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# PUBLIC SERVICES INFRASTRUCTURE

# DAMAGE ASSESSMENT REPORT

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACOSETCA | Asociacion de Cooperativas de Aprovisionamiento de Ahorro, Credito y Servicios Mutualistas de Transporte de Carga; Association of Cooperatives for the Provision of Savings, Credit, and Mutual Services for Cargo Transport |
| AEAS | Asociacion de Empresas de Autobuses Salvadorenas; Salvadoran Bus Enterprises Association |
| AID | Agencia Internacional para el Desarrollo; Agency for International Development |
| AME | Administracion de Maquinaria y Equipo (MOP); Machinery and Equipment Administration |
| AMSS | Area Metropolitano de San Salvador; San Salvador Metropolitan Area |
| ANDA | Administracion Nacional de Acuaductos y Alcantarillados; National Administration for Water and and Sewer |
| ANTEL | Administracion Nacional de Telecomunicaciones; National Administration for Telecommunications |
| BCIE | Banco Centroamericano de Integracion Economica; Central American Bank for Economic Integracion (CABEI) |
| BID | Banco Interamericano de Desarrollo; Inter-American Development Bank (IDB) |
| BIRF | Banco Interamericano de Reconstruccion y Fomento; InterAmerican Bank for Reconstruction and Development (IBRD) |
| CABEI | See BCIE. |
| CASALCO | Camara Salvadorena de la Construccion; Salvadoran Chamber of Construction |
| CEL | Comision Ejecutiva Hidroelectrica del Rio Lempa; Executive Commission for Lempa River Hydroelectricity |
| CEPA | Comision Ejecutiva Portuaria Autonoma; Autonomous Executive Port Commission |
| CIG | Centro de Investigaciones Geotecnicas; Center for GeoTechnical Research |
| DGC | Direccion General de Caminos; |

| | |
|---|---|
| | General Directorate for Roads |
| DUA | Direccion de Urbanismo y Arquitectura (MOP); Office of Urban Works and Architecture |
| FENADESAL | Ferrocarriles Nacionales de El Salvador; National Railways of El Salvador |
| FIGAPE | Fondo de Inversiones y Garantias para Pequeñas Empresas; Fund for Investments and Guarantees for Small Businesses |
| GCA | Direccion General de Aviacion Civil; General Directorate for Civil Aviation |
| IDB | See BID. |
| IBRD | See BIRF. |
| IGN | Instituto Nacional Geografico; National Geographic Institute |
| IRCA | International Railway of Central America |
| IRD | Infrastructure and Regional Development (USAID) |
| KV | Kilovolt |
| KW | Kilowatt |
| KWH | Kilowatt hour |
| MOP | Ministerio de Obras Publicas; Ministry of Public Works |
| MSPAS | Ministerio de Salud Publica y Asistencia Social; Ministry of Public Health and Social Assistance |
| MV | Megawatt |
| PLANSABAR | Plan Nacional Sanitario Basico Rural; National Rural Basic Sanitation Plan |
| SETEFE | Secretaria de Tesoreria y Financiamiento Externo; Secretariat for Treasury and Foreign Finance |
| USAID | (Used interchangably with AID.) |

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## EXECUTIVE SUMMARY

Infrastructure in El Salvador has been under intensive attack by insurgents since 1979, and facilities of all public service organizations have been damaged.

Direct military operations of the insurgents have declined but numbers of attacks have not. Sabotage designed to weaken the infrastructure, and thereby weaken the country's ability to resist insurgency, remains a publicly announced important guerrilla tactic in the political, social and economic life of the country.

During the first half of 1988 primary targets have been electric power facilities, minor telephone installations, and the railroad. Attacks on major highway installations, which were heavily damaged in the early years, have decreased somewhat at the present time.

While direct attacks have created great losses for targeted organizations, indirect losses have been greater for all infrastructure organizations. Even facilities never directly attacked, the international airport and the ocean ports, have suffered from electric power outages and low voltage induced by sabotage of the power system, and from lack of budget and foreign exchange to perform critical maintenance and equipment replacement. Infrastructure reconstruction foreign exchange costs were estimated in 1985 to total US$200,000,000, excluding ports and airports. That estimate had risen to US$230,000,000 in June, 1988 as a result of continued guerrilla activity. Total cost of reconstruction, including local currency, is estimated at US$390 million.

The immediate and vital need of all infrastructure organizations is the ability to make immediate repair of sabotage damage. This need has been and is being met with USAID assistance in providing material, equipment, and budget to perform the work.

That need will be required into the indefinite future; that is, until the end of the insurgency. At the same time, maintenance management and field organizations, especially in the Ministry of Public Works and the National Water and Sewerage Authority, must be strengthened.

A second level of need exists to address lesser and indirect damages, and to begin reconstruction of a number of facilities now out of service or operating with temporary repairs, or operating with greatly impaired effectiveness.

Interference with operation of and losses to the infrastructure affect all segments of the economy and social structure to a greater or lesser degree. Immediate loss of production in process or being transported; of refrigerated foods in storage or shipment; and the personal losses and inconvenience to users, affect all segments of the population, either directly or

indirectly. Increases in costs of production and transport inevitably make goods less plentiful and more costly, thus affecting everyone in the cash economy. This also affects adversely the ability of El Salvador to compete in foreign markets.

Private sector direct losses in the transportation sector have been suffered primarily by bus and truck operators. Indirect costs of spoiled goods and losses of time, goods, and wages have been great, but any estimate would be conjectural. Indirect losses continue, although at a lesser level in the private sector, as the agencies have developed skill and quick response to damage incidents, and have reduced damage of individual attacks to some degree by practicing passive and active security measures.

Repairs to infrastructure damage are essential to the functioning of the existing economy, so maintaining a repair capability is a cost effective activity in itself. Some measures which reduce costs or time of repair or reduce damages have demonstrated the economy of their use. Helicopters for electric transmission line repair have cut repair time from as much as twelve days to as little as a few hours, thus increasing revenue of the electric power company and avoiding major disruption of production processes. Radio communication for the railroad has cut response time of repair crews from several days to a few hours. Furnishing and maintaining construction equipment for the Ministry of Public Works have assured a capability to repair road and highway damage.

Recent experience shows a rapid increase in the number of sabotage incidents. It should be expected that this higher level of attacks will continue through the rest of 1988 and at least until after the election in March, 1989; possibly beyond. Whether the outcome of the election will influence guerrilla activity one way or the other is, of course, unknown. Under one possible, though hardly probable, scenario the insurgents could adopt a wait-and-see attitude that would decrease the violence, at least temporarily. A more likely scenario is considered to be one in which the number of attacks will diminish somewhat, but continue at a level that will require frequent emergency repair and continued operation on an emergency basis.

Under either scenario, routine and minimum maintenance will continue to be deferred on many facilities, thereby increasing cumulative indirect costs and increasing the cost as facilities eventually will require reconstruction.

Beginning in the immediate future, and extending over a period of five or more years, there is a number of objectives toward which El Salvador should work, with AID assistance. The rate at which the objectives are approached will, of course, depend on the rate at which insurgent activity declines, is contained in smaller areas, or is stopped entirely.

Given the primary national objective of a stable and growing economy in a peacetime environment, with the benefits of development spread to an ever growing part of the population, the objectives in the infrastructure portion of the economic structure are reasonably clear. The overall objective is well organized, properly funded public service agencies, capable of building, expanding, and maintaining the infrastructure required to serve the people and to enable growth of an efficient and competitive economy to occur.

If the infrastructure is functioning effectively at the end of the insurgency and the agencies are prepared and funded to meet their post insurgency duties, they should reflect the policy of the government which will encourage other donors to assist with reconstruction; and more importantly, create an environment which will attract private investment to productive enterprises.

In pursuing the objectives, certain strategies or policies should be followed. During the indefinite interim period, when quick repair of sabotage will be required, management and organization of the Ministry of Public Works, and to a lesser degree ANDA, should be examined and modernized in an attempt to assure affective use of assets. This probably will be most easily accomplished when reconstruction projects are begun, unless the next GOES administration is serious about dealing with institutional problems. ANDA should evolve as an effective national utility company, similar in strength and philosophy to the utilities in telecommunications and electric power.

The national transportation system should be rationalized on an economic basis. To this end, a national transportation study should determine the economic utilization of all of the transportation modes, and a national transportation policy adopted that will encourage economic development and use of the various modes. It may be that three or more lines of the railroad should be retained and encouraged, especially in light of the need to import all fuels and vehicles, and the heavy damage to highways.

The gradual elimination of subsidies should be encouraged. The present low bus fares should be rationalized to make passenger carrying systems self sufficient without discouraging the use of public transportation. The greatly subsidized fuel costs should be examined.

IDB and CABEI both have been and are active in infrastructure projects. That involvement should continue, selectively, in sectors which contribute to economic development. Other donors, such as Germany, Japan, Canada, and Italy have demonstrated at least passing interest in future involvement in infrastructure investment projects in specific areas. Attempts should be made with the GOES to identify specific projects that can be packaged for those donors. France and Belgium have recently agreed to help CEL with construction of two small geothermal generating plants.

During the next few years, activity in infrastructure will evolve through five distinct phases, although time frames will overlap and two or more phases may be in progress simultaneously in different organizations and in different parts of the country. These phases can be described as: (1) Limited maintenance and damage repair, (2) Extension of geographic area of maintenance activities, (3) Extension of services to new users and areas, (4) Final reconstruction of damaged facilities, and (5) Major new investment in infrastructure facilities, such as urban water systems, electric generating facilities and telecommunications facilities.

The USAID will need to be very active in the first two phases, and selectively in phases three and four. The fifth, major new investment, is the arena of multinational lenders, and to bi-lateral programs of other countries to a lesser degree.

There is a need to develop improved maintenance organizations, and funding thereof; especially for water systems and roads. USAID should be able to influence evolution toward that end.

Service can be extended in the form of village and rural water systems, in rural roads, and rural electrification. Projects in these areas should be developed for implementation when the time is right. Some could go forward now.

Reconstruction of roads, rural electric systems, and substations, can begin in secure areas, with the stipulation that all possible road work, especially in fringe areas, should be done by labor intensive methods. Construction by modern mechanical techniques invariably is cheaper than by manual labor, given a choice between the two. However, with the unemployment situation and the need to reduce dependence on non-essential imports, labor intensive methods are much more attractive. Further, large spreads of equipment in rural areas create attractive targets for guerrillas and should be minimized. Reconstruction of certain facilities in secure areas can begin now, with the rate to increase as security conditions improve. Selection of projects for early reconstruction should be made carefully to avoid waste of resources. Most present "temporary" bridges actually can serve for several years with reasonable maintenance, so there should be no rush to rebuild bridges without consideration of all alternatives. The same can be said for many of the wooden transmission line structures which are serving in lieu of damaged steel towers.

Priority in reconstruction should go to projects which reduce cost of operation, such as damaged roads which increase vehicle, tire, and fuel costs; or which directly serve the agricultural and rural commercial sectors, such as water and rural electric distribution.

Some priority will have to be given to a limited number of projects at the port in Acajutla to assure that some of the piers do not become inoperable.

All of the above assumes that the GOES will adopt policies and practices which encourage health of the various infrastructure agencies, provides funding at a level required to do the work, and causes the economy to grow at a rate which will support the necessary expenditures.

Specifically, it assumes that tariff policies of all of the revenue generating utilities, including ANDA, will be adjusted to rates which reflect the cost of providing service; that is, that charges for services will be such as to cover all costs. This is particularly true for ANDA as it evolves in its role as the national water utility, with responsibility extending to development of rural organizations and construction of rural systems.

It is assumed that rail freight rates will be normalized in the same way, to eliminate subsidy in a post-insurgency environment, or reduce it in line with policy to make most economic use of transportation resources.

For Ministry of Public Works activities, recurring costs will remain a problem since they are funded by government appropiation or allocation. Rational road user fees, in the form of fuel taxes, license and registration fees, should go a long way toward solving the problem. Users of streets and roads should pay for them, but conversely funds raised from such sources should not be diverted to other use. If coupled with a cost reduction effort at headquarters level, it should be able to strengthen regional and maintenance efforts with funds raised as noted above, plus a declining percentage of other appropriated funds which would reflect public and defense value of road use.

Maintaining, improving, and extending infrastructure services to a greater percentage of the people will contribute to the general health and wellbeing, and should tend toward creating social stability. It is also assumed, although it has been demonstrated often enough to be more than an assumption, that economic development depends on an effective and reliable infrastructure. While good infrastructure does not cause economic development, economic development is impossible without it. And economic development is a prerequisite to generating the funds which support social programs to improve living conditions of the urban and rural masses.

The estimate of cost of reconstruction of infrastructure, in US dollars, is shown in Table E.S.1. Direct and indirect losses are shown in Tables E.S.2 and E.S.3.

TABLE E.S.1: COSTS OF RECONSTRUCTION OF PUBLIC SERVICES FACILITIES (IN US$ MILLIONS)

| Agency | To 12/31/1985 As estimated in 1986 | As Revised 6/30/88 |
|---|---|---|
| CEL | 195 | 71 |
| Electric Distribution | 14 | 9 |
| Water and Sewer | 5 | 6 |
| Telecommunications | 29 | 10 |
| Highway and Bridges | 218 | 260 |
| Railroad | N/A | 17 |
| Ports | N/A | 16 |
| Airports | N/A | 1 |
| Totals | 461 | 390 |

Notes:

1. Much of the highway costs (bridges) and electrical costs (many transmission towers) will be relatively low priority. Temporary replacements presently installed can serve for ten or more years.

2. Totals for current reconstruction costs in some agencies are less than the 1986 estimate because of better data. Local currency costs for plans made by the agencies in 1987 have been converted to dollars at the current exchange rate of 5:1. Prior to 1986, an exchange rate of 2.5 to one was used. The colon is presently significantly over-valued and costs will increase.

3. The table includes cost of reconstruction of damage to facilities in order to restore service or provide reliable service. It does not include costs for systems expansion to serve new growth.

4. Foreign exchange requirements will vary from service to service, but will be approximately 60% of the total, or US$230 million.

5. The apparent reduction in total reconstruction costs is the result of revised reconstruction plans prepared by CEL and ANTEL. The plans are current and are prepared by the utilities themselves.

TABLE E.S.2: DIRECT COSTS OF VIOLENCE DAMAGE TO PUBLIC SERVICES INFRASTRUCTURE (IN US$ 000)

| Description | 1979-1985 | 1986 | 1987 | 1/1 to 6/30 1988 | Total |
|---|---|---|---|---|---|
| Electric Power - CEL | 20,734 | 11,350 | 2,395 | 3,609 | 38,088 |
| Electric Distribution Companies | 9,787 | 381 | 324 | 1,014 | 11,506 |
| Telecommunications - ANTEL | 7,955 | 1,236 | 274 | 431 | 9,896 |
| Water Service - ANDA | 2,332 | 459 | 794 | 589 | 4,174 |
| Railroad | 21,905 | 161 | 1,996 | 179 | 24,241 |
| MOP | 51,263 | 3,330 | 1,957 | 7,078* | 63,628 |
| Ports | ---- | ---- | ---- | ---- | ---- |
| Airports | ---- | ---- | ---- | ---- | ---- |
| Buses | N/A | N/A | N/A | 34,800* | 34,800* |
| Trucks | N/A | N/A | N/A | 1,720* | 1,720* |
| Total | 113,976 | 16,917 | 7,740 | 49,420 | 188,053 |

* Includes losses for previous years not distributed in agency records.

TABLE E.S.3: INDIRECT COST OF DAMAGE TO PUBLIC SERVICES INFRASTRUCTURE (IN US$ 000)

| Description | 1979-1985 | 1986 | 1987 | 1/1/ to 6/30 1988 | Total |
|---|---|---|---|---|---|
| Electric Power - CEL | 62,545 | 10,628 | 5,090 | 16,364 | 94,627 |
| Electric Distribution Co. | 16,734 | 3,059 | 2,605 | 2,632 | 25,030 |
| Telecommunications - ANTEL | 1,219 | 640 | 1,876 | 588 | 4,323 |
| Water Service - ANDA | 34,936 | 2,232 | 3,012 | 2,022 | 42,202 |
| Railroad | 752 | 105 | 199 | 232 | 1,288 |
| MOP | 245,161 | 1,823 | 1,978 | 2,555 | 251,517 |
| Ports | 13,246 | 1,776 | 2,253 | 1,326 | 18,601 |
| Airports | 401 | 98 | 905 | 866 | 2,270 |
| Buses | N/A | N/A | N/A | 210* | 210* |
| Trucks | N/A | N/A | N/A | 176* | 176* |
| Total | 374,994 | 20,361 | 17,918 | 26,971 | 440,244 |

* Denotes total losses since 1980, not recorded by year in reports of the organizations.

# I. INTRODUCTION

## A. Historical Perspectives

Military violence, which began in 1979, has exacted a heavy toll on facilities and equipment of the utilities and public service organizations that underpin the national economy. Operational military strength reached a peak by the end of 1981-1983 period after which the GOES military gained and held superiority and returned much of the country to control of the lawfully constituted authorities. Public services have improved as evidenced by the increased customers and revenues of the ANTEL and CEL systems. Not even the 1986 earthquake stopped the steady growth of these utilities.

While military strength of the insurrectionists has declined in the field, their determination to destabilize the economic and social structures of the country has not. The insurgents have turned even more strongly to sabotage as a major strategy in destabilization. Attacks on the electric power grid have sharply increased in 1988, and attacks on telephone installations and the railroad now occur at a greater rate than during 1986 and 1987. Improved security measures and operating practices have resulted in reducing direct damage cost from the attacks on facilities of the infrastructure agencies. Agencies other than the ports and airports continue to suffer losses in 1988.

### 1. 1979-1985 Damages

Economic and political systems have been under insurgent attack since 1979. A major target during the first five years was the nation's infrastructure. Greatest direct damages were suffered by roads and bridges, the electric power transmission and distribution systems, and the railroad. Telecommunications and water systems were damaged seriously though to a lesser extent. In early 1986, reconstruction costs for damages incurred through 1985 were estimated at more than US$450 million. In spite of the damages inflicted, and with heavy USAID support, all systems have continued to function with improved quantity and quality of service rendered since 1985, and some of the projected reconstruction requirements have been met.

### 2. Damage Caused by Lack of Maintenance

The utilities and other public service agencies have been unable to perform required maintenance on facilities for at least three reasons. Some installations are in contested areas where access is denied due to unacceptable risk to personnel and equipment. This is especially true of roads, bridges, highways, portions of the railroad and electric power lines; and to a lesser but significant degree for water and telephone facilities. Losses due to lack of maintenance will require major reconstruction in many instances, particularly on roads and power lines.

Another maintenance problem for some agencies is the lack of local budget, especially for the highways, ports, and the railroad. A third, which most seriously affects ports, ANTEL, the railroad, and airports is the lack of or difficulty in obtaining foreign exchange for import of repair parts and replacement equipment.

