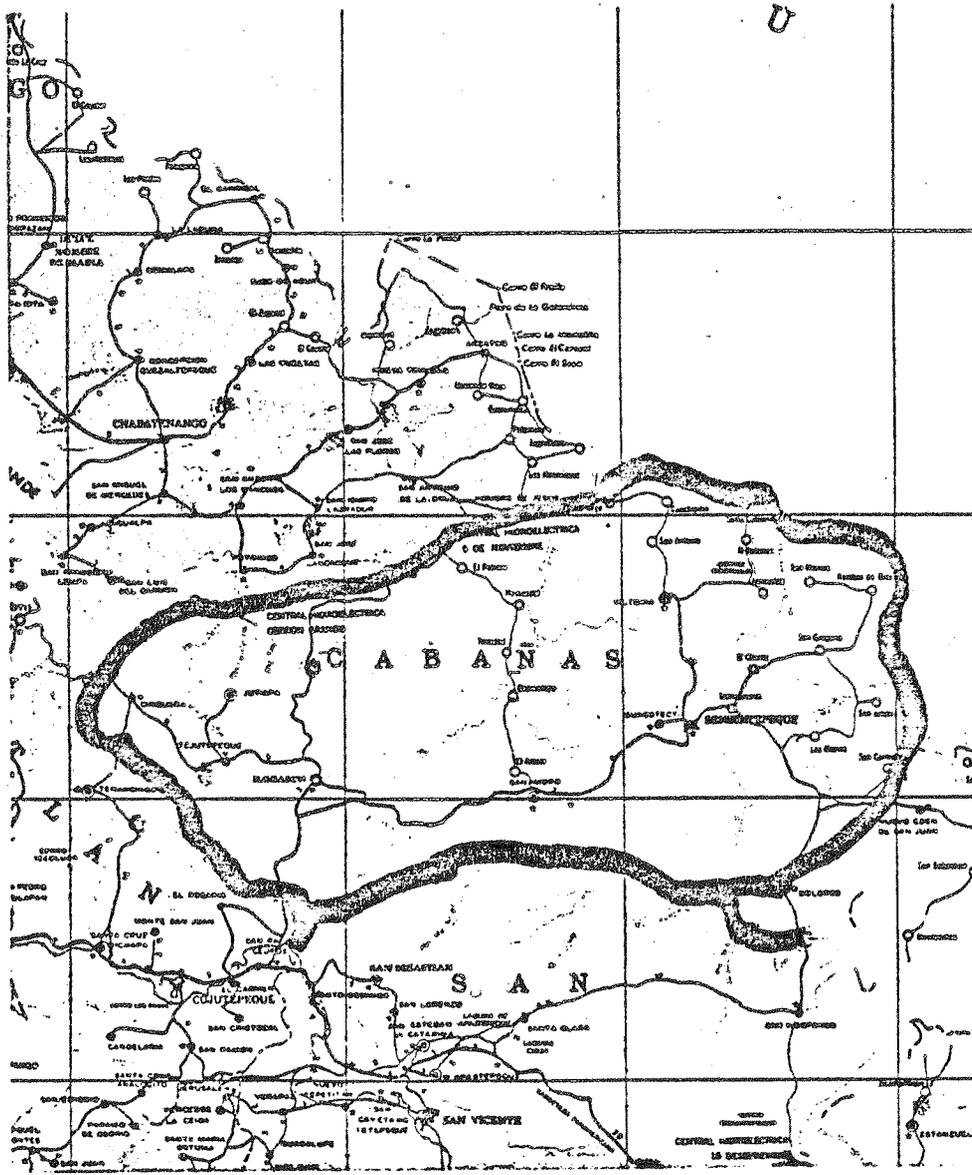
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VISTAS PERMANENTES
 CIUDADES DESTRUIDAS
 COMUNIDADES DE TIERRA ANCIANAS
 CAMINOS DE CERCA
 FERRUCIAS INFORMACIONALES
 LINEAS DE DEPARTAMENTOS
 PUERTOS, PUESTOS DE APERIBAZAJE



CABAÑAS



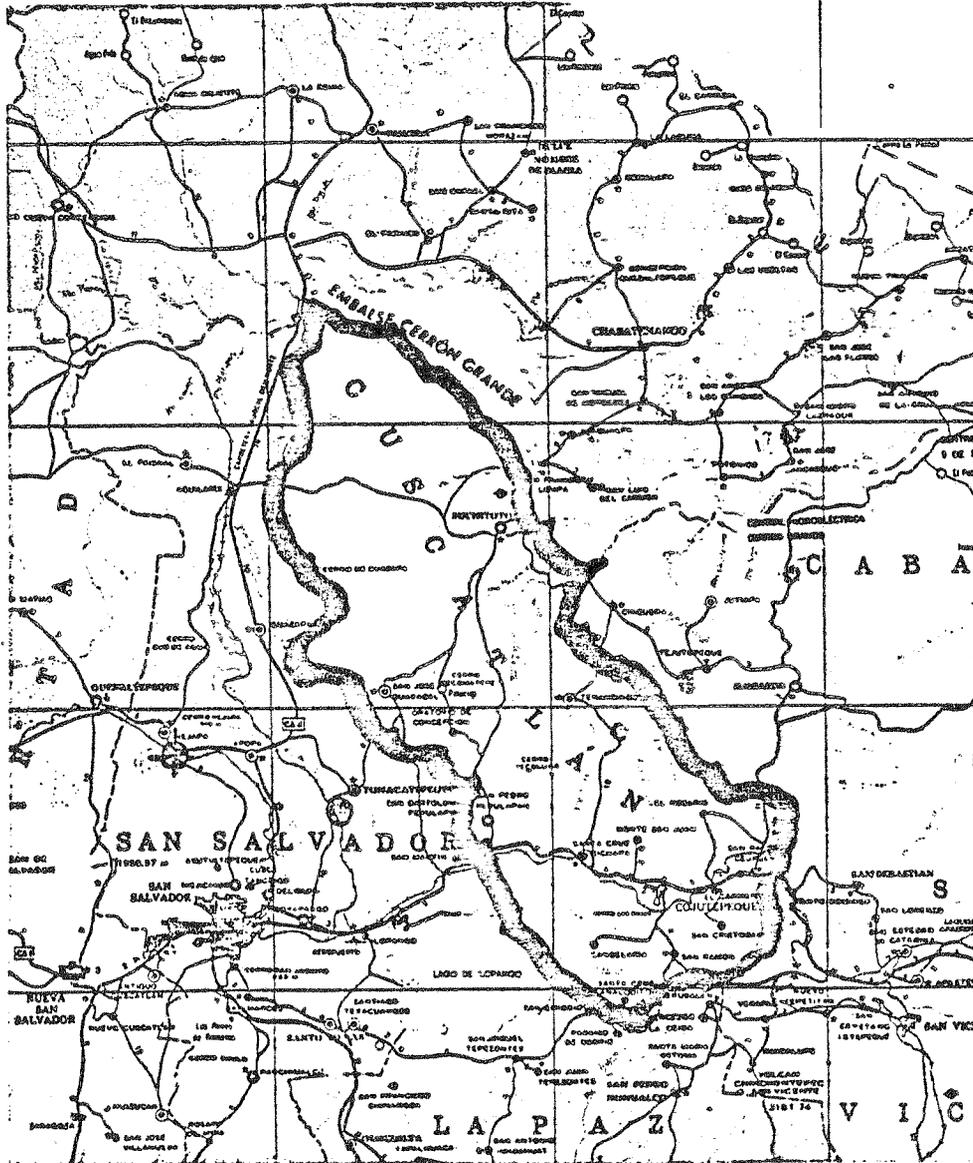
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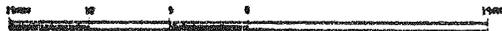
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CUSCATLAN



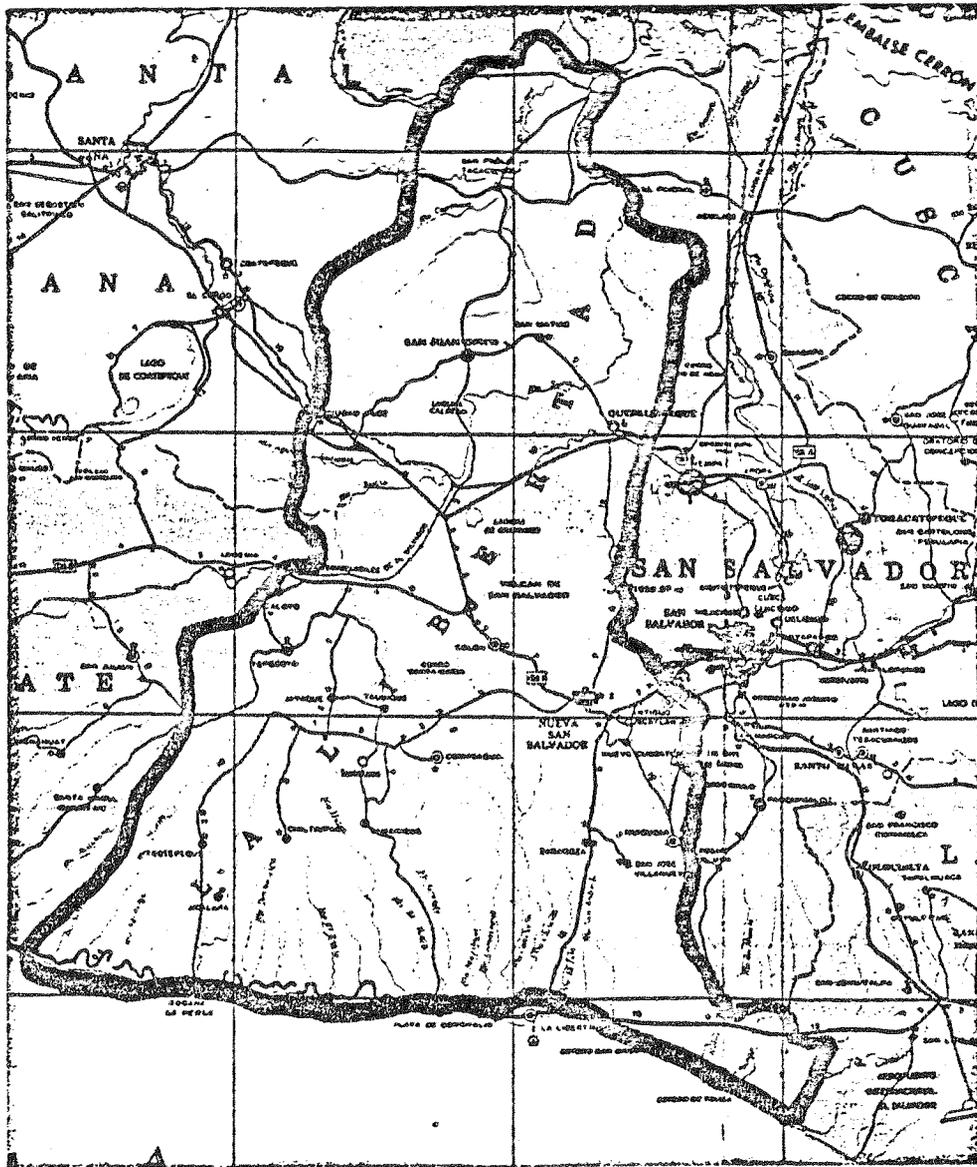
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DE BARRIO A BARRIO		CANALIZACIONES VERTICALES	
DE BARRIO A BARRIO		PROYECTOS DE CONSTRUCCION	
DE BARRIO A BARRIO		LINEAS DE TRANSMISION	
DE BARRIO A BARRIO		PUNTO DE OBSERVACION	

LA LIBERTAD



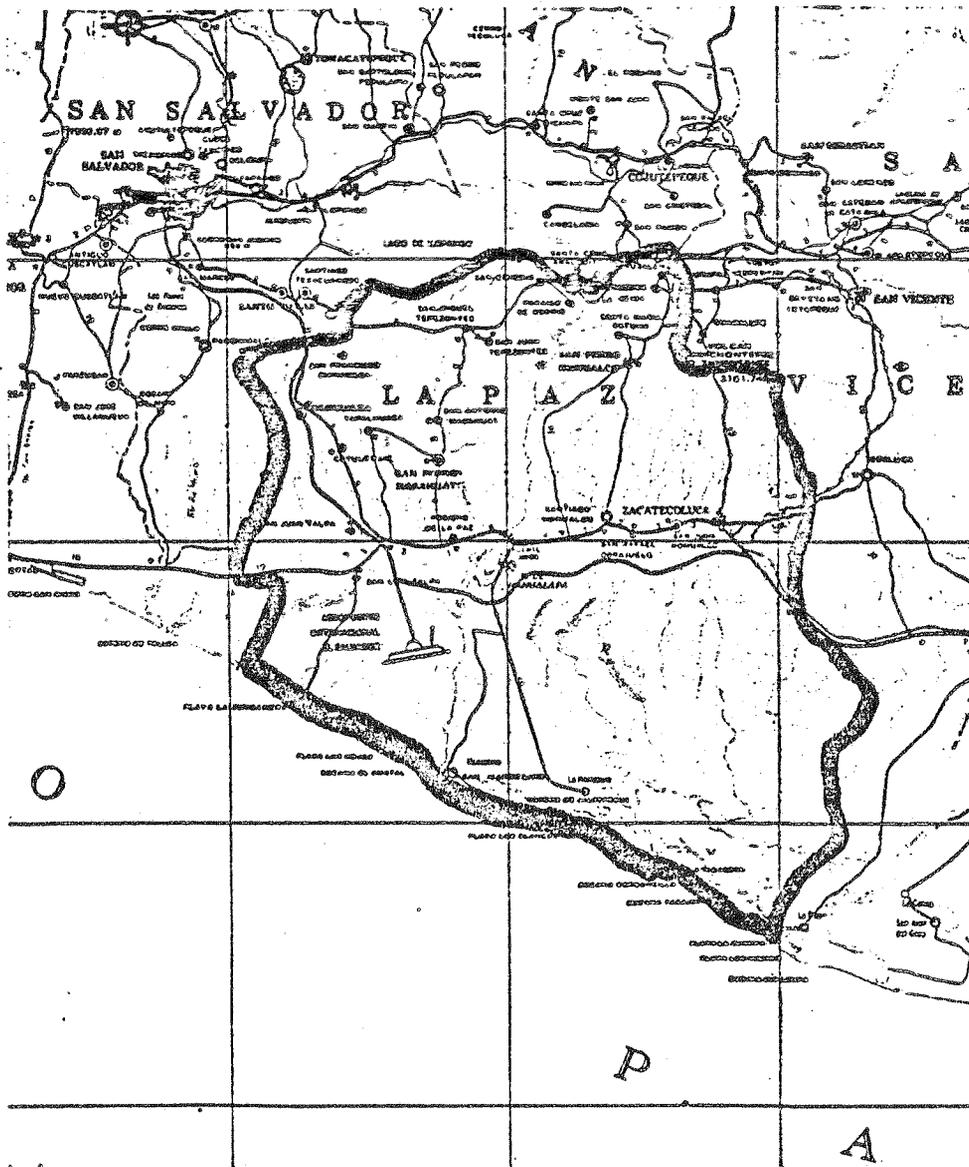
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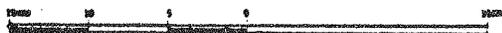
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LA PAZ



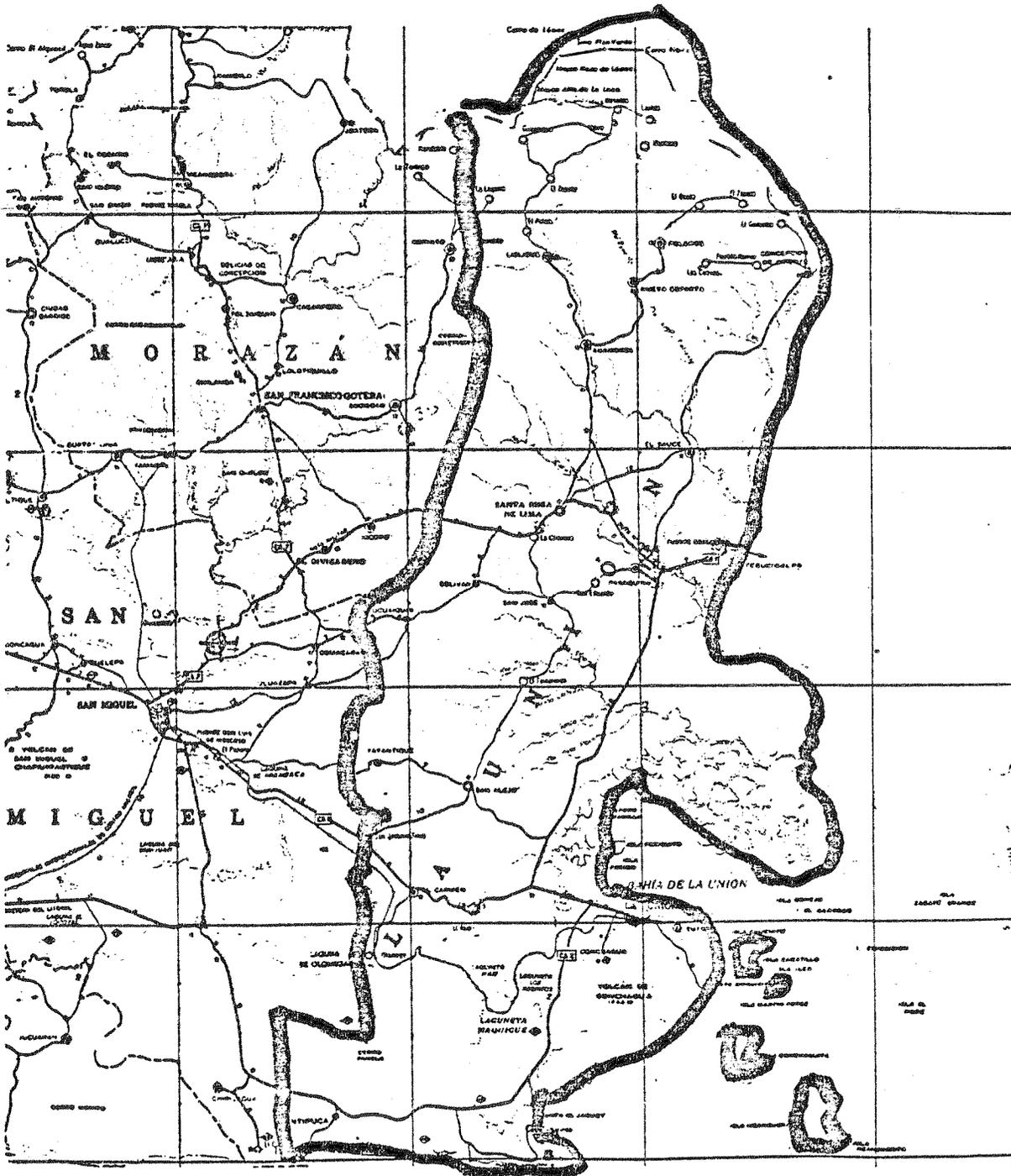
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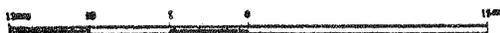
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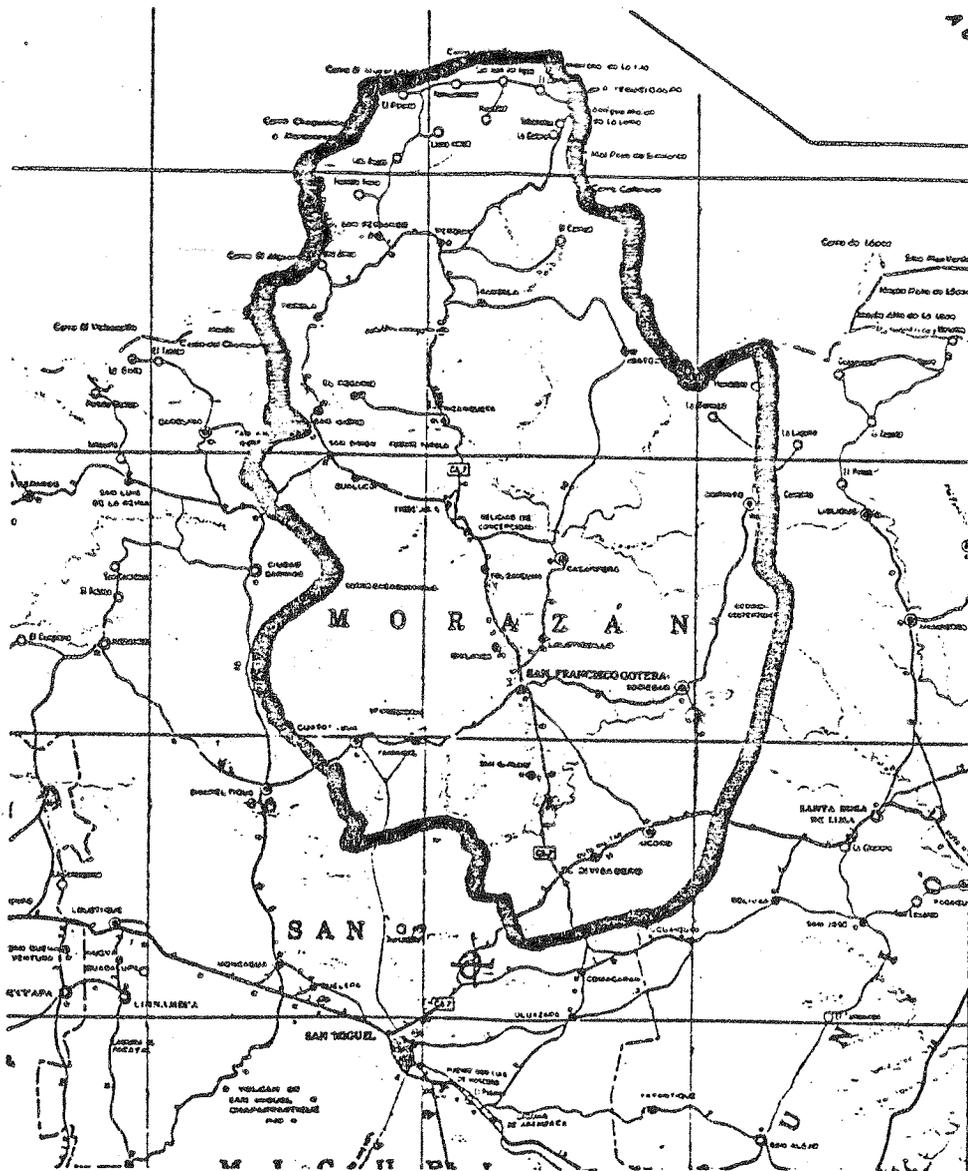
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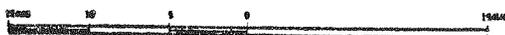
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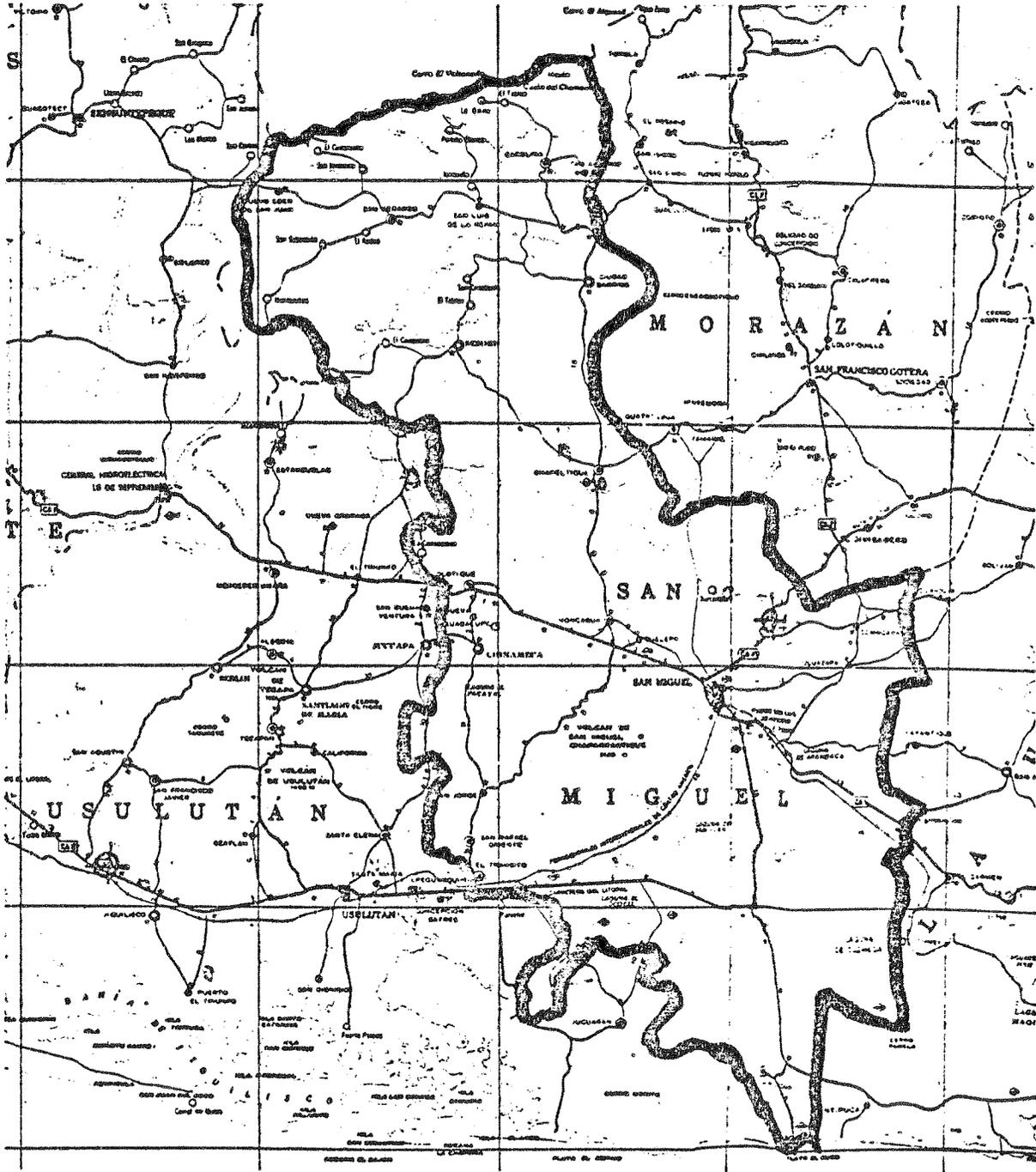
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EXPLICACION

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DE 10000 A 20000 HABITANTES		CANALES VEGETALES	
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DE 1000 A 5000 HABITANTES		LIMITE DE DEPARTAMENTOS	
DE MENOS DE 1000 HABITANTES		QUEBRAS NOTAS DE OPERACION	

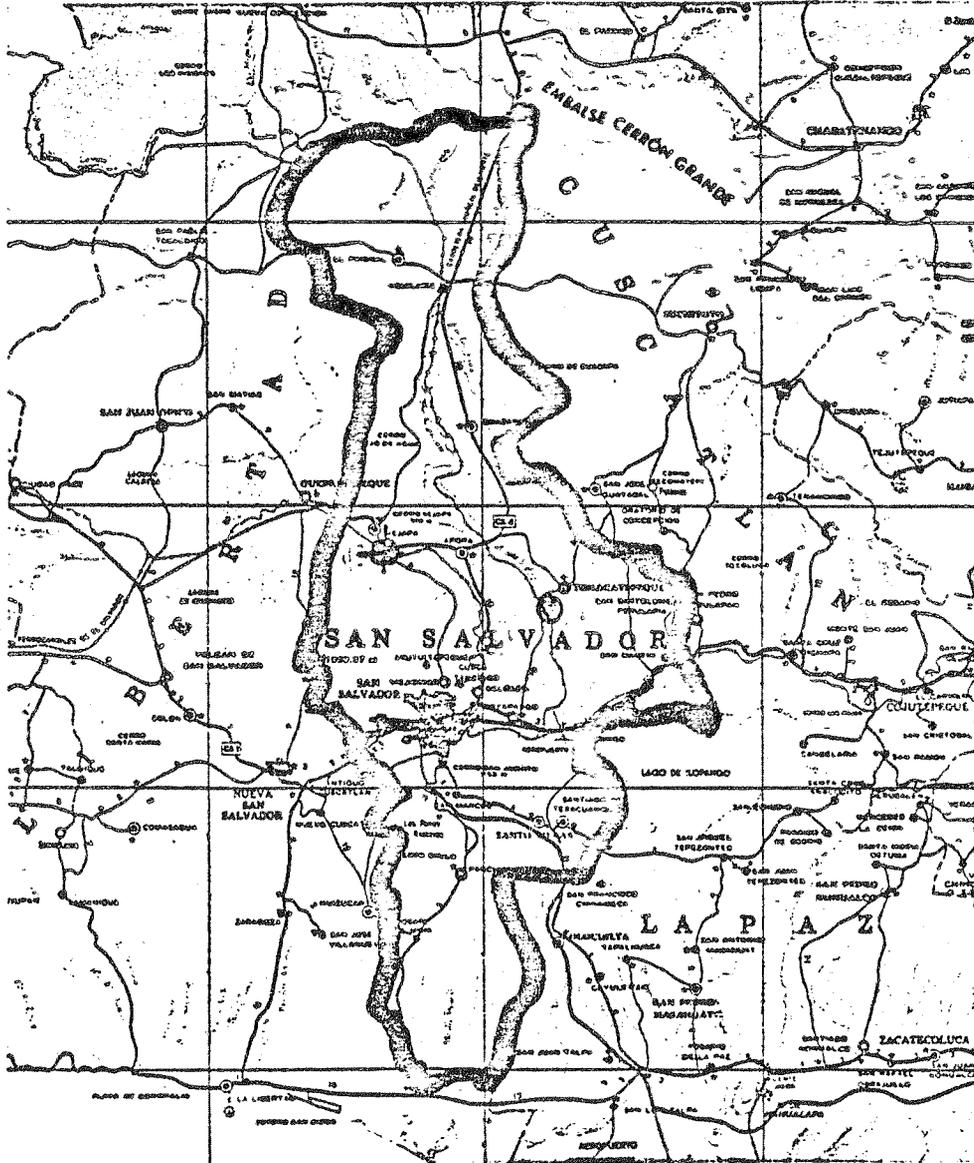
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SAN SALVADOR



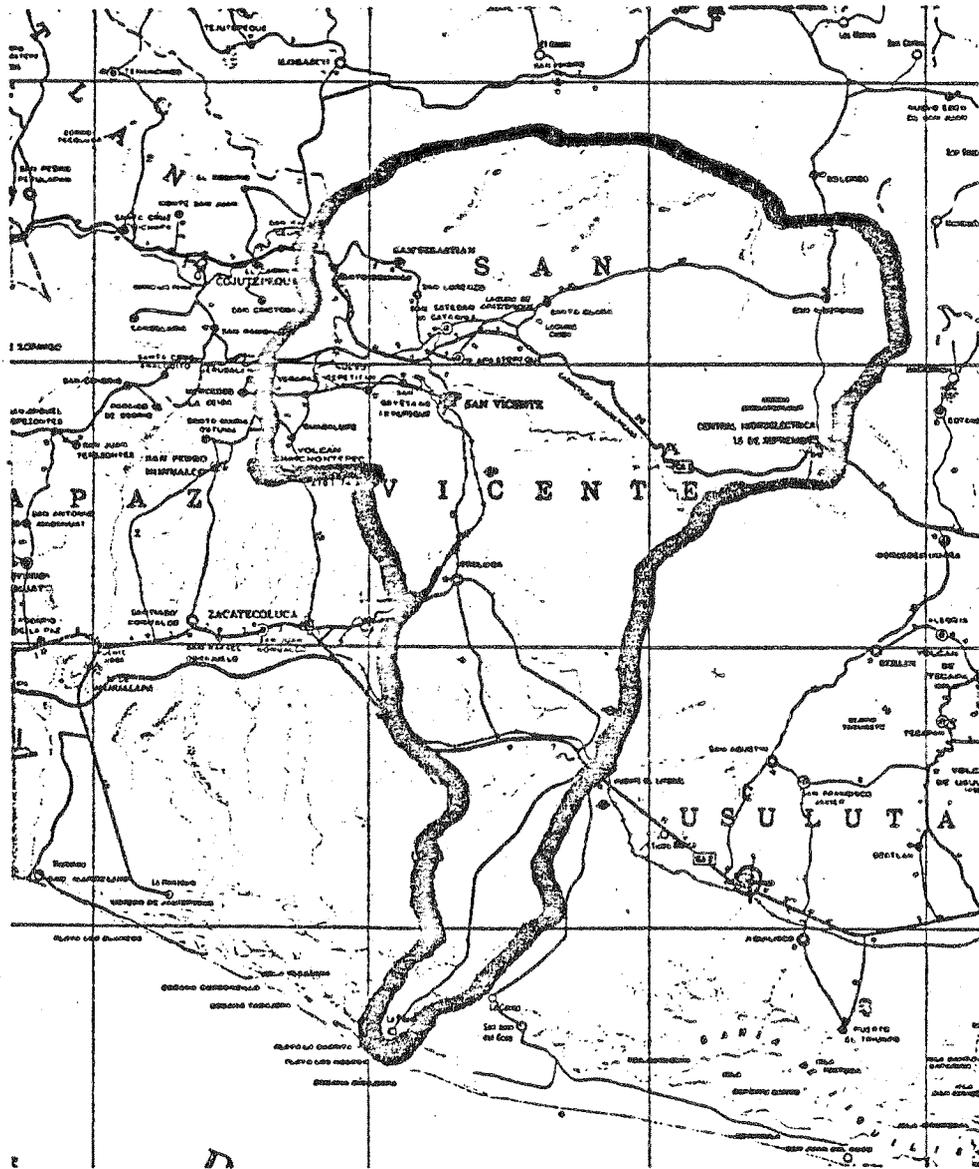
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EXPLICACION

CAPITAL DE LA REPUBLICA		CORRECCIONES ADMINISTRATIVAS	
CANCCIONES DEPARTAMENTALES		CORRECCIONES GOBIERNOS	
DE FERRO O CARRIL ANTIQUO		CORRECCIONES DE TERRENO ANILLADO	
DE FERRO A VAGONES ANTIQUOS		LACUNAS VIEJAS	
DE FERRO A VAGONES ANTIQUOS		PREVISIONES ANTICICLONICAS	
DE FERRO A VAGONES ANTIQUOS		LIMITE DE DEPARTAMENTOS	
DE FERRO DE VAGONES ANTIQUOS		CUATRO PUESTOS DE ATERRIZAJE	

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EXPLICACION

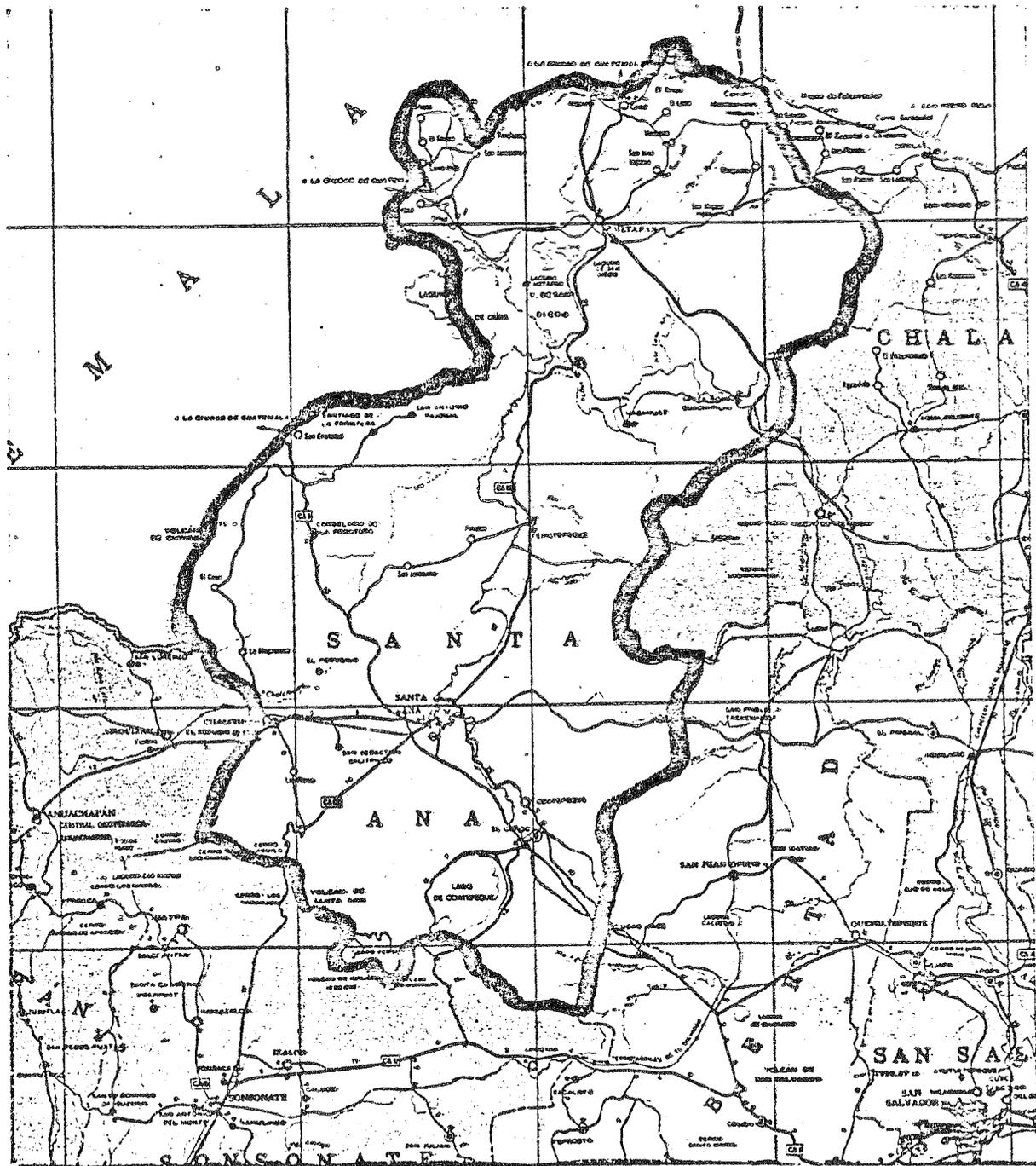
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- CABECERA DEPARTAMENTALES
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- DE 2000 A 5000 HABITANTES
- DE 500 A 2000 HABITANTES
- DE 100 A 500 HABITANTES
- DE MENOS DE 100 HABITANTES



- LINEAS FERROVIARIAS
- CARRETERAS DE VERANO
- CARRETERAS DE TIEMPO COMPLETO
- CARRILES VECIALES
- PROYECTOS ANUNCIADOS
- LINEA DE DEPARTAMENTOS
- PUERTOS PUERTOS DE ATERRIZAJE



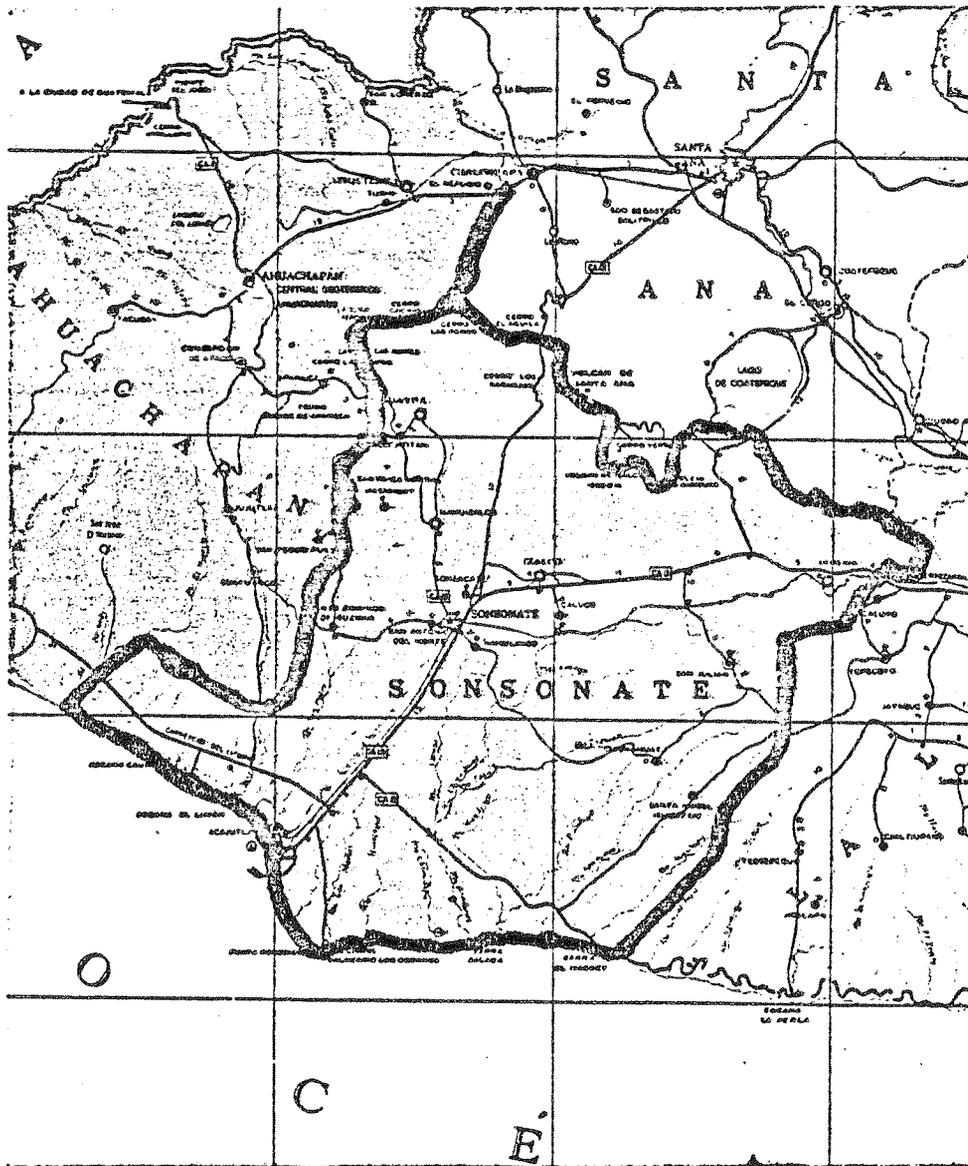
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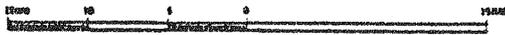
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EXPLICACION

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I. INTRODUCTION

A. History and Current Status

The economic life of El Salvador has been characterized since 1979 by political violence including an organized armed insurgency with a clearly defined strategy of economic and social disruption. While insurgent strategy has also included military and political objectives, including denial of central authority access to extensive areas of the country, the economic infrastructure has suffered most heavily and this damage is the subject of this report. The insurgent strategy has been effective; the disruption of electric power service, telecommunications, water and sanitary services, road and rail transport has reduced production, investment and consumption and badly damaged entrepreneur and investor confidence. Although other factors have been at work, the atmosphere and actuality of insurgent violence was largely responsible for the 25% drop in national output sustained between 1979 and 1985.

Sabotage and damage to the public service institutions has not followed a consistent pattern. Violence directed at the electric power net peaked in 1984, attacks on water distribution systems were at their highest two and three years earlier. Similarly, damage to the road net mostly occurred before 1984 with the exception of one of the major bridges. The telecommunications system suffered major attacks on a relay station in 1985 and an earth-satellite station in San Julian, Izalco, was attacked and damaged in 1983. Since then it has suffered numerous and costly attacks on smaller installations, urban and rural. Attacks on certain installations, high tension electric transmission lines, for example, are from the guerrilla point of view highly cost-effective. They provide maximum disruption at minimum cost or risk. It has been suggested that, as the Government authorities establish military superiority over the guerrilla forces, the level of violence directed against public services will decline. The authors of this report do not share this opinion. There may be some shift in specific targets, but attacks will continue and cause severe problems of maintenance of service and repair and operating costs to the various agencies, especially electric power.

-2-

Despite the destruction of high tension electrical transmission towers, of highway and railroad rolling stock, of highway transport equipment and of all sorts of installations, the systems continue to function and disruptions are at low levels. But the cost to the public service agencies has been high. Even with extensive help from the Agency for International Development financial resources of the public service companies, except ANEP have been reduced to almost nothing. The budget resources of the Ministry of Public Works are inadequate to meet any but emergency needs. The urgency and need for full-scale reconstruction, repair and extension will develop as guerrilla violence is reduced, but the public services do not and will not have the resources needed to undertake this task; they will require massive assistance.

B. Analytical Concept of the Survey

This survey is based on administrative and financial concept that public utilities require a certain income, at established tariffs, sufficient to cover the costs of providing the public service, to provide a return of capital and to establish reserves for expansion and improvement of service.

Destruction of infrastructure can only be paid for (if not insured) by the depletion of reserves; reserves can only be re-established by increased earnings. In Colombia, if the company has to spend its cash on replacing destroyed infrastructure, it will soon be unable to maintain service at existing levels and meet any new demands. At first glance, the costs encountered by a company suffering destruction are the costs of repairing the damage or replacing the item. This would be true of a single incident or accident although it would have to be considered including lost revenues or increased costs during the time required to make the repair. This is not true if a service agency suffers a series of damages over an extended period. These damages become increasingly important, and the agency's ability to meet emergency demands is progressively weakened.

The basic documents which report are the tables showing the direct cost of damages sustained and tables which show the indirect costs. These are the costs which directly affect the income and outgo of the companies and hence their financial ability to respond to civil violence.

The damage sustained ~~in the past~~ has resulted in the deferral of planned investment. ~~Such an investment~~ would have resulted in increased revenues, ~~and savings~~. Appropriately planned investment is designed to ~~maintain the~~ financial position of a firm; deferral of the investment ~~is a result of~~ the deferral of investment is a significant element ~~of the structure~~ of an institution or agency, it is described in this report.

This report makes an ~~attempt~~ ~~to~~ ~~complete~~ to evaluate the cost of interruptions in public ~~services~~ of the service, especially the private industrial sector ~~to~~ ~~indicate~~ of what would be the cost to the economy if it were ~~to~~ ~~maintain~~ services at an adequate level.

Finally, the public ~~will~~ ~~eventually~~ ~~have~~ the opportunity to repair and rebuild. ~~There is~~ ~~no~~ ~~doubt~~ for the future will be higher and resources lower as a result of violence. The report shows this.

In sum, the purpose ~~of the report~~ ~~is~~ ~~to~~ ~~show~~ how much it has cost the public service agencies to maintain ~~levels~~ of service despite the continuing guerrilla attack on infrastructure and personnel. In the case of the railroad, the report ~~gives~~ ~~an~~ ~~idea~~ of whether the cost of maintaining rail service is justified. ~~The~~ ~~Ministry~~ of Public Works, especially the Highway Department, ~~has~~ ~~been~~ ~~used~~, fiscal rather than financial, but the end ~~is~~ ~~the~~ ~~interests~~ of maintaining services are related to the availability.

II. EXECUTIVE SUMMARY

A. Direct Costs

The direct costs of urban and rural guerrilla sabotage directed at the public service infrastructure is shown in Table I. Most of this damage was inflicted with explosives or small arms fire or by burning. In the early years urban sabotage predominated, since 1980 rural areas have been most affected. Some urban activity continues, however, especially attacks on smaller telephone installations.