Roads in contested and marginal areas have had no maintenance for several years and truck and bus operators report secondary roads to be in poor condition. It is expected that as much as 50 percent of the investment in roads in contested areas will have been lost due to lack of maintenance and will have to be rebuilt. Roads in fringe areas presently travelled by private trucks and buses will require major overhaul.

Track maintenance and reconstruction of the railroad will require several years, with wooden ties replaced by concrete ties to reduce the demand on the national timber supplies. Some locomotives were destroyed and must be replaced.

CEL will need to reconstruct over 300 Km. of rural distribution lines in contested areas, plus eight transmission lines, three of which are completely out of service due to lack of access.

ANTEL estimates that more than 90 small central stations will require complete rebuilding or replacement due to damages and inability to go to the sites to work during the insurgency.

The Port of Acajutla and the international airport have not yet (June 1988) been attacked directly. However, they have suffered severely crippling indirect damage, primarily due to power problems and the lack of maintenance budget and foreign exchange for parts and equipment.

The loss in capital plant due to lack of access cannot be determined with precision for obvious reasons, but the reconstruction and repair cost which will face the infrastructure agencies when the insurgency is ended will be immense.

B. Summary of Assistance Rendered

The infrastructure agencies have received loans from IDB and CABEI during the period of insurgency for improvements to highways, water works, and electric power systems. Only USAID has helped for the specific purpose of repairing direct and indirect damage inflicted by guerrilla activity.

Other nations have assisted with earthquake reconstruction. That assistance has not extended to the repair of damage due to sabotage. Several donors are discussing assistance now but no agreements have been signed.

In 1979-1980, the US Government responded rapidly to the problems, declaring the situation a disaster and providing emergency equipment via the Office of Foreign Disaster

Assistance. That help made it possible to keep some public services operating.

Under USAID Project No. 519-0279, assistance has been and is being provided, distributed as follows:

| | | |
|---|---|---|
| CEL | -- | US$53.8 million |
| MOP | - | US$18.7 million |
| CEPA | - | US$ 5.6 million |
| ANDA | - | US$12.8 million |
| ANTEL | - | US$ 1.7 million |
| Program Support | | US$ .40 million |

As now programmed, Project No. 519-0279 is scheduled to terminate in mid-1989. Continuation of the assistance provided by this project will be required, however, so long as the insurgency continues; and the format by which that assistance can be provided is being considered. Assistance from other USAID programs has provided local currency support for ANDA, CEL and MOP.

## II. STUDY PURPOSES AND METHODOLOGY

The stated purposes of this report are to assess damages to public utilities and transportation infrastructure since 1985, to the cognizant organizations, suffered as the result of guerrilla activity; to provide information to the Mission for use in programming decisions; and to provide background for the preparation of the CDSS, PIDs and Project Papers as determined by the Mission to be required.

This report will vary from the earlier Damage Assessment Report in that it undertakes to recommend potential courses of action on the basis of information developed in the course of the study.

### A. Purposes and Goals

The purposes of the study and this report are clearly stated in the contract Scope of Work, Article II - Objective:

"To assess direct and indirect damage to public services infrastructure caused by guerrilla activity; to identify infrastructure rehabilitation, reconstruction, and upgrading needs; to identify financial constraints on public infrastructure agencies in El Salvador..."

Article III also states, in part,

"The combined analysis of each public service system will comprise a report of the overall status of essential public services infrastructure in El Salvador."

The goal of the study is to evaluate the scope and types of future assistance needs of various infrastructure systems, and the form which that assistance should take.

The report is expected to be a primary source of information in the shaping of future strategy in the various infrastructure segments of the public services sector, and in formulating policy, programs, and projects in support of that strategy. In the latter regard, this report will vary from the earlier damage regard in that it presents specific conclusions, and recommendations for Mission consideration.

It provides economic conclusions and estimates of indirect cost for some services, and goes into some depth in the study of ports and airports which were not included in the earlier damage assessment report. It reworks the study of damage to the railroad due to availability of more complete information. Some information is presented on trucks and buses. Where updated data have been discovered, as in loss of revenue for the telephone system, conclusions of the earlier report have been revised.

## B. Review of the Documentation

### 1. Previous Studies and Documentation

This report covers primarily the period 1 January, 1986 to 30 June, 1988. The point of departure is the Public Services Infrastructure Damage Assessment Report submitted by Development Associates, Inc., in April 1986. In the course of the work, several earlier studies were also consulted.

### 2. Pertinent Projects in Progress or Pending

The most significant project in progress which assists directly in repair of sabotage damage is AID Project No. 519-0279. Local currency budget assistance also has been provided under PL 480 Title I and ESF generations. Funds have been provided on a grant basis, and project funds have purchased and provided equipment and materials for nearly all the infrastructure agencies, although assistance to airports has been minimal and none has been provided directly to ports (except for a generator). Neither the airports nor ocean ports have come under direct attack.

Other projects such as earthquake repair and school construction are not directly involved in repair of guerrilla inflicted damage to public services. They are not germane to the present study.

Various government agencies have loan projects in progress or being negotiated with the IDB, CABEI, and bilateral lenders for infrastructure construction. These are not concerned with repair of sabotage, however, but in what might be called "normal" development projects.

In summary, this report is concerned primarily with damage inflicted by the insurgency and the effect of those damages on the concerned agencies; the agencies and their facilities which receive assistance under Project No. 519-0279.

Given the relative health of those agencies and the quality of service being provided, it must be noted that project 279 is accomplishing the purpose for which it was designed and is doing it effectively.

## C. Methodology

Time restraints and security conditions mandated that the vast majority of the assessment be based on documents and records of the affected GOES agencies rather than field inspection. Some short trips were made, however. A helicopter flight to inspect transmission line damage and two bridges was made; a trip by road to Acajutla to inspect the port, the CEL steam plant, and railway facilities at the port, helped; and inspections of the international and Ilopango airports were accomplished.

The assessment, then, is based more on evidence developed by others than the assessment team. In some cases estimates include replacement costs only. In others, such as transmission line damages, cost of immediate repair plus replacements are included.

From an accounting point of view, the depreciated value represents the true loss; but, practically, the replacement or reconstruction costs are the estimates of current concern. Estimates of the construction costs are tabulated separately from the tables which enumerate total loss. The replacement or reconstruction costs do not relate directly to estimates of losses and damage costs. The latter include costs of temporary repairs which cannot be recovered.

Indirect costs and losses are estimated on the basis of loss obviously the result of guerrilla action. Examples are security costs, extra fuel costs, and others incurred due to the insurgency but not involving repair of damage caused by direct attack. Income loss is estimated for revenue producing agencies on the basis of projected revenue growth in absence of insurgency compared with actual receipts.

For nearly every agency, indirect losses are much greater than direct costs. For instance, the ports and the airports have suffered no direct attacks, but have sustained significant indirect damage.

All costs and estimates have been converted to equivalent dollars, at the appropriate exchange rate for the year under consideration. This was done with Mission approval to provide a uniform base for comparing costs and, where appropriate, revenues. Where appropriate, local currency data are shown in the annexes.

Publications and working papers not included in the report or its annexes were delivered to USAID/IRD.

D. Limitations to the Study

The primary limitations of the study are the result of using data generated by others, most of which must be accepted at face value, in the absence of better data with which to refute or compare. It is believed that most data are reasonably reliable, however. It certainly states an order of magnitude of the problem faced by all the agencies, now and in the future.

The loss data are indicative and are considered reliable and precise enough to use as a source of information for planning purposes.

Most organizations have been judged on past and present performance in conducting their duties and managing their assets. There has been no effort made to accomplish a management and methods audit. Such an effort might have been counterproductive.

Such financial records as have been utilized have been generated by the agencies, except for those provided by USAID. There is little evidence of external audits, although most agencies show both internal and external auditors on their organization charts. In all probability the auditors in revenue producing utilities function more effectively than in, say, the Ministry of Public Works, but equal creditability was given to data from all of them for lack of a suitable alternative.

Chapter VIII examines financial and economic effects of damage, direct and indirect of the guerrilla action as it affects the agencies and the economy. In the final analysis, however, deciding the relative importance of the infrastructure viz-a-viz other sectors will be a judgment, and to some degree a political decision. It is the opinion of the writers of this report that effective public services are essential to social and economic stability in ways that cannot be evaluated solely in economic terms. All other projects assume, overtly or tacitly, that transportation, communications, and power systems will be available to support those projects; that imports and exports will flow through the ports and airports; and that project inputs will be delivered on time to their point of use. As noted elsewhere in the report, effective public service infrastructure in and of itself is not enough to ensure economic stability and growth, nor social and political tranquility. Nevertheless, it is believed to be a prerequisite for all of these things in a modern economy. None of these values of infrastructure is quantified in this report, but they are recognized as assets of inestimatible value in the present circumstances.

## III. LEMPA RIVER HYDROELECTRIC EXECUTIVE COMMISSION (CEL)

### A. General Discussion and Background

CEL facilities continue to be a major target as insurrectionists attempt to disrupt and destabilize the economy. In the first six months of 1988 the rate of attack on transmission and distribution facilities ran far ahead of the average pace of the last eight years. The number of overt attacks also is 70% greater than for the corresponding months in 1987. If sabotage events occur for the rest of 1988 at the same rate as during the first half, 1988 will see more attacks on CEL facilities than any previous year of the insurgency. The number of attacks on CEL facilities of all types, by quarterly periods since August, 1980 is shown on Figure III.A.

During sabotage interruptions, CEL must burn imported fuel when the hydro and geothermal plants cannot supply power due to damage to transmission towers or other parts of the system. When fuel oil is not available, or foreign exchange required to buy the oil is not made available, power rationing is instituted.

It should be noted that not all blackouts or power rationing are due to overt insurgent attacks on the power grid. When water at the hydro plants is not sufficient to generate requirements, as after a less than normal rainy season, and fuel oil is not provided for generation, power is rationed and blackouts occur.

All the dependent distribution organizations and systems receive CEL management and maintenance assistance. CEL has taken on the characteristics of a unified national utility during the current period of insurgency and has been required to intervene in operation and maintenance of all electric utilities, nationwide, although the individual companies continue to maintain their own systems using AID financed materials, and CEL assistance when necessary. The long term effects of these interventions, and the configuration of the utility industry in El Salvador after the insurgency is stopped, are yet to be determined.

CEL generating capacity has a nominal nameplate rating of 650.9 megawatts (MW) located at ten differnet sites around the country. However, capability at this time is more nearly 458 MW due to dependable river flow in dams where hydro-electric power is generated, malfunction of a well in the geothermal field at Ahuchapan, and condition of some of the diesel plants. Generating capacity for base load has continued to be installed during the 1980s with major additions to the system made in 1980 (geothermal); in 1983 and 1984 (hydro-electric) and 1984 and 1986 (fuel burning units). The growth of the generating system is shown on Figure III.B.

Given the present degraded capability of national generation capacity, the 1987 maximum demand and rate of growth of demand since 1983, it can be projected that the system demand will equal

FIGURE III.A:

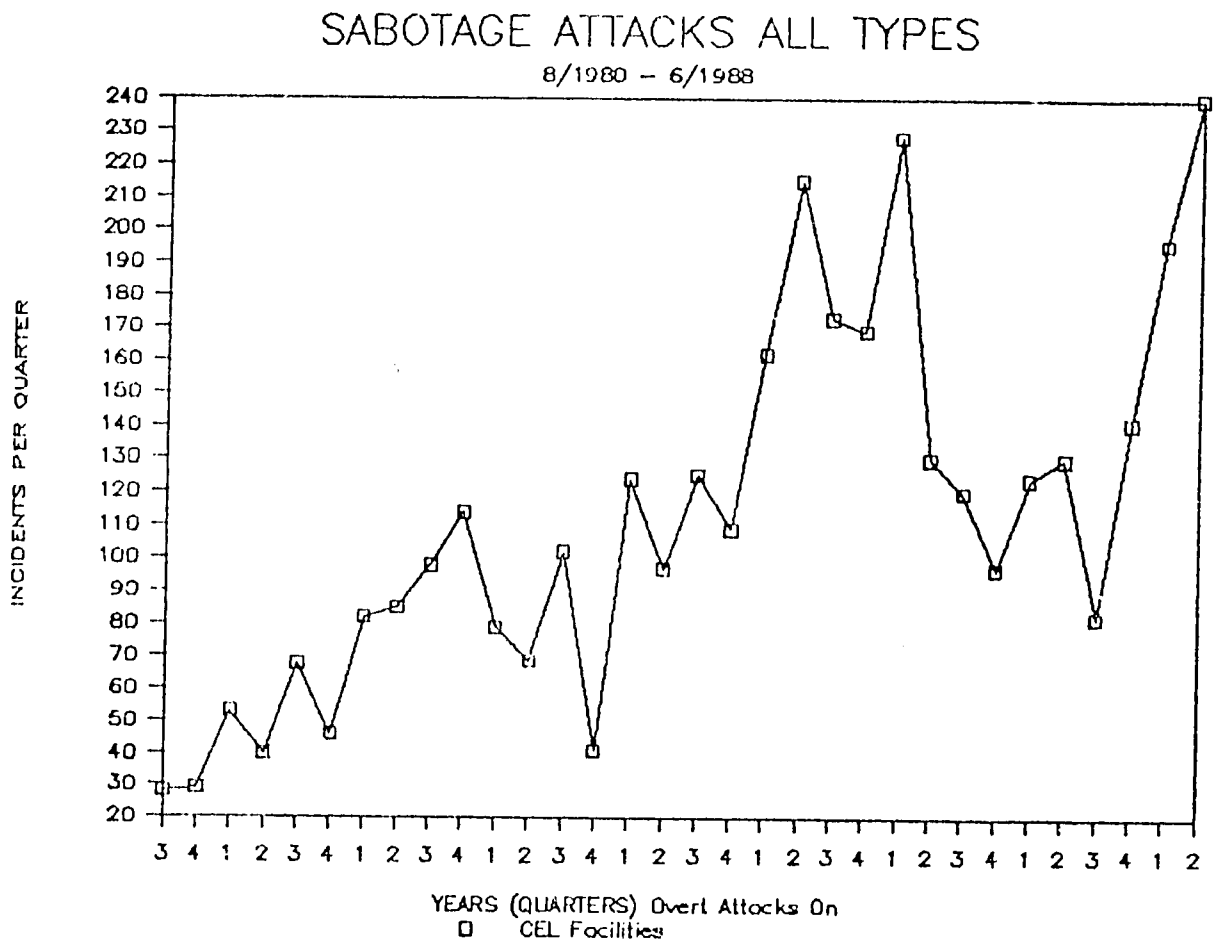
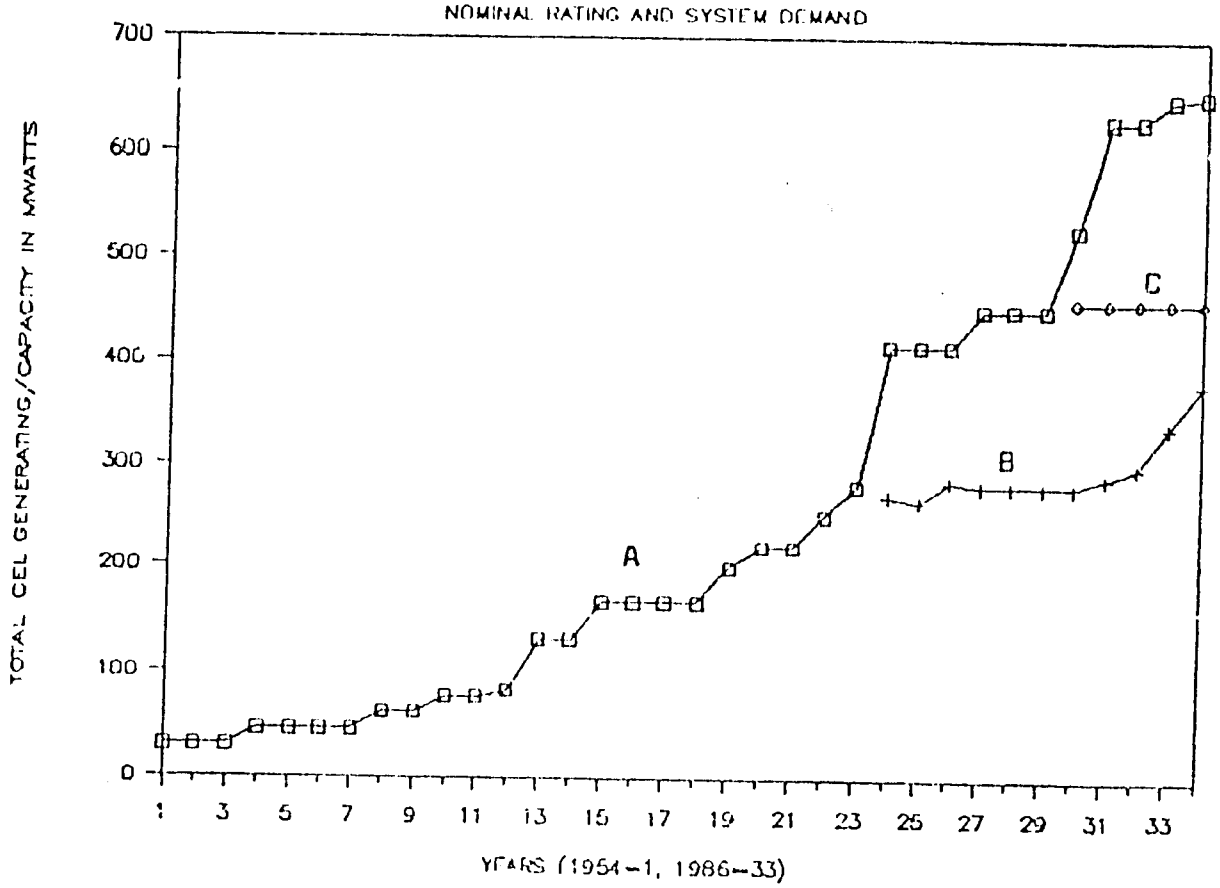

SABOTAGE ATTACKS ALL TYPES
8/1980 – 6/1988
INCIDENTS PER QUARTER
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2
YEARS (QUARTERS) Overt Attacks On
CEL Facilities

FIG.IIIB:INSTALLED GENERATING CAPACITY




A. Rated Capacity, Installed Generation

B. System Peak Demand

C. Actual Capability of Installed Generation

generating capacity in three to five years. Thus, it is imperative that presently installed generating capacity be rehabilitated, and capability quickly increased to as near rated capacity as feasible. High priority should be given to correcting deficiencies in the existing geothermal field as soon as possible. Planning and construction of the next increments of geothermal and hydroelectric generation should proceed as an urgent priority because of the long lead time required for financing, design, and construction of major power plants. In this regard, CEL has completed agreements with France and Belgium for each to construct a 5 MW geothermal generating plant at new fields, and is negotiating with CABEI for funds to renovate the existing field to restore the lost capacity. Discussions are underway with IDB for larger plants to follow on later.

Note that as a base load unit, a 35 mw increase in capability of the existing geothermal system could generate energy which would require import of oil in the amount of US$5,500,000 per year if the same energy were produced in the oil burning steam plant.

The major transmission system consists of approximately 775 Km. of 115 KV lines, except 15 Km of 230 KV which forms a tie to Guatemala. Most of the 26 separate lines are built on steel towers, although one short line two kilometers in length is built on concrete poles, and another, 28.6 Km long, is on wooden structures. Of something more than 2,000 steel towers, more than six hundred have been damaged by sabotage and the number increases almost daily, although many have been damaged, repaired, and damaged again, many times.

The entire national power system served a total of 492,033 customers in 1987, distributed among the classes of service as follows:

| | |
|---|---|
| Residential | 432,871 |
| Commercial | 48,540 |
| Industrial | 5,447 |
| Government and Municipal | 4,923 |
| Public Lighting | 252 |
| Total | 492,033 |

Of the total, 74,842 were customers of CEL rural electrification, although definition of rural customers may vary between CEL and other studies or agencies. Both the total number of customers and the number of rural customers have increased every year since 1977, the earliest date for which records were available when this report was prepared.

The increase in users is reflected in increases in system demand, and sales for all years except 1980, 1981, and 1982 when much of the system was out of service for long periods due to insurgent activity.

The average sale price of electric power since 1977 has been approximately US$0.0427 per Kwh. At the present exchange rate the average rate is US$0.03768 per KWH, and ranges from US$0.02826 for government and municipal service to US$0.0442 for commercial customers. The average residential rate is US$0.0353 per KWH. All of these tariffs are CEL revenues only and do not show the retail prices at which power is sold by the independent companies.

CEL revenues have increased regularly, although not always as fast as cost. The income in equivalent dollars has dropped with change in the exchange rate, as shown on Figure III.C. The status of Accounts is shown in Annex C.

Of the public service agencies, CEL has been most heavily damaged by continuous insurgent attacks, and has received the largest amount of assistance from USAID. To date the USA has provided US$53.8 million to CEL including materials for the "independent" distribution companies intervened by CEL, distributed as follows:

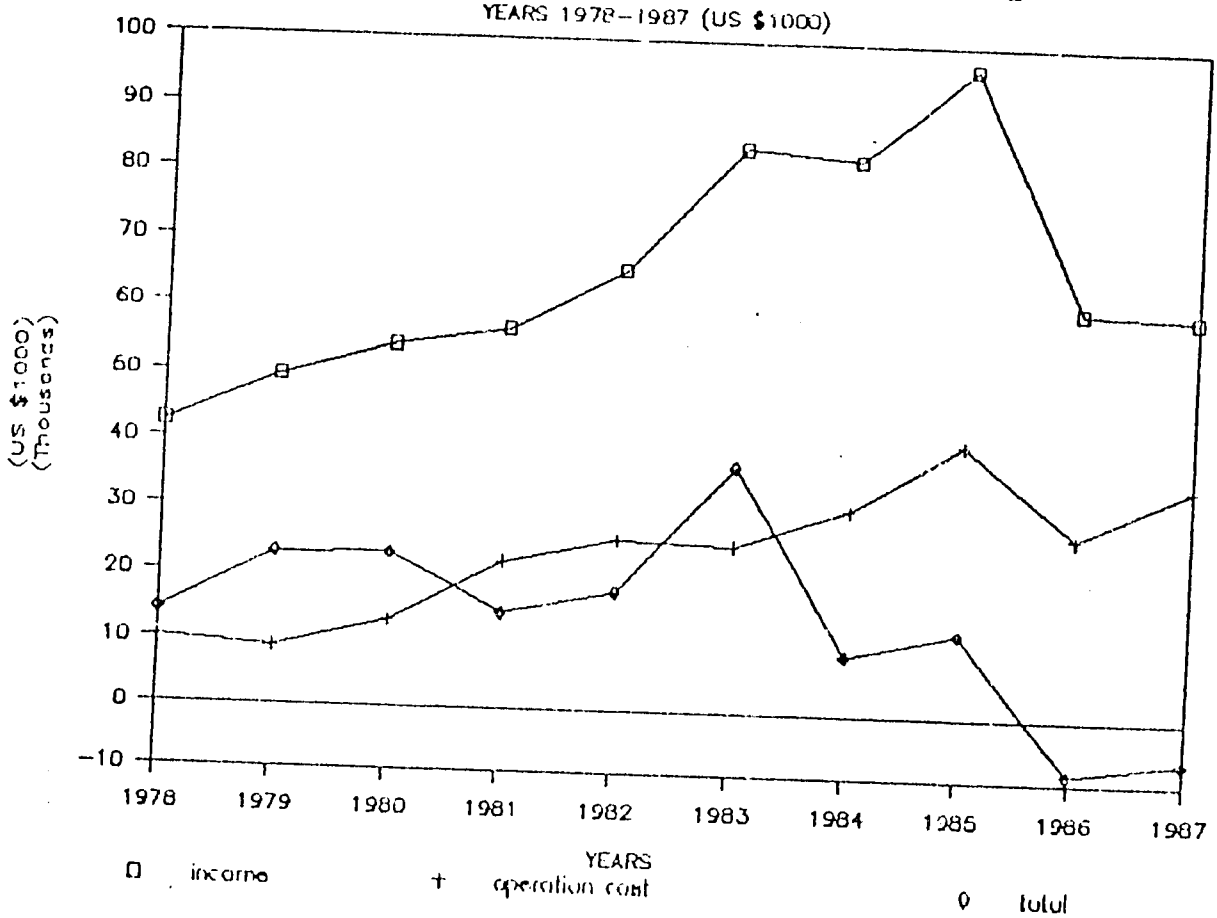
| | |
|---|---|
| Procurement of tools, equipment, parts, and materials for immediate repair of the electric system | US$37.9 million |
| Lease of helicopter for inspection and repair of transmission lines | 7.6 million |
| Procurement of gas turbine for the eastern region | 8.3 million |
| Total | US$53.8 million |

Note that most of these expenditures have been for the purpose of making temporary repairs to keep the system in operation under emergency conditions or to provide emergency generation when transmission lines are down. Many of the wood pole transmission structures being installed as temporary replacements for damaged steel towers can serve for several years after the end of the insurgency. Replacement can be planned and executed systematically without danger to the system at that time.

The Public Services Restoration Project is presently scheduled to terminate June 30, 1989. Unless the insurgency can be brought to an end before that time, CEL will continue to require assistance in maintaining service after that date. The level of assistance required will depend on the nature and scope of the insurgency, and the tactics employed by the insurgents.

CEL also will require financing for deferred maintenance, for expanding the rural electrification system, and for system expansion to serve pent up demand and normal load growth. As noted above, CEL is seeking funding now from other bilateral and multilateral lenders for meeting long term requirements.

FIG.IIIC STATUS OF CEL ACCOUNTS




Note: Operation cost is not total cost
It does not include capital costs, depreciation.

B. Damage Caused by Violence since 1985

Since keeping of records began in August 1980, CEL installations have been subjected to 3,356 acts of sabotage; 1,248, or 37%, of those attacks have occurred since January 1, 1986. By far the greatest number of attacks have been against steel towers of the transmission system, substations, and poles and transformers of the distribution system. Attacks have also been made against heavy equipment, light equipment and tools, and structures.

Physical damage to facilities can be measured at least two ways: by expense incurred in making temporary repairs, and by estimating the cost of permanent repairs or reconstruction at some future date. By careful record keeping, one can determine immediate cost of making repairs. Estimating future cost cannot be as precise for a number of reasons. One is that detailed inspection of all damaged facilities cannot be made.

Another, more subtle reason is that some direct damage will not be known until some future time, and even then may not be recognized as such. For instance, repeated operation of high voltage circuit breakers to clear line faults caused by sabotage shortens the life of the equipment; repeated surges stress transformer insulation; life of instrumentation and even generators and turbines may be shortened; and unscheduled stopping and starting of oil fired generating equipment produce direct damage by wear and tear. These damages are the direct results of attack, but they cannot be quantified until they occur.

Table III.1, shows total apparent damage resulting from overt attacks and includes both cost of making temporary repairs and replacements or permanent reconstruction of facilities attacked, where applicable.

In addition to direct damages reflected in Table III.1, since 1981 helicopter lease plus operating costs total US$9.5 million, jointly funded by USAID and CEL. See Annex C.

Further, since 1983 CEL has expended US$920,000, in addition to AID funded materials in the amount of US$2,005,000, in providing improved security for important installations: central control facilities, generating plants, and substations. While neither helicopter costs nor security costs represent direct damages to facilities, they represent costs directly attributed to guerrilla activity. They are included as indirect cost in Table III.2, however.

C. Damage Occasioned by Lack of Maintenance

Lack of regularly scheduled maintenance results in deterioration of any facility. This is certainly true for electrical equipment, including pole lines and transformers as well as generating equipment. Broken and rotten poles must be replaced, transformer oil filtered, loose wire resagged, machinery

TABLE III.1: SUMMARY OF DIRECT COST OF SABOTAGE OF THE ELECTRIC LIGHT AND FUEL POWER SYSTEM (IN US$ 000)

| Description | Through 1985 | 1986 | 1987 | To 30 June 1988 | Total |
|---|---|---|---|---|---|
| CEL | | | | | |
| Sub-Transmission and Distribution | 1,134 | 170 | 201 | 206 | 1,711 |
| Transmission | 15,523 | 10,682 | 2,047 | 2,454 | 30,706 |
| Installations | 3,466 | 396 | 42 | 900 | 4,804 |
| Transport | 324 | ---- | 29 | 20 | 373 |
| Others | 287 | 102 | 76 | 49 | 514 |
| Sub-Total CEL | 20,734 | 11,350 | 2,395 | 3,629 | 38,108 |
| Distribution Companies | | | | | |
| CAESS | 5,223 | 297 | 204 | 985 | 6,709 |
| CLESA | 865 | 7 | 80 | 8 | 960 |
| CLES | N/A | ---- | ---- | ---- | N/A |
| CLEA | 8 | Negligible | ---- | ---- | 8 |
| DEUSEM | 3,586 | 77 | 40 | 21 | 3,724 |
| DESSEM | 105 | ---- | ---- | ---- | 105 |
| Sub-Total | 9,787 | 381 | 324 | 1,014 | 11,506 |
| Total | 30,521 | 11,731 | 2,719 | 4,643 | 49,614 |

* Cost estimates include cost of temporary repair plus eventual permanent reconstruction where applicable. They do not include cost of helicopter rental and operation. For transmission and sub-transmission replacement cost = approximately 65% of figures shown.

TABLE III.2: SUMMARY OF INDIRECT COSTS OF SABOTAGE AND LOST REVENUE TO THE ELECTRIC LIGHT AND POWER SYSTEM (IN US$ 000)

| | Through 1985 | 1986 | 1987 | To June 30 1988 | Totals |
|---|---|---|---|---|---|
| CEL | | | | | |
| Loss of Revenue | 105,000 | 20,000 | 21,000 | 10,000 | 156,000 |
| Fuel Burned | 35,079 | 5,607 | 813 | 922 | 42,421 |
| Deterioration Due to No Access | ---- | ---- | ---- | 2,400 | 2,400 |
| Deterioration Due to No Budget | N/A | ---- | ---- | 11,000 | 11,000 |
| Other | 27,466 | 5,021 | 4,277 | 2,042 | 38,806 |
| Indirect Damage CEL | 62,545 | 10,628 | 5,090 | 16,364 | 94,627 |
| Estimated Indirect Costs | | | | | |
| CAESS | 9,776.4 | 1,787 | 1,522 | 1,538 | 14,623 |
| CLESA | 2,984.2 | 546 | 465 | 470 | 4,465 |
| CLES | 764.9 | 140 | 119 | 120 | 1,144 |
| CLFA | 444.6 | 81 | 69 | 70 | 665 |
| DEUSEM | 2,703.6 | 494 | 421 | 425 | 4,043 |
| DESSEM | 60.2 | 11 | 9 | 9 | 89 |
| Sub-Total Ind. Cost | 16,733.9 | 3,059 | 2,605 | 2,632 | 25,029 |
| Total Indirect Cost | 79,279 | 13,687 | 7,695 | 18,996 | 119,657 |

overhauled, and wornout parts replaced. CEL has performed major maintenance on power plant with their own forces. Failure to perform maintenance to the CEL system during the insurgency is most likely to have been caused by one or the other of two conditions:

1. Damage in Inaccessible Areas

Portions of the system lie in areas that are contested by the insurgents, into which CEL either is unable to enter without undue risk to personnel and material, or where repeated damage to lines is so extensive as to make it impractical to keep lines in service. One transmission line has been completely out of service since 1982 and 360 Km of distribution lines are not accessible. Thus, immediate direct cost incurred for repair is not applicable. It is estimated that eventual reconstruction and performing of deferred maintenance will require an expenditure of approximately US$5.3 million equivalent, primarily in the eastern end of the country. Details are shown in Annex C.

2. Lack of Maintenance Damages Ascribed to Budget

CEL has been able to perform much essential maintenance, but personnel cite two problem areas which they believe are caused by lack of foreign exchange. One is repair/renovation/replacement of a geothermal system, at a cost of about US$10,000,000. The other is overhaul of three heavy diesels of English manufacture, which will require approximately US$2,000,000 (1,200,000 English pounds). The problem of the geothermal well has reduced the capability of the geothermal generating plant from its rated capacity of 95 MW to approximately 45 MW although the geothermal field is being managed for conservation to maximize total KWH and in some months capacity demand is held to 40 MW. If the well could be repaired or replaced for an estimated US$10,000,000 and 35 MW recovered, cost per megawatt would be US$286,000. The actual technical solution is still under study. Compared to the cost of US$375,000 per MW for the gas turbine at San Miguel, repair of the geothermal system would be very cost effective. It is even more attractive since the geothermal generation reduces the need for imported fuel. Rehabilitation of the well should be undertaken at the earliest opportunity, after the optimum technical solution to the problem is determined. As noted elsewhere, CEL is negotiating with CABEI for funding for this work.

Maintenance of some thermal generating units is at less than normal levels, (e.g., worn blades on turbines) and these problems will have to be addressed in the normal CEL planning cycle. It is believed that deferring of these maintenance functions should be attributed to need to keep the units ready for service and press of other work rather than to lack of funds. CEL has requested technical assistance from Japan for boiler and turbine maintenance. It is Japanese equipment. But Japanese teams have declined to come to El Salvador.

D. Loss of Revenues

CEL has suffered a number of indirect losses due to sabotage. The two largest are lost revenues due to reduced sales and the cost of burning imported oil to generate electricity. Loss of sales due to sabotage can be most easily estimated by comparing actual annual loads with projected load growth which should have occurred in absence of the insurgency. The comparison is shown graphically on Figure III.D.

Before onset of the insurgency, KWH sales for two consecutive years grew at the rates of 11.25% and 9.43%. The decrease in growth probably should be attributed to the domestic and international climate, but in any event it would appear that the rate of load growth was decreasing.

In the first major year of the insurgency, 1980, the annual sales decreased 8.07%, followed by decreases of 4.6% and0.7% in 1981 and 1982, when sales hit a minimum and began to turn around. Sales increased 9.43% in 1983, and have continued to grow at varying rates through 1987. The average load growth from 1982 to 1987 has been 5.9%.

Figure III.D shows two load growth scenarios, and therefore two estimates of revenue loss.

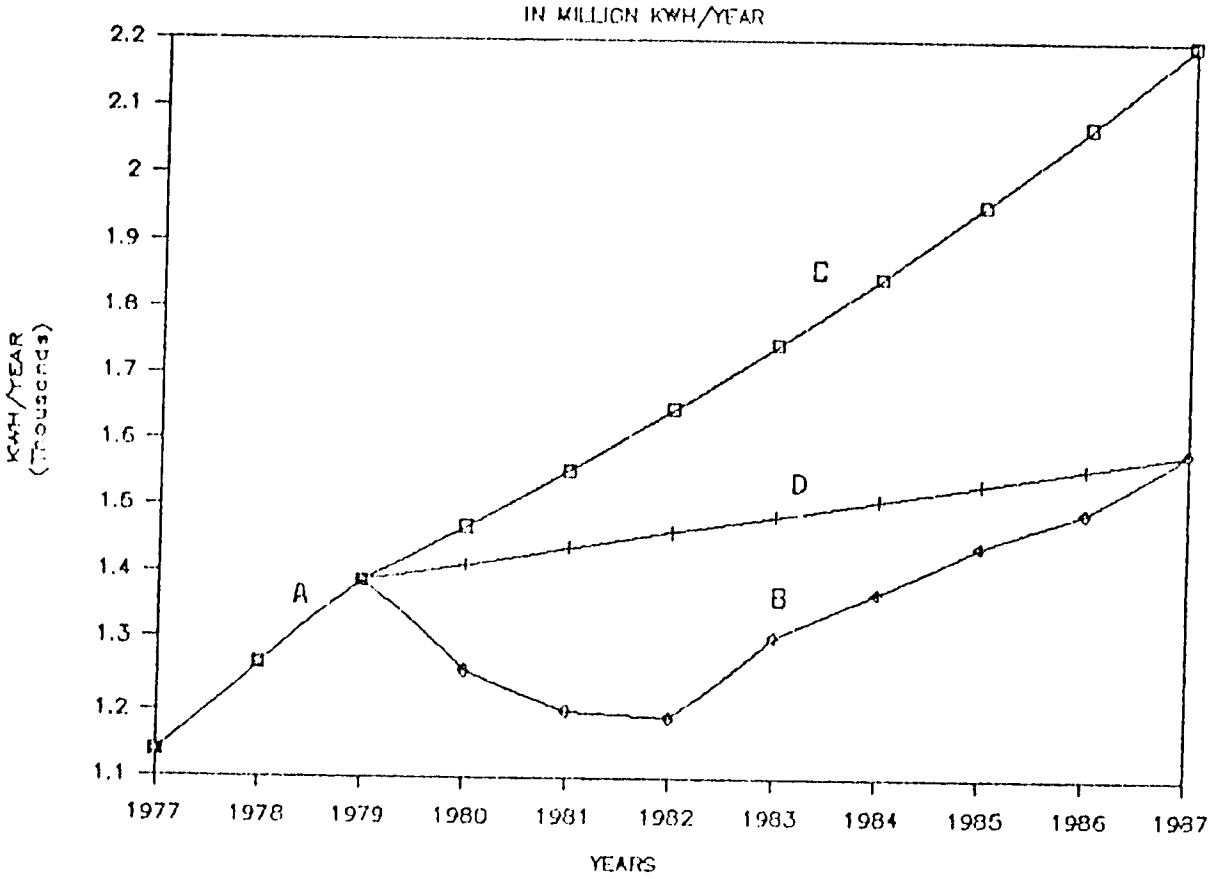
The lower estimate projects straight line growth from actual sales in 1979 to actual sales in 1987. This figure is considered to be less than the actual loss, but represents an absolute minimum estimate of lost revenue. Under that scenario the estimated loss is US$47,700,000.