The most expensive damage has been suffered by the highway system of the Ministry of Public Works and the most costly items of damage have been the major bridges of the Pan American and Coastal Highways which account for about half of all damage suffered. The national electric power company has sustained most damage to its transmission net. Destruction of transmission towers is a highly cost efficient guerrilla activity. The electric power distribution system (six companies) was an early target in urban areas and continues to suffer since its transformers are easy targets. Moreover, the damage suffered by the railroad and its inability to offer reliable service has significantly reduced its usefulness.

The destruction of telecommunication installations, in some cases very costly damages to mountain top repeaters and to the earth-satellite station, is an example of an important nuisance effect of guerrilla sabotage. No businessmen interviewed could quantify the cost of interrupted national or international telephone or telex service. All considered it is important in terms of relationships with suppliers and customers. All considered it to be one more example of the environment of civil violence that discourages private investment. In terms of psychological impact, attacks on urban pay phone booths, junction boxes, etc., are also very cost-effective for the guerrillas. Even more so has been the effect of isolating rural areas by destroying local telephone offices.

The damage to water and sewage service has also had an important psychological affect on public opinion.

The total cost of all direct sabotage is estimated at 245,568,400 colones. At the then rate of exchange this is the equivalent of US\$105,827,360. Some additional repair costs to major structures which will not be incurred until the middle of 1986 will bring direct costs up to an estimated 107 million U.S. dollars. This is an estimate, not a precise costing, since the price attached to an individual act of sabotage can vary according to the costing method used. As described in the Annex on Methodology and in the Introduction, this report uses a damage cost estimated midway between depreciated book value and ultimate replacement cost.

B. Indirect Costs

Indirect costs of guerrilla violence are shown in Table II. They total over one billion colones and illustrate the point that the indirect costs of sabotage, the ripple effect, tends to be greater than the original cost. The two major targets were the electric transmission net of the national power company and the Ministry of Public Works. In the first case, the major indirect costs are those for security installations and services, petroleum products for emergency generation and lost revenues from interruptions in service. In the second case, MOP, the indirect costs are lost revenues from budget reductions. This has been a major constraint on the system's ability to maintain roads, highways and bridges. In the other case, most indirect costs have been lost revenues, but the water system has had to spend considerable sums on alternate electric generation to maintain water service during major power interruptions.

Table II shows another interesting impact on the water and sewer system. ANDA uses electric power to pump water. When either CEL or CAESS are attacked, ANDA loses power; its electric motors are highly vulnerable to power surges and are burnt out, an indirect damage that may occur at considerable distance from and much later than the original direct damage. This is the ripple effect, a stone in the pond makes a noisy splash but the ripples spread widely and do the damage.

Indirect cost to ANTEL and the railroad are relatively low, ANTEL technicians have been able to maintain the high earning international services. The railroads revenue losses have been offset by a subsidy from the Government of El Salvador. These further indirect costs to the economy, as distinct from costs to the railroad company itself, are discussed in Chapter 7 on the railroad and in Volume II of this report.

C. Impact on the Economy

According to the Review of the Central Bank of El Salvador, Banco Central de Reserva, for the third quarter of 1985, Gross Domestic Product at constant prices dropped a little over 20% between 1979 and 1984. Most of this drop was between 1979 and 1982 with signs of slight recovery apparent in some sections in 1983. Preliminary statistics for 1984 showed some further improvement offset by continued declines in coffee and cotton production.

The period of civil violence coincides with a period of falling export prices for El Salvador's agricultural products and high prices for petroleum imports. Consequently, some stagnation in the economy was to be expected. But the fact is that agricultural production only dropped 19% in the period covered while industrial output fell 26% and commerce dropped 37%. This could well lead to the conclusion that most, if not all, of the decline in output should be attributed to the civil violence, its direct and indirect consequences, and to the uncertain business and investment climate it has created. This would put the cost of the violence in 1984 market prices at about 2.5 billion colones or the equivalent of a billion U.S. dollars.

D. Repair, Reconstruction and Financial Needs

The following is a list of the financial needs, by service, for repairing damages sustained and starting a program of reconstruction and some extension or expansion of services. It covers the years 1987, 1988 and 1989 and makes the rather heroic assumption that sufficiently peaceful conditions will have returned by 1987 to start on the task of infrastructure repair and replacement.

RECONSTRUCTION REQUIREMENTS

	1987	1988	1989	TOTAL
CEL	115.5	132.0	240.7	488.2
Electric Distribution	14.9	10.6	8.8	34.3
Water	4.4	4.3	4.3	13.0
Telecommunications	20.9	1.0	50.0	71.9
Highways	<u>181.8</u>	<u>181.8</u>	<u>181.8</u>	<u>545.4</u>
	337.5	329.7	485.6	1,152.8

CEL has indicated that it might be able to meet the local costs of its investment plan in 1988 and 1989. This would presumably contribute about 96.5 million colones to the reconstruction bill. ANTEL is financially strong and apparently well managed. It should be able to obtain conventional international financing. The balance for just the first three years is a requirement of 984.4 million colones or 196.9 million U.S. dollars. Simply put, El Salvador is probably going to need at least US\$200 million of concessional, or semiconcessional international financing in the first three years after the civil violence is brought under control.

E. The Future of the Railroad

This report contains a separate report on the future of the railroad (see Volume II). Very briefly, this report recommends that the railroad be assured of long-term support only if the conditions necessary for it to become a viable component of the nation's transportation needs can be met. The most important conditions are operational and management improvements, such as setting up a marketing department, opening the way to the Atlantic port(s) in Guatemala and effective use of the railroad in bulk freight transport, particularly cement. In short-run terms, the report discusses certain advantages, particularly security advantages, that could be obtained from the potential Santa Ana by-pass.

TABLE I

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE PUBLIC SERVICE INFRASTRUCTURE (Thousands of colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
ELECTRIC POWER-National Comp.		1,907,6	7,087,3	10,091,0	7,879,6	13,623,0	11,215,6	51,834,1
ELECTRIC POWER DISTRIBUTION	3,070,6	737,0	4,713,1	8,916,0	2,925,4	2,098,5	2,008,1	24,168,7
TELECOMMUNICATIONS - ANTEL	1,321,0	3,615,6	2,214,9	2,567,2	7,155,5	911,9	2,202,2	17,998,3
WATER SERVICE - ANDA	967,6	1,670,0	619,8	1,169,3	773,5	283,8	346,6	5,830,6
RAILROAD		6,456,0	6,591,0	7,252,0	5,837,0	7,545,0	698,0	34,379,0
HIGHWAY - HCF	111,0	2,049,6	68,206,5	10,447,7	18,703,1	27,764,0	875,8	128,157,7
TOTAL	5,478,2	16,435,8	89,432,6	40,143,2	43,284,1	52,126,2	17,376,3	264,568,4

TABLE II

RESUMEN DE COSTOS INDIRECTOS DE DAÑOS A INSTALACIONES OF PUBLIC SERVICE INFRASTRUCTURE (Thousands of colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
ELECTRIC POWER-NATIONAL COMP.	3,154,5	23,767,0	60,070,7	84,834,8	91,403,8	72,518,5	83,114,5	418,863,8
ELECTRIC POWER DISTRIBUTION	905,1	2,662,0	5,066,9	8,085,9	7,397,7	8,797,8	8,919,9	41,835,3
TELECOMMUNICATIONS - A N T E L -	184,0	1,962,7	2,638,9	3,297,4	4,083,2	2,392,0	2,578,8	17,137,0
WATER SERVICE - A N D A -	3,187,1	5,652,9	8,635,7	10,619,7	12,278,2	17,067,7	30,500,6	87,340,9
RAILROAD	-	900,0	3,439,0	3,266,0	473,0	894,0	1,101,0	10,081,0
HIGHWAYS - K O P -	(4,090,0)	30,486,1	43,648,1	92,145,3	128,446,1	155,518,7	166,747,5	612,901,8
TOTAL	3,340,7	65,438,7	122,899,3	202,248,1	244,082,0	257,188,7	292,962,3	1188,159,8

III. ELECTRIC ENERGY-GENERATION, TRANSMISSION, AND DISTRIBUTION

A. Organization of the Electric Power System

Electric power in El Salvador is almost entirely generated by the National Power Company, the Comision Ejecutiva Hidroelectrica del Rio Lempa, CEL, which takes its name from the river that provides the largest part of El Salvador's power. CEL produces 90% of all power consumed; private firms with their own generating plants produce a bit less than 8% of the total, and several of the electric distribution companies have small generating facilities producing a bit more than 2% of the total consumed. Sales of electric power in 1984 totaled 1,368,230 megawatthours (MWh) to 422,458 consumers of all kinds -- industrial, commercial, municipal and residential. Industrial users account for 34% of consumption, residential users another 34%, government and municipalities 15% each and street lighting 2%.

The generating facilities consist of four hydroelectric plants (three on the Lempa River), one geothermal plant, two gas turbines and a thermal plant. The thermal plant, near the Port of Acajutla is used only for emergencies. A gas turbine near San Salvador is also used primarily in emergencies or to meet peak demand. A gas turbine was installed in San Miguel in 1984 only as a result of the emergency. Normally, the area served by the gas turbine would be served from the hydroelectric plant on the lower Lempa River. The transmission lines from the generating plant to the San Miguel substation being under constant attack, the gas turbine had to be installed at a cost for the plant of 21 million colones, financed by AID, and installation costs of 2.6 million colones, financed by CEL. A return to peaceful conditions would make this generation capacity excess to needs since plans already exist to develop the geothermal potential of the San Miguel area which would meet increased demand at far lower cost. In 1984, hydro and geothermal generation accounted for 96% of all electric power delivered. The fuel cost of generating the remaining 4%, mostly steam generated at Acajutla, is considered a loss to the company since it would not have been necessary if transmission lines had not been attacked.

The transmission net consists of 617 kilometers (19 lines) of 110 kV transmission and 18 substations. Power is delivered to the distributing companies or to the rural electrification net at the substations for distribution at 23, 34.5 or 46 kV. CEL distributes directly about 9% of the power consumed, 4.8% to a few industrial consumers and 4.2% to its rural electrification program. All other electricity is distributed by private companies, of which there are seven. The following table shows the companies, the area served, and the percent of total power distributed.

ELECTRICITY DISTRIBUTION

<u>COMPANY</u>	<u>AREA(S) SERVED</u>	<u>% TOTAL</u>
San Salvador Light and Power (CAESS)	San Salvador, San Miguel and parts of the central and eastern departments not covered by CEL	75.0
Santa Ana Light and Power (CLESA)	Santa Ana	10.0
Sonsonate Light and Power (CLES)	Sonsonate	2.8
Usulután Light and Power (DEUSEM)	Usulután	1.8
Ahuachapán Light and Power (CLEA)	Ahuachapán)))	
Sensuntepeque Light and Power (DESSEM)	Sensuntepeque) part of Cabanas) Department))	1.4
R. de Matheu Company	Two small areas in) Sonsonate Department)	
		91.0%

The companies listed are private enterprises with the exception of DEUSEM and DESSEM which are local mixed enterprise companies whose stockholders include CEL, the local private sector and the municipality. All of the distributing companies are in financial difficulties and the smaller ones have been "intervened" by CEL with interventors supervising their management. While it is difficult to attribute all of the financial problems of the distributing

companies to the guerrilla violence and its side effects, this has certainly been a major cause.

B. Direct Damages

The most serious and costly damage suffered by the National Power Company (CEL) has been the destruction of high tension transmission lines and towers. This makes up over 80% of the direct damage cost. The other installations most attacked have been substations. The target towers have been the steel frame towers carrying 110 kilovolts. Up to the end of 1985, 462 high tension towers had been damaged in 1,208 attacks. This means that many towers have been attacked more than once. In fact some towers have been attacked more than a dozen times. Repairs to the towers have usually been accomplished by bracing or propping the tower with long wooden poles and possibly some scavenged steel beams. Wires are restrung and service restored. The next attack will usually further damage the steel structure and seriously damage the wooden support. Ultimately, a complete wooden structure, serviceable but not ideal, replaces the steel tower. This wooden structure becomes highly vulnerable to further attacks. As noted, the 462 steel towers were for the 110 kV transmission system. Lower tension lines are usually carried on concrete posts. In the case of the distribution companies and the rural electrification system of CEL, concrete poles, the lower voltage lines and especially the transformers have been the prime targets. Machine-gunning transformers is a quick, easy and effective way to interrupt local service.

In the eastern regions, whole systems of rural distribution, poles, lines, transformers have been destroyed and service has not been provided to some of these areas for years.

The earliest reported damage to the electric power system was not to the National Power Company, CEL, but rather to the San Salvador Light and Power Company, CAESS. The earliest damage reported was on November 17, 1978, when three switch boxes were blown up in a residential area of San Salvador. Since that time, the focus of guerrilla sabotage has shifted away from urban distribution to the transmission installations in the countryside.

In the Santa Ana area, CLESA's most expensive damage has been the destruction of three small hydroelectric plants. These produced cheap power. Consequently, in addition to the direct cost of the damage, CLESA has incurred indirect damage costs for higher priced electricity purchased from CEL.

The great direct damage sustained by the Usulután Light and Power Company (DEUSEM) indicates clearly how this company has suffered from being in the heart of the insurgency in the eastern region.

No damage has been directly done to the installations of the Electric Light Company of Sonsonate, although they have suffered indirectly from damage to CEL's installations.

CLEA is not in a center of violence zone; DESSEM, in Sensuntepeque, definitely is, but, in this area, it is CEL's transmission lines that have suffered mostly.

No attempt was made to get a damage report from R. de Matheu and Co., a tiny company west of Sonsonate, a relatively peaceful area, which uses a small hydro plant to generate most of its power. Its purchases from CEL are minuscule.

The total direct cost of all damage to the entire system, the National Power Company and the distributing companies is estimated at \$78,806,900, just a bit over thirty-one million U.S. dollars.

C. Indirect Damage Cost

Table EP-II shows the indirect costs to the Electric Power System of the civil violence inflicted upon the nation since 1979. These indirect costs tend to fall into two categories: the ripple effect described above and the cost of responding to the climate of violence, sabotage and insecurity. The indirect costs to CEL have been about eight times the direct cost. From Table EP-III we note that CEL spent over 22 million colones in security measures. More and more of its labor cost are going toward maintenance of service. Its loss of sales, i.e., power not delivered to the distributing entities, is alone more than five times the cost of direct damage. The cost of fossil fuels is not only a cost to the power company but a drain on the economy as imported

petroleum prices were very high during all this period. The most interesting figure, although not so dramatically large, is the cost of additional air transport. This represents the use of helicopters to deliver repair crews to damage sites and the use of helicopters as flying cranes, "skyhooks", to transport and place wooden poles. (Note: Reinforced concrete poles might be more economical and more durable, but they weigh more and cannot be moved about by helicopter.)

The major element of indirect cost for the distribution companies has been the loss of revenue resulting from inability of CEL to provide power to them. There is again the ripple effect. In the case of the largest company, the Electric Light and Power Company of San Salvador, CAESS; the loss of revenue is about 93% of all indirect costs. It is also about 176% of the direct costs suffered by that institution.

D. Deferred Investment

During the period 1979-1985, the electric power companies have been deferring investment, whether in new installations and material or in maintenance of existing investments. For example, CEL has deferred the development of geothermal generation calling for an investment of over 325 million colones. In normal times, this deferral of investment would involve a cost, the cost of benefits foregone. In the case of an electric power company, it would mean losses resulting from inability to meet demand. However, the frustrated growth of the economy has been such that existing generation has been sufficient to meet peak demand. Electric power interruptions have resulted from destruction of transmitting facilities, not from failure to invest in generation, transmission or distribution. The importance of the level of deferred investment lies in what it means in terms of financial requirements in the reconstruction period. CEL estimates that the requirement for new generations alone, i.e., nothing for new transmission lines, not even the line into Guatemala, will exceed 1.3 billion colones, the equivalent of US\$260 million.

For the distributing companies, investment during this period would probably have been counter-productive. Of course, if there had been no violence, demand would have increased and CEL would have met the demand from planned new

generating facilities, especially geothermal plants in the eastern regions near Berlin and Ahuachapan in the west. There is no reason to quantify such a speculative indirect loss. However, one deferred investment is quite noteworthy. For lack of foreign exchange, CAESS has not purchased metering equipment needed for 40,000 direct connection customers now being charged a flat fee. CAESS estimates non-metered billing costs of about 2 million colones per year.

With the exception of DEUSEM in Usulután, none of the smaller distribution companies have given much thought to reconstruction and deferred investment. In fact, in the absence of redesign of the tariff structure, much investment would be unprofitable. For example, in rural areas, the minimum monthly charge for domestic service is 1.25 colones (25 U.S. cents) for 7 kWh per month. This is the equivalent of two 25 watt bulbs burning four hours a night. The Santa Ana Company, CLESA claims about 8,000 such customers who cost more to serve than they bring in. Investment to increase service to this low demand sector cannot be justified.

E. Impact on Electricity Users

Every user of electric power suffers some economic loss when electric service is interrupted. The industrialist loses production, the businessowner sees office staff idle, the shopkeeper loses sales, even the residential user has food spoiled and loses to the use and enjoyment of electrical appliances. The losses from interruptions in the electric power supply are second only to the damage to road and rail transport in the economic impact on the nation. Unfortunately, the resources available for the preparation of this report were not sufficient to quantify fully these losses. The following represents some indicative information.

All of the electric distributing companies were asked to attempt an estimate of the cost to their clients of interrupted service. Only three were able to reply. Table EP-IV was prepared by the Electric Light Company of Usulután, DEUSEM, in the heart of an area of violence. It was prepared on the basis of interviews conducted by a young engineer on the staff. He was asked to comment on the margin of error of his report and said that, in the case of agricultural,

commercial, and residential losses, he could be off 10% either way. He thought that the information from industrial users was quite accurate since the establishments concerned were experienced in calculating their costs. The residential figure is probably the least accurate since it is hard to measure the damage suffered by household appliances from current fluctuations and interruptions. In any case, it is interesting to note that this company estimates the indirect damage to its clients as far higher than its own direct and indirect damages, over three times as high, in fact. The data reaffirms a need for the study of the direct and indirect cost of violence to the private sector.

The Electric Power Company of Sonsonate (CLES) used a different approach. It sent out 22 questionnaires to its principal customers asking them to estimate indirect cost in various categories such as lost sales, overtime wages, fuel costs, etc. It received 11 replies and the results are summarized on Table EP-V.

Again the indirect costs to only half of the company's customers exceeded the indirect costs to the company itself. This was in an area of relatively low guerrilla activity. The Sonsonate Power Company itself suffered no direct damage. The 11 customers responding claimed indirect costs of 1,687,067 colones in 1985. In that year CLES, cut off service to its customers for about 166 hours (see back-up files) or a little over three hours per week. The cost per hour per principal customer was about 1,000 colones or 400 U.S. dollars.

The Light and Power Company of Ahuachapan queried its principal customers; it has only one major industrial customer -- a textile plant -- and received similar data. The loss to the customer, in terms of lost sales, exceeds the loss to the power company from lost sales of power.

The general managers of several industrial establishments in San Salvador were asked to estimate the cost to them of lost electric power. Two textile plants, one making consumer products, one producing industrial textiles, calculated the value of lost production and provided data on electrical power consumption per month. Both plants work three daily shifts so lost production cannot be easily made up if at all. By dividing lost production by lost kWh of power, it was

discovered that the cost of one lost KWH meant between US\$3.75 and US\$4.75 of lost production. These figures need refinement, adjustment for savings in unused other production inputs, for example, but they are by no means out of line with the ten-year-old results of the World Bank's Study on the Economics of Power System Reliability.

A steel plant calculated its cost of operation for one hour of idleness, taking into account labor, fixed and semi-variable costs. Loss of production would be a less meaningful measure in this case because the plant is not working full time. In the steel shapes department (mostly rebar), the cost was estimated in 1985 at 965 colones (US\$386) per hour; in the galvanized sheet plant, the cost was 877 colones (US\$351) per hour.

A plastics plant estimated lost production at ₡7,600 per hour. This plant also operates 24 hours a day. They have a waste recovery system so that spoiled raw material (plastic) is not a total loss. However, they have had to abandon the use of certain materials and certain lines of production because three or four minutes of power interruption could cause ten hours of lost time in disassembly and cleaning a machine.

Finally, as a small indication of what the impact of lost electric power might be on commerce, one company estimated that its sales and administration staffs work at about 30% of efficiency when electric power goes off and lights, typewriters, air conditioners, copying machines and coffee makers all are lost.

The above is really only anecdotal material with a few numbers attached. A complete study of the impact of power shortages on industry and commerce is needed. It should be based on detailed questionnaires and a broad sample of enterprises. It will be most needed when the civil violence subsides, lost ground is recovered and sustained development growth is again possible.

F. Financial Impact

1. CEL

The National Power Company (CEL), has borne the brunt of both direct attack costs and of indirect costs. The costs have escalated over the years. One

measure of their damage is their relationship to operating revenue. In 1980, CEL had direct losses of 1,907,600 colones and indirect losses of 23,767,000. In 1980, CEL enjoyed a net operating revenue, after all operating costs, of 84 million colones on sales of energy of 136 million. Operating earnings were 62% of sales. Direct and indirect damages were 30% of earnings; they were 19% of sales. In 1984, earnings from operations were 69 million colones on sales of 185 million. Direct and indirect damages totaled 85.1 million colones or 125% of earnings, about 47% of sales of power. Operating revenue as a percentage of sales dropped from 62% in 1980 to 37% in 1984.

The opposite side of the coin is the great increase in operating costs that began in 1981 as direct and indirect damage rose. Two items in the profit and loss statements take on importance: the use of petroleum fuels and security costs which first appear in the earnings statement of 1983. By 1984, these two items make up about one-third of all costs of operation. Financial statements for 1985 were not available. Balance sheets and earnings statements for 1980 through 1984 were available. The trends they show are reportedly continued into 1985 and will go on into 1986. Two trends are directly related to this report: operating costs are going up much faster than sales; accounts receivable are increasing as a percentage of current assets. In simple and obvious terms, running a power company that somebody keeps blowing up is expensive; customers are not paying their bills and a cash problem is inevitable. (Note: the CEL financial statements are in the back-up data provided to USAID/San Salvador.) Finally, the devaluation of the colon has greatly worsened CEL's position in terms of cash versus immediate debt services needs and overall debt/equity ratio, which was already weak.

2. CAESS

The San Salvador Light and Power Company, CAESS, is the largest of the private distributing companies purchasing power from CEL. It covers principally the city of San Salvador but also has a rural electrification program (largely out of service at the moment) and serves several other less urbanized areas. But overwhelmingly, CAESS is co-terminous with greater San

Salvador. The financial statements of CAESS show the same trends as those of the generating company. Accounts receivable are a higher percentage of current assets. The quick ratio is less than unity, the company has a cash problem. The company is profitable, but net income as a percentage of sales has dropped from 6% in 1982 to less than 3% percent in 1985.

Both CEL and CAESS have ambitious, and necessary, plans for rehabilitation and deferred investment for the years ahead if the civil violence is brought under control. Both hope to deploy some of their resources toward new investment so as to assure international financial support. Continued direct and indirect damage from guerrilla sabotage will make any such contribution from the companies extremely doubtful.

3. Other Distributing Companies

The five smaller private (or mixed, in the cases of Sensuntepeque and Usulután) companies are worse straits. All are currently losing money. All are in debt to CEL and four have been "intervened" by CEL which in effect is managing them. These are not little, poorly managed fly-by-night companies. The Santa Ana Light and Power Company made money up until two years ago, and it was started over ninety years ago. The increased use of power purchased from CEL to replace cheaper power from its own small hydroplant has aggravated the situation and CLESA's debt to CEL is growing. Under proper circumstances, an end to violence, reconstruction of the generating facilities, a rational tariff structure, and prompt payment of their power bills from government agencies, CLESA could be profitable for another century. At the moment, it looks as if CLESA will be unable to survive as a private company.

The Usulután Light and Power Company (Distribución Eléctrica de Usulután, Sociedad de Economía Mixta - DEUSEM) is as its name shows, a mixed public-private enterprise. Its shareholders include CEL, the municipality and the local private sector. The company is over 25 years old and until 1980 enjoyed healthy growth and profitable operation. In fact, the municipality never had to pay a light bill, the bill was covered by its annual dividends. However, by 1980 the profit had dropped to a tiny margin, 0.1% of sales and losses have accumulated every year since.

DEUSEM has suffered very high direct losses in proportion to its assets and operations. In 1982 direct damages exceeded the book (depreciated) value of its fixed assets; its inventory of parts and equipment was wiped out. However, this only partially explains its financial problem. Even the indirect losses resulting from interruptions in CEL's power deliveries do not account for the company's decline. The most important reasons are probably the fact that demand has not grown in this area of violence and that many government clients have not paid their bills. ANDA, an important user of electrical power for pumping water has not paid its bills since June of 1984. Even private consumers delay paying their bills to the last minute and no interest is charged to them or, of course, to the public consumers. CEL, on the other hand, charges interest to the distributing companies for unpaid bills. The interest paid to CEL now uses up income from consumers; debt is accumulating and bankruptcy is inevitable. Clearly, civil violence is to blame, but some unwise policies, especially in tariffs and collection procedures have worsened the situation.

The other smaller distributors are in similar situations. All are going bankrupt; all have been intervened by CEL. The combination of public and private enterprise that prevailed before 1979 was apparently a very healthy mix; the power needs of an expanding economy were being met. Only an end to the violence and a thorough reorganization and change in tariff policy can reform the situation.

G. Future Financial Requirements

The National Power Company (CEL), the San Salvador Light and Power Company (CAESS) and the Usulután Power Company (DEUSEM) responded to questions regarding future plans and financial needs. CEL estimates that it will need 150 million colones over five years, 1987-1991 to repair all damage to date, i.e., about three times as much as the original damage cost. Beginning in 1968, CEL would expect to contribute local costs and finance the foreign exchange costs. Cost of restoring service to areas not now covered would cost about 12 million colones and take three years. Two thirds of the cost would

have to be financed. The major investment deferred over the past six years. This would cost about 1,188 million colones. CEL would meet most of the local costs.

RECONSTRUCTION FINANCIAL REQUIREMENTS -- CEL

Total Requirements	1,349 million
CEL Contribution	490 million
Financing Needed	<u>859 million</u>

The San Salvador Light and Power Company looks to a three year program of repair, deferred investment and restoration of service to its rural customers. It estimates a total cost of 50.5 million colones and hopes to contribute 16.6 million of this amount from its own resources.

The Usulután Company states its requirements as 12.1 million over three years.

All of the above is both highly speculative and highly indicative. It is speculative since the estimates have not been subject to vigorous review and in the case of CEL and CAESS the local contributions may not be forthcoming unless both companies make remarkable recoveries. Usulután might very easily be put back on its feet with an injection of 12 million colones, that is, after all, more than two years total sales of power.

The bottom line is that the electric power system is going to require a tremendous investment if it is going to contribute effectively to a normalization process and a return to economic growth. A billion colones, the equivalent of US\$200 million, about US\$40 million a year for five years is a conservative estimate of this need.

TABLE E.P.-1

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DEL SISTEMA LUZ Y FUERZA ELECTRICA

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
								Miles de Colones
CEL		1,907.6	7,087.3	10,091.0	7,872.6	33,623.0	11,245.6	51,834.1
G A E S S	3,070.6	692.7	1,320.2	2,522.8	2,236.6	1,664.3	1,550.9	13,058.1
G L E S A		25.3	1,050.0	404.3	226.8	338.1	117.9	2,162.4
G L E S		NO DIRECT DAMAGE			SUFFERED			
G L E A					21.0			21.0
D E U S E M		19.0	2,291.0	5,943.4	275.1	96.1	339.3	8,963.9
D E S S E M			51.9	45.5	165.9			263.3
TOTAL	3,070.6	2,644.6	11,800.4	19,007.0	10,805.0	35,721.5	13,253.7	76,302.8
Damages reported 1986 CEL, DEUSEM								2,504.1
Damages to Feb.28/86								78,806.9
		Damages to Dec.31,1985 @	\$2.50= US\$1.00	\$30,521,120				
		Damages Jan.-Feb.1986 @	\$5.00= US\$1.00	500,620				
		TOTAL IN US\$						\$31,021,740

TABLE E.P.-2

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE C E L (En miles de colones) 1980 - 1985

DESCRIPCION	1979	1980*	1981	1982	1983	1984	1985	TOTAL
1 - TORRES Y ESTRUCTURAS		1,469.7	6,925.8	7,077.5	6,140.5	9,779.0	10,987.0	42,379.5
2 - OTRAS INSTALACIONES		437.9	161.5	2,314.5	1,629.1	3,844.0	258.6	8,645.7
3 - VEHICULOS		---	---	699.0 **	110.0	---	---	809.0
TOTAL		1,907.6	7,087.3	10,091.0	7,879.6	13,623.0	11,245.6	51,834.2
TORRES DE 115 KV DAÑADAS			166	84	80	76	56	462
NUMERO DE ATENTADOS			240	197	179	220	372	1,208
* Datos a partir de Agosto de 1980								
** Datos acumulados hasta el 29 de Diciembre de 1980								

TABLE E.P.-3

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE CAESS (En miles de colones)

DESCRIPCION	1979 (*)	1980	1981	1982	1983	1984	1985	TOTAL
<u>Edificios e Instalaciones</u>								
Costo de Reparación	1,239.9	204.1	318.2	623.9	494.1	331.7	307.3	3,519.2
Costo de Reemplazo	1,768.8	422.4	980.7	1,560.9	1,742.1	976.1	1,213.6	8,665.0
Costo Total	3,008.7	626.5	1,298.9	2,184.8	2,236.6	1,307.8	1,520.9	12,184.2
<u>Equipo Pesado</u>								
Costo de Reparación								
Costo de Reemplazo						339.0		339.0
Costo Total						339.0		339.0
<u>Equipo Liviano y Herramientas</u>								
Costo de Reparación	11.9	12.0	6.3	138.0		2.8	30.0	201.0
Costo de Reemplazo	50.0	50.0	--	190.0		--	--	290.0
Costo Total	61.9	62.0	6.3	328.0		2.8	30.0	491.0
<u>Otros (**)</u>								
Costo de Reparación		--	--	--		--		--
Costo de Reemplazo		4.2	15.0	10.0		14.7		43.9
Costo Total		4.2	15.0	10.0		14.7		43.9
TOTAL	3,070.6	692.7	1,320.2	2,522.8	2,236.6	1,664.3	1,550.9	13,058.1
(*) Incluye \$235,500.- de daños ocurridos el 17/11/1978 por haber sido el primer dato del que se tiene cuenta.								
(**) Incluye robos de radios portátiles, radios móviles, binoculares, aslitos y robos a agencias.								

TABLE E.P. - 4

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE CIESA (Compañía de Alumbrado Eléctrico de Santa Ana)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
								Miles de Colones
INSTALLATIONS			1,050,000	185,000		300,000		1,535,000
TRANSFORMERS		20,780		201,262	208,683	36,311	101,324	568,360
STEEL AND CONCRETE POSTS				18,000	18,070	1,800	16,550	54,420
STREET LAMPS		4,500						4,500
TOTAL		25,280	1,050,000	404,262	226,753	338,111	117,874	2,162,280

TABLE E.P.-5

DISTRIBUIDORA ELECTRICA DE USulután, SOCIEDAD DE ECONOMÍA MIXTA
 COSTOS DIRECTOS DE LOS DAÑOS (EN COLONES)
 RESUMEN DEL CUADRO No.1

	<u>COSTOS ACTUALES</u>	<u>COSTOS DE REPARACION</u>	<u>TOTALES</u>
Transformadores	542.000	63.970	605.970
Sub-estaciones	1.050.000	--	1.050.000
Sistemas eléctricos (destrucción total)	6.099.000	768.500	6.867.500
Líneas rotas	16.600	9.575	25.375
Reclosers	123.500	33.000	156.500
Edificaciones	100.000	100.000	200.000
Capacitores	10.000	1.000	11.000
Postes	76.350	--	76.350
Cables (extraviado de las líneas)	5.715	--	5.715
Cortacircuitos	3.000	--	3.000
Aisladores	1.600	--	1.600
Pararrayos	1.350	--	1.350
	<u>8.028.315</u>	<u>976.045</u>	<u>9.004.360</u>
1 9 7 9	--	--	--
1 9 8 0	15.500	3.450	18.950
1 9 8 1	2.175.500	115.500	2.291.000
1 9 8 2	5.185.500	757.900	5.943.400
1 9 8 3	207.200	67.875	275.075
1 9 8 4	80.215	15.930	96.145
1 9 8 5	325.450	13.890	339.340
1 9 8 6	38.950	1.500	40.450
	<u>8.028.315</u>	<u>976.045</u>	<u>9.004.360</u>

TABLE E.P. -7

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE DESSEM (Sensuntepeque)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
CONCRETE AND WOOD POSTS			13.117	6.072	12.812			32.001
TRANSFORMERS			23.600	11.900	71.000			106.400
OTHER ELECTRICAL EQUIPMENT			15.183	27.628	82.088			124.899
TOTALS			51.900	45.500	165.900			263.300

TABLE E.P.-6

CORPORACION DE LUZ ELECTRICAS DE AMBACORAH, S.A.

ANEXO -No. 1

COSTOS DIRECTOS DE LOS DAÑOS EN VOLANTES

Estructura, Equipo Dañado	Fecha de la Ocur- rencia	Costo Actual	Clase del G. Actual	Costo Reparación	Condición Final	Conside- raciones
Transformador Monofásico de 37.5 K.V.A.	Junio/83	\$ 5.000,00	Costo Reemplazado	\$ 500,00	Reparado en ser- vicio	Total del evento \$ 5.500,00
1 Transformador Monofásico de 37.5 K.V.A.	Junio/83	\$ 5.000,00	Costo Reemplazado	\$ 500,00	Reparado en ser- vicio.	Total del evento \$ 5.500,00
1 Transformador Monofásico de 37.5	Junio/83	\$ 4.500,00	Costo Reemplazado	\$ 500,00	Reparado en ser- vicio.	Total del evento \$ 5.000,00

TABLE E.P.-8

ELECTRIC POWER - GENERATION, TRANSMISSION, DISTRIBUTIONINDIRECT COSTS OF CIVIL VIOLENCE (Thousands colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
C F L	3,154.5	23,767.9	60,070.7	81,834.8	91,403.0	72,518.5	83,114.5	418,863.9
Electric Light Power SONSONATE			145.7	145.2	151.0	82.5	617.8	1,312.2
Electric Light Power AHUACHAPAN	183.0	142.4	135.8	85.7	122.3	232.9	142.5	1,111.6
C L E S A SANTA ANA	112.2	172.2	394.4	1,376.2	1,521.7	1,872.7	2,011.2	7,460.6
G A E S S SAN SALVADOR	685.1	1,914.0	3,799.2	4,420.8	4,439.3	4,971.7	4,291.2	24,441.1
Electric Light Power SENSUNTEPEQUE			22.6	26.0	29.0	33.2	38.0	150.4
U S E n USulután	4.0	425.5	569.2	2,011.2	1,134.4	774.7	1,812.1	6,758.9
T O T A L	8,059.6	26,428.9	65,137.6	92,920.7	93,801.3	81,316.2	92,034.3	460,698.6

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TABLE E.P.-9

COMISION EJECUTIVA HIDROELECTRICA DEL
RIO TEMPA (CEL)

EJEMPLOS :

CUADRO 2 - PARTE II - COSTOS INDIRECTOS DE LOS GABOS INSTITUCIONALES, INCLUIDOS EN EL PRESUPUESTO (MILES DE COLONES)

ANO CALENDARIO	DICIEN. 71	DICIEN. 71	DICIEN. 71	DICIEN. 71	DICIEN. 71	DICIEN. 71	DICIEN. 71	TOTAL	CONSIDERACIONES
BANOS CONSIDERADOS	1979	1980	1981	1982	1983	1984	1985		
a: Ingresos No Recibidos (Anexo 2.a)	-	16,600.0	40,000.0	58,000.00	65,600.0	40,500.0	36,800.0	255,500.0	
b: Costo de Energia Produccion P6altes ^a (Anexo 2.b)	839.4	2,542.3	11,589.7	16,321.8	12,746.0	16,657.7	26,776.1	85,471.0	
c: Seguridad: Personal (Anexo 2.b, 1-7)	128.7	519.5	1,437.9	2,318.7	2,261.2	4,067.6	5,098.6	16,812.2	
d: Seguridad: Insumos (Anexo 2.b, 1-7) Anexo 2.c)	74.5	244.9	406.2	578.2	1,464.4	1,070.1	1,624.6	5,462.9	
e: Dedicado a Restauracion de Servicio (anexo 2.b, 1-7)	1,006.4	2,062.7	4,031.3	4,677.4	4,619.0	6,096.9	7,760.8	30,274.5	
f: Sobrecostos (anexo 2.b, 1-7)	16.7	106.1	151.8	256.9	201.8	5.6	16.7	751.6	
g: Entrenamiento de Personal	-	-	-	-	-	-	-	-	-
h: Costo de Transporte Aéreo Adicional (anexo 2.d)	-	-	-	194.3	217.6	204.1	340.8	956.8	
i: Costo de Transporte Ter- restre Adicional	-	-	-	-	-	-	-	-	-
j: Costo de Equipo Adicional Pesado (anexo 2.c)	-	-	437.6	153.7	10.0	10.2	252.0	851.5	
k: Costo de Equipo Adicional Liviano (anexo 2.e)	-	-	-	-	228.0	30.0	258.1	516.1	
l: Indemnizaciones-Seguros	3.0	22.0	13.0	3.0	3.0	8.0	5.0	57.0	
m: Servicios Especiales (anexo 2.b, 1-7)	1,085.8	1,671.5	2,013.2	2,325.8	3,052.8	5,468.3	6,185.8	21,803.2	
TOTAL	3,156.5	23,767.0	60,070.7	84,834.8	91,403.8	72,518.5	83,114.5	418,863.8	

^a Lo dedicado a restauracion se estima así:
1979=25%, 1980=40%, 1981-1985=50% del total de los gastos reales de Transmision.

^{aa} Corresponde a los gastos hechos por la CEL en concepto de ayuda para funerales por valor de \$1,000.00 por cada empleado fallecido.

TABLE E.P.-10

COSTOS INDIRECTOS DE LOS DAÑOS A CLESA, INCLUIDOS EN EL PRESUPUESTO

AÑO CALENDARIO	DIC.31	CONSIDERACIONES						
DAÑOS CONSIDERADOS	1979	1980	1981	1982	1983	1984	1985	
a. INGRESOS NO RECIBIDOS	51.8	96.7	130.8	1123.6	1137.1	1436.0	1517.0	dejados de producir, reaccionamiento de energía
b. SEGURIDAD PERSONAL								
c. SEGURIDAD-INSTALACIONES	15.0	15.0	18.0	18.0	28.0	30.0	30.0	protección militar e instalaciones
d. AUMENTO DE PERSONAL			168	108	216	249	286	Mantener plaza de personal de planta.
e. SOBRETiempos	3.0	4.5	5.4	6.8	8.64	11.5	15.7	Pagos extras por atención a daños
f. ENTRENAMIENTO DE PERSONAL								
g. COSTO DE TRANSPORTE AEREO ADICIONAL								
h. COSTO DE TRANSPORTE TERRESTRE ADICIONAL	6.3	7.0	7.5	8.4	9.5	10.8	16.3	Consumo de gasolina adicional
i. COSTO DE ENERGIA ADICIONAL (ELECTR. COMBUSTIBLE, ETC.)	1.5	2.8	3.5	42.0	45.8	52.0	58.3	Pago a Cfo. Suministradores por lo dejado de producir
j. COSTO DE EQUIPO ADICIONAL-PESADO								
k. COSTO DE EQUIPO ADICIONAL-LIVIANO	28.5	42.5	56.60	64.0	71.5	76.8	80.9	Vehículos, repuestos y equipo de trabajo

	DIC.31 1979	DIC.31 1980	DIC.31 1981	DIC.31 1982	DIC.31 1983	DIC.31 1984	DIC.31 1985	CONSIDERACIONES
L. INDEMNIZACIONES-SEGUROS	3.1	3.7	4.6	5.4	6.0	6.6	7.0	Aumento en póliza de seguro por protección a daños
OTROS	112.20	172.20	394.40	1.376.20	1.521.74	1.872.70	2.011.20	
NOTA: CANTIDADES EN MILES								

TABLE E.P.-11

PRINCIPALES CLIENTES

CLES - SONSONATE

Anexo 2

COSTOS INDIRECTOS DE LOS DAÑOS OCACIONADOS POR CORTES DE ENERGIA ELECTRICA EN EL SUMINISTRO (EN COLONES ₡)

ANO CALENDARIO	DIC.31	DIC.31	DIC.31	DIC.31	DIC.31	DIC.31	DIC.31	
DAÑOS CONSIDERADOS	1979	1980	1981	1982	1983	1984	1985	
a.- INGRESOS NO RECIBIDOS - - -	- - -	- - -	409.770.	241.000.	472.363.	587.623.	1.267.953.	2.978.709.
b.- SEGURIDAD PERSONAL - - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
c.- SEGURIDAD INSTALACIONES - - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
d.- AUMENTO DE PERSONAL - - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
e.- SOBRETIEPOS - - -	- - -	- - -	83.753.	163.925.	152.407.	234.050.	384.623.	1.018.758.
f.- ENTRENAMIENTO DE PERSONAL - - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
g.- COSTO DE TRANSPORTE TERRESTRE ADICIONAL - - -	- - -	- - -	- - -	- - -	- - -	- - -	6.000.	6.000.
h.- COSTO ENERGIA ADICIONAL (ELECT - COMBUST) 19.000.	30.000.	30.000.	30.000.	30.000.	42.000.	30.000.	24.000.	204.000.
i.- COSTO DE EQUIPO ADICIONAL - PESADO - - -	- - -	- - -	5.000.	5.000.	55.000.	20.000.	- - -	85.000.
j.- COSTO DE EQUIPO ADICIONAL - LIVIANO - - -	- - -	- - -	4.500.	4.500.	4.500.	4.500.	4.500.	22.500.
k.- INDEMNIZACIONES Y SEGUROS - - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

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TABLE E.P.-12

ANEXO No. 2

COMPANIA DE LUZ ELECTRICA DE AHUACHAPAN, S. A.

PARA C.L.E.A. S. A.

<u>DETALLE</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
a) INGRESOS DEJADOS DE PERCIBIR POR CLEA, S. A.	178.582	138.652	110.074	37.353	77.753	230.763	54.424*
b) INCREMENTO DE COSTOS POR PA- RALIZACION DE PLANTA DE ATE- HUESIAS (GENERACION PROPIA)	4.439	10.765	25.710	48.343	44.596	62.140	58.088
TOTAL	183.021	149.417	135.784	85.696	122.349	292.903	142.512

* Se extraviaron reportes de planta
Atehuesias.

DISTRIBUIDORA ELECTRICA DE SENSINTEBOUR
Sociedad de Economía Mixta.

TABLE E.P.-13

MUESTRA

CUADRO 2 - COSTOS INDIRECTOS DE LOS DAÑOS INSTITUCIONALES, INCLUIDOS EN EL PRESUPUESTO

ANO CALENDARIO	DIC.31	DIC.31.	DIC. 31	CONSIDERACIONES				
DAÑOS CONSIDERADOS	1979	1980	1981	1982	1983	1984	1985	
a. INGRESOS NO RECIBIDOS			₡ 14.600.00	₡ 16.400.00	₡ 18.650.00	₡ 21.900.00	₡ 24.800.00	
b. SEGURIDAD PERSONAL								
c. SEGURIDAD - INSTALACIONES								
d. AUMENTO DE PERSONAL			₡ 5.380.00	₡ 7.400.00	₡ 8.500.00	₡ 8.500.00	₡ 9.800.00	
e. SOBRETIEPOS			" 987.55	" 1.054.33	" 944.50	" 1.009.36	" 1.042.55	
f. ENTRENAMIENTO DE PERSONAL								
g. COSTO DE TRANSPORTE AEREO ADICIONAL								
h. COSTO DE TRANSPORTE TERRESTRE ADICIONAL			₡ 1.646.20	₡ 1.961.00	₡ 1.751.00	₡ 1.845.00	₡ 2.398.00	
i. COSTO DE ENERGIA ADICIONAL (ELECTR. COMBUSTIBLE,ETC)								
j. COSTO DE EQUIPO ADICIONAL - PESADO								
k. COSTO DE EQUIPO ADICIONAL - LIVIANO								
l. INDEMNIZACIONES-SEGUROS								
O T R O S								
TOTAL			₡ 22.609.75	₡ 26.815.33	₡ 29.845.50	₡ 33.254.36	₡ 38.040.55	

TABLE E.P.-14

DISTRIBUIDORA ELECTRICA DE USULUIAN, SOCIEDAD DE ECONOMIA MIXTA

RECONSTRUCCION DE INFRAESTRUCTURA BASICA (EN COLONES)

	<u>1 9 8 7</u>	<u>1 9 8 8</u>	<u>1 9 8 9</u>	<u>TOTALES</u>	
Costo de Reparación	203.342	195.209	187.075	585.626	Promedio 1980-1985 a/25%, 20% y 15%
Inversiones Diferidas	1.977.600	2.063.600	2.149.600	6.190.800	Base de cálculo año 1985 a/15%, 20% y 15%
Costo de restauración de servicios	1.875.908	1.800.872	1.725.836	5.402.616	Promedio 1980-1985 a/25%, 20% y 15%
TOTAL	4.056.850	4.059.681	4.062.511	12.179.042	

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TABLE E.P.-15

ANEXO No. 3

COMPANIA DE LUZ ELECTRICA DE ANUACHAPAN, S. A.