It is more probable that in a pre-1980 environment, the load would have grown at at least the rate of actual growth since 1982, 5.9%, although at less than the rate of 9.43% experienced in 1979, due to economic conditions. When the growth rate of 5.9% is projected from actual sales in 1979, revenue loss is calculated at US$156,000,000. The exact loss cannot be known precisely but obviously, it is a very large amount, and has had a significant effect on the financial condition of the national power systems. The figure of US$156,000,000 is taken as most probable.

CEL has been forced to import fuel to generate electricity in its thermal plants when transmission lines or substations which provide power from the hydro and geothermal plants are damaged. Since January 1, 1986, CEL records show consumption of imported fuels at a cost of US$7,342,000. The total since 1980 is US$42,421,000.

It should be noted here that extensive burning of imported oils for generation of electricity is not normally contemplated by CEL and apparently no provision for burning of high cost fuel is included in the total CEL tariff structure. The cost of the fuel is an increase in the cost of providing service, and should be

FIG.IIID:ELECTRICAL POWER SALES




A. Actual KWH Sales - 1977-1979

B. Actual KWH Sales - 1980-1987

C. Projected Sales, Probable Scenario in Absence of Insurgency

D. Projected Minimum Sales

paid by all consumers through a fuel cost adjustment clause in the tariff structure. In 1985, the year in which cost of fuel for power generation was highest, the average surcharge for fuel costs should have been US$0.00389 (approximately C. 0.0195) per KWH. (The surcharge should vary from month to month, depending on the cost of fuel actually burned.) While the cost of burning fuel is not a revenue loss per se under the present definition, it is a direct increase in cost which should be paid by the consumers, and as such could be included as a loss of revenue.

Most probable loss of revenue since 1980, including fuel cost, therefore would be as follows:

| | |
|---|---|
| Loss due to reduced sales | US$156,000,000 |
| Loss due to burning imported oil | 42,421,000 |
| Total revenue loss | US$198,421,000 |

In the tables, fuel burned is included as an indirect cost, however, since it is hypothetical, given the rate structure actually in use.

E. Institutional Analyses

The CEL organization chart is shown in Annex C.

The CEL technical staff is performing extremely well during the period of insurgency, and training of technicians, operators, construction, and maintenance personnel should not be required except for site-specific operator training when new equipment or generating stations are brought on line. While it cannot be documented, it is probable that the crisis atmosphere has prevented CEL management staff from keeping abreast of modern utility management techniques. Short terms visits to major systems in other countries should indicate to CEL management the areas in which they need training or technical assitance. An attempt to provide management or other technical assistance before CEL management is convinced of the need will be counter-productive in an organization that has performed so well in time of crisis.

CEL has the capability and capacity to perform major maintenance and rehabilitation of damaged transmisssion and distribution lines, and the construction of substations, with their own resources. Where either transmission or distribution lines must be completely rebuilt, however, the work should be done by contract to prevent overtaxing CEL capacity. The capability to manage the contracts exists in the CEL organization. In either case, the main constraint will be a source of foreign exchange for purchase of materials and equipment.

Data provided by CEL from current records, and the production and use of operating and financial statistics, indicate a capable management organization that should be able to manage a

rehabilitation/reconstruction program with a minimum of assistance. The most likely need for assistance, if any, will be in adapting to more normal peacetime operation.

F. Conclusions and Recommendations

1. Restoration and Rehabilitation

The CEL plan for restoration of service and rehabilitation of the system covers a five year period from 1989 to 1993. The total cost of the program is estimated at US$44.7 million and C. 131.2 million; a total of US$70.94 million equivalent. Included in these estimates is rehabilitation of distribution systems of the six distribution companies now operated under CEL intervention. The details of the proposed programs are shown in Annex C.

The program could be executed safely over a longer time frame, since some of the temporary repairs to transmission lines should serve satisfactorily for up to ten years.

The CEL estimates are as reliable as any that can be developed at this time. It is recommended that they be accepted until inventories of damages can be made in the field.

It is recommended that the rehabilitation program proceed in secure areas simultaneously with the program to restore service and make temporary repairs due to current damage. Rehabilitation priorities should be assigned as follows:

1. Transmission lines and sub-stations from geothermal and hydraulic plants in order to minimize burning of imported fuels.

1A. Simultaneously, begin reconstruction to original condition of rural distribution lines.

1B. Purchase of any equipment required to execute the work.

2. Communications and control systems, and generating equipment.

3. Replacement of damaged but operating switches, breakers, transformers, etc. in urban systems.

4. Replacement of critical towers where wood poles now serve; that is at ends of long spans across valleys, roads, etc.

5. Systemmatic replacement of remaining wood poles with steel towers, line by line; and of buildings.

Obviously priorities will be affected by security of access and of the completed lines, but in general, the order of importance which should be assigned in rehabilitating various parts of the system should be approximately as shown.

2. Additional Infrastructure Investment

CEL has outlined a plan for system additions between 1988 and 2000, and has recently discussed the plan with IDB. The plan calls for addition of approximately 550 MW of generating capacity by 1998. Most of the early additions will be geothermal units, with large hydro coming on line late in the decade. The present CEL proposal probably is overly optimistic concerning its timing and availability of financing, but additional generating capacity will be needed, and quickly.

The plan also envisions major expansion of rural electrification systems and studies for major transmission line construction.

So long as the load continues to grow at the present rate, CEL will need to add generating capacity and transmission to stay ahead of the load curve. If export industries develop in new industrial zones, electricity requirements will develop even faster than at present. To meet the potential demand, CEL probably should be investing an average of approximately US$75,000,000 per year in generation, transmission, and distribution, given the trend to geothermal and hydroelectric power. While investment in steam plants would be less, economics and foreign exchange requirements make fuel burning plants unattractive in spite of their lower initial cost.

3. Management and Training

Short term tours of large utilities should be instituted for upper level management personnel of the CEL organization before an extensive training program is instituted. Then, any major training effort should be worked out with CEL management. CEL obviously has an excellent and devoted management organization that can best determine the parts of the organization that should be strengthened after observing modern management and organization techniques in other large utilities operating in a peacetime environment.

4. AID and Other Donor Technical Assistance

The need for technical assistance for CEL systems financed by AID will be minimal. CEL does require assistance in solving the problems at the geothermal field, and in developing the new geothermal sites. France and Belgium are providing some assistance now.

There is a need for assistance in replacing turbine blades at Acajutla, but it is Japanese equipment and so far Japanese engineers decline to come to El Salvador.

USAID will need to provide technical assistance under a number of other agencies other than CEL, and those cases are discussed elsewhere in the report.

## Addendum: Siltation of Reservoirs

Notice should be taken of the silting problem which is developing in the CEL reservoirs that store water for hydroelectric generation. CEL is aware of this problem but has had trouble in making a study of it because of security conditions, although they are trying.

The oldest reservoir is losing capacity as the upper reaches fill up with silt dropped by flow of the river when it reaches the still water of the reservoir. This is a problem common to all man-made reservoirs. The size of the problem, and how fast the reservoir fills, is directly dependent on agriculture and forestry practices upstream and the rate of upstream erosion.

CEL is attempting to map the bottom of the reservoirs most seriously affected. Until that is completed the amount of water storage lost and how some or all of it might be regained cannot be determined.

Removing silt from the reservoir is a last resort alternative, and may not be technically nor economically feasible. Removal requires several large sites in the proximity of the reservoir to which the silt can be pumped and where it will remain forever. The cost of the dredging itself is high.

Other alternates may be available to alleviate the problem, if not solve it. Most reservoirs are designed with a silt storage capacity, located at an elevation below the intake to the hydroelectric turbines, or the power pool. If hydrographic surveys show a sizable silt storage capacity in the bottoms of the El Salvador reservoirs, it may be possible to pump silt from the shallow water, where it settles out and displaces storage capacity, to deep parts of the reservoir below the power pool.

Upstream programs to reduce erosion are a key factor in prolonging the life of reservoirs. Reforestation of eroding hillsides and improved farming techniques are the most obvious, and should be pursued.

Silt catchment dams on particularly bad tributaries and tertiary streams might be useful in some cases, and could be economical if constructed as part of multi-use (agricultural water, fisheries, industrial and potable water supply) programs.

It is obvious that unless the problem is solved, El Salvador could lose large segments of power generating capacity in a very few years. Surveys, data collection, and planning should proceed as rapidly as security conditions permit. Neither decrease in the rate of silting nor movement of the silt already in the reservoir can be done quickly nor cheaply.

## CHAPTER IV. NATIONAL ADMINISTRATION FOR WATER AND SEWERS (ANDA)

ANDA is an autonomous public service agency attached to the Ministry of Public Works. It was created in 1961 to provide, manage, and maintain the water and sanitary sewer service in the urban and rural areas of the country.

In 1971, the rural component of this responsibility was transferred to the Ministry of Health. Today ANDA controls and provides all the water and sanitary systems of the country up to small semi-urban areas of not fewer than 2,000 inhabitants. A decision has been made, though not yet implemented, to move the rural water segment back to ANDA from the Ministry of Health in order to put all national potable water responsibility under single management.

ANDA is organized in six geographical zones. Northern, Western, and Eastern, and three locations in San Salvador.

ANDA reports that it provides water service to a population of 2,116,356 as of June, 1988. Average annual revenue per meter was US$45 in 1986. Average sanitary sewer revenue was US$9/year per connection. The water and sanitary sewer rates vary according to three types of tariffs designed for three types of customers located in different parts of the country, according to the economic conditions existing in those areas. See Annex D for costs of water and sanitary service in those three areas. A significant percentage of the services in major cities is provided through water meters, but lack of financing has precluded ANDA from continuing placing more meters. The situation creates waste of water which cannot be transformed into revenues. At this time, the number of personnel working with ANDA is approximately 3,550, including both executives and labor force. The company has around 240,000 water connections at a rate of more or less 70 connections/employee, or one employee per 407 persons served. It is normally assumed that a good rate of productivity is more than double what is shown now. A good ratio for which ANDA should strive is 1,000 to 1,200 persons served per employee. See Table IV.1 for portion provided with service in 1986, the latest complete record available from ANDA.

TABLE IV.1: POPULATION WITH POTABLE WATER SERVICES, SEWER SERVICES AND LATRINES

| | Potable Water | | | | Sanitary Sewer | | |
|---|---|---|---|---|---|---|---|
| | Urban | | Rural | | Urban | | Rural |
| | House Connect | Easy Access | House Connect | Easy Access | House Connect | Latrines | Latrines |
| ANDA | 1,445,316 | 109,500 | 40,240 | 1,800 | 1,146,216 | ----- | ---- |
| MSPAS | ----- | ----- | 327,000 | 192,500 | ----- | 670,863 | 984,166 |
| Total | 1,445,316 | 109,500 | 367,240 | 194,300 | 1,146,216 | 670,863 | 984,166 |

Source: ANDA Boletin Estadistico 1986.

Notes: Urban Population to June 30, 1986: 2,049,128.
Rural Population to June 30, 1986: 2,796,460.
75.9% of the urban population had potable water service in 1986.
20.1% of the rural population had potable water service in 1986.
55.9% of the urban population had sanitary sewer system through house discharge and 32.7% had latrines in 1986.
35.2% of the rural population had latrine service in 1986.

A. Damage Caused by Violence since 1985

In the previous report, which covers a period of time between 1980 and 1985, the extent of the damage caused by overt attack was extensive. Now there is little direct damage but indirect damage is still being suffered. The direct cost has been reduced, mostly involving equipment.

The destruction of property and the disruption of service by the insurgent forces have been carefully planned. They are hitting selected targets, exposing themselves to a minimum risk, disrupting electric lines which damage water pumping equipment and blackout extensive areas of the country on important days or events. Beside the work stoppages, which creates higher costs of operation and salaries being paid for non-productive time, ANDA is required to use thermal generators to maintain the water supply. ANDA burns imported fuel in diesel generators to operate the pumping system.

The intensity of these damaging events has increased due to increasing attacks on CEL facilities which affects ANDA when high tension lines are destroyed and the institution has to switch the electric pumping system to stand-by fuel generators.

TABLE IV.2: SUMMARY OF DIRECT DAMAGE COSTS TO ANDA INSTALLATIONS FROM 1986 TO JUNE 1988 (IN US$ 000)

| Description | 1986 | 1987 | To June, 1988 | Total for the Period |
|---|---|---|---|---|
| 1. Buildings and Installations | 54.4 | 253.4 | 25.6 | 326.4 |
| 2. Heavy Equipment | 340.9 | 491.0 | 370.6 | 1,202.5 |
| 3. Light Equipment and Tools | 61.0 | 50.0 | 123.8 | 234.8 |
| 4. Others | ---- | ---- | 48.4 | 48.4 |
| Total | 459.2 | 794.4 | 568.5 | 1,822.1 |

In order to differentiate the type of damage caused to ANDA, see Table IV.2, which presents the direct damage, and Table IV.3 showing the indirect losses. The indirect costs are 190% of direct costs for the period 1986 thru the first half of 1988.

TABLE IV.3: SUMMARY OF INDIRECT COSTS OF DAMAGES AND LOST REVENUE (IN US$ 000)

| Description | 1986 | 1987 | 1988 | Total |
|---|---|---|---|---|
| 1. Revenues not received | 1,170.9 | 1,474.1 | 1,139.6 | 3,784.6 |
| 1. Personal security | 4.5 | 4.8 | 4.2 | 13.5 |
| 2. Security - installation | 10.6 | 27.5 | 22.8 | 60.8 |
| 3. Personnel increases | 3.7 | 6.8 | 4.7 | 15.3 |
| 4. Overtime | 112.7 | 146.6 | 80.2 | 339.4 |
| 5. Additional transp. cost | 14.5 | 16.8 | 7.4 | 38.7 |
| 6. Additional energy cost | 66.3 | 394.1 | 28.0 | 488.5 |
| 7. Additional heavy eqpt. cost | 8.0 | 12.0 | 7.0 | 27.0 |
| 8. Indemnizations - Insurance | 37.3 | 13.1 | 21.0 | 71.3 |
| 9. Indemnization claims | 3.3 | 34.3 | 9.0 | 46.6 |
| 10. Others | 47.0 | 35.7 | 20.4 | 103.1 |
| 11. Interest for late payments | 0.4 | 0.5 | 0.4 | 1.2 |
| 12. Services not invoiced | 18.4 | 18.4 | 18.4 | 55.2 |
| 13. Additional construction | ---- | ---- | ---- | ---- |
| 14. Late payment costs | 615.6 | 743.7 | 623.1 | 1,982.5 |
| 15. Protection construction | 3.6 | 4.0 | 2.4 | 10.0 |
| 16. Work stoppage salaries | 115.4 | 79.1 | 33.7 | 228.2 |
| Total Indirect Cost | 1,061.3 | 1,537.4 | 882.7 | 3,481.4 |

## B. Damage Occasioned by Lack of Maintenance

### 1. Damage Due to Lack of Budget

This item deserves special attention. The funds provided for maintenance have been meager. The existing maintenance has been corrective and not preventive. Small amounts of money have been provided to restore services due to rupture of lines and other necessary repairs. There has been no regular program, however, to replace defective material at the end of its useful life on the distribution lines, or on the water transmission lines, in accordance with more normal maintenance programs.

City water lines are designed normally for a life of not less than 25 years providing that regular maintenance is performed, not only to repair the damaged pipes for excess of pressure, age or excessive external loads (traffic), but to extend that life for some extra years.

The entire water system requires constant maintenance, such as repair of leaks, and cleaning unwanted material accumulated in certain lines which reduces the capacity or pressure of the water in the pipes. This type of maintenance has been almost forgotten for lack of resources.

It is estimated that maintenance cost not performed has been approximately 2% per year of the cost of the overall existing original cost for transmission and distribution lines. ANDA estimates they own about 1,000 Km of waterline. The average cost of maintenance not being performed is US$900/Km, or US$900,000 per year.

Similar assumptions have to be made in relation to the sanitary sewer system. Lack of maintenance can cause the system to reach the point of no return when, in the future, the cost of deferred maintenance will be higher that the replacement costs. Assuming 850 Km of sanitary sewer as estimated by ANDA at a cost of US$50/meter, and using 2% of the cost of the overall cost of the system for maintenance not performed, the loss due to lack of maintenance of the sanitary sewer system is US$850,000 per year.

It is necessary to start a maintenance program of at least 5 years duration as soon as possible to bring the water and sewer systems to a normally productive and economical condition. After that time, regular and routine maintenance programs should be planned and funded, and executed for each system.

### 2. Damage in Inaccessible Areas

If very little has been done in the city, the inaccessible areas have been hurt worse. Silted reservoirs, lines in contested territory, old pumping stations, direct dependency on an unpredictable or inoperative electric power system make the problems acute.

The systems (water and sewer) located in zones dominated by the insurgents or areas of poor control by the government forces are the ones which have suffered the most, although the systems continue to operate under ANDA management.

At present the labor force dedicated to provide repairs in contested areas is pressing for higher salaries to compensate for the risks they face. Two workers have been killed since 1985.

C. Loss of Revenues

It is evident that the insurgency is directly causing the loss of revenues to all government utilities. ANDA shows their loss of revenues as "Revenue not Received," that is, bills not collected. The estimates are shown in Table IV.3. This understates the loss since it does not account for what income would have been in the absence of the insurgency. If service had not been repeatedly interrupted, at least in the early years and if economic growth had continued at even a modest pace from 1979 levels without the disruptions.

ANDA has operated at a loss for years. Economic disruption is part of the problem; failure to collect bills is another. The greatest causes of deficit other than guerrilla damage, however, are failure to adjust ANDA rates to cover normal costs, and overstaffing. The fact that ANDA appears to be grossly overstaffed by usual management ratios for countries in a similar state of development, as noted earlier, needs serious attention. If by no other way, staff should be reduced by attrition and transfers.

Note that approximately 50% of the unpaid water bills is due for water service provided to the central government and its branches, autonomous agencies, and municipalities.

Unfortunately, ANDA records made available do not provide data from which projections can be made. That in itself is troubling. That is not as troubling as that ANDA management records observed by the team are of limited use in managing a utility.

D. Institutional Analysis

As noted earlier, population/employee ratio shows ANDA to be grossly over-staffed, with 2 to 2.5 times as many employees as should be required to serve the customers presently reached. ANDA seemed to be typically urban based and oriented, which is not surprising given the history of divided responsibility in the water sector. A suitable national water program which minimizes use of resources and serves all parts of the population will require a stronger management, greater autonomy, and decentralization, at least to a limited degree. In a small country there is much to be said for the single manager concept with ultimate responsibility for development and support of potable water systems vested in a single entity.