COSTOS INDIRECTOS DE LOS PRINCIPALES CLIENTES OCACIONADO POR SUSPENCIONES

DE ENERGIA ELECTRICA EN COLONES, PARA:

<u>DETALLE</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>TOTAL</u>
INGRESOS NO RECIBIDOS	69.306	258.473	34.150	15.012	41.025	282.656	292.140	992,742

REQUERIMIENTOS FINANCIEROS PARA RECONSTRUCCION

DE LA INFRAESTRUCTURA BASICA

(MILES DE COLONES)

	1987		1988		1989		1990		1991		1992		INVERSION		TOTAL
	AL	DE	AL	DE	AL	DE	AL	DE	AL	DE	AL	DE	AL	DE	
a) RECONSTRUCCION DE BARRIOS	6,473.0	19,364.9	8,414.9	19,682.0	19,379.0	21,042.0	11,442.0	17,036.0	14,821.6	19,182.3	0.0	0.0	32,053.9	97,821.3	149,875.1
b) INVERSIONES DIFERIDAS	24,776.0	64,736.5	22,768.0	77,238.6	73,718.6	136,633.6	171,684.3	287,743.7	169,321.6	136,681.0	32,282.5	39,912.3	314,742.8	672,329.9	1,487,672.1
c) RECONSTRUCCION DEL SERVICIO	872.0	2,697.2	1,132.6	2,784.5	1,473.7	2,976.6							2,479.3	8,368.3	11,847.6
TOTAL	32,119.0	81,364.6	32,316.9	99,765.1	94,571.3	154,652.2	183,126.3	225,581.7	184,343.2	175,783.3	32,282.5	39,912.3	378,275.0	778,919.5	1,349,194.8
FINANCIAMIENTO:															
DEL (Recursos Propios)			22,768.0		73,718.6		171,684.3		169,321.6		32,282.5		469,967.0	0.0	469,967.0
NECESIDAD DE FINANCIAMIENTO	32,119.0	81,364.6	9,548.9	97,785.1	12,413.1	154,652.2	11,462.8	225,581.7	14,821.6	175,783.3	0.0	39,912.3	84,308.0	778,919.5	659,227.8
ESTERNO:															
TOTAL	32,119.0	81,364.6	32,316.9	99,765.1	94,571.3	154,652.2	183,126.3	225,581.7	184,343.2	175,783.3	32,282.5	39,912.3	378,275.0	778,919.5	1,349,194.8

TABLE E.P.-17

DISTRIBUIDORA ELECTRICA DE USULUTAN, SOCIEDAD DE ECONOMIA MIXTA
 COSTOS INDIRECTOS SUFRIDOS POR LOS CLIENTES .-

UBICACION E IDENTIFICACION	1979	1980	1981	1982	1983	1984	1985	Consideraciones
Agricultura -Varios sectores	--	--	2.500.000	3.750.000	3.500.000	--	4.850.000	
Industria Textil(PROASAL) Usulután	--	--	550.000	480.000	590.000	19.500	756.000	
Industria Algodonera Usulután	--	--	650.000	530.000	613.000	25.000	915.000	
Ganadería y Lácteos Varios sectores	--	--	795.000	980.000	--	--	2.350.000	
Industria Pesquera Puerto El Triunfo	--	--	2.800.000	2.500.000	2.900.000	155.000	3.000.000	
Producción de Panela Cantón El Volcán	--	--	--	--	--	--	550.000	
Beneficio de Café California-Ctn.El Volcán	--	--	--	2.300.000	--	--	3.800.000	
Industria de Madera San Juan del Gozo	--	--	--	2.750.000	--	--	--	
Comercio Varios sectores	--	--	595.000	785.000	1.300.000	--	1.975.000	
Residencial	--	--	300.000	450.000	550.000	--	750.000	
TOTAL			6.190.000	14.525.000	9.453.000	199.500	18.946.000	

IV. COMMUNICATIONS

A. Organization and Services

The National Telecommunications Administration, Administracion Nacional de Telecomunicaciones, ANTEL, ~~in~~ El Salvador with telephone, telegraph, telex, radio and television ~~and~~ national and international. It is an autonomous public agency. ~~It has~~ 100,000 subscribers to its telephone service located in San Salvador ~~and other~~ major cities. Telephone density at the end of 1985 was 2.32 tele~~phone~~ 100 inhabitants, a bit low for a country at El Salvador's level of development. There is a considerable unsatisfied demand for tele~~phone~~ installations. With the exception of the telegraph service, a bit of ~~age~~, the services provided are very modern. National traffic depends on ~~connections~~ ~~or~~ convenient mountain tops. International traffic depends ~~on~~ a large modern, German-built earth station at Izalco, west of San Salvador ~~and~~ the highway to Sonsonate.

B. Direct Damage

ANTEL Chart I summarizes ~~the~~ damage sustained by the institution. ANTEL Chart II provides further ~~data~~.

Damage to the telephone net ~~is~~ very widespread and has involved all sorts of installations. Two sorts of ~~damage~~ should probably be distinguished. The first is damage to the major ~~stations~~, especially the repeater stations. Major attacks took place in ~~the~~ again in March of 1985 when the repeater station on the Picacho mountain~~side~~ outside of San Salvador was attacked and dynamited. Among the ~~attacks~~ 1983 was that on the earth station at Izalco. The great parabolic ~~antenna~~ was hit by rockets with resulting damage of over 1.5 million colones. ~~The~~ costs of this damage was the required rerouting of international ~~traffic~~ through Guatemala and Costa Rica at a cost of about 350,000 colones (US\$~~700,000~~). In response to these attacks, ANTEL has made major investment in ~~security~~. Nevertheless, the parabolic antenna of the earth station remains ~~vulnerable~~ to rocket or recoilless rifle fire. ANTEL has estimated the cost of ~~these~~ attacks at just under six million colones, a bit less than ~~one~~ the estimated total damage from

1979 to 1985. The balance has gone to the destruction of all sorts of installations. Much of the damage to buildings and offices. Blowing up junction boxes (armarios) continues. There have been a number of such attacks in San Salvador during the writing of this report in February and March 1986.

C. Indirect Damages

ANTEL Chart III shows indirect damages costing 17 million colones. Less than the cost of direct damages. The figure is too conservative. It fails to include income foregone from telephone centrals which have not been installed because of the violence. If this investment had been made as planned, ANTEL could have expected to receive revenues of 76 million colones in 1983, 1984 and 1985.

Costs of providing telephone service in 1985 were 67% of receipts. These lost revenues meant net revenue lost of about 27.75 million colones and this amount should be added to the figure shown on the chart.

The entry for insurance and indemnities brings up a point that this report has probably not covered adequately. Between January 1979 and December 1985, 53 full-time ANTEL employees and 14-day rate workers have been killed by guerrilla violence, or nearly ten per year. The figures show the death benefits paid plus company life insurance provided to a few employees in 1983, 1984 and 1985.

D. Impact on Users

Although a number of managers from the private sector were interviewed, in San Salvador and elsewhere, none of them could quantify the cost of interruptions in telecommunications services. All were sure that there were considerable costs involved but nobody had sought to calculate them. There may be a good reason for this lack. A generator can substitute for a power loss; a company can dig its own well; what can't go by rail may possibly go by truck; but a private telephone/telex system is not a practical response. The costs and inconvenience are accepted. For lack of data, this report has also been unable to quantify this cost. However, it is likely that the cost to potential users

whose demands have not been met is greater than that borne by the existing users.

E. Financial Requirements and Deferred Investment

ANTEL estimates that restoration of damage suffered to date will call for an investment of a bit over 15 million colones in the first year after a return to normal conditions. Service will have to be restored to those areas cut off by the violence at an estimated cost of 46 million colones. A long deferred investment in service expansion should begin in about 1989 and the program now not being carried picked up again.

ANTEL is in good shape financially. Net income was 31% in gross sales of 194 million colones in 1985, i.e., about 62 million colones in profit available for investment. ANTEL has a strong equity/debt ratio; very positive quick ratio, and substantial cash. Long-term international debt is low. ANTEL is clearly financially capable of meeting its financial requirements for reconstruction and expansion. There could be a foreign exchange problem, but that is a national concern.

ANTEL CHART I

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE ANTEL POR ACCIONES TERRORISTAS (En colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. EDIFICIOS E INSTALACIONES	1,213,613	2,724,132	2,098,806	2,086,064	6,658,765	777,172	1,778,710	17,127,272
2. EQUIPO PESADO	---	725,000	---	402,140	320,500	---	300,000	1,747,640
3. EQUIPO LIVIANO	43,000	75,468	85,056	48,000	100,000	33,248	96,000	480,782
4. OTROS	34,380	30,982	30,988	30,982	86,200	1,500	27,500	232,532
TOTAL	1,320,993	3,615,582	2,214,860	2,567,186	7,165,465	811,921	2,202,211	19,898,226

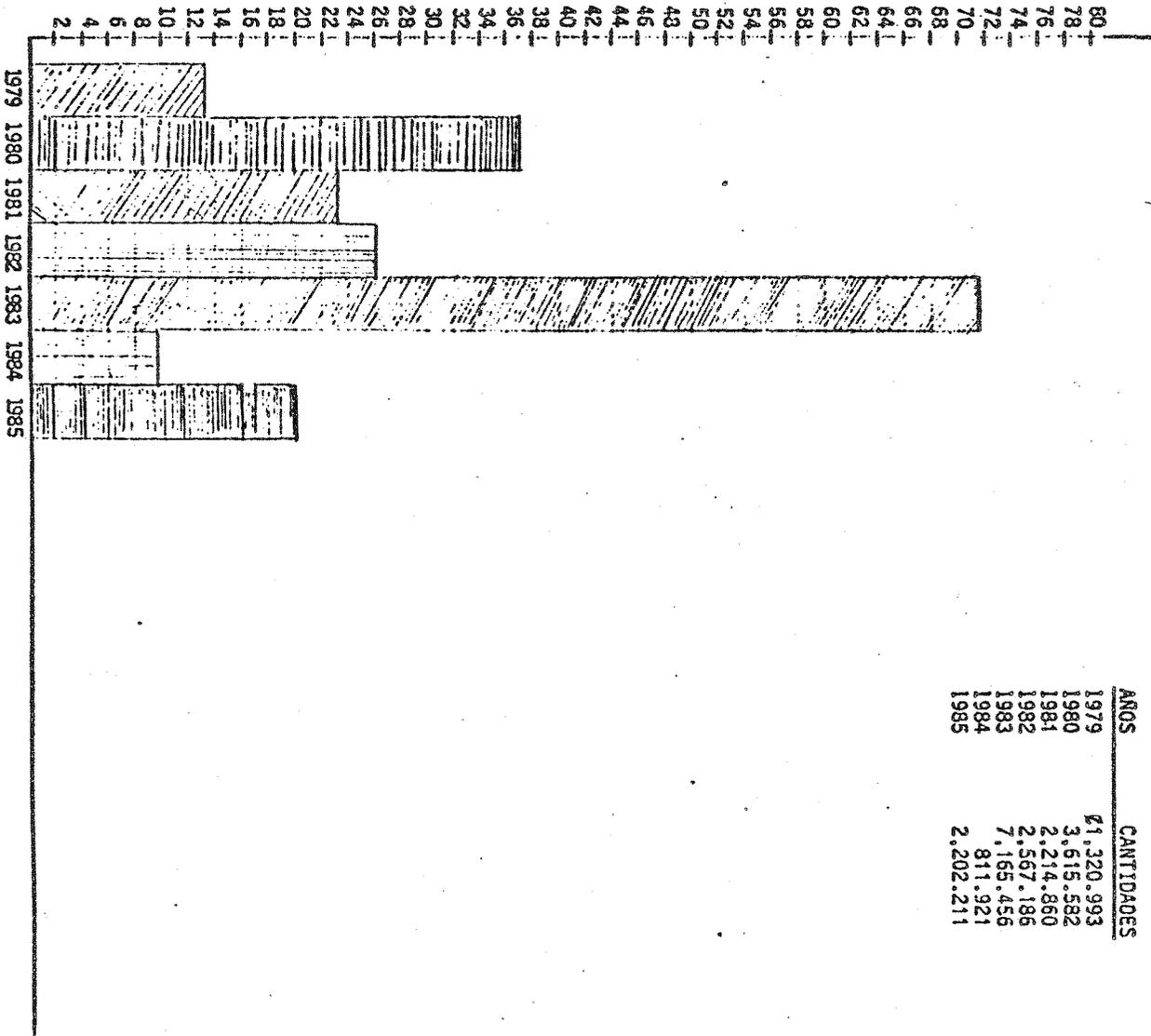
ANTEL CHART II

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE ANTEL POR ACCIONES TERRORISTAS (En colones)

DÉSCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. EDIFICIOS E INSTALACIONES								
1.1 Edificios		967,600	384,000	147,269	313,500	28,500	302,600	2,143,469
1.2 Mobiliario y Equipo		912,400	446,000	155,000	381,500	54,500	196,300	2,345,700
1.3 Conmutadores	24,620	172,340	221,580	147,720	147,720	50,240	52,200	816,500
1.4 Armarios		30,000	480,000	620,000	120,000	150,000	90,000	1,490,000
1.5 Pozos de Vista				385,000				385,000
1.6 Líneas Telefónicas	1,172,526	408,843	474,277	158,126	189,751	442,752	315,250	3,162,525
1.7 Estaciones Repetidoras		200,000		380,000	4,197,000	4,000	821,279	5,902,279
1.8 Plantas Telefónicas					1,000,000			1,000,000
1.9 Teleimpresores						10,000		10,000
1.10 Cables de Enlace	37,172	74,359	74,359	74,359		37,160		297,439
1.11 Miscelaneas	9,295	13,590	18,590	18,590	9,294			74,360
SUB-TOTAL	1,243,613	2,784,132	2,098,806	2,086,064	6,658,765	777,172	1,778,710	17,427,272
2. EQUIPO PESADO								
2.1 Vehiculos Pesados				142,540				142,540
2.2 Motores Generadores				259,500				800,000
2.3 Bancos de Bateria		725,000			320,500		220,000	805,000
SUB-TOTAL		725,000		402,040	320,500		300,000	1,747,640
3. EQUIPO LIVIANO								
3.1 Vehiculos Livianos	43,000	75,468	85,066	48,000	100,000	33,248	96,000	480,782
	43,000	75,468	85,066	48,000	100,000	33,248	96,000	480,782
4. OTROS								
4.1 Aparatos Telefónicas	3,400							3,400
4.2 Ponteria	18,590	18,590	18,590	18,590	5,000	5,000	1,500	108,360
4.3 Teléfonos Públicos	12,390	12,392	12,392	12,392	81,200			130,772
SUB-TOTAL	34,380	30,982	30,988	30,982	86,200	1,500	27,500	242,532
GRAN-TOTAL	1,320,993	3,615,582	2,214,860	2,567,186	7,165,465	811,921	2,202,211	19,898,226

ANTEL GRAPH - I

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES
(A.N.T.E.L.)
Daños a la Infraestructura
(1979-1986)



ANTEL CHART III
INDIRECT COSTS OF CIVIL VIOLENCE

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES (En colones)

COSTS INCURRED	1979	1980	1981	1982	1983	1984	1985	TOTAL
a. LOST REVENUES	88	4,205	23,952	43,788	62,205	73,337	97,007	304,582
b. SECURITY - PERSONNEL								
c. SECURITY - INSTALLATIONS		594,778	872,166	189,556	1486,945	872,165	872,165	5,947,775
d. ADDITIONAL PERSONNEL		451,658	677,487	903,316	1129,145	677,487	677,487	4,516,580
e. OVERTIME	41,190	111,305	128,873	153,160	126,507	81,304	85,414	727,853
f. SPECIAL TRAINING COSTS		1,041	1,561	2,080	2,601	1,561	1,561	10,405
g. AIR TRANSPORT		1,715	2,573	3,870	38,058	17,952	19,302	83,480
h. LAND TRANSPORT		4,000	6,000	8,000	10,000	6,000	6,000	40,000
i. ADDITIONAL ENERGY, FUEL, ETC.	12,754	166,483	213,007	274,954	336,532	201,797	209,096	1,414,623
j. HEAVY EQUIPMENT								
k. LIGHT EQUIPMENT								
l. INSURANCE - INDEMNITIES	122,000	437,000	400,500	242,000	130,970	152,300	193,800	1,678,370
OTHERS	8,008	170,559	292,758	476,675	760,217	288,235	396,942	2,413,394
TOTAL	174,410	1,962,744	2,638,877	3,297,399	4,083,208	2,392,028	2,578,794	17,137,082

ANTEL CHART IV
ADMINISTRACION NACIONAL DE TELECOMUNICACIONES
NECESIDADES DE FINANCIAMIENTO
RECONSTRUCCION DE INFRAESTRUCTURA BASICA (En colones) 1/

DESCRIPCION	1987	1988	1989	TOTAL
RESTAURACION DE DAÑOS	15,276,800	2/		15,276,800
AMPLIACIONES DIFERIDAS 3/	1,000,000	1,000,000	50,000,000	52,000,000
RESTAURACION DE SERVICIOS	4,621,500			4,621,500
TOTAL	20,898,300.	1,000,000	50,000,000	71,898,300

NOTAS

1/ El tipo de cambio utilizado en este informe el US\$ 1.00= ₡2.50 debido a que en nota N° 3513 del 15 de Noviembre de 1985 se solicitó el financiamiento necesario para la adquisición del equipo, a l tipo de cambio vigente en esa época.

2/ Para los años 1988-1989, no se reportan los fondos necesarios para la restauración de daños porque se desconocen los posibles daños en este período.

3/ Las ampliaciones diferidas corresponden al IV proyecto.

V. WATER AND SEWER

A. Organization

The National Water and Sewer Administration, Administracion Nacional de Ace ductos y Alcantarillados, ANDA, was created in 1961 to provide water and sewer services to the entire country. In 1967, the Ministry of Health took over rural services and ANDA limited its activity to the metropolitan area. Since 1971, in agreement with the Ministry of Health, ANDA provides water and sewer services to San Salvador, the major towns in the interior (mostly departmental capitals) and some rural villages. As of 1985, ANDA provided services to 176 urban localities and 33 rural areas. Some of the so-called urban localities are pretty small, in 81 of them there are less than 200 customers hooked up to the system. Some areas of service are controlled by the guerrillas and among the indirect costs are uncollected bills for service in these areas.

ANDA, in addition to the usual head office staffs and departments, is organized into six geographic zones. Three in San Salvador for various parts of the city and three in the country -- Northern Zone, Western Zone and Eastern Zone. The Northern and Eastern Zones have been hardest hit by the violence, the Oriental Zone especially hard hit.

B. Direct Damages

Chart ANDA I shows direct damages. Some items merit comment. First we note that ANDA was an early target. The heavy equipment lost in 1980 included a drilling rig, a back-hoe, and two heavy dump trucks. The back-hoe was lost in Chalatenango, a department which has long been a stronghold of the guerrillas and the scene of heavy fighting recently. Secondly, we note the heavy loss of light equipment and tools in 1980. These were mostly trucks and equipment shot up by guerrillas or stopped and burned. The drop in losses after 1980 does not reflect any reduction in violent intent; it indicates ANDA's decision to stop sending work crews into areas under guerrilla control.

The damage to buildings and installations has been mostly to pumping stations, piping and installations outside of San Salvador. However, in 1982 the central offices of ANDA in San Salvador were dynamited twice, with varying degrees of damage. Before that, in 1980, the main office was assaulted and occupied by the Bloque Popular Revolucionario (BPR) and nearly 80,000 colones of damage sustained. However, all things considered, ANDA's direct damages have been of lesser magnitude than those suffered by other agencies. Other direct costs are mostly robberies of rural or outlying bill collectors.

C. Indirect Costs

The pattern is the same for all the public service agencies except the railroad. The indirect costs greatly exceed the direct costs. In the case of ANDA, the difference is even greater because ANDA has less costly direct damage. ANDA's losses have been relatively inexpensive light vehicles and equipment. But the repercussion of this damage has been great. Some of the items again require comment.

Lost revenues (ingresos no recibidos) in the case of ANDA do not reflect services not provided, as in the case of electric power. They represent bills not paid.

Over half of these unpaid bills are for services provided to the central government autonomous agencies and municipalities. (See Chart ANDA V.) This points up a problem that runs through the entire public finance structure of the country. Every power distributing company complains that the government institutions do not pay their bills, especially ANDA which uses a lot of electricity to pump water. ANDA does not pay because it cannot collect; DEUSEM or CLESA run up arrears in payment to CEL, another autonomous government agency. It can be argued that this represents mostly transfer payments within the public sector and hence mean little to the national economy. But the sums are substantial; the arrears and non-payments distort the finances of the agencies, seriously disturb cash flows and certainly represent some serious misallocation of resources including resources from foreign assistance.

Two other items are related to the lost collections. Interest on collectables (intereses por mora, no pagadas) is uncollected interest on uncollected bills. This is clearly an indirect loss but it is also a financial distortion. These sums, in all likelihood, will never be collected. Yet they are carried on the balance sheets as assets. This overstates the net worth of the company as well as its earnings. The item "Interest Costs" (costo por mora) represent interest paid by ANDA resulting from its inability to pay its own bills, whether interest charges by creditors or by banks for moneys borrowed to pay bills. It is a true cost but it is also an example of distorted finances and misallocated resources.

Cost of additional energy represent the cost of operating stand-by generators, mostly in the Eastern Zone.

The item of "Lost Wages" (salarios caidos) is really lost labor costs. It represents wages paid when work could not be done because workers were prevented from getting to work sites. The exception is the large sum in 1985. Over 4 million of the 5.3 million colones recorded represents the cost of labor disputes and associated work stoppages. Normally this report would not include such an item but ANDA insists that the labor troubles were politically inspired and a result of the climate of violence and civil strife in the country. This cost should still probably be reduced by 4,468,800 colones.

D. Deferred Maintenance and Financial Requirements

ANDA has had to defer a great deal of maintenance either for lack of resources or the inability to enter certain areas. In fact, deferred maintenance reported by ANDA at 31.6 million colones exceeds the estimated reconstruction costs shown in ANDA Chart III. It is the report's conclusion that it is too low by at least this amount and that ANDA will need reconstruction, rehabilitation and expanded service financing of at least 45 million colones (US\$9 million) over three or more years. An analysis of the water and sewerage needs of the thousands of immigrants to San Salvador from rural areas may increase this financial requirement. International financial assistance should probably be conditioned on management improvement. The organigram attached shows a very complicated structure which made writing this report somewhat more difficult.

ANDA Chart III shows no contribution from ANDA to its reconstruction program. At the moment, that might be a fair judgement. However, ANDA did have positive revenues up until 1983 and its severe cash flow problems are both of recent origin and susceptible of correction. ANDA should be able to start contributing to local costs of reconstruction within a year or so of return to normal conditions.

ANDA CHART I

"ADMINISTRACION NACIONAL DE ACUEDUCTOS Y ALCANTARILLADOS"
(A N D A)

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE 1979 - 1985 (Expresado en colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. EDIFICIOS E INSTALACIONES	4,102	106,862	255,227	393,141	45,674	66,812	172,560	1,044,678
2. EQUIPO PESADO	840,579	65,000	---	96,000	150,000	---	---	1,151,579
3. EQUIPO LIVIANO Y HERRAMIENTAS	27,741	1,498,151	364,569	680,160	566,440	216,940	113,745	3,467,716
4. OTROS	94,920	---	---	---	11,395	---	60,296	166,611
TOTAL	967,642	1,670,013	619,796	1,169,301	773,509	283,752	346,601	5,830,614

ANDA CHART II

RESUMEN DE COSTOS INDIRECTOS DE DAÑOS A INSTALACIONES DE ANDA INCLUIDOS EN EL PRESUPUESTO. (Miles de colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. INGRESOS NO RECIVIDOS	1,341,0	2,430,8	3,519,2	4,855,7	4,975,9	6,419,5	10,410,4	33,952,5
2. SEGURIDAD PERSONAL	---	10,2	28,6	54,1	60,2	62,8	61,9	277,7
3. SEGURIDAD - INSTALACIONES -	---	21,0	40,3	66,0	494,3	835,8	838,2	2,295,6
4. AUMENTO DE PERSONAL	88,5	95,0	98,5	96,8	80,1	61,0	9,7	529,6
5. SOBRETIEPOS	18,6	71,5	94,8	130,3	199,9	223,5	258,3	996,9
6. COSTO DE TRANSPORTE ADICIONAL	4,2	49,7	60,0	82,3	87,5	118,5	121,9	524,1
7. COSTO DE ENERGIA ADICIONAL	476,8	476,8	1,252,4	1,288,1	1,145,7	1,059,4	1,487,1	7,186,3
8. COSTO ADICIONAL DE EQUIPO PES.	---	---	---	---	---	---	500,0	500,0
9. INDEMNIZACIONES - SEGUROS -	220,2	332,0	347,4	431,5	584,6	666,0	982,2	3,563,9
10. INDEMNIZACIONES POR RECLAMOS	---	9,3	9,7	7,2	---	---	---	26,2
11. OTROS	53,0	53,0	54,2	54,2	54,2	54,3	55,9	378,8
12. INTERESES POR MORA, NO PAGADAS	---	---	---	45,5	875,4	2,872,6	3,180,5	6,973,6
13. SERVICIOS NO FACTURADOS	---	---	7,6	8,7	84,2	122,3	175,1	397,9
14. OBRAS ADICIONALES	---	---	---	100,0	---	---	---	100,0
15. COSTOS POR HORA	964,6	1,564,8	2,074,9	2,966,5	3,152,4	4,119,6	7,119,7	21,962,5
16. OBRAS DE PROTECCION	4,0	5,0	6,5	7,5	26,5	10,0	10,0	69,5
17. SALARIOS CAIDOS	16,2	533,8	441,6	424,2	457,3	442,4	5,289,7	7,605,2
T O T A L E S	3,187,1	5,652,9	8,035,7	10,618,7	12,278,2	17,067,7	30,500,6	87,340,30

ANDA CHART III
 ADMINISTRACION NACIONAL DE ACUEDUCTOS Y ALCANTARIILLADOS
 (A N D A)

REQUERIMIENTOS FINANCIEROS
 RECONSTRUCCION DE INFRAESTRUCTURA DAÑADA
 (En colones)

DESCRIPCION	1987	1988	1989	TOTAL
A) RESTAURACION DE DAÑOS	372,167	372,167	372,167	1,116,501
B) AMPLIACIONES DEFINIDAS	50,000	50,000	50,000	150,000
C) RESTAURACION DE SERVICIOS	3,977,118	3,887,118	3,887,118	11,751,354
TOTAL	4,399,285	4,309,285	4,309,285	13,017,855
ANDA RECURSOS	-	-	-	-
NECESIDADES FINANCIERAS	4,399,285 ↘	4,309,285 -	4,309,285 ↗	13,017,855 ↗

ANDA CHART IV

ADMINISTRACION NACIONAL DE ACUEDUCTOS Y ALCANTARILLADOS

ANEXO No. 3

MORA DEL GOBIERNO CENTRAL, INSTITUCIONES AUTONOMAS Y MUNICIPALIDADES

PERIODO (1979- 1985)

SECTOR AÑO	GOBIERNO CENTRAL	INSTITUCIONES AUTONOMAS	ALCALDIAS MUNICIPALES
1979	₡ 49.143.28	₡ 13.836.06	₡ 824.910.77
1980	" 60.633.84	" 15.203.46	" 1.281.245.44
1981	" 34.941.62	" 87.696.59	" 1.612.493.52
1982	" 881.180.86	" 201.128.35	" 1.418.607.49
1983	" 1.075.333.51	" 235.147.19	" 1.412.161.54
1984	" 1.959.613.60	" 221.877.48	" 1.386.504.99
1985	" 3.403.302.00	" 1.127.610.80	" 1.783.390.96
T O T A L	₡ 7.464.148.75	₡ 1.902.499.93	₡ 9.719.314.71

VI. MINISTRY OF PUBLIC WORKS

A. Organization and Responsibilities

The Ministry of Public Works is in charge of planning, construction and maintenance of the public infrastructure of the country. Operating under the Minister, the Directorate of Planning coordinates, controls and supervises the following directorates and institutions:

1. General Directorate of Roads (DGC), which builds and maintains inter-urban highways, feeder roads and bridges throughout the country. This institution and its infrastructure has been most heavily attacked by the insurgent forces. Direct losses are estimated at approximately ₡154,000,000 (US\$1,600,000) and civil violence has taken the lives of 45 persons in only the Highway Department.

The major targets have been the larger bridges, including the two most important in the country which account for about ₡150,000,000 of the total direct damage costs. Other damages have costs approximately ₡4,000,000 (US\$1,600,000) most of it in heavy equipment and vehicles.

2. Directorate of Urbanism and Architecture (DUA), which takes care of urban facilities and infrastructure. The cost of the direct damage has been in the order of ₡1,200,000, most of it in vehicles and equipment. One life has been lost.
3. National Geographic Institute in charge of providing the national catastroer and cartographic maps in support of national programs. The direct cost of the guerrilla attacks has only been in the amount of ₡166,000, but the loss of lives has been 15.

4. The Geotechnic Investigation Center provides specialized technical services in the field of geology, seismology and behavior of soils. They reported direct losses of ₡244,000, most of it in equipment, and one life lost.
5. The Directorate of Planning itself has suffered damages in the amount of ₡10,000 and the loss of one life.

The intention of this description is to show that each branch of the agencies working with the Ministry of Public Works has been the target of guerrilla violence which reached a high point in 1981, with ₡71,000,000 in damage costs. Losses from the insurgency were lower in 1982-1983, but in 1984 when the guerrilla action increased, damages were in the range of ₡38,000,000. Apparently once the damage was done and good targets became scarce, the insurgency turned to other targets and much less damage was reported in 1985.

Most of the destruction caused by the guerrilla action was directed at disrupting the economy and creating panic and social instability. The damages to the Ministry of Public Works falls into this category, and, to a great extent, the insurgency accomplished its goals.

The economy has slowed down, the construction and maintenance of roads have come to a halt and the meager available resources for infrastructure maintenance have been exhausted or diverted to cover emergency situations created by the violence.

6. The Special Resources Organization (ORE) was established to channel resources into employment generation. It receives funding from the Agency for International Development. Table A-7 shows the amount of the damage (mainly to equipment) caused by guerrilla action aimed at ORE in the amount of ₡301,400. Table A-8 shows disbursement of funds made available by ORE to two different agencies from 1980 through 1985. In the case of the MOP, these emergency funds have in small part replaced the funds for maintenance and repair that were not included in the annual budgets. See organigram chart.

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

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>TOTAL</u>
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

B. Direct Costs

Table A shows a summary of the "Direct Damage Costs" of the Ministry of Public Works. It includes costs sustained from the various Directorates of the Ministry. Costs of the individual entities are shown in Table A-1 through A-7, attached. Additional back tables A1.1 thru A1.7 can be found in the report file.

Direct costs have been calculated by taking the estimated replacement costs of the damaged structure or equipment at the time of the incident and adding the repair costs to put the object back into service. If the structure or equipment only needs repair, the direct damage costs is the repair cost. If the object can neither be repaired nor replaced, the direct cost of the damage is the estimated replacement or market costs at the time of the incident.

In the case of the bridges, Table A-2, all costs, labor, material, design, supervisions, etc., have been estimated and included as a single cost per incident.

The damage estimate for the Golden Bridge (Puente de Oro across the Lempa River on the coast highway) in 1981 includes an estimate of \$50,000,000 for the replacement cost at the time of the incident. This is actually a cost estimated four years later in connection with proposed international financing for reconstruction. It probably understates the cost of the damage because it does not include work on approaches and abutments associated with repair to the structure. The direct damage cost estimate for the Cuscatlan Bridge includes an estimate of 1984 replacement at 18,000,000 colones (US\$7.2 million). This is also on the low side. In other words the damage cost for major bridges is probably overly conservative.

Analysis of Table A shows direct damage to bridges and roads becoming important in 1980, probably in 1981 as one major bridge (Puente de Oro) is destroyed but many other lost bridges are also attached. There was a drop in 1982, increased activity in 1983, especially bridges and another peak in 1984. In 1984, the jump in bridges damage is almost entirely damage to one bridge, Cuscatlan. However, the damage to roads and highways should be noted; this is mostly a big

increase in attacks on road building equipment. All damage to MOP installations and materials drops off in 1985, probably, as noted above from a shortage of easy targets.

The total direct cost for the Ministry of Public Works of damage for insurgent sabotage for the period of 1979 to 1985 is not less than $\text{¢}128,157,700$ or US\$51.5 millions. (See the following chart.)

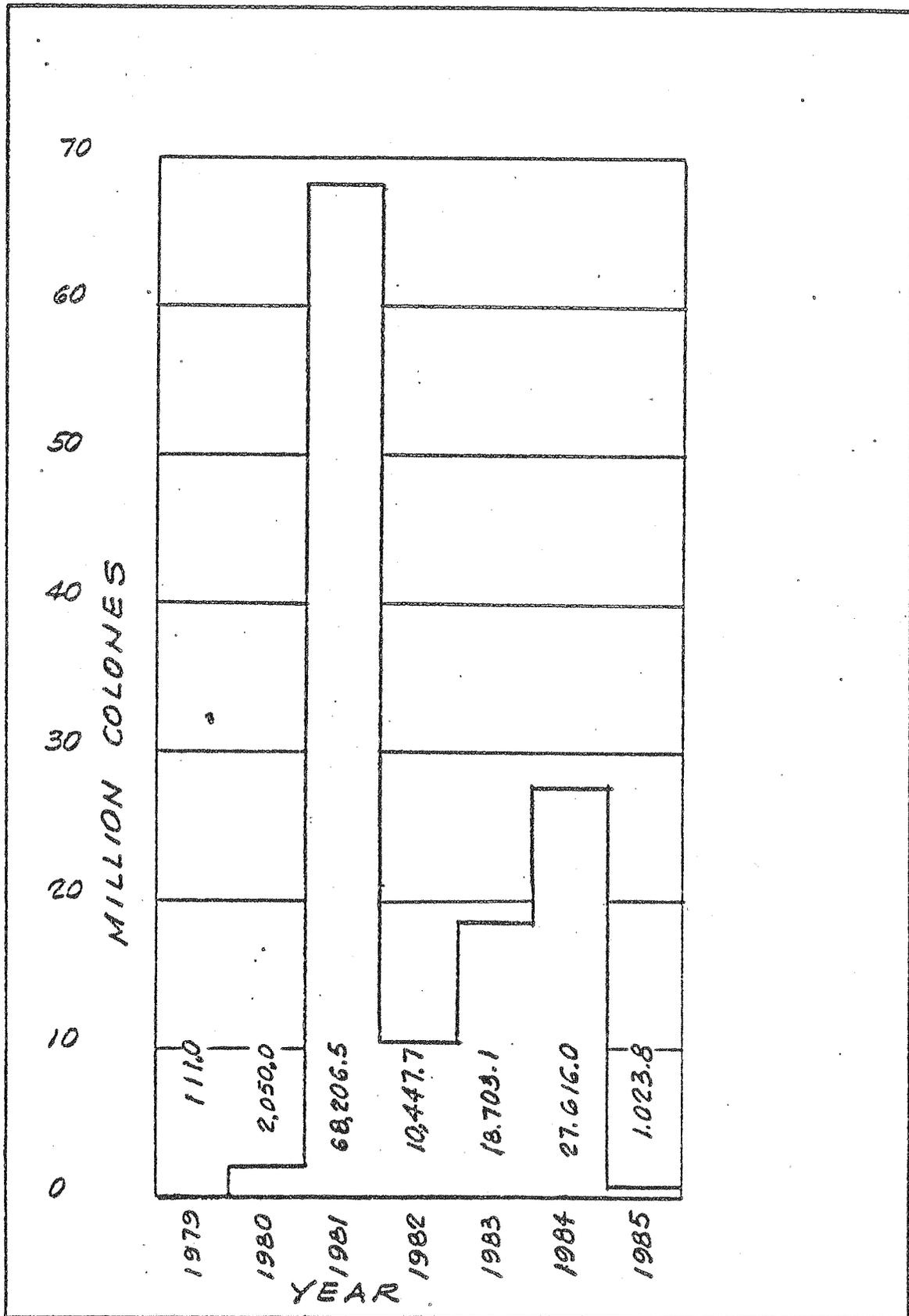
1. Further Constructions - Temporary Bridges

In the "Direct Damage" Table A-1, we have shown repair costs for bridges for each of the years since 1980. This was the cost of the repair at the time of or shortly after the event of sabotage. This does not cover the full cost of the damage, however, since, in the case of major bridges, the first temporary repairs have not been enough to maintain traffic. Consequently, this year new temporary bridges will be installed at the sites of the Cuscatlan, Golden and Moscoso bridges. The first two are over the Lempa River which runs all the way across El Salvador and divides the eastern third of the country from the western part. The Moscoso bridge is on the Pan American Highway east of San Miguel over the San Miguel River. These are the three most important bridges in the country since their destruction cut both the Pan American and coastal highways and isolated the eastern areas. The situation at Cuscatlan is described below in some detail.

In 1986 the planned expenditure on the three bridges for access, abutment and support and placing of Bailey bridge sections is expected to total 10.6 million colones. Pile driving costs, including purchase of pile driving equipment will add 4.5 million colones to this cost. The total 11.1 million colones (US\$2.2 million) should be added to the direct cost of damage to bridges shown in Table A-1.

A new bridge, but of temporary type construction, is to be built at Citila over the upper reaches of the River Lempa along the northern border with Honduras. The road involved is Central American Highway No. 4 to San Pedro Sula in Honduras. Such a bridge has long been needed. The fact that it has not been built is an indirect result of the insurgency. It is thus an

CHART A-10- REPRESENTATIVE OF DIRECT COST IN THE MINISTRY OF PUBLIC WORKS



exception to the rule that provisional bridges are used to replace damaged bridges. This exception recognizes the need for alternative traffic routes in this area of El Salvador. However, since it is not in response to direct guerrilla damage, it is not included as a direct cost.

A number of the damaged bridges have been repaired using Bailey bridging material imported for that purpose by AID at a cost of US\$2,650,000. This material had to be painted, moved to sites, installed, etc. The cost of the local work is estimated at ₡2,750,000. Using the 2.5:1 rate of exchange then prevailing, this results in additional repair cost for bridges of ₡9,375,000. This is shown on the appropriate table.

2. The Cuscatlan Bridge over the Lempa River

A very typical example of the physical, economic and social damage caused by the insurgency, in relation to the bridge destruction, is the Cuscatlan Bridge.

On January 1, 1984, this bridge was dynamited and completely destroyed, causing a serious disruption of traffic on the Pan American Highway. Some vehicles tried to cross the river through the shallows, and several of them sank and were helped out with the use of heavy equipment. Some traffic was allowed on top of the crown of the hydroelectric dam which was being built by a CEL contractor, which roughly alleviated the traffic problem. In the meantime, the contractor, with approval of the MOP, was ordered by CEL to do the necessary earth work to provide accesses and the embankment to place a Bailey bridge, a job which was completed on the 20th of January, at a cost of ₡1,000,000, only three weeks after the bridge had been blown up. This solution, changed the topographical conditions which prevailed when the dam was originally designed and created the almost certain possibility of losing the Bailey bridge, when the rainy season arrived and the water elevation and the discharge would increase. By this time, the crown of the dam was sufficiently finished, and it was decided to divert the traffic to the top of the dam, an operation which was accomplished on about June 30 of the same year at a cost of ₡1,850,000. The Bailey bridge was pulled out, and this is the solution that prevails today with the aggravating inconvenience of a one-way lane of traffic.

It is very important to notice that this dam was not designed to accept loads and the vibrations which come with the constant heavy traffic. Moreover, the two turbines now in place could be easy objects of guerrilla action, and the dam itself could be blown up. For this reason a two-way temporary bridge (over pilings) has been designed and is being built at an estimated cost of ₡5,000,000, under the supervision of the U.S. Corps of Engineers.

Since all these solutions are temporary, the construction of a new bridge to restore the Cuscatlan bridge to its original condition or better is still contemplated, but the timing is uncertain. Nevertheless, we estimate that the cost of that bridge would be around ₡50,000,000 (\$10,000,000).

The direct repair cost at this moment is at least ₡7,850,000 and that does not include the cost of the Bailey bridge, transportation and placement, which are included in the other cost table. The cost of the approaches to the two-way temporary bridge are not included either.

This example shows the complexity of repairing bridges, different than other structures or installations which have been damaged and repaired several times, such as electric high power towers. The large bridges have been damaged once but have required several costly repairs or temporary replacements.

All this explanation indicates that the cost of the damage caused by the guerrillas on bridges does not end with a simple solution; it is a continuous high cost series of disbursement.

The "Golden Bridge," the longest bridge over the Rio Lempa, has a similar problem. A temporary solution, using a railroad bridge, will be replaced by another temporary solution, a one-way bridge on pilings, which will ultimately have to be replaced by a permanent structure costing at least US\$10 million.

C. Indirect Costs

Table 2A is a summary of indirect damage costs caused to the different institutions which ~~are~~ Ministry of Public Works. The sum of the most important damages ~~in~~ the MOP indicates a total loss of ₡612,901,870 (US\$245,160,800) from ~~1974 to~~ 19.5% or ₡609,950,000 (US\$243,980,000) is the budgetary difference ~~to~~ 1985 of funds not received. Chart 2A-1.1 shows one broken line ~~representative~~ of the actual budget during the year and the other a straight ~~representative~~ of the budget projection from 1974 to 1979 extended to 1985

In order to calculate ~~equipment~~ indirect costs in the MOP, we assume that the ministry works ~~in~~ the same way as any private enterprise. It does not produce revenue ~~but~~ provide services, and it has losses. If a truck or piece of equipment ~~is~~ damaged, the MOP has to buy, repair or rent another truck to replace it so ~~as~~ continue normal operations; this is a direct cost which is reported in Table ~~A-1~~. If there are no funds to replace it, the rental value of another truck ~~for~~ the time during which the truck is not available will be the indirect ~~cost~~ loss, based on the cost of the truck at the time of the damage. ~~(See~~ Table 2A.) The same concept is applicable to heavy equipment. If the ~~life expectancy~~ of the equipment damaged would be the number of remaining years ~~at~~ the date of the incident to 1985 and 20% a year is applied for equipment ~~lost~~, the indirect cost of the "Equipment Service Loss" has been calculated ~~and~~ represents the lost value of the services of the material. This is ~~in~~ Table 2A.

If equipment has ~~been~~ repaired, the repair cost appears as a direct cost in Table A-1.

Indemnities, the ~~lost~~ cost to the Government, is the amount that the family members will ~~be~~ according to INPEP (National Institute of Pensions for Public Employees) ~~if~~ the children reach the age of 18 or the wife of the deceased remarries, ~~she~~ averages ₡200.00 a month with a minimum of ₡150.00 per decedant.

D. Budgetary Requirements

In the discussion of indirect ~~to~~ Ministry of Public Works and on the chart which described them, ~~the~~ item for "Budget Insufficiency." This figure was derived by taking ~~the~~ line for the MOP budget from 1969 to 1979 and extending it to 1985. ~~The~~ line assumes normal economic growth and relative shares of ~~the~~ budget as part of GDP and of the MOP budget as part of the entire ~~budget~~ were other factors affecting the economy, falling export prices ~~caused~~ costs for imported petroleum, for example. Nevertheless, the major ~~reason~~ why the Ministry of Public Works did not have greater budget resources ~~was~~ the civil violence. The following table shows the difference ~~between~~ actual and projected budgets. This is graphically shown in ~~Chart~~.

~~Chart~~ MOP

YEAR	BUDGET	Actual	DIFFERENCE	PERCENT
1979	236.70	240.79	-4.09	-1.73
1980	232.90	262.97	30.27	13.0
1981	250.45	313.73	43.28	17.28
1982	232.81	324.65	91.84	39.45
1983	226.94	404.85	177.91	56.36
1984	230.48	385.41	154.93	67.22
1985	250.16	315.07	65.81	65.28
TOTAL	1,923.38	2533.33	609.95	

When this budget shortfall is ~~in~~ consideration along with the 613 million colones of direct damage ~~to~~ bridges and MOP equipment, the effects on the economy are ~~notable~~.

- A great drop in infrastru~~cture~~ investment,
- Poor maintenance of highwa~~y~~ roads, bridges, etc,

- Inefficient use of manpower resulting from an inadequate equipment base, and
- Reduced generation of employment in private sector normally supporting infrastructure construction and maintenance.

Two measures of this indirect impact are the estimated value of all maintenance deferred, 503.6 million colones and the inability of the Government of El Salvador to meet its counterpart commitment, 98.5 million colones, to its priority road building program of 245.7 million colones for which international financing commitments were available.

A detailed study is needed to establish the full impact on the private transport sector, but deferred maintenance means higher fuel, repair and other operating costs for the transport of persons and goods.

Finally, there is a further secondary cost involved when investments in maintenance or construction are not made. Such investments are expected to produce a return directly or in savings. Given the opportunity cost of capital in El Salvador over the last six years (probably between 10% and 15%) a return on infrastructure investment of about 20% would seem conservative.

This report has not listed the lost return to deferred investment as an indirect cost of the violence, but it should be noted here, if only to show that including the "lost" budgetary resources as an indirect cost is actually a conservative measure.

LOST RETURN TO BUDGET RESOURCES

YEAR	DIFFERENCE	20% RETURN	No. YEARS	TOTAL COST
1979	-4.09	-0.82	7	-5.74
1980	30.27	6.05	6	36.3
1981	43.28	8.66	5	43.3
1982	91.84	18.36	4	73.5
1983	127.91	25.58	3	76.74
1984	154.93	30.99	2	61.98
1985	165.81	33.16	1	33.16
TOTAL	609.95			319.24

E. Deferred Costs

The maintenance provision for roads and highways in the MOP budget has always been less than that required to provide an efficient transportation system and never satisfied the "use life" of the roads of El Salvador. The roads built before 1979, which satisfied the designated characteristics of that time, did not meet later conditions, when the increased load capacity of trucks and the daily-annual transit average created a reduction in the life of roads and highways and consequently the need for improvement in the maintenance program. Maintenance of roads and highways had a tendency to repair damage rather than to prevent it.

At the beginning of 1979, the conditions became worse; the destruction of vital structures, such as bridges, culverts, pavements, installations and equipment caused by the insurgent forces, created the need to transfer the meager maintenance funds toward other accounts, where the need could not be postponed. The damage caused by the use of the roads had a multiplier effect, that means that a small damage on the pavement, if not repaired, is multiplied, in size, several times; as a consequence and with the years of no maintenance, a road with little damage, becomes practically destroyed, at least the top course and the base material of support. Not all the damage can be blamed to the last 5 years of insurgency due to the fact that the maintenance of past years although deficient, always existed, but it is evident that the life of the roads has been reduced several years and, consequently, the costs of reconstruction will be very high.

It is important to indicate, also, that the enormous damage caused to the railroad system has transferred at least 70% of the cargo and passenger movement to the road system; increasing greatly the use of the main highways and, consequently, the deterioration of the road.

Some roads, especially those located in conflictive zones, are completely abandoned, showing their shoulders full of vegetation and their bituminous pavement with cracks caused by the weather, because the lack of use of herbicides and preventive seal, respectively.

In order to estimate the damage for lack of maintenance, the total cost of the roads of the country in different categories, is divided by the average useful life of the roads, which gives the cost of reconstruction and maintenance for one year. Multiplying this value by the five years of abandonment, the sum to invest, to reconstruct all the roads of the country and place them in optimum condition will be found. Chart 3A-1, representative of the maintenance cost, has been elaborated using a life use of 25 years for asphaltic roads (specials, primaries and secondaries), and 20 years for the roads built with cobblestone or only base materials (tertiaries, rurals "A" and "B" and the vecinals). For information, Chart 3A-1 shows the traffic count in the two main roads of the country, the Pan American and the Littoral Highways.

F. Reconstruction of Roads and Bridges after 1986

The Government of El Salvador will have to be prepared to start a program of reconstruction of roads and bridges once the insurgency comes to an end and the country returns to normality. Estimating that by January 1987 this condition would be met, it is suggested that a five-year crash program ending in 1991 would bring the highway and road net back to at least the 1980 level.

Chart A-9 shows the amount of money required to reach that goal, using damage costs described in this report plus the cost of a long deferred priority program. The total requirement is estimated at 909.1 million colones.

The availability of funds was obtained by adding the estimated projected budgets for years 1987 - 1991 in the amount of $\text{¢}1,114.2$ millions and assuming very conservatively that the MOP could set aside 25% of its yearly budgets for a total of 278.2 million colones for this program. International financing commitments already exist for 177.2 million colones. From 1987 through 1991, the country would have available for the program $\text{¢}455.7$ million (US\$91.1 million).

Subtracting the availabilities from the requirements and the unmet need, excluding inflation costs, will be 453.4 million colones (U.S. \$90.7 million). Inflation costs have not been considered.