The climatic conditions and the cost of energy for more complicated systems call for waste water treatment based on oxidation ponds, lagoons, or similar systems, with minimum consumption of energy. The uncontrolled discharge of sewage without any, or little, treatment is polluting the natural water ways and threatening the environment and health of the population. Very little or nothing can be expected outside San Salvador in treatment of wastewater while the insurgency persists. But ANDA should prepare an action plan without delay to face the situation as soon as funds become available. In this regard alternates to conventional water borne sewage systems should be examined to reduce construction and maintenance costs.

A program to assure potable quality of water requires ANDA's attention due to the periodic recurrence of illnesses produced by contamination of water. The Health Ministry is at this time reported to be intensifying its efforts in this direction. As the water producer, ANDA must design water quality control into the production process as one of its major reponsibilities. Production and delivery of safe water is, or should be, an ANDA responsibility. The Ministry of Health can check for purity, but it cannot produce it.

Publications and data provided by ANDA indicate it lags the other utilities in management practices. This is not surprising when the precarious nature of ANDA finances is considered. Many of the institutional problems of ANDA apparently are the results of conscious government policy (low water rates, non-payment of bills, overstaffing) and beyond the capability of ANDA to solve alone. If ANDA is to develop to meet the nation's needs, the policies must be changed and ANDA's management and organizational problems addressed.

In spite of these problems, ANDA has some dedicated field and technical people who keep the water systems working in spite of the emergency. They deserve help from management.

## E. Conclusions and Recommendations

### 1. Conclusion

The number of new customers served has slowly increased during the 1985-1988 period. Some financial help from international banks and donations from AID made this more easily possible. Nevertheless, the increasing cost of water production and distribution has been damaging to the financial health of the institution since rate adjustments have not kept pace with cost increases.

Several other factors have intensified the problems of the utility:

Dependency on diesel when electric service are disrupted.

Non-payment of water bills by government institutions, municipalities, and private customers.

Inability of private customers to pay the bills due to lack of work.

Compensation paid during periods when employees do not work.

Managerial deficiences, an excess of non-productive personnel, and general overstaffing.

Centralization of ANDA institutional organization in the capital, lack of managerial authority and decisions in the zones away from San Salvador.

Existing equipment is in poor condition in much of the system.

Recommendations

ANDA should be reorganized to function as a national utility along the lines of CEL and ANTEL.

After reorganization, provide professional training at managerial and department levels.

A rates study should be made and a national rate schedule developed and adopted which will cover at least the cost of all operations and maintenance, including the rural water service responsibilities of ANDA. However, the water customers should not be expected to pay for the present bloated staff.

Initiate an action plan for maintenance for lines and appurtenances, beginning in areas not affected by insurgency. USAID approval of a plan prepared by ANDA should be a prerequisite for AID assistance in overhaul and post-insurgency maintenance to correct indirect damages.

Initiate another less ambitious plan for areas with lesser probability of guerrilla attacks.

Provide ANDA with the necessary equipment and technical assistance to realize both these tasks. An inventory of the ANDA equipment fleet will be required. They may be in need of light trucks.

Computerize or improve the records systems to make them more efficient, especially the central information center, to keep up to date data related to the reconstruction program with information on when, how, where, and why, with the actual costs, for future reconstruction plans.

Improve radio-communication system for fast and better response.

Do not increase executive personnel. New management personnel will need utility management backgroung or training as opposed to being engineers only.

Use labor intensive construction and maintenance procedures where feasible, to generate work for the lower income laborers, instead of mechanizing the maintenance and reconstruction process.

Decentralize ANDA for a more effective managerial structure, independent of direct government influence.

2. Restoration and Rehabilitation

ANDA has not prepared a post-insurgency reconstruction plan, but it is anticipated that light vehicles, pumps, valves, and other materials for major maintenance will be needed. The maintenance program should be carried out at the rate of approximately US$1,000,000 equivalent per year, primarily in local currency, but the ability of the agency to plan and manage such a program at this times is not assured. Reorganization of management probably will be required.

3. Additional Infrastruture Investment

Several financial institutions have been providing funds to ANDA for specific projects. The IDB recently approved a soft loan of US$184,500,000 for the AMSS to improve the sanitary and water system of San Salvador. The project includes a strong program for installation of water meters. To bring the other towns to a service level similar to San Salvador may require an equivalent new investment. AID has initiated a program to supply water to the rural areas. PLANSABAR has initiated a program and has spent more than a year organizing and planning. It is very early to evaluate the results of this program, but it is to be recognized that it can go in the right direction with competent, strong management.

About 40% of the total population still does not have water service, according to ANDA figures.

The rural population not receiving water has been estimated using ANDA statistics at about 1,653,000 persons, although the total may be much greater. Considering a cost of US$100/person, the cost to provide water to the rural population estimated above would be approximately US$165,000,000. Given the time required to execute it, the increases in cost and the population growth in the interim, the final cost of rural water probably will exceed US$200,000,000. This is certainly not excessive, considering the US$184 million being spent merely to make improvements in San Salvador.

4. Management and Training

ANDA will require some technical assistance and training to be

prepared for future programs of maintenance, future restoration programs, and future reconstruction of the country. In order to be ready for project of such magnitude, the institution will need to improve its strength in technical readiness, before the programs start. Reorganization and decentralization are expected to be required before a major training program can be productive.

5. AID and Other Donors Assistance

Continuous financial assistance will be needed by ANDA, from various sources. Most of the loans or donations, with the exception of USAID, have been provided to satisfy specific economic growth and recovery projects or emergency situations.

Donations from AID have been disburse to GOES and from there to ANDA for economic survival and to keep the country moving with the institution intact. Table IV.4 shows the different ways that funds have been channeled to ANDA all coming from USAID, directly or indirectly.

Table IV.5 shows an statement of funds distributed between 1985 and June 30, 1988, from all external sources

TABLE IV.4: ANDA DONATIONS AND SUBSIDIES RECEIVED DURING THE PERIOD 1985-1988 (JUNE) (IN US$ 000)

| | 1986 | 1987 | 1988 | Total |
|---|---|---|---|---|
| Donations | | | | |
| - AID | 3,172.5 | 3,631.5 | | 6,804.0 |
| - Government Contribution Urban Area | | 559.1 | 678.7 | 1,237.8 |
| - Emergency Fund | | 1,156.9 | | 1,156.9 |
| - Government Contribution Water Management | | 2.2 | | 2.2 |
| - Local Currency | | 400.0 | | 400.0 |
| - Earthquake Recuperation Program | | 1,200.0 | | 1,200.0 |
| - Balance of Payments Program | | 463.0 | 188.9 | 651.9 |
| - PL 480,84-85 | | | 69.3 | 69.3 |
| - Government Subsidies | 4,126.9 | | | 4,126.9 |
| Total | 7,299.4 | 7,412.7 | 936.9 | 15,649.0 |

Source: ANDA

TABLE IV.5 ANDA STATEMENT OF FUNDS RECEIVED DURING THE PERIOD 1985-1988 (JUNE) (IN US$ 000)

| Loan Name | Contracted Amount | Disbursements 1985 | 1986 | Receipts 1987 | 1988 (June) |
|---|---|---|---|---|---|
| External Debt | | | | | |
| FCIE-176-0 PZN | 10,800.0 | 1,314.0 | 482.9 | 442.6 | |
| Internal Debt | | | | | |
| AID/PRONAVIPO/BANCAPI/ UDI | 686.8 | ---- | ---- | 686.8 | |
| AID/PRONAVIPO/BANCAPI/ UDI | 514.9 | ---- | ---- | 430.0 | 849.2 |
| AOD/SETEFE/UDI | 1,000.0 | 200.0 | 160.0 | | |
| BCR-AG-10/85 | | 254.0 | | | |
| BCR-AG-22/85 | | 676.0 | | | |
| BCR-AG-18/94 - 2nd Withdrawal | | 450.0 | 3,388.1 (Refinancing) | | |
| GNL DIRECTION OF TREASURY | | 300.0 | | | |
| BANCO AGRICOLA COMERCIAL (Rotating Credit) | | 237.4 | 117.6 (Line of Credit Renovation) | | |
| BANCO CUSCATLAN | | 1,137.2 | 830.4 (Refinancing) | 800.0 (Refinancing) | |
| FOSEP-CT-1/88 | | | | | 71.9 |
| SETEFE/AID | | | | | |
| Rural Areas | | | | | 188.9 |
| Urban Areas | | | | | 678.8 |
| PL 480,84/85 | | | | | 69.3 |
| SETEFE/BID | | | | | |
| Rio Lempa | | | | | 200.0 |
| Total | | 4,568.6 | 4,979.0 | 2,359.4 | 1,293.8 |

Source: ANDA

## V. NATIONAL ADMINISTRATION FOR COMMUNICATIONS (ANTEL)

### A. General Description and Background

Sabotage of ANTEL facilities has continued during the last two and one-half years, inflicting direct damages of US$1,940,000 during that period. Nevertheless, ANTEL has provided a remarkably reliable level of service under the circumstances. The greatest number of incidents has been attacks on telephone junction boxes but the greatest single incident of damage (US$940,000) occurred in 1986 when two repeater stations were attacked.

ANTEL continues to be a significant earner of foreign exchange. Perversely, foreign exchange earnings rise in time of disaster as the 1986 earthquake or other events which generate news of international interest. Control of earned foreign exchange passes from ANTEL to the government, however, and ANTEL representatives report a shortage of foreign exchange to replace equipment as one of their major problems.

In spite of all problems, however, ANTEL has managed to add service to 13,800 users since 1983, and reports 96,884 subscribers in 1987. Income has risen steadily.

ANTEL has repaired and returned to service many small installations, such as junction boxes, poles, and telephone lines. For practical purposes, these facilities can be considered restored. Larger installations such as central office equipment have in some cases been damaged beyond repair and will have to be replaced. The need for greater capacity throughout the system to serve pent-up demand and to support industrial growth will be required as quickly as financing can be arranged. ANTEL has developed a proposed project list for renovation and expansion showing needs as presently perceived. The plan runs from 1988 through 1995; and the estimated equivalent total cost is US$339 million; C. 419.7 million plus US$197.25 million, including the cost of reconstruction. Each project will require justification or feasibility study as required by the financing institution, as the financial viability and economic feasibility have not been proven for all projects. Nevertheless, the US$339 million total, an average annual expenditure of approximately US$42 million, is a good indicator of weaknesses and needs of the system as perceived by the managers of the company.

### B. Damage Caused by Violence since 1985

Cost of damage and number of incidents during 1986-1987, and the first half of 1988 are shown in Table V.1. Note that incidents and losses to the middle of 1988 exceed those for the full year in either 1986 or 1987, excluding major losses at the two repeater stations in 1986.

TABLE V.1: SUMMARY OF DIRECT DAMAGE COST TO FACILITIES OF ANTEL (IN US$ 000)

| Description | 1979 to 12/3/85 | 1986 | 1987 | 1/1/88 to 6/30/88 | Total |
|---|---|---|---|---|---|
| 1. Buildings and Installation | 6,791 | 1,213 | 218 | 424 | 8,826 |
| 2. Equipment Light and Heavy | 891 | 20 | 55 | 6 | 972 |
| 3. Other | 93 | 3 | 1 | 1 | 98 |
| Total | 7,955 | 1,236 | 274 | 431 | 9,896 |
| Number of Attacks | Not Recorded | 107 | 99 | 131 | ---- |

Source: ANTEL

TABLE V.2: SUMMARY OF DIRECT DAMAGE COST TO FACILITIES OF ANTEL (IN US$ 000)

| Description | 1979 to 12/31/85 | 1986 | 1987 | 1/1/88 to 6/30/88 | Total |
|---|---|---|---|---|---|
| Lost Revenue | 23,741 | 15,165 | 46,720 | 14,629 | 100,255 |
| Security | 2,379 | 167 | 162 | 69 | 2,777 |
| Additional Personnel | 1,807 | ---- | ---- | ---- | 1,807 |
| Insurance and Indemnities | 671 | ---- | 16 | 7 | 694 |
| Additional Fuel and Energy | 566 | ---- | ---- | ---- | 566 |
| All Others | 1,310 | 673 | ---- | ---- | 1,983 |
| Total Indirect Cost | 6,733 | 840 | 178 | 76 | 7,827 |

Source: ANTEL

Note: See Appendix E for greater detail and costs in local currency.

Many of the damaged facilities have been repaired and returned to service using ANTEL resources. However, a number of smaller facilities are out of service and eventual replacement will be required. It is estimated that 90 small central stations must be rebuilt at a cost of approximately US$10 million.

Annex E shows types of damage in greater detail.

C. Damage Caused by Lack of Maintenance

1. Lack of Maintenance in Inaccessible Areas

ANTEL has reported the need for replacement of equipment in over 90 small centers which they have been unable to service due to lack of access and other reasons. Cost estimates are imprecise, for the same reason that the systems cannot be repaired and maintained. Nevertheless, the project for reconstruction, for which ANTEL is seeking funding, is currently estimated at US$10 million.

2. Lack of Maintenance Damages Ascribed to Budget

ANTEL revenues per se should be adequate to cover all necessary maintenance, provided foreign exchange were allocated. Equipment used by ANTEL is imported, so foreign exchange is required to buy replacement parts. ANTEL personnel report this to be a serious constraint.

D. Loss of Revenues

1. Loss of Revenue

Loss of revenue constitutes by far the greatest loss suffered due to insurgency as estimated by ANTEL. The total to 30 June, 1988 is estimated to be US$100,255,000, and annual losses have increased each year. Loss of revenues as estimated represents 96% of estimated indirect loss to ANTEL, and is nearly 17 times as great as calculated direct losses. Loss of revenue is somewhat conjectural, since loss of domestic revenue probably has been offset somewhat by international revenues generated by the insurgency itself. Nevertheless, there is no doubt that loss of domestic facilities, and inability to expand and modernize the system during the insurgency, have caused a significant drop in total revenues.

Indirect costs, including loss of revenue, are shown in Table V.2, and in greater detail in Annex E.

2. Income Growth

ANTEL has reported a growth of income of approximately US$3.5 million annually since 1983. During that period the number of customers has grown from 83,003 to 96,884, and the income per customer has risen from C. 149 to C. 268. (This represents a decline in dollar terms, given exchange rates, from US$59.60 in

1983 to US$53.60 in 1987.) Whether this rate of increase in customers and net income can continue to grow at the same rate is conjectural unless rates are increased, given the condition and load of the system. Additional growth in number of subscribers with existing plants is limited. Nonetheless, ANTEL has projected incomes of US$29.4 million in 1988, US$32.9 million in 1989, and US$36.3 million in 1990. At the present time additional revenue is there to be earned if ANTEL can install new system capacity fast enough to earn it. More detail is given in Annex E.

## E. Institutional Analysis

Judging by performance, it must be concluded that ANTEL is an effective organization. Damages usually are repaired quickly in accessible areas, and the number of customers served is increasing annually in spite of the violence. Planning for system expansion is going forward. Revenues and income are growing.

## F. Conclusions and Recommendations

### 1. Restoration and Rehabilitation

Restoration and rehabilitation costs for damaged facilities have been absorbed in ANTEL's current operating revenue where feasible. At the present time, however, replacement of equipment is required in approximately ninety smaller central offices and their service areas. When these systems are replaced, large and more modern equipment than that destroyed should be installed to provide improved service, and to provide communications systems for support of increased commercial and other productive activity. Total cost is estimated at approximately US$10 million. No source of funds for this requirement has been identified.

### 2. Additional Infrastructure Investment

Most of the project expenditures being contemplated in ANTEL during the next eight years would be for system expansion and modernization. ANTEL funding proposals to date are as follows, excluding sabotage damage replacement.

| | |
|---|---|
| Own (ANTEL) funds (Includes US$55.2 million for damage reconstruction in 1988) | US$ 91.72 million |
| IDB | 5.64 |
| Other Banks | 9.90 |
| CABEI and/or Japan, or others | 3.50 |
| West Germany | 8.80 |
| Without funding | 208.98 |
| Total | US$328.54 million |

Foreign exchange requirements for this plan total US$237 million

and foreign exchange restrictions may hinder or delay execution of projects proposed to be done using ANTEL own funds, as well as the rest of the program.

While it is obvious that ANTEL cannot provide all needed service all over the country now, it is not as obvious that the future growth of the system will continue at the same rate after end of the insurgency and when US assistance and staff begin to phase down. ANTEL will need a sizable investment to catch up with demand, provide and improve service in smaller centers, but major new investments other than for reconstruction should be limited until the end of hostilities. The system should then be re-evaluated and feasibility studies confirmed under more usual circumstances.

### 3. Management and Training

From results produced, it must be concluded that management and technical skills of ANTEL are of a high order. Training should consist of short, intensive courses of instruction on new equipment as it is installed for technicians and junior engineers.

Orientation and familiarization tours of major telecommunication systems in other countries for management and senior technical personnel should assure that ANTEL does not lag behind the industry because of preoccupation with the current insurgency.

### 4. AID and Other Donor Technical Assistance

No formal programs for technical assitance in ANTEL are proposed. Future equipment suppliers should provide training, advice, and assistance on their equipment, but the apparent competence of ANTEL organization and staff does not indicate a priority need for technical assistance, given the demands in other sectors for critically short resources.

## VI. MINISTRY OF PUBLIC WORKS

The Ministry of Public Works is in charge of the planning, construction, and maintenance of all public roads and streets. Its many general directorates include those that specifically carry out these functions and others that perform some related activities. (See organization chart for MOP in Annex F.1 and the English key to the offices that follows.)

The operations for the roads and highways flow from the Minister to the General Directorate for Planning. This directorate does the overall planning and conducts the general supervision and control of the rest of the offices. Not all of the directorates and other offices are concerned with the direct repair and rehabilitation of roads but they are addressed herein.

### A. Direct and Indirect Damage from the Violence

During the first several years of the insurgency, many bridges, culverts, and equipment were targets of the rebels. As was shown in the 1986 damage assessment, the losses were enormous in cost. Most of the larger dynamited spans were replaced by Bailey bridges and those have served to this day. Still another problem for MOP was that the revolutionaries did not allow the personnel to go into some areas and effect repairs. There are still some places they cannot go, but the area has been greatly reduced.

MOP did not provide a detailed list of each of the attacks and the damage inflicted. The incidents have diminished in the last two years, although some still occur. The direct and indirect damages are discussed in this chapter according to the directorate affected, except that the lack of maintenance, whether caused by the guerrillas or from some other source, is discussed separately since their circumstances are similar across directorates.

#### 1. General Directorate for Roads

This Directorate, GDC, designs, builds, inspects, and maintains the interurban roads and highways. It is also responsible for feeder roads and bridges. The infrastructure under its care has been heavily attacked by the insurgents since the beginning of the conflict. During the period 1986 to the end of June 1988, the direct losses are estimated by MOP at approximately US$6,011,000. MOP reports larger expenditures during these two and a half years, but a large part of that was incurred from followup repairs of damages suffered before December 31, 1985. Those losses were included in estimates presented in the 1986 report and are not duplicated here. Table VI.1 gives the summary and later tables give some of the details.

More lives have been added to the losses suffered in the past. The numbers are down, but they still represent difficult times for DGC and its employees.