CUADRO N° 3A-1

TPDA (TRANSITO PROMEDIO DIARIO ANUAL) - 1985

CARRETERA PANAMERICANA			CARRETERA LITORAL		
TIPO DE TRAFICO	Nº DE VEHICULOS	% DE TRAFICO	TIPO DE TRAFICO	Nº DE VEHICULOS	% DE TRAFICO
Liviano - Pasajeros	1498	23	Liviano - Pasajeros	1161	50
Liviano - Carga	1953	30	Liviano - Carga	780	31
Pesado - Pasajeros	1693	26	Pesado - Pasajeros	116	5
Pesado - Carga	1367	21	Pesado - Carga	325	14
	6511	100		2322	100

* DISTRIBUCION DE TRAFICO PESADO

* DISTRIBUCION DE TRAFICO PESADO

Carga C 2	1285	94	Carga C 2	283	87
Carga C 3	41	3	Carga C 3	16	5
T 3 S 2	27	2	T 3 S 2	26	8
OTROS	14	1	OTROS	-	0
	1367	100		325	100

* Estos valores son porcentajes del tráfico pesado de carga.

CUADRO N° 3A-2

COSTOS DE MANTENIMIENTO DIFERIDO

CAMINOS Y CARRETERAS

	LONG. TOTAL KMS	COSTO/KM ₡	COSTO TOTAL (000)	VIDA DE USO AÑOS	COSTO VIDA 1 AÑO (000)	COSTO MANT. 5 AÑOS (000)
Carreteras Especiales	107.24	2,535,482	271,191	25	10,848	54,238
" Primarias	577.70	1,267,741	732,374	25	29,295	146,475
" Secundarias	1020.32	1,140,558	1,163,734	25	46,549	232,747
" Terciarias	1678.27	39,268	65,902	20	3,295	16,476
" Rural "A"	1742.37	32,723	57,016	20	2,851	14,254
" Rural "B"	4342.63	29,451	127,895	20	6,395	31,973
" Vecinales	2695.00	11,090	29,888	20	1,494	7,472
T O T A L E S	12,163.53		2,448.000		100,727	503,635

LONGITUD DE LA RED VIAL DE EL SALVADOR POR DEPARTAMENTO DE ACUERDO A SU CLASIFICACION

1984

Departamento	TOTAL KMS.	ESPECIALES (A)	PRIMARIAS (B)	SECUNDARIAS (C)	TERCERIAS (D)	RURALES (E)	RURALES "B" (F)	VECINALES (G)
Abasco	976.91		59.10	41.20	150.35	130.0	346.0	270.2
Agua Caliente	1,145.59	24.79	59.90	101.70	67.14	170.80	300.0	307.50
Amoltepec	849.22		37.50	70.50	97.82	93.00	210.40	319.90
Atlixco	850.35	55.0	104.0	53.0	172.0	89.0	184.45	235.50
Chalchicomula	990.50		7.0	59.5	95.46	189.0	548.60	269.20
Chalchicomula	602.50	27.4		129.1	62.15	61.2	255.10	83.40
Chalchicomula	757.42	-	-	51.7	83.65	83.93	377.33	135.81
Chalchicomula	841.28	-	-	42.52	117.60	52.50	364.80(1)	236.40
Chalchicomula	635.90		14.40	82.55	154.40	70.65	184.50	121.40
Chalchicomula	907.81	20.05	36.00	70.42	124.24	150.60	494.60	91.90
Chalchicomula	1,005.50		42.00	113.40	154.50	121.0	384.70	177.3
Chalchicomula	945.14		42.34	137.07	110.5	320.69	270.2	44.64
Chalchicomula	110.00		14.0	31.2	126.5	23.92	230.85	68.35
Chalchicomula	913.50		101.10	49.3	173.2	67.1	331.1	251.0
TOTAL KMS.	12,163.53	107.24	577.7	1,020.32	1,678.27	1,742.37	4,342.63	2,690.5

(1) Cifra revisada.

CHART 3A-4

MINISTRY OF PUBLIC WORKS

Roads and Highways

Financial Requirements Five Year Rebuilding Plan

REQUIREMENTS	COLONES
Deferred maintenance	503.6 millions
Highway and Roads	245.7
Major Bridges	110.0
Other Bridges	35.9
Highway Construction Equip.	13.9
TOTAL	909.1
AVAILABILITY	
Total Budget (estimated) 1987-1991	1,114.2 millions
Available for Rebuilding 25%	278.5
International Commitments	177.2
TOTAL	455.7
UNMET NEED	
Total Requirements	909.1 millions
Total Availability	455.7
TOTAL	453.4 millions
U.S.\$ equivalent @ 5:1 =	----- \$ 90.7 million

A - MINISTERIO DE OBRAS PUBLICAS
RESUMEN DE LOS COSTOS DIRECTOS

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	COSTO TOTAL
A - OBRAS PUBLICAS								
A-1 CAMINOS Y CARRETERAS	85.5	220.3	105.0	902.0	311.1	1758.2	542.9	3,725.0
A-2 PUENTES	---	1205.2	67901.0	9162.5	18176.0	25850.0	---	122,294.7
A-3 D U A	25.5	387.1	83.3	346.7	216.0	---	148.0	1,206.6
A-4 CIG-Centro Inv.Gestao.	---	155.0	59.2	0.5	---	7.8	31.5	254.0
A-5 ING-Inst.Ges.Nac.	---	72.0	58.0	36.0	---	---	---	166.0
A-6 Dir.de Planeamiento	---	10.0	---	---	---	---	---	10.0
A-7 Ofi.de Recursos Esp.	---	---	---	---	---	---	301.4	301.4
GRAN TOTAL	111.0	2049.6	68206.5	10447.7	18703.1	27616.0	1023.8	128,157.7
To the above should be added:								
Further temporary bridge repair cost				\$ 11,100.000				
Bridging material (Bailey) purchase and installations				<u>9,375.000</u>				
				20,475.000				
\$ 137,532.700	@ 2.5 : 1	Cost in US	\$ 55,013.000					
11,100,000	@ 5.0 : 1	Cost in US	2,220.000					
			<u>57,233.000</u>					

A - OBRAS PUBLICAS
A - 1 CAMINOS - COSTOS DIRECTOS

DESCRIPCION	Año de la Ocurrescia	Coste Estimada	Coste de Destrucción	Coste de Reparación	Coste Final	Coste Estimado de Reparación
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1979		5,460 80,000 ---	--- --- ---	85,460	35,000 500,000 ---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1980		126,000 49,000 ---	4,000 41,300 ---	220,300	545,000 630,000 ---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1981		41,200 59,000 ---	4,800 --- ---	105,000	295,000 340,000 ---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1982		10,000 882,000 ---	--- 10,000 ---	902,000	40,000 3092,000 ---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1983		25,000 250,000 ---	5,000 31,000 ---	311,100	135,000 1670,000 ---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1984		48,000 1658,000 10,000	2,000 40,200 ---	1758,200	200,000 4985,000 15,000
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1985		350,000 150,000 ---	39,376 3,500 ---	542,876	1120,000 250,000 ---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	TOTALES		605,660 3128,000 10,000	55,176 126,100 ---	3924,936	3852,000
	GRAN TOTALES		3743,660	181,276		
* Esta tabla esta respaldada por tablas A-1.1 incluidas en el material de soporte						

A - OBRAS PUBLICAS

A - 2 PUENTES Y BOVEDAS - COSTOS DIRECTOS (000)

DESCRIPCION	Año de la Ocurrencia	Coste Estimado	Coste de Destrucción	Coste de Reparación	Coste Final	Coste Estimado de Repeición	
BRIDGES AND CULVERTS	1979	NO HUBO ACTIVIDAD					
	1980		1,097.0	108.2	1,205.2	---	
	1981		65,893.0	2,008.0	67,901.0	---	
	1982		8,665.0	497.5	9,162.5	---	
	1983		16,898.0	1,278.0	18,176.0	---	
	1984		18,000.0	7,850.0	25,850.0	---	
	1985					---	
	TOTALES			110,553.0	11,741.7	122,294.7	---
	* Esta tabla esta respaldada por tablas A-2.1 incluidas en el material de soporte						

A - OBRAS PUBLICAS

A - 3 DUA - COSTOS DIRECTOS

DESCRIPCION	Año de la Ourrencia	Coste Estimado	Costo de Destrucción	Costo de Reparación	Costo Final	Costo Estimado de Reparación
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1 9 7 9		25,500 --- ---	--- --- ---	25,500	---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1 9 8 0		247,145 19,000 24,195	--- 96,800 ---	307,140	---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1 9 8 1		38,100 9,100 35,797	--- --- ---	83,297	---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1 9 8 2		174,335 9,100 163,271	--- --- ---	346,706	---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1 9 8 3		101,250 86,700 28,045	--- --- ---	215,995	---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1 9 8 4		--- --- ---	--- --- ---	---	---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	1 9 8 5		--- 148,000 ---	--- --- ---	148,000	---
1- Vehículos 2- Equipo de Construcción 3- Herramientas	TOTALES		586,630 271,900 251,308	--- 96,800 ---	1206,638	6,045.000
* Esta tabla esta respaldada por tablas A-3.1 incluidas en el material de soporte						

A - MINISTERIO DE OBRAS PUBLICAS

A - 4 C I O - CENTRO DE INVESTIGACIONES GEOTECNICAS (COSTOS DIRECTOS)

DESCRIPCION	Año de la Ocurrencia	Costo Estimado	Costo de Destrucción	Costo de Reparación	Costo Final	Costo Estimado de Reparación
1- Vehículos 2- Equipo y Herramientas	1979	NO	HUBO	ACTIVIDAD		
1- Vehículos 2- Equipo y Herramientas	1980	---	---	---	155.0	155.00
1- Vehículos 2- Equipo y Herramientas	1981	59.0 20.0	44.2 15.0	---	59.2	208.9
1- Vehículos 2- Equipo y Herramientas	1982	---	---	---	0.5	0.5
1- Vehículos 2- Equipo y Herramientas	1983	---	---	---	---	---
1- Vehículos 2- Equipo y Herramientas	1984	---	---	---	7.8	7.8
1- Vehículos 2- Equipo y Herramientas	1985	---	---	---	31.5	31.5
1- Vehículos 2- Equipo y Herramientas	TOTALES	59.0 181.1	44.2 157.8	---	254.0	403.7
* Esta tabla esta respaldada por tablas A-4.1 incluidas en el material de soporte.						

A - MINISTERIO DE OBRAS PUBLICAS

A-5 I.N.G.- INSTITUTO GEOGRAFICO NACIONAL (COSTOS DIRECTOS)

DESCRIPCION	Año de la Ocurrencia	Costo Estimado	Costo de Destrucción	Costo de Reparación	Costo Final	Costo Estimado de Reposición
1- Vehículos 2- Equipo y Herramientas	1979	NO	HUBO	ACTIVIDAD		
1- Vehículos 2- Equipo y Herramientas	1980	---	72.0	---	72.0	180.0
1- Vehículos 2- Equipo y Herramientas	1981	---	58.0	---	58.0	140.0
1- Vehículos 2- Equipo y Herramientas	1982	---	36.0	---	36.0	90.0
1- Vehículos 2- Equipo y Herramientas	1983	---	---	---	---	---
1- Vehículos 2- Equipo y Herramientas	1984	---	---	---	---	---
1- Vehículos 2- Equipo y Herramientas	1985	---	100.0	---	100.0	320.0
1- Vehículos 2- Equipo y Herramientas	TOTALES	---	266.0	---	266.0	730.0
* Esta tabla esta respaldada por tablas A-5.1 incluidas en el material de soporte						

A - MINISTERIO DE OBRAS PUBLICAS

A - 7 ORIGINA DE RECURSOS ESPECIALES (COSTOS DIRECTOS)

DESCRIPCION	Año de la Ocurranca	Costo Estimado	Costo de Destrucción	Costo de Reparación	Costo Final	Costo Estimado de Reposición	Costo Total del Daño
1. Vehículos 2. Equipo 3. Herramientas	1980						
1. Vehículos 2. Equipo 3. Herramientas	1982						
1. Vehículos 2. Equipo 3. Herramientas	1983						
1. Vehículos 2. Equipo 3. Herramientas	1984						
1. Vehículos 2. Equipo 3. Herramientas	1985	241,400 60,000	240,000 60,000	1,400	301,400	320,000	
1. Vehículos 2. Equipo 3. Herramientas	TOTAL	301,400	300,000	1,400	301,400	320,000	
*Esta tabla está respaldada por tabla A-7.1 incluida en el material de soporte.							

2A - MINISTRY OF PUBLIC WORKS

RESUMEN DE COSTOS INDIRECTOS DE DAÑOS A INSTALACIONES DEL M O P

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
2A-1 EQUIPMENT SERVICE LOSS	-	96,836	193,881	270,729	506,128	583,498	934,198	2,585,270
2A-2 BUDGETARY DIFFERENCE	(4,090,000)	30,270,000	43,280,000	91,840,000	127,910,000	154,930,000	165,810,000	609,950,000
2A-3 INDEMNITIES	-	119,200	174,200	26,000	39,000	5,000	3,000	346,400
TOTAL	(4,090,000)	30,489,200	43,548,081	91,966,729	128,144,128	154,935,000	165,817,000	610,801,000
<p>* This tables are supported by Tables 1, 2A-1, 2A-2 (chart) and 2A-3.</p>								

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

	1980	1981	1982	1983	1984	1985	TOTAL
<u>A-1 DDC - (HIGHWAYS)</u>							
1- Vehicles	37.092	66.332	118.332	179.932	235.332	258.132	915.152
2- Equipment	---	---	---	105.600	124.600	388.600	618.800
<u>A-2 BRIDGES</u>							
1- Vehicles							
2- Equipment							
<u>A-3 DUA (URBAN DEVELOPMENT)</u>							
1- Vehicles	24.344	62.209	78.757	107.796	117.326	117.326	507.758
2- Equipment	---	4.620	5.620	24.780	24.780	54.380	114.180
<u>A-4 C I U</u>							
1- Vehicles	---	8.840	8.840	8.840	8.840	8.840	44.200
2- Equipment	21.000	24.000	24.100	24.100	25.260	31.560	150.020
<u>A-5 ING - (NAT.GEOG.INST.)</u>							
1- Vehicles	14.400	26.000	33.200	33.200	33.200	33.200	173.200
2- Equipment	---	---	---	---	---	---	---
<u>A-6 PLANNING DIRECTORATE</u>							
1- Vehicles	---	1.880	1.880	1.880	1.880	1.880	9.400
2- Equipment	---	---	---	---	---	---	---
<u>A-7 SPECIAL RESOURCES OFF.</u>							
1- Vehicles	---	---	---	---	6.280	34.280	40.560
2- Equipment	---	---	---	---	6.000	6.000	12.000
<u>TOTALS</u>	96.836	193.881	270.729	506.128	583.498	934.198	2585.270
Esta tabla está respaldada por tabla 2A - 1.1							

A - MINISTRY OF PUBLIC WORK

2A-3 INDEMNITIES - BASED \$200 OF MONTHLY INDEMNIZATION

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
1. HIGHWAYS		42.400	103.600	26.000	18.600	5.200	3.400	199.400
2. NATIONAL GEO. INST.		63.000	43.800	8.600	11.400	-	-	132.600
3. GEOTECHNICAL INVEST. CENTER		-	10.400	-	-	-	-	10.400
4. PLANNING		13.000	-	-	-	-	-	13.000
5. D U A		-	11.200	-	-	-	-	11.200
TOTAL		119.200	174.200	34.600	30.000	5.200	3.400	366.600

This table is backed up by tables 2A-3.1 included in the support material (file).

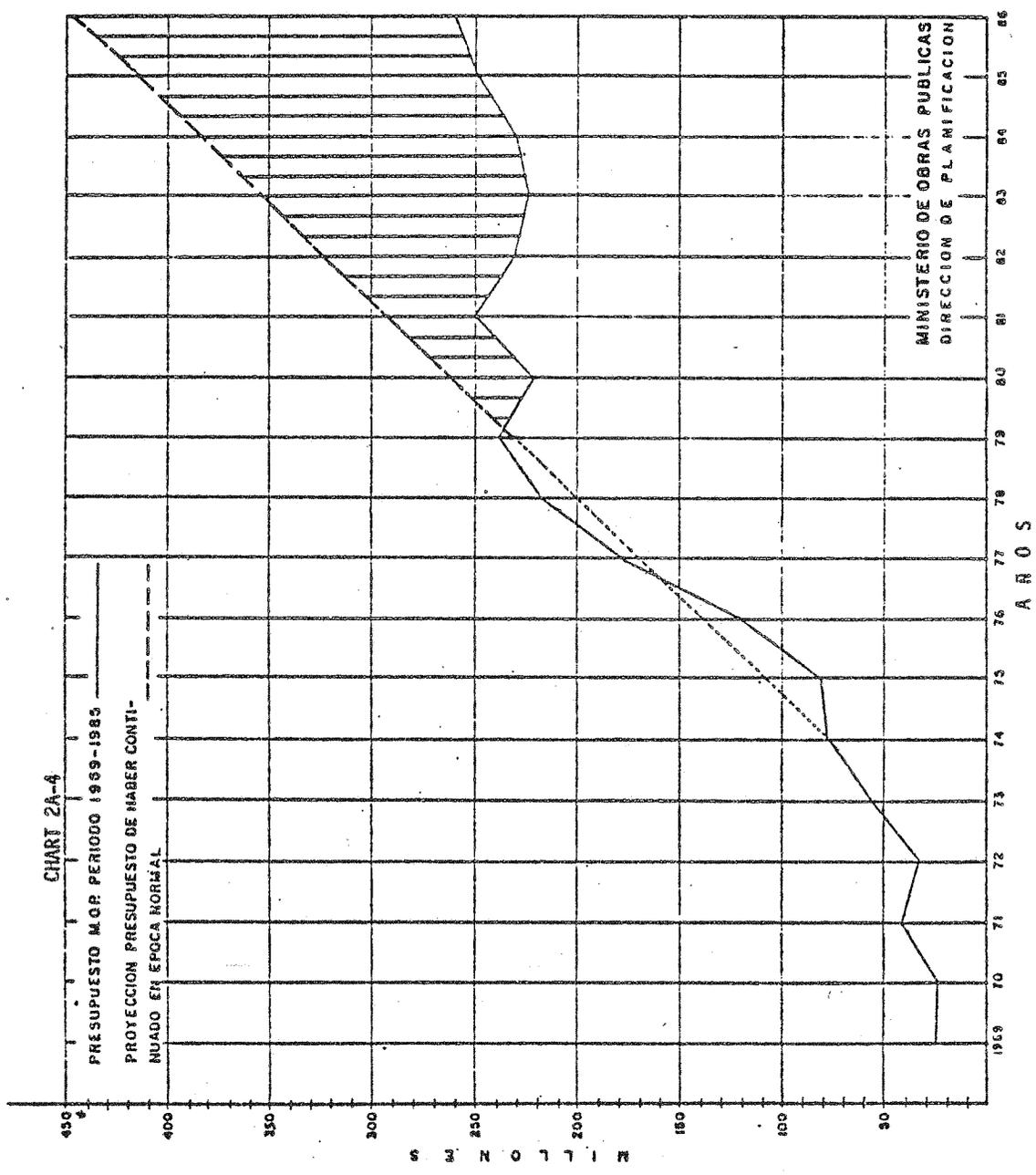


TABLE 2A-2 ANALISIS PRESUPUESTARIO M. O. P. 1969 - 1986

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	
SECRETARIA DE ESTADO																			
Funcionamiento	596,730	625,870	630,750	631,970	636,050	631,650	635,020	728,180	777,780	1,011,150	1,055,850	1,232,000	1,278,770	1,380,790	1,573,460.00	1,711,760	4,771,080	6,757,760	
Inversión	--	--	--	--	--	--	--	--	--	--	2,000,000	400,000	476,000	676,300	6,823,890	1,941,400	4,122,950	9,090,790	
Transferencias Corrientes	399,500	399,500	399,500	200,000	2,700,000	3,300,000	5,258,070	5,475,370	5,200,370	7,770,000	4,930,440	6,659,950	364,700	--	--	--	--	--	
Transferencias de Capital	1,800,000	--	--	--	4,000,000	6,050,000	6,350,000	19,145,300	20,700,000	21,790,000	16,850,000	20,850,000	35,778,000	2,700,000	2,120,000	2,485,480	--	200,000	
Financiamiento	--	--	--	--	6,000,000	--	--	--	--	--	--	--	--	37,145,800	4,765,750	1,500,000	5,000,000	6,500,000	
DIRECCION DE PLANIFICACION																			
Funcionamiento	--	193,600	199,740	271,680	254,620	421,070	614,760	945,350	932,380	1,049,070	1,119,480	1,158,550	1,175,760	1,096,620	1,141,160	1,146,160	1,179,960	1,171,120	
PROYECTOS ESPECIFICOS																			
Funcionamiento	217,020	256,170	207,250	220,050	211,360	243,280	301,710	364,840	382,750	452,830	664,910	550,780	573,360	535,130	535,130	535,130	738,650	776,200	
CENTRO DE INVESTIGACIONES CIENTIFICAS																			
Funcionamiento	390,700	378,170	630,760	635,120	605,890	821,900	1,126,990	1,251,770	1,174,960	1,351,630	1,600,040	1,519,830	1,549,710	1,371,000	1,373,000	1,373,000	1,300,270	1,359,590	
Inversión	227,300	213,600	120,000	90,500	125,000	75,000	233,600	542,090	942,550	820,470	750,500	912,400	558,500	532,590	673,680	611,430	551,300	551,300	
INSTITUTO GEOMORFOLOGICO NACIONAL																			
Funcionamiento	289,300	278,830	275,190	279,350	289,330	264,960	578,610	582,650	647,130	693,760	693,260	762,110	833,650	784,020	764,020	786,270	748,650	8,534,370	
Inversión	1,000,000	800,000	1,000,010	900,010	1,000,010	2,350,180	3,316,210	5,380,130	6,208,300	7,832,680	7,949,900	8,436,800	9,511,500	8,751,600	8,761,250	5,960,400	8,477,010	--	
DIRECCION GENERAL DE MUESTREO Y AGUICULTURA																			
Funcionamiento	3,065,600	2,879,470	2,881,120	2,871,730	2,895,470	3,399,910	6,339,540	10,092,740	9,432,830	10,463,020	11,102,760	11,995,310	12,317,310	11,457,620	12,195,990	10,125,950	10,285,210	10,665,130	
Inversión	4,122,200	1,550,000	3,125,520	1,250,220	5,600,020	8,129,600	9,730,010	22,890,380	46,079,050	38,124,310	38,162,100	31,722,150	37,201,000	31,544,900	35,795,050	30,877,400	36,495,230	35,830,590	
DIRECCION GENERAL DE CAMINOS																			
Funcionamiento	5,943,000	5,805,010	7,226,440	7,488,070	8,312,960	12,373,690	16,446,540	23,547,300	34,129,820	40,115,150	40,067,260	45,809,010	51,214,690	49,694,260	44,676,620	44,676,670	58,912,750	62,337,260	
Inversión	8,231,030	12,577,000	24,946,070	19,318,050	25,031,160	37,880,650	29,503,260	25,618,270	48,335,500	38,006,900	107,329,880	100,800,100	97,640,300	84,629,430	127,534,750	126,367,230	117,267,730	121,394,090	
TOTAL GENERAL																			
Funcionamiento	26,490,360	25,702,220	41,741,540	33,717,570	37,473,650	78,677,670	120,551,800	170,548,990	178,462,060	219,014,040	236,701,860	232,908,390	250,444,250	232,805,620	228,943,040	230,484,510	250,160,320	252,930,290	
Inversión	10,510,350	16,147,720	11,658,650	12,877,690	13,017,680	18,443,640	25,929,370	41,494,630	47,436,250	55,169,660	56,693,040	63,122,990	68,948,730	66,323,420	60,021,000	62,021,000	77,484,370	89,600,730	
TOTAL INVERSION																			
Transferencias Corrientes	399,500	399,500	399,500	200,000	2,700,000	3,300,000	5,258,070	5,475,370	5,200,000	7,770,000	4,930,440	6,659,950	384,700	--	--	--	--	--	
Transferencias de Capital	1,800,000	--	--	--	4,000,000	6,050,000	6,350,000	19,145,300	20,200,000	21,790,000	16,850,000	20,850,000	35,778,000	2,700,000	2,120,000	2,485,480	--	200,000	
Financiamiento	--	--	--	--	6,000,000	--	--	--	--	--	--	--	--	37,145,800	4,765,750	1,500,000	5,000,000	6,500,000	

VII. RAILWAY OF EL SALVADOR - FENADESAL

A. Origin of the Railroad

The railroad system in El Salvador was established primarily under authorizations 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 kilometer section from Sonsonate to the Port of Acajutla. It was inaugurated in June of 1882.
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 began 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.