TABLE VI.1: SUMMARY OF DIRECT DGC DAMAGE COSTS (IN US$ 000)

| Item | 1979-1985 | 1986 | 1987 | 1988 | Totals |
|---|---|---|---|---|---|
| Equipment | 1,570.0 | 129.7 | 252.6 | 50.8 | 2,003.1 |
| Bridges/culverts | 49,917.9 | 3,200.0 | 1,704.6 | 673.1 | 55,495.6 |
| Totals | 51,487.9 | 3,329.7 | 1,957.2 | 723.9 | 57,498.7 |

Source: MOP Memoria 1987

The de line in damage cost is evident from the table; each year since 1985 was less than the year before. (1988 appears to be following that same pattern from the first six months data.) Damage to bridges, of course, is very expensive; even culverts often amount to thousands of dollars. The loss of equipment not only incurs the loss of their value but also means that the repairs and maintenance cannot be done.

Construction equipment is quite expensive so a single loss can be very high. The overall total for the period is nearly US$312,400 but only US$9,000 of that has occurred in 1988.

The loss figures for the equipment including vehicles total only US$433,300 since 1985, but MOP stated that it would take US$965,200 to replace it. The depreciated value stated in the loss will not buy it new. Losses on tools have been negligible in this period.

The cost of bridges and culverts is quite a different story. During 1986-1988 (June 30), the losses were reported as:

| | |
|---|---|
| 1986 | US$3,200,000 |
| 1987 | 1,704,600 |
| 1988 | 673,100 |

Their figures total to US$ 5.7 million as final cost, consisting of amounts charged as "cost of damage" and another as "cost of repair." In each case, the repair item is many times greater than the damage. It is not clear from the discussions why both items are charged since still another amount is listed as "replacement cost" (excluded from final cost).

The MOP reported costs for bridges and culverts are displayed in Table VI.2. Note that the same categories are used except that the eventual replacement values are left out.

TABLE VI.2: DIRECT DAMAGE COSTS TO GDC BRIDGES AND CULVERTS BY YEAR (IN US$ 000)

| Year | Cost of Damage | Cost of Repair | Final Costs |
|---|---|---|---|
| 1986 | 560.0 | 2,639.2 | 3,200.0 |
| 1987 | 71.2 | 1,633.4 | 1,704.6 |
| 1988 | 13.1 | 660.0 | 673.1 |
| Totals | 945.3 | 4,932.6 | 5,577.7 |

Source: MOP Memoria 1987

TABLE VI.3: MOP SUMMARY OF INDIRECT AND APPLICABLE DEFERRED COSTS (IN US$ 000)

| Item | 1986 | 1987 | 1988 | Total |
|---|---|---|---|---|
| Equip. Service Lost | 324.3 | 495.4 | 145.5 | 965.2 |
| Indemnities | 6.3 | 1.4 | 1.3 | 9.0 |
| Maintenance Deferred | 66.9 | 66.9 | 33.5 | 167.3 |
| Total | 397.5 | 563.7 | 180.3 | 1,141.5 |

Source: MOP Memoria data sheets

The damage for 1986 accounted for more than half the reported costs and there appears to be somewhat of a decline since then. Even 1988, using whichever of the categories, will be less than 1987 unless the violence escalates against these facilities.

The Ministry of Public Works also calculates its indirect losses somewhat differently from the other institutions. In Table VI.3, for example, it reports quite large sums for the "equipment service lost" and for "maintenance." The latter refers to maintenance that was deferred because the personnel could not work on some roads. Small quantities are listed for "indemnities," stating that they had acquired property on which to build roads and bridges but had been unable to do so. Apparently the government, through MOP, had paid for land and thus was incurring a banking expense. It seems a doubtful category for indirect costs, but the interviewees felt sure it was legitimate. The consultants report MOP's recounting of all three categories, but suggests that some revision of these amounts is probably necessary.

Deferred replacement costs have generally been treated as new investment for the future with the other public service agencies. The MOP publication lists them as indirect so they are presented in this section but with the understanding that they actually represent new investment.

TABLE VI.4: MOP REPORTED REPLACEMENT COSTS FOR VEHICLES AND EQUIPMENT BY YEAR OF LOSS (IN US$ 000)

| Type | 1986 | 1987 | 1988 | Total |
|---|---|---|---|---|
| Vehicles | 24.6 | 14.0 | 14.0 | 52.6 |
| Equipment | 299.7 | 481.4 | 131.5 | 912.6 |
| Totals | 324.3 | 495.4 | 145.5 | 965.2 |

Source: MOP data sheets

2. Directorate of Urbanism and Architecture

This Bureau, usually abbreviated to DUA, is in charge of the urban facilities and infrastructure. It reported US$ 4,108 as direct damages. It listed the indirect damage, mostly due to budgetary limitations to effect maintenance, as over two million US dollars. Details were not provided.

3. National Geographic Institute

This service institute carries out the cadaster and cartographic surveys and produces the maps in support of any national program. Loss of equipment, supplies, and tools has, according to its figures, amounted to a cost of over two million dollars. Much of this was said to be direct damage but some was classified as indirect.

4. Geotechnical Research Center

This organization provides specialized services in the field: geology, sysmology, and soil mechanics. They gave a total loss amounting to $745,524. Most of the direct damage was to the special instruments and equipment but deferred costs, mostly maintenance failures, were the greater part of the value listed.

5. Administration for Machinery and Equipment - (AME)

Some years ago, a special unit was formed to purchase, service, and maintain, directly or through funding, for MOP, ANDA, CEL, and others in the public sector. Its funds were furnished by AID.

In July 1987, the unit was reorganized, still under MOP, but now only to service that ministry. Equipment, shop tools, and other items needed for light and heavy construction were included. The 1987 budget was US$ 4,113,525. Twelve million dollars are earmarked for 1988. The principal idea is to provide MOP with a strong maintenance capability. This unit is critical in assuring maintenance of equipment, and must be retained until the Ministry demonstrates a capability to absorb totally this function into the organic system of MOP.

B. Damage Caused by Lack of Maintenance

MOP is charged with the repair and maintenance of 12,151 kilometers of roads in the nation. A very high proportion of these (one-third) is Rural "B" roads, consisting primarily of dirt and gravel surfaces. (See the breakdown by type and department in Annex F.2.) These and many of the others require frequent maintenance because of washing by the heavy rains.

Paved roads (asphalt) are high cost, too, when preventive maintenance is not done when required. Heavy traffic on some of them, of course, compounds the problem. The unusually heavily loaded trucks delivering cement and other commercial loads, have caused extensive damage and that continues. Although there are legal load limits, these are not enforced.

The inadequate budget (the estimates for personnel salaries is 90%), and the maintenance deferred because of danger to equipment and crews, have amassed an enormous future burden on the nation. MOP now calculates these costs at more than US$ 167 millions. A part of the problem is the unusually high personnel cost per kilometer, figured from the MOP numbers to be about 1.4 workers per kilometer. Since the 1988 budget was no more generous in increasing money for supplies and equipment, the figure will rise still higher by the end of the year.

While routine maintenance is neglected, there is another facet to the problem. The guerrillas have become much more sophisticated in interrupting traffic. With a relatively small amount of explosives, they can now damage the heart of a culvert or bridge, and although the structures are not destroyed, they make the road impassable. MOP has had much help from AID in replacing these with Bailey bridges and those are surviving well. They will do so for many years. The smaller bridges and culverts, however, usually must be rebuilt for lasting use. The tactic has most often been to patch enough to allow traffic to flow, leaving the reconstruction for later years. These have accumulated and will one day require a substantial investment.

The AID programs of ORE (the special organization that preceded AME) and the new unit, AME, have furnished huge sums of money to MOP for equipment and other assistance. The Bailey bridges are expensive and thus used large portions of the money that was available. MOP cites a need on the order of twice what they have received in order to just "keep up" with the emergency work on

unpassable roads, whether from the rebels or from lack of maintenance.

The 1986 assistance included the placement of Bailey sections on top of pilings for the 15 de Septiembre bridge. Although destroyed in 1981, only last year was replacement possible. The overall construction appears to be well done and holding. Heavy rains, however, have eroded the defense of the main abutments. The Golden Bridge, damaged in 1982, was also completed in 1986. If proper maintenance is done, the Bailey structures will last for 20 years. There is no urgency to rebuilding either of the bridges.

The consultants calculated the more immediate needs and those are provided in the Executive Summary. Those figures assumed, from the expected life of the roads as designed, plus the problems of violence and poor maintenance, that the total would be so high that AID could not possibly finance them. The team applauded the provision of an inhouse maintenance capability and urged followup to assure fruitful use of the equipment in effecting maintenance. Some funds for maintenance (1,000 Km per year) were recommended with a view to keeping down the excessive deterioration and to assure that the roads are kept open, even if not in good condition.

The encouraging, apparent, trend for lessened guerrilla action against the roads and highways suggests that MOP could greatly accelerate its maintenance program, especially with the AME unit available for special assistance. It would appear necessary that the Government of El Salvador and MOP demonstrate a dedication to road maintenance that they have not shown in the past.

## C. International Funding

The international financial institutions have approved very large amounts of loan monies for the roads and highways. In 1987, and one loan in 1988, the sums were:

| | |
|---|---|
| CABEI | US$102 million plus 61.2 in 1988 |
| IDB | 10 million |
| IBRD | 43 million |

Those amounts are sorely needed; if appropriately utilized, they could rebuild, repair, and maintain at least the amount MOP suggests under deferred maintenance. Some of these funds are specified for new construction, so the entire amounts will not be available for the catchup exercise needed.

## D. Management Perspectives

Although few staff members have left MOP so far, there is a feeling that two kinds of potential problems are surfacing:

- Many of the personnel "have lost spirit" and no longer have the dedication they once had.

- Many outsiders perceive a "patch up mentality" among the staff that makes it difficult to plan and manage maintenance and other customary activities.

Some of that is to be expected in a prolonged war with extensive damage and a considerable loss of lives. Fortunately, these conditions are not yet endemic and some stimulus could bring about a greater dedication.

There are, too, some special needs within the management and support staffs of the several directorates:

- Management skills training is badly needed to help the staff become more efficient and effective.

- A traffic engineer should be added to improve attention to that field.

- Computer training is needed immediately, in and out of the country; the computers are being improperly and ineffectively used.

- The norms and standards should be reviewed so they can be brought to bear on the present problems and on future planning.

- All future hiring should be done on a competitive basis.

- A new building should be constructed to house the scattered personnel.

- The satellite offices must be strengthened, given more authority, and provided with equal standards of equipment and working conditions.

- Further decentralization is urgently needed; the San Salvador personnel contingent is far too high a proportion of the total. The work is in the field, and not just in portions that are within commuting distance from the capital.

- Train the laborers so they can produce more and better, while moving upward in rank and pay.

There was some expression of duplication between work done in the AME and the regular MOP shops. While it is difficult to see how that could happen, an investigation should be made to determine its veracity and take corrective action.

There are several plans around for revitalization. Some of these are too general to serve as direct guidance for the assignment of funds, personnel, and equipment. Others are of better quality, such as those produced for the lending agencies, but they are invariably partial and specific to certain projects. Without a

master plan of at least five years, twenty would be better, it is improbable that the best use of funds will occur.

It is also imperative that the plan include, in detail, the needs for the special service institutes and centers. This is not to say that they are understaffed, rather, that the development of these vital services must also be planned and executed with alarcity. Their equipment and instruments are in pitiful condition and are being allowed to deteriorate still further, not only from lack of replacement parts but also because of inattention to their normal upkeep.

## E. Conclusions and Recommendations

The management section is a part of the gamut of conclusions and recommendations. Their specificity masks some general problems that should be addressed. That section and the present one must be taken together as a whole.

### Conclusion: General Aspects

The ministry is a massive public institution that gives an impression of sometimes failing to understand its purposes. Nearly every government agency considers it inefficient and some state ineffective. Although the preceding sections have chronicled some huge amounts of money that must be spent to rehabilitate the roads and highways, there is a serious question about the ministry's capacity to carry out a massive program.

#### Recommendation

The government and the donors/lenders should conduct a thorough study of the ministry management, top to bottom, to determine what improvements could be made in the organizational structure and functioning. MOP should then be reorganized as needed to assure good working conditions.

Management training should then be offered where needed so that the new structures will function appropriately.

### Conclusion: Transportation Needs

There is a tendency for the ministry and many of its offices to think about small jobs without concern for where they are placed in the total network. "Build new roads" is a typical refrain.

#### Recommendation:

Several sections of this report have recommended a nationwide transportation study. When the data have been analyzed and conclusions drawn, they should be applied to the MOP five year plan for repair, replacement, and construction - according to the nation's need and in a priority set from the study findings. The USAID should give

priority in local currency programs to funding road repair rather than new construction.

The conditions the Ministry of Public Works faces are difficult. They are, however, not impossible.

## CHAPTER VII: THE AGENCIES FOR THE TRANSPORTATION OF FREIGHT AND PASSENGERS

Two organizations have authority over the operations of the railway, airports, and ports. In brief, the management is:

Autonomous Executive Port Commission (CEPA)

CEPA is the overall supervisory agency for the ports of Acajutla and Cutuco, the El Salvador International Airport, and the railway system. Supervision is accomplished via the following offices under its aegis:

Office of the El Salvador Intgernational Airport (that facility only)

Office of the Port of Acajutla (that facility only)

National Railways of El Salvador, FENADESAL (all railways and carries out the management of the Port of Cutuco), FENADESAL

Office of the Port of Cutuco (not yet begun)

CEPA also has an agency in Guatemala to coordinate inter-national transportation via ports, airports, and railways to and from that country and El Salvador.

All civilian airports except the El Salvador International Airport are either managed directly or supervised by the:

General Directorate for Civil Aviation (GDCA), an entity of the Ministry of Public Works (MOP)

The GDCA directly administers the civilian portions of the airports at Ilopango (which is also international), Los Comandos, El Tamarindo, and Santa Ana. It manages the civilian airport at La Union in conjunction with the Ministry of Public Works' equipment divisions.

It must also be noted that many of the civilian airports in El Salvador are privately owned. The small air strips from which the crop dusters operate are all private. Similarly, some of those from which the private airlines serve the public are in private hands. The facilities, planes, and pilots must be examined/inspected by GDCA and, as appropriate, licensed. The owners of airports, however, have most of the management responsibilities for them.

The transportation of passengers by bus is by private bus companies. Most of these are grouped into an association that aids them in several ways.

Salvadoran Association of Bus Enterprises

This is an umbrella organization that assists its members with the financing and purchase of buses for both the urban and the interdepartmental lines in the country. It and its members are supervised by the General Directorate for Land Transportation of the Ministry of Defense, which sets routes and fares. The individual businesses manage their internal operations.

Mutual Entrepreneurs Association for Savings, Credit, Services, and Freight Transport

This organization, too, is a private cooperative that includes many of the owners of trucking businesses in the nation. It assists the members in the financing and purchase of trucks, parts, and fuel. It is supervised by the Ministry of Economy.

Two studies were found that covered some phases of transportation in El Salvador. The first was the summary of a survey conducted by the Ministry of Planning, Coordination, and Economic and Social Development. It includes useful information on certain aspects of the problems but does not cover all phases that are needed. The second, Estudio de Transporte Regional de Centroamerica, presents many kinds of information of utility to regional planners, but gives few data on specific countries.

A. The Institution

CEPA is an umbrella organization that provides general oversight for four of the public service institutions included in this study: the railway, the ports of Acajutla and Cutuco, and the main international airport. It acts as a managerial rather than an operations entity.

The Ministry of Public Works, the parent organization for the General Directorate for Civil Aviation, is described in detail in Chapter VI and is not repeated in this portion of the report. Instead, only the institutional arrangement for civil aviation is described.

1. Autonomous Executive Port Commission

CEPA is governed by a Board of Directors that sets general policies, provides the general oversight for the main institution and its dependencies, and makes final decisions on the budgets. It appoints the president and operates through that office. (See the organizational chart presented in Annex 6.4.a and the English key to the offices is in Annex 6.4.b.)

A general management office conducts the day to day operations, with the assistance of offices for legal advice, technical assistance and projects, internal audit, and secretarial services. These work directly with the general CEPA management on general concerns, as well as with specific ones in the dependent entities.

In addition, some of the general services needed by both the parent and the dependency organizations are provided by three CEPA offices: marketing and public relations, human resources, and general administration. Each of these is comprised of the sections it requires to carry out its functions.

The principal direct line from the Presidency and its support offices is through the Office of Operations. A special office is attached to Operations, Risk Prevention, to address these overall concerns throughout the CEPA organization.

The four entities (often called divisions) that directly manage their operations are:

Office for the El Salvador International Airport (previously called "Cuscatlan")

Office for the Port of Acajutla

Office for the National Railways of El Salvador

Office for the Port of Cutuco (in La Union), presently managed by FENADESAL.

The internal organization and the descriptions of their operations are described in special sections for them except for the Office for the Port of Cutuco; its management is still conducted by the National Railways (FENADESAL).

2. General Directorate for Civil Aviation (DGAC)

Until late May of 1988, GDCA operated as a separate agency. At that time, it was transferred to the Ministry of Public Works as one of its major offices. (See the organizational chart in Annex G.4.c and the English key to the positions in Annex G.4.d.) The DGAC will continue to carry out its routine operations and its liaison with the private airlines, airports, and the military as it did before.

a. Institutional Structure

MOP delegates the routine management of Civil Aviation to a directorate, which is assisted by a subdirectorate. Four service offices furnish overall help to administrate its departments: judicial advice, billing, planning, and secretarial assistance. Of special importance to the administration is a liaison office with the major aviation agencies: International Civil Aviation Organization, Central American Air Navigation Corporation, and the Latin American Civil Aviation Commission.

The operations departments depend directly on the administrative offices, and conduct the day to day duties of airport management, inspection, and the relations with the other agencies involved. Their staffs are relatively small in comparison with the scope of their work.

The Technical Department is composed of five sections: general supervision, technical services, planning, air transport, and direct arrangements with the international organizations. The department's work can be described as that of general assistance to the other departments.

The Department of Aeronautical Operations contains three directly dependent sections - transit services, aeronautical information, and air administration. It also is the liaison department with meteorological services.

The Department of the Salvadoran Aeronautics Registry contains two registries, one for national and the other for international planes, airports, and pilots. Its duties are complicated by the large number of spray planes and facilities that primarily operate privately throughout the nation.

The Engineering Department oversees the sections dealing with projects and their design, physical facilities, maintenance of electronic instruments, the several shops, and the materials warehouse. It is the largest of the six departments.

The direct acts of inspection of planes and airport facilities, and the examination of pilots, rest with the department with the acronym of DICAN (inspection and control). It works in close coordination with the Registry Department.

The General Administrative Department has a wide variety of support services: accounting, files, secretarial, statistics, correspondence, warehousing, and other general activities. It, too, serves all of the other departments.

b. Functions of Civil Aviation

The DGAC performs many of the functions expected of any civil aviation authority, as can be perceived from the offices and departments in its organization. These include general supervision of the air information and transport services, meteorology, inspection of airports and planes, and examination of pilots.

DGAC also, however, has additional duties. It is charged with the direct operation of Ilopango Airport (an alternative international facility), and the airports of Los Comandos, El Tamarindo, and Santa Ana. While all but the first are small, their operation still requires personnel and equipment.

Civil Aviation also supervises, as a general control function, the three private domestic airlines: TAES, ALAS, and AEROSAT (a pilots' cooperative). It also works closely with the military, coordinating their flights to and from the airports operated by DGAC. It also cooperates with the Aviation Club on training and other functions impinging on the civil aviation of El Salvador.

One of the most time consuming duties is the inspection and

supervision of the 94 crop duster planes (only 26 are currently in operation) and the 150 landing strips they use, only 40 of which have been properly maintained and/or restored to standard condition. The examination and licensing of these pilots and others flying small private planes is a difficult task since many of them fail to appear for their annual examinations. Civil Aviation has only two planes of its own to use for inspection flights, severely restricting their inspection coverage and determination of the operation of unlicensed pilots, planes, and strips.

A further complication is that most of the landing strips in the country are privately owned. The owners and/or operators are reluctant to make improvements under the present conditions of violence and economic uncertainty. While GDCA can refuse permission to operate, and does, the owners know that the authorities cannot be there sufficiently often to assure that they meet the conditions set by law.

GDCA is also charged with the supervision of all pilot and mechanics training in the nation. Two schools operate regularly and a third occasionally. The agency's officials review the curriculum, approve the instructor , and conduct the final examinations of the candidates.

Finally, Civil Aviation is charged with the investigation of the causes of air traffic accidents. While these have not been as numerous as might be expected under the violent environment of El Salvador, they do occur and GDCA studies the accidents and near accidents, and reports its findings to the Government of El Salvador, making recommendations for correcting any operational deficiencies and/or traffic control problems.

In summary, the General Directorate for Civil Aviation, recently incorporated into the Ministry of Public Works, performs most of the functions by a civil aviation authority plus those of an actual airport operations organization. It has a small but well trained staff that, within the limits of its resources and the present conditions, serves a useful function within the air passenger and transport systems of El Salvador.

### 3. Salvadoran Bus Enterprises Association (AEAS)

As the name suggests, this cooperative is purely a service organization for the bus companies. It assists the owners to obtain permits to import vehicles and parts, aids them in the negotiations with the Fund for Investments and Guarantees, and represents them, as necessary, before the Agency for Land Transportation. Each individual business has, of course, its own institutional structure that varies from small manager-operator firms to quite large, multiple vehicle enterprises. A membership fee to AEAS finances the services it provides. As needed, it represents the owners with the Ministry of Defense.

4. Trucking Entrepreneurs Association (ACOSETCA)

This mutual association functions in almost exactly the same form as that for the buses. It furnishes assistance services to the truck business owners by interceding for financial assistance and suubsidies on fuel, manages savings and loan operations with the funds deposited by the trucking companies with the organization. It represents them, when requested, with the Ministry of Economy.

B. The National Railways of El Salvador

The Government of El Salvador let a contract to a foreign construction company in 1881 to build the first railroad in the country, a 20 kilometer track between the City of Sonsonate and the Port of Acajutla. That road was completed the following year. In 1894, the El Salvador Railway Company was formed as a private enterprise. It constructed the tracks from Sonsonate to San Salvador, completing that work in 1902.

In 1895, the national government contracted the construction of another railway, starting from the Port of Cutuco (La Union) through San Salvador to the western part of the country. The construction and operations contract was given to the International Railway of Central America Company (IRCA) which, over some years, established the connecting lines from La Union to San Salvador (connecting there to the line to the Port of Acajutla), and onward to Metapan and a line to the border of Guatemala, where it joined the system of that nation.

In 1961, The El Salvador Railway Company (San Salvador to the Port of Acajutla) was experiencing reduced revenues and did not meet the terms of its operating contract. The line was taken over by the Government of El Salvador and placed under the management of the Autonomous Executive Port Commission (CEPA) in an entity entitled Ferrocarriles de El Salvador (Railways of El Salvador). By 1972, the International Railway Company of Central America was also experiencing financial difficulties, and it, too, began to break clauses in its contract. The Salvadoran Government took over the administration of that railway and placed it, also, with the railway divisioin of CEPA, the port authority. That same year, the operating division, El Salvador Railways, was modified and named Ferrocarriles Nacionales de El Salvador (FENADESAL), the National Railways of El Salvador. It remains under that organization today. A brief description of the FENADESAL organization was given under CEPA; the FENADESAL organizational chart is provided in Annex G.4.a and an English key to the departments and sections is in G.4.b.

1. Direct Violence Damage to the Railway System

Although there was intensive fighting in the nation in 1979, there were no attacks on the railway system. Early in 1980, however, the first damage was inflicted; the incidents then increased each quarter so that by the last period in 1980, 16 separate incidents were registered. See Figure VII.A for a

graphic presentation of the separate incidents (different times and/or locations) by quarter and year; the individual listings by date, location, type of damage, and equipment or facilities are documented in Annex G.1.

The number of attacks diminished in 1981 but then escalated to their highest level in 1982, with 25 recorded in the April to June period alone. The incidents continued to be frequent in 1983, then declined until 1987, when they again rose to a peak of 16 in the third quarter but fell to only 2 in the last quarter. In the first six months of 1988, the attacks were intensified, rising to 15 from April to June.

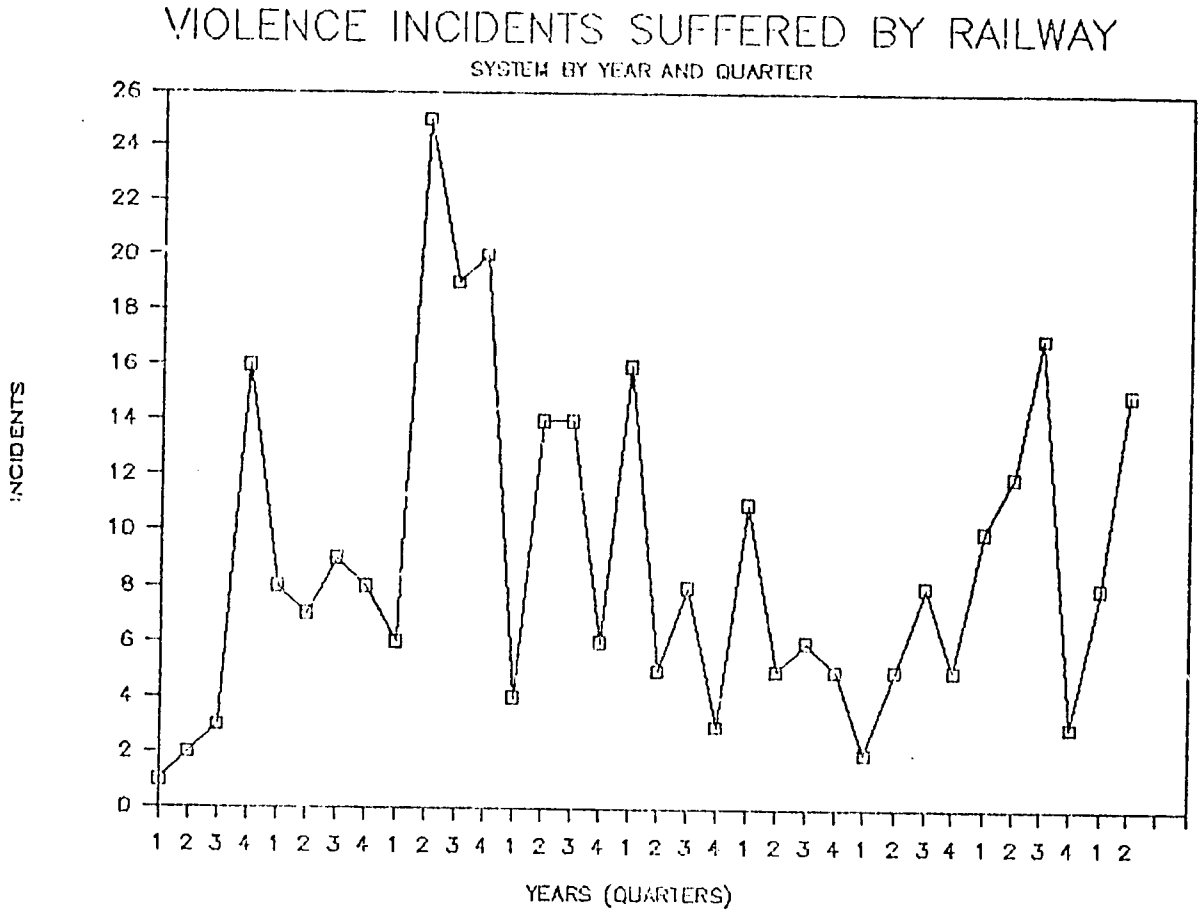
No obvious pattern appears in the frequency of incidents of violence against the railroad. July through September tends to be a higher period of the year, but there are enough exceptions to eliminate it as a definite preferred target.

The cost of the damage inflicted is depicted in Figure VII.B in millions of US dollars. One of the most obvious comparisons is that the number and cost of the attacks do not coincide. The primary reason for the disparity is due to incidents that resulted in the destruction of locomotives, a very expensive item. When that occurred, the cost shot upward. Often, too, when locomotives were destroyed, some rolling stock was involved, further elevating the cost. (See Annex G.1.a for the number of attacks on locomotives and the severity of the damage; rolling stock damage is listed in G.1.b.)

The separate incidents by date, location, equipment/facilities damaged, and the cost of the loss (depreciated value for that year or cost of replacement or repair) are detailed in this report rather than an update because they were not presented in the previous damage assessment report. Further, the damage costs were substantially understated for some years in that publication; the accompanying details in the present report thus furnish the direct evidence for the numbers presented. It must be emphasized that much of the destroyed equipment was not replaced. Had it been, the damage assessment for the railways would have been much higher. Constant 1979 colon depreciated value was used by FENADESAL for unreplaced losses. Had the equipment been purchased, the values would have tripled due to inflation. Repair costs were actual at the time, so those reflect increased labor and materials costs. (When FENADESAL was able to buy parts, it enjoyed the use of the official exchange rate - US$1 = C. 2.5 through 1985 and US$1 = C. 5 thereafter.

It must also be noted that year after year, the railway simply had less equipment that could be damaged. The 20 locomotives operating in 1979, for example, were reduced to a maximum of 10 in 1988 and at times between these years, amounted to only four. Rolling stock, support equipment, and motorized cars suffered fewer losses but their numbers, too, declined. The rebels simply had fewer expensive targets.

FIGURE VII.A


VIOLENCE INCIDENTS SUFFERED BY RAILWAY
SYSTEM BY YEAR AND QUARTER
INCIDENTS
0
2
4
6
8
10
12
14
16
18
20
22
24
26
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2
YEARS (QUARTERS)

Perhaps even more important to this discussion was the increased security arrangements implemented by FENADESAL in conjunction with the military. The latter greatly increased and improved its surveillance and counterattacks. The railway took several important measures to reduce the number of incidents (reduction of services for some very violent periods and geographic areas). The effects of the dynamite or other damage inflicted was reduced by modifications of the equipment. As the wooden parts of box cars were burned or broken, they were replaced by metal. Light metal on many items of equipment was replaced with much heavier gauges when metal sheets, for example, were twisted. A very innovative modification was employed on locomotives - a very heavy and long metal platform was added to the front with a heavy steel pole rising in front and above the locomotive. This addition has served in two valuable ways: the platform causes the dynamite to explode before the locomotive reaches the charge, greatly reducing the damage to that important and costly piece of machinery. The rebels took note of this improvement and began stringing the fuse wire above the tracks rather than under them; the pole was then mounted ahead of the engine and that "pre-detonated" the charge, substantially reducing the cost of damage. (A 1988 tactic is to place the detonator wire in bamboo, partly cushioning the first weight; the locomotive then completes the job. A remedy is being devised.)

Another reason for the discrepancy between the number of incidents and the damage costs is that the guerrillas found that they could, with nearly complete safety, interrupt the operation of the railroad by damaging the lines. At first, they concentrated on the bridges, but when the military with newly installed lights greatly improved the guard over these, the rebels turned to track damage. With a small amount of dynamite or other means, they could disrupt traffic by simply disconnecting the rails or removing ties. Burning became an inexpensive method. And these incidents could be carried out in many isolated locations with relative impunity since it is impossible to guard every foot of track. Many of the incidents in 1987 and 1988 were to rails and ties. Their repair was not costly, mostly involving labor and some tie replacement (now with concrete).

During the first several years, the railway telegraph line was also cut when an attack occurred. This made rapid reports of damage impossible in isolated spots and slow in others since the regular telegraph and telephone lines were also often destroyed. The interruptions of traffic, and thus the lost revenues, were both high. USAID came to FENADESAL's assistance by providing a high quality radio communications system. That has been operating over most of the railway lines for some time and it will be totally in place within a month or so. Each locomotive and other motorized cars now carry the radios and the central offices know almost immediately when an incident occurs. This allows them to respond quickly, bringing in auxilliary equipment or repair crews. It is substantially increasing traffic flow and cutting lost freight hauling opportunities.

FIGURE VII.B

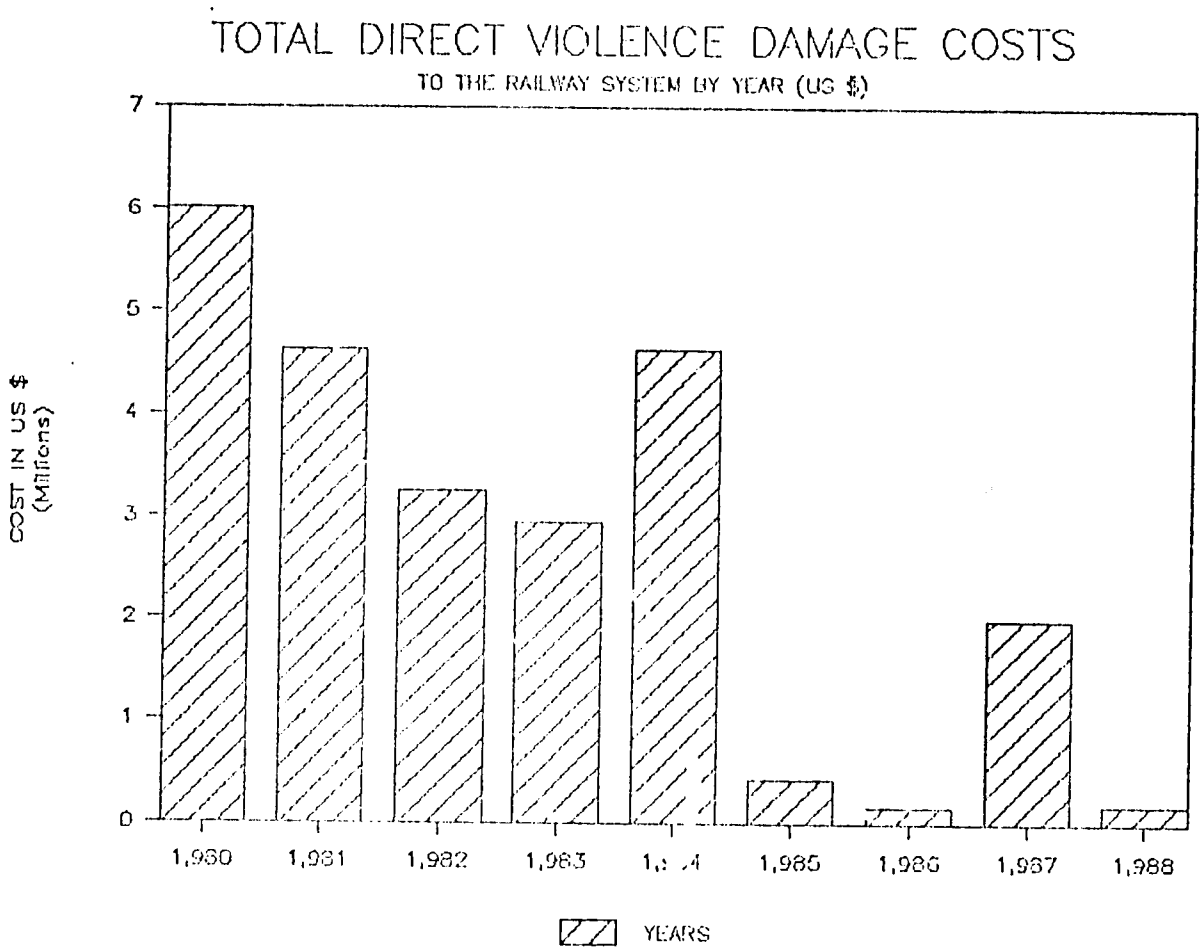

TOTAL DIRECT VIOLENCE DAMAGE COSTS
TO THE RAILWAY SYSTEM BY YEAR (US $)
COST IN US $ (Millions)
7
6
5
4
3
2
1
0
1,980
1,981
1,982
1,983
1,985
1,986
1,987
1,988
YEARS

Table VII.1 details the yearly damage costs by the type of equipment or facility. The total (remembering that much of the equipment has not been replaced) amounts to more than US$24 millions. That is an exhorbitant sum for a relatively small railway system. Neither CEPA-FENADESAL nor the Government of El Salvador could absorb that loss and make any kind of reasonable investment to improve or increase services. Indeed, neither had the money to replace the totally destroyed equipment. That remains to be done in the future. It is important for the later discussions on revenues from the system, to highlight the enormous loss, including many locomotives and rolling stock, in 1980: almost US$17 million, approximately two-thirds of the total. That was followed by the second greatest damage year, 1981, further depleting the equipment available to provide rail services. Repercussions of these two years are still being felt today in the amount of freight hauled and passengers transported. (Only one short stretch of the passenger line has been restored.)

2. Indirect Damage to the Railway System

The railways, although increasingly sharing the cargo hauled with truckers, showed a steady growth from the mid-sixties through the mid-seventies. When the prices for coffee, sugar, and cotton began to decline, both forms of transportation suffered reductions. Beginning in 1976, however, industrial shipments increased and the railroad benefitted, increasing its tonnage each year from 1976 to 1979. (See Table VII.2 for the details of 1976-1987.) During that period, import quantities varied from lower to higher, exports increased only very slowly, but local cargo moved upward about 25% in each of the first two years, then 15% the next. The net result of these differing tonnages amounted to a rise of 28% of total tonnage during the period.

With the onset of the attacks on the railway system in 1980, freight fell off dramatically for the next two years, rose somewhat in 1983, and then fell to its lowest level for two decades in 1984: 314,452 metric tons compared to the high of 589,497 in 1984. Since that year, the total cargo hauled has increased just under 12.5% despite the continuing violence and the shortage of equipment that could not be replaced or repaired. The cargo shipped during the first six months of 1988 gives promise of another annual increase.