B. Changes in the Railroad Administration

1. Due to increasing competition from road transport, 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 Comission Ejecutiva Portuaria Autonoma (CEPA).
2. By 1972 IRCA was no longer profitable and failing to meet the terms of its contract. Thus, in that year, the Government took over the administration

of this railway. In 1974, this administration was passed on to Port Authority CEPA, and the 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 kms. long with 1,000 railway and 300 port employees.

The railway has suffered from the 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, and track 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; 3 more will be rebuilt shortly as a result of AID's purchase of spare parts.

C. Future Role

El Salvador is a small country which, while densely populated, has few major cities. The role of the railway would appear to be primarily the movement of shipping containers between the ports and the major population centers. Also the bulk movement of products such as grains, fertilizers and cement. Its most important role will almost certainly be the movement of containers to the Atlantic coast ports in Guatemala. Unfortunately, while the rail connection does exist, there has been no traffic across the border in 18 years.

For passengers, it will be very difficult for the railway to be competitive in both time and cost with buses so the railway's role will probably be limited to urban service in the San Salvador area.

D. Direct Damage to the Railway

Table RR-I shows the cost of direct damage to locomotives, rolling stock, mechanical and track equipment, bridges, track, structures and telephone and telegraph equipment. The logic used for determining these costs is listed below.

1. Locomotives Destroyed

To the original fleet of 20 diesel locomotives there have been 73 incidences of damage, resulting in 4 being damaged beyond repair. These locomotives are 20 years-old, but, due to the fact they are 3-foot gauge (there are only 4 railways with this gauge in the Americas) secondhand units are not available. It was, therefore, necessary to use the new replacement cost of a US\$1 million when determining the value. Deducted from this figure is US\$250,000, the value of the salvaged parts and scrap.

2. Wagons and Coaches Destroyed

In the original fleet of 517 freight wagons, there have been 67 incidences of damage to one or more wagons resulting in 24 being damaged beyond repair. These wagons range, with few exceptions, in age from 20 to 72 years old. However, since there is no secondhand market for 3-foot gauge rolling stock, the new replacement cost minus salvage and scrap value has been used.

Of the original fleet of 32 coaches, there have been 6 incidences of damage resulting in 1 motor coach being damaged beyond repair. These coaches range in age from 38 to 81 years old. Because the need of replacing the destroyed coach is questionable, it has been given a nominal cost.

3. Other Equipment Destroyed

This equipment includes cranes, trucks, welding machines and scales most of which was damaged beyond repair. The costs listed are for used items where it is possible to obtain a similar used piece of equipment; in the case of a specialized machine for 3-foot gauge, new prices have been used.

TABLE RR-1

RESUMEN DE COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE RAILWAYS OF EL SALVADOR. (Thousands of colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
Locomotives Destroyed		3,750	1,875			1,875		7,500
Wagons and Coaches Destroyed				450	700	1,400		2,550
Other Equipment Destroyed		212	61	539	226	80		1,118
Locomotives Damaged		1,331	3,312	3,447	2,720	3,163	178	14,157
Wagons Damaged		489	876	1,651	691	758	404	4,869
Other Equipment Damaged			71	34	58		28	191
Rerailing Cost		47	94	142	40	67	61	451
Track Repair Cost				49	13	29	19	110
Bridges Damaged		618		488	1,251	71		2,428
Stations Damaged		6	20	85	10			121
Track Equipment Damaged		3	153	15	12		8	191
Telephone and Telegraph Damaged			123	352	116	102		693
TOTAL		6,456	6,591	7,252	5,837	7,545	698	34,379

4. Locomotives Damaged

Two approaches have been used for determining the cost of the repairing locomotives. The actual cost of repairing a sample of 12 locomotives was determined and averaged and then multiplied by the total number of locomotives damaged. (Note: Some locomotives have been damaged as many as five times.) The total cost was approximately one million colones less than the total cost based on estimates made at the time of the damage. However, since the actual costs do not include the secondhand parts used in repairs, it should be expected that the actual cost data would be low. At the present time, there are three locomotives awaiting repair and the estimated value of the parts removed to repair other locomotives is approximately equivalent to the one million colones. This, therefore, indicates that the estimates are accurate. The estimated values have been used.

5. Wagons Damaged

The exact cost of repairing a sample of 25 wagons was determined. The average was then applied to the wagons repaired. This should be considered statistically accurate due to the large number of wagons repaired.

6. Other Equipment Damaged

This is primarily the mechanical repair costs of repairing track inspection or gang cars. These costs are based on the actual audited cost to repair.

7. Rerailing Cost

The cost of rerailing and removing damaged equipment is based on the actual audited cost of labor, but does not include the transportation cost of moving the equipment to the repair shop.

8. Track Repair Cost

This is the budget account cost for repairing the track after it has been directly damaged or indirectly damaged as a result of damage to a train.

9. Bridges Damaged

There has been a total of 18 attacks on 10 railway bridges. The cost of replacement or repair is the actual amount spent.

10. Stations Damaged

A total of six stations have been damaged or destroyed. Since the stations have not been repaired or replaced, the cost is an estimate of the repair or replacement.

11. Track Equipment Damaged

These are the actual costs for repairing the body work of track inspection equipment, also an estimate for replacing a destroyed bridge repair crane.

12. Telephone and Telegraph Damaged

This is the actual cost of repairing the equipment. A large part of this cost was a result of a live, damaged power line coming in contact with the railway's telegraph wires.

E. Indirect Cost or Losses Incurred by the Railway

Table RR-II shows the additional costs incurred by the railway for protection and for losses in revenue. An explanation of the costs and the logic used for the determination of these costs is shown below.

1. Track Inspection Before Trains

Prior to the operation of each train, a railway employee riding in a small rail car inspects the track for damage or planted explosives. This cost is from a budget account.

2. Locomotive Protection

The cab of all locomotives are protected with 5/8 inch steel plate. This cost is the actual money spent.

3. Wagon Protection

At one point the army rode in the train to provide protection. This method of protection was stopped after an incident when a large number of soldiers were killed. This cost was the actual money spent in protecting the coaches with steel and sandbags. It does not include the cost of pulling the train which would have been about one colon per km.

4. Bridge Lighting

After the destruction of the Puente de Oro highway bridge the railway bridge has been used for single file highway traffic. The cost of conversion was paid for by the highway department. However, the railway was required to provide and maintain floodlighting for the bridge. The costs are from the railway budget accounts.

5. Security Coordination

The railway is required to pay for the coordinating activity between itself and the army. Trains are only operated when the army is available to provide protection and, depending on the railway line, up to a 1,000 soldiers are involved. The cost of the protection is borne by the army. The coordination cost is from a budgeted account.

6. Mechanics on Trains

To minimize the risk of a mechanical failure stopping the train in a dangerous area, the army requested the railway to provide a mechanic in all trains. This cost is from a budgeted account.

7. Installation of Radios

To enable the train drivers and conductors to request immediate assistance, all locomotives are to be equipped with radios. The conductor will use a hand held radio. This cost is the budget figure for purchase and installation.

8. Lost Contribution to Overhead

The railway has lost over the period 1980-85 about 23.8 million colones revenue as a result of the violence.

The method of determining the lost revenue is as follows:

Freight

The average annual freight handled for the 10 years prior to 1980 was calculated and the difference between this amount and that which was actually handled was multiplied by the average revenue per ton of freight. At present, freight is about 60% of the pre-1980 10-year average.

Passengers

The average number of passengers moved for the 5 years prior to 1980 was calculated and the difference between this and the number actually moved was multiplied by the average revenue per passenger. At present, passenger revenue is about 15% of the 5 year average.

The loss of revenue is reduced, in effect, since the railway has saved the cost of fuel and a proportion of the labor that would have been required to transport the freight and passengers. (For union and political reasons, it has not been able to reduce the labor force in proportion to the lost traffic.) Therefore, the net benefit lost or the lost contribution to overhead is the lost revenue minus the cost of fuel not used and the value of the labor reduction it has been possible to effect.

TABLE RR II

SUMMARY OF INDIRECT COSTS OR LOSSES INCURRED BY RAILWAY AND REFLECTED
 IN FINANCIAL RECORDS (Thousands of colones)

DESCRIPCION	1979	1980	1981	1982	1983	1984	1985	TOTAL
<u>SECURITY COSTS</u>								
Track inspection before trains			41	57	72	102	65	357
Locomotive Protection				79				79
Wagon Protection				47				47
Bridge Lighting						471	313	784
Security Coordination (1)		2	53	100	129	131	7	422
Mechanics on train							50	50
Installations of Radios (2)							625	625
Lost Contribution to overhead		966	3,345	2,983	272	190	21	7,717
TOTAL		968	3,439	3,266	473	894	1,101	10,881
(1) Coordination with Army								
(2) Radios will not be installed until 1986. Other indirect costs already incurred in 1985 include bridge lighting \$50,000 and security coordination \$2,000								

F. Indirect Costs or Losses Incurred by Railway not Reflected in Financial Records

Table RR-III shows the cost or losses that have been or will be incurred by the railway that will not be under usual accounting procedures. A description of these items and the method of determination of the cost is listed below.

1. Deferred Maintenance

Between 100 and 200 people who would normally be used for equipment and installation maintenance have been consistently employed in repairing damage resulting from the violence. Assuming that the maintenance work would normally be justifiable and of value to the smooth running of the railway, the fact that it has not been done will result in, either higher than estimated deferred costs, such as those resulting from accidents, or deterioration of the track, etc., it will eventually necessitate that maintenance be done (such as installing new crossties). To determine these costs that have been used for damage repair in Table I have been used and material costs, have been added based on the typical labor material ratios for the particular department. In the case of track, an estimate of the shortfall in the number of ties installed (46,000) had been made for the material cost.

2. Deferred Investment

Plans were formulated in 1980 for an investment program that included the purchase of 6 locomotives, 70 wagons, a container handling crane and material handling equipment, such as lift trucks. These investments were either cancelled or postponed.

The effect of these investments would have been to reduce the cost of operation and to increase revenue. To make an accurate determination of the economic impact of these investments would require a comprehensive study to achieve a reasonable degree of accuracy. However, if the assumption is made that is made that at least a 5% return would have resulted from the investment (approx. US\$10 million) then the lost savings or revenue would be about US\$0.5 million per year.

TABLE RR III

SUMMARY OF INDIRECT COSTS OR LOSSES INCURRED BY RAILROAD NOT REFLECTED IN FINANCIAL RECORDS
(Thousands of colones)

DESCRIPCION	1980	1981	1982	1983	1984	1985	1986	TOTAL
<u>DEFERRED MAINTENANCE</u>								
TRACK		171	66	562	311	456		1,566
LOCOMOTIVES	330	918	888	676	792	443		4,039
WAGONS	551	874	1,873	742	848	597		5,485
OTHER EQUIPMENT		31	15	26		12		84
CUTUGO PORT		150	150	150	150	200		500
TOTAL	881	2,144	2,984	2,156	2,101	1,700		11,674
<u>DEFERRED INVESTMENT</u>								
LOCOMOTIVES								
WAGONS								
CONTAINER HANDLING EQUIPMENT								
MATERIAL HANDLING EQUIPMENT								

Planes had been formulated in 1980 for these investment. They were either cancelled or postponed. The effect of these investments on the economics of the railway would be very difficult to determine with a reasonable degree of accuracy.

G. Costs Suffered by Railway Customers or Economy as a Whole

Table RR-IV shows the additional costs or losses suffered directly by the railway's customers. The method and logic used for calculating these costs is listed below.

1. Damage to Cargo

Under normal circumstances, it is the shipper's responsibility to insure cargo moved by the railway, but cargo is normally not insured. Cotton, while insured, is not insured for acts of violence.

The damaged or destroyed cargo includes at least the following: cotton, medicine, cement, beer, steel, oil, gasoline, cosmetics, coffee, cigarettes and fertilizer. The value was determined by determining the amount destroyed based on the bill of lading and multiplying by the good's value. No cost has been associated for secondary costs such as loss of production resulting from loss of material.

2. Increased Transportation Cost

Freight

Due to uncertainty of freight service (trains only run when military protection is available) and the increased risk for movement by train, many shippers have transferred freight to trucks. Generally, even when door-to-door service is considered, trucks are more expensive than the train so there is an increase in overall cost.

The method of calculation is as follows: A 4% per year decrease in freight traffic (tons/km) from the 10 year average has been assumed to account for the 25% reduction in the national economy. The differences between this figure and that carried by the railway is then assumed to be the amount transferred to the highway. Using a figure of 0.03 colones per ton/km additional cost for trucks (the 0.03 colones was determined from the difference in cost for cement transportation between road and rail; this takes into consideration railway delivery costs) was calculated.

TABLE RR IV

SUMMARY OF COSTS SUFFERED BY RAILWAY CUSTOMERS OF BY ECONOMY AS A WHOLE
(Thousands of colones)

DESCRIPCION	1980	1981	1982	1983	1984	1985	1986	TOTAL
DAMAGE TO CARGO (1)	1,623	2,812	2,534	1,004	2,115	63		10,101
INCREASED TRANSPORTATION COST								
FREIGHT (2)	176	404	395	196	284	191		1,726
PASSENGER (3)	5	134	216	236	228	227		1,046
INCREASED SUBSIDY	1,536	4,912	4,584	2,565	3,560	3,069		20,226
TOTAL	3,340	8,372	7,729	4,001	6,187	3,550		33,179
<p>(1) While normally cotton is insured, it as well as all other products are not insured for acts of violence. (2) This is based on a 0.03% difference in cost between similar service for truck and train, the actual figure is probably considerably more than this since if there is danger the truck freight tariff can be 4 times the normal tariff. (3) Approximately 85% of the passengerkm have been transferred 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.</p>								

It should be noted that truck delivery through areas considered dangerous is as much as four times the normal delivery cost. Calculation based on the danger premium cost was not made.

Passenger

The railway, because of danger to passengers, has been forced to discontinue 85% of its passenger service. The buses are approximately 0.01 colones per passenger per kilometer more expensive than the train. The number of passengers/km reduction from the five-year average was calculated and multiplied by 0.01 colones per km to determine the additional cost borne by the railway's passenger customers. It should be noted that buses charge considerably more for areas considered dangerous. This has not been taken into consideration.

3. Increased Subsidy

The government covers the losses of the railway. The railway has lost 85% of its passenger traffic and 50% of the freight traffic but has only been able to reduce its payroll by about 24%. As a result, it has a number of surplus employees. The cost of these employees is an increased subsidy the government is having to pay directly as a result of the violence.

H. Personnel Death and Wounded Related to the Railway

Table V lists by railway employees, army and passengers the number of people killed or wounded by attacks on trains and attacks on individuals. Over the six years, there have been:

	<u>Killed</u>	<u>Wounded</u>
Railway Employees	17	60
Army	77	125
Passengers	12	25
TOTAL	106	210

I. Investment Needs and Financial Status

The management of the railway has shown reasonable skill in operating the railway in what must be considered very adverse conditions. To their credit, they have kept the system operational and even developed container unit trains.

Unfortunately, the railway is in very poor physical and financial condition. Most of its equipment is very old, and this year its operating costs expected to be 200% of revenue. It is also subject to restrictive government and union rules.

Prior to any further significant investment, there should be a program of technical assistance to develop a national plan for the railway. Also, the government and CEPA should immediately undertake at least to open negotiations with the Guatemala Railways, create a marketing department, and allow the railway to acquire trucks to operate door-to-door service and to negotiate with the unions to increase labor efficiency.

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TABLE V

YEARS	FENADESAL				A R M Y				PASSENGERS				TOTAL	
	ATTACK ON TRAIN		OTHER		ATTACK ON TRAIN		OTHER		ATTACK ON TRAIN		OTHER		DEAD	WOUNDED
	DEAD	WOUNDED	DEAD	WOUNDED	DEAD	WOUNDED	DEAD	WOUNDED	DEAD	WOUNDED	DEAD	WOUNDED		
1980	0	5	5	0	2	6	0	0	0	4	0	0	7	15
1981	4	19	2	1	8	16	0	0	0	1	0	0	14	37
1982	0	11	1	2	24	50	0	0	0	0	0	0	25	63
1983	0	2	1	0	0	10	2	0	0	0	0	0	3	12
1984	0	14	1	0	41	43	0	0	12	20	0	0	54	77
1985	3	6	0	0	0	0	0	0	0	0	0	0	3	6
TOTAL	7	57	10	3	75	125	2	0	12	25	0	0	106	210

ANNEX: METHODOLOGY

A. Collection of Data

The information for this report was obtained from the institutions involved on the basis of questionnaires, discussions and interviews. The questionnaires consisted of suggested formats for tables reporting direct and indirect damage and explanatory notes on items to be included and cost principles to be applied. The questionnaires were discussed when presented to the public service agencies and while the data was being collected daily contact was maintained to identify problems in listing or in costing and to assure completeness and accuracy. Three basic sets of tables were developed: summaries by year of all direct damage suffered, broken down by kinds of installations or material damage and total costs involved; summaries by year of indirect costs, listing the kinds of costs incurred; and a listing by year of deferred investment in plant, other infrastructure, heavy and light equipment. Some of these tables make up parts of this report. Resulting from a dialectic process, they are joint products of the agencies concerned and the study team.

Because the tables as originally designed were not appropriate to each of the institutions there is some variation among them. They all, however, reflect the same basic data and concepts.

The agencies providing the data in this report were:

Electric Power and Generation

- 1) The National Power Company, Comision Ejecutiva Hidroelectrica del Rio Lempa (CEL)
- 2) The San Salvador Light and Power Company (CAESS)
- 3) The Electric Company of Usulután (DEUSEM)
- 4) The Electric Company of Sensuntepeque (DESSUM)
- 5) The Electric Company of Santa Ana (CLESA)
- 6) The Electric Company of Ahuachapán (CLEA)
- 7) The Electric Company of Sonsonate (CLES)

Water and Sewer

Administracion Nacional de Acueductos y Alcantarillado (ANDA)

Telecommunications

Administracion Nacional de Telecomunicaciones (ANTEL)

Transport

- 1) Department of Public Roads, Ministry of Public Works (CAMINOS, MOP)
- 2) National Railroad of El Salvador (FENADESAL)

Other Public Works Agencies

Ministry of Public Works, Department of Special Resources and Department of Urban Development (MOP/ORE and MOP/DUA)

B. Establishing the Costs of Damage or Losses

Each of the institutions included in this report has long been reporting the physical damages resulting from guerrilla activity. For instance, the National Power Company (CEL) prepares a weekly report on damage to transmission lines and other installations. Other institutions prepare similar reports but not so frequently. It is thus possible to count the transmission towers damaged or destroyed, the bridges blown, the trucks and buses burned and the freight cars and contents destroyed. They have not used a consistent method for establishing the cost of each incident. Moreover, this report takes note of three categories of damages and costs: Direct cost of a specific event; indirect costs of violent environment and consequent response; and, indirect costs of deferring expenditure and investment. How this report treats each of these areas of damage is described below.

1. Direct Damage Costs

This report uses the cost of reestablishing service as the basic cost element. If service can be restored by repairing the object then the cost of the damage is the cost of repair. Similarly, if an object destroyed can

and must be replaced, the cost of the damage is the replacement cost. In many cases only a provisional repair can be made and the full repair is deferred. In such cases we have used the estimated replacement cost at the time of the event plus the provisional repair cost as the cost of the damage. When provisional repairs have been destroyed or damaged, we have used only the cost of the subsequent temporary repairs thus avoiding a double counting.

2. Indirect Costs

The existence of indirect costs of guerilla violence has been recognized by all of the agencies covered but not all such costs have always been identified and calculated. For instance, the Electric Power Company maintains records of the cost of fuel used in generation to replace hydro or thermal power when the transmission net is broken. Similarly, the telephone company has calculated lost revenues. This report, as indicated in the tables, has made a special effort to identify all such costs.

Most indirect costs, the cost of maintaining an expanded guard force, for example, show up in agency accounts as an expenditure. Other indirect costs or losses can be documented from accounting records, the best example is lost revenue or sales. In developing information on this indirect damage the problem has been to seek out all such losses and damages whether resulting from actual damage, the need to protect against damage or from the general environment of threatened violence which influences management decisions. Assigning costs has been easy, what was actually spent or lost shown in the accounts is the reported cost.

3. Cost of Deferred Investment

The public service institutions have had to defer investments in expansion and improvement of services, improved facilities, routine maintenance and repair, replacement of obsolete or worn-out equipment, etc. This deferred investment has obviously resulted in inefficiencies, higher maintenance and repair costs, reductions in levels of service and benefits (income) foregone.

There is another kind of deferred investment related to the direct damage costs. In many cases, especially in the Ministry of Public Works, damages sustained are not repaired or destroyed equipment is not replaced. This failure to keep up the infrastructure or equipment base implies an indirect cost.

In the case of heavy and light equipment of the MOP, this report assumes an indirect loss to the agency equal to one fifth of the market value of the equipment in each of the five years subsequent to the date of the destruction. This recognizes that there are two costs involved when an equipment item is destroyed: the value of the equipment itself and the value of the work it was expected to do.

Deferred public service investment in some facilities has been identified and listed. The cost of deferring the investment is considered to be the opportunity cost of capital for each year that the investment does not produce a return, beginning with the originally planned year of start-up service.

4. Costs to Users of Public Services

No report on the damage to public service agencies would be complete without some mention of the costs incurred by the users of those services, i.e., the private sector. A full study of the impact on the private sector of guerrilla violence will require greater and different resources than those available for this report. However, some attempt at both quantifying and generalizing the private sector experience has been attempted. The information was obtained by interviewing management officials of specific industrial establishments and asking them to estimate the cost of power outages or other disruptions. Interviews were also held with industrial associations. All concerned agreed that the breakdown in telecommunications was costly but none had attempted to calculate the cost. Almost all had attempted to calculate the cost of one hour of lost electric power, i.e., the benefit/cost ratio of the installation of standby power. In some cases the measure used was the loss of production at market price. This measure

may seem somewhat arbitrary since in many cases lost production is made up and sales are not completely lost. However, spoiled or wasted raw materials, wasted labor, machinery overhaul and special cleaning, interest costs of stored inventory, administrative overhead and administrative inefficiencies during blackout have not been separately calculated and consequently lost production is a fairly good measure.

A steel company has calculated the cost of a one hour shut down of electricity on the bases of : labor costs, overhead and the "semi-fixed costs" of variable costs. In one department they add the cost of fuel oil needed to reheat an oven. In recent years each one hour break in power supply has entailed a cost, depending on the process involved, of from US \$386.00 to US \$167.00.

5. The Cost of Re-establishing and Extending Full Public Services

Finally, this report sets forth what it will cost each agency to repair damage to restore and expand service. This is related to the financial resources available to the institution to meet these requirements.

5. Producing Data for Future Projects

Using the tables developed for this report and the methodology described here periodic reports on direct and indirect damages should be easily produced.