It is important to note that during the near decade of violence, coupled with decreased rail tonnage, that two of the important crop shipments for export fell almost continuously. Coffee declined 80% as a rail cargo from 1977 to 1987. Cotton fell 96% rom its 1978 high to its 1987 low. Molasses shipments suffered a similar decline. A portion of this was a decline in crop shipments was due to changes to trucks, but the major factor was declining production. Had one of these products maintained its shipping level, or recovered when the railroad was able to haul greater amounts, the overall picture for FENADESAL would have been far better.

TABLE VII.1 SUMMARY PF DIRECT DAMAGE COST TO RAILWAY INSTALLATIONS AND EQUIPMENT BY TYPE AND YEAR (US $): JAN 1, 1980-JUNE 30, 1988 *

| YEAR | LOCO-MOTIVES | RAILWAY CARS | MOTORIZED CARS | SUPORT EQUIP. | BRIDGES | TRACKS | STATIONS | TOTAL |
|---|---|---|---|---|---|---|---|---|
| 1,980 | 5,332,460 | 332,206 | 84,783 | 0 | 260,000 | 0 | 10,000 | 6,019,449 |
| 1,981 | 3,727,060 | 707,672 | 28,442 | 103,000 | 0 | 0 | 61,508 | 4,627,702 |
| 1,982 | 1,378,820 | 1,440,540 | 182,977 | 132,000 | 119,706 | 0 | 4,000 | 3,258,043 |
| 1,983 | 1,087,000 | 1,316,348 | 107,868 | 4,000 | 409,215 | 7,393 | 6,000 | 2,938,624 |
| 1,984 | 3,265,280 | 1,193,309 | 0 | 100,000 | 17,413 | 55,258 | 0 | 4,631,260 |
| 1,985 | 71,300 | 291,765 | 50,200 | 0 | 0 | 16,440 | 0 | 429,705 |
| 1,986 | 109,460 | 34,706 | 8,460 | 0 | 0 | 7,741 | 0 | 161,387 |
| 1,987 | 1,878,240 | 67,910 | 25,600 | 0 | 10,000 | 14,625 | 0 | 1,995,775 |
| 1,988 | 73,270 | 59,655 | 25,000 | 2,000 | 10,000 | 8,724 | 0 | 178,649 |
| | 16,924,230 | 5,444,111 | 513,235 | 341,000 | 826,334 | 110,181 | 81,508 | 24,240,594 |

* The railway system was not attached in 1979

**1988 includes only the first six months; if the damages continues at this same level, the year would total $ 357,298.

The pattern for passenger traffic was similar to that for cargo. At the beginning of the period, there was a steady growth, then with the violence, the decline was at first small but dropped abruptly from 1981 to 1982. Most of the reduction was occasioned because FENADESAL had to close many of the lines to passengers; it could not guarantee their safety. Despite the small stretch of railway presently used for passenger cars, the number of riders is increasing. The count has risen 25% in the last four years.

TABLE VII.2: METRIC TONS OF CARGO SHIPPED ON THE RAILROAD AND PASSANGERS TRANSPORTED: 1976-1987

| Year | Imports | Exports | Local | Total | Passengers |
|---|---|---|---|---|---|
| 1976 | 150,252 | 136,272 | 174,373 | 460,897 | 1,794,123 |
| 1977 | 164,523 | 137,841 | 216,257 | 518,621 | 1,980,453 |
| 1978 | 150,042 | 157,698 | 279,208 | 586,948 | 1,986,806 |
| 1979 | 143,050 | 136,208 | 320,239 | 589,497 | 2,010,574 |
| 1980 | 93,589 | 114,683 | 242,132 | 450,404 | 1,695,868 |
| 1981 | 96,486 | 88,173 | 156,859 | 341,518 | 905,046 |
| 1982 | 64,702 | 80,620 | 181,813 | 327,135 | 381,430 |
| 1983 | 94,826 | 102,662 | 165,865 | 363,353 | 246,814 |
| 1984 | 93,558 | 60,089 | 160,805 | 314,452 | 290,179 |
| 1985 | 120,170 | 67,221 | 136,781 | 324,172 | 307,718 |
| 1986 | 114,685 | 47,462 | 159,849 | 321,996 | 322,240 |
| 1987 | 102,293 | 60,078 | 190,973 | 353,344 | 364,053 |

Note: The total cargo for 1975 was just over 400,000 metric tons, but the breakdown was not available.

Source: FENADESAL

The scope of these indirect losses can be better appreciated in Figure VII.C, in which the revenue from metric tons of cargo and the passengers are depicted. Financially, the losses are proportionally greater since many costs are fixed. The net revenues declined more than the total because the operations costs were larger. That meant that the cost-revenue relationship was in serious imbalance. It still is, but some recovery can be ascertained from the figure.

The relative cost-revenue position is not due just to the reduced traffic. A major ingredient in the costs is that of the extra manpower, use of equipment, and repairs caused because the violence occurred. While these are indirect costs, they weigh heavily on the financial positiion of FENADESAL. Some of those costs were detailed in the direct damage assessment in the previous section. There are two other components, however, that must be included in indirect costs: the additional costs of operating a railroad under war conditions and the special arrangements that must be made to be able to operate at all.

Some public services institutions, although they provide fewer services, have maintained their personnel numbers or even increased them. That is not the case of the railways. In 1980, when the railroad became a target for the guerrillas, the total work force in FENADESAL was 1,352. (See Table VII.3.) That number has declined every year since then to a total of 914 in 1987; it has dropped to 896 in 1988. Notice in the table that every type of employee has declined in number (some minor variations occurred for a year but then fell substantially thereafter). While in some institutions the upper management groups remain high, FENADESAL has been able to effect efficiencies in that bracket as well as in those directly related to operations and repairs.

TABLE VII.3: NUMBER OF FENADESAL PERSONNEL BY CLASSIFICATION AND YEAR: 1980-1987

| Classification | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|
| Management | 65 | 59 | 50 | 34 | 37 | 38 | 36 | 36 |
| Financial* | 60 | 56 | 55 | 51 | 51 | 50 | 48 | 44 |
| Traffic | 10 | 8 | 8 | 6 | 6 | 4 | 4 | 4 |
| Materials | 39 | 30 | 26 | 23 | 22 | 22 | 20 | 20 |
| Equipment | 226 | 227 | 218 | 189 | 176 | 176 | 171 | 155 |
| Transportation | 440 | 437 | 410 | 377 | 355 | 343 | 334 | 321 |
| Lines & Stations | 512 | 524 | 501 | 418 | 403 | 380 | 354 | 334 |
| Total | 1,352 | 1,341 | 1,268 | 1,098 | 1,050 | 1,013 | 967 | 914 |

* Includes all accounting and station paymasters and fare collectors.

Source: CEPA-FENADESAL

Despite these efficiencies, the apparent productivity per worker measures continue to be unfavorable. Although in partial reiteration, this condition is caused by a combination of the proportionately lowered payloads and the excessive repairs necessary because of the violence. The status of the income/employee and costs/employee are detailed in Table VII.4. And this occurred despite the personnel reductions, increased tonnage per trip, and the low cost repairs effected in the shops.

TABLE VII.4: FENADESAL INCOME AND COSTS PER EMPLOYEE (STATED IN C. 000 SINCE THE RELATIVE POSITION WOULD NOT VARY WITH A DOLLAR CONVERSION)

| Measure | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|
| Persons | 1,352 | 1,341 | 1,268 | 1,098 | 1,050 | 1,013 | 967 | 914 |
| Income | 8,151 | 6,123 | 6,935 | 8,490 | 6,249 | 8,195 | 7,968 | 8,267 |
| Cost | 16,810 | 15,711 | 16,922 | 14,459 | 14,342 | 20,708 | 24,027 | 24,191 |
| Inc/Per | 6,029 | 4,566 | 5,469 | 7,732 | 5,951 | 8,090 | 8,240 | 9,067 |
| Cost/Per | 12,433 | 11,716 | 13,345 | 13,168 | 13,695 | 20,445 | 24,847 | 26,467 |

Source: CEPA-FENADESAL

Although some lines had become less profitable as early as 1972, the railways about broke even until the shipments of coffee, molasses, and cotton decreased seriously. By 1975, the income to cost ratio was at 1:1.2 and varied only slightly until 1980 when it stood at 1:2. With more damage plus repairs, with the impossibility of operating some sections at times, the elimination of most of the passenger services, and a union agreement in 1985 forcing CEPA to pay during work stoppages and power outages, costs soared. Too, throughout the period, FENADESAL had many additional costs because of the threat of attacks (discussed in more detail in the following section). The 1987 ratio of 1:3 was the worst in the enterprise's history. During the first half of 1988, revenues have increased (more shipping, more cars per locomotive per trip) while costs have not risen commensurately (fewer personnel, less costly damage to repair). If the trend for the first six months continues through the year, the 1988 ratio will be about 1:2.5. The improvement has been effected by adding more freight cars per locomotive per trip. This will necessitate more maintenance on the tracks, but with the few locomotives available, it is the only method for increasing efficiency and hauling more cargo.

The costs presented in Table VII.5 although a direct result of the violence, were expended as preventive measures or were suffered after attacks happened. (They are excluded from the direct damage costs that involved repairs.) Inspections of the equipment before it is moved and daily inspections of all facilities and tracks have become a fact of life. They are credited with avoiding a great deal of damage and delays in the movement of the trains. The protection of the locomotives and rolling stock, as described earlier, have been very important in the reduction of damage during attacks or from sabotage. Probably no locomotives would now be in service had it not been for these measures. Bridge lighting improves the ability of guards to detect attacks and sabotage attempts.

FIG.IIIc FREIGHT AND PASSENGERS TRANSP.

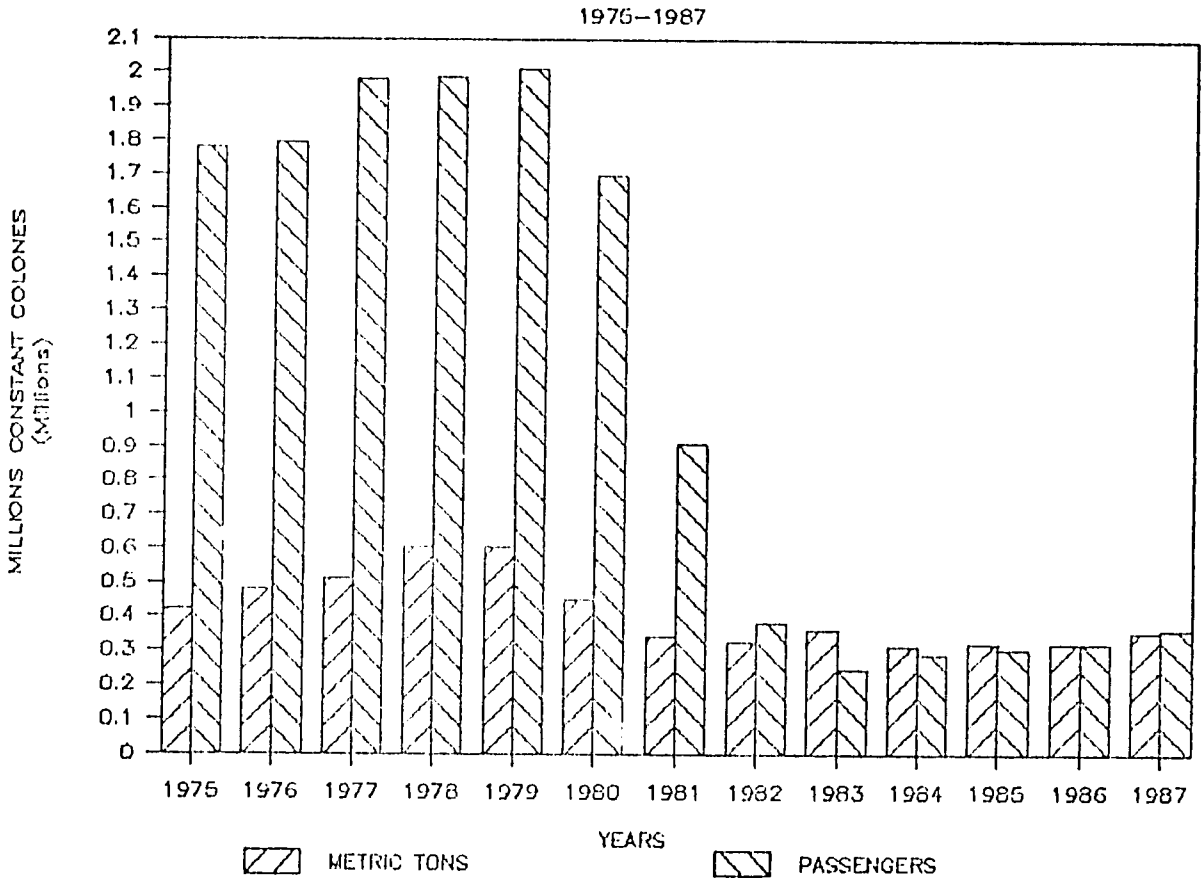


FIG.VII D INCOME AND COST PER WORKER

(1980–JUNE 1988)

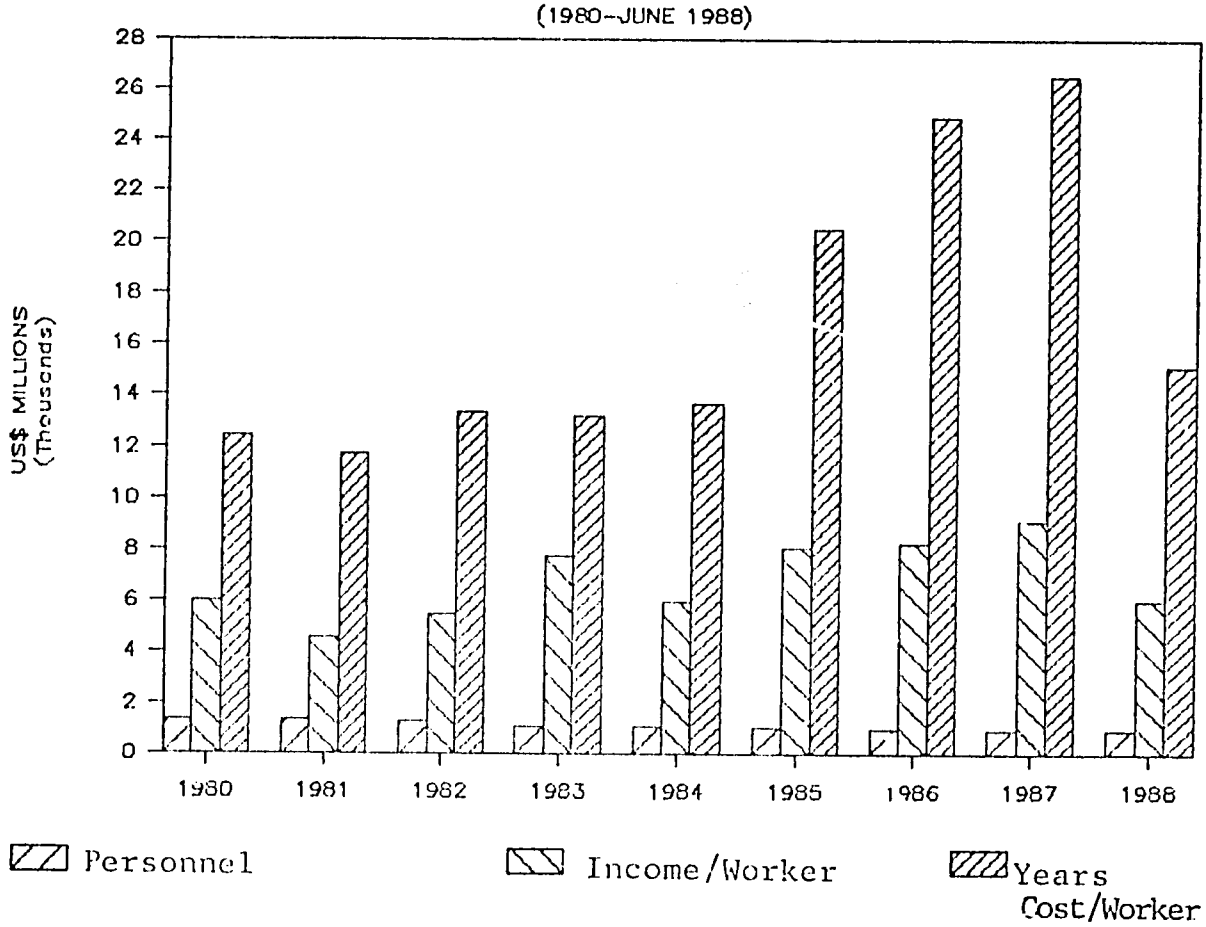


TABLE VII.5: OTHER COSTS OCCASIONED BECAUSE OF THE THREAT OF ATTACKS: 1980 THROUGH JUNE 1988 (US$ 000)

| Description | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Inspection | 0 | 16 | 23 | 29 | 41 | 34 | 17 | 17 | 8 | 185 |
| Protect locos | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| Protect cars | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 10 | 29 |
| Bridge lights | 0 | 0 | 0 | 0 | 188 | 125 | 70 | 160 | 80 | 623 |
| Security* | 1 | 21 | 40 | 52 | 52 | 3 | 2 | 2 | 2 | 175 |
| Mech/train** | 0 | 0 | 0 | 0 | 0 | 20 | 10 | 0 | 0 | 30 |
| Radios | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 125 | 125 |
| Strike wages | 0 | 2 | 8 | 2 | 8 | 6 | 2 | 5 | 2 | 35 |
| Death benefit | 6 | 5 | 0 | 0 | 1 | 2 | 2 | 8 | 3 | 27 |
| Attack wages | 0 | 2 | 8 | 2 | 8 | 6 | 2 | 5 | 2 | 35 |
| Totals | 7 | 46 | 130 | 85 | 298 | 196 | 105 | 199 | 232 | 1,296 |

* FENADESAL pays only for coordination, which varies according to frequency of attacks in a region.

** During two years of intense attacks, the railway sent one mechanic with each locomotive so that on the spot repairs could be made.

Source: FENADESAL

The military provides armed soldiers for all train movements. FENADESAL must pay for the coordination of the security forces, but not the soldiers. Sending mechanics on trains during heavy episodes of attacks has allowed the immediate repair of some equipment. Since they are on the spot, these take much less time and the freight can continue on its journey with minimum delay. As mentioned earlier, it is a simple matter to cut the telegraph lines, preventing communications about incidents. USAID/El Salvador provided an excellent radio system and it is nearly installed. Most of the system has been in operation for some time and the rapid response to attacks that the radio permits is vital to the reduction of delays. Quicker medical attention because of the radios has already been credited with saving lives.

Three other categories of losses associated with the violence must be added to these expenses. One is that when attacks occur, almost inevitably some workers cannot continue with their jobs. They must, of course, be paid during the time they wait. A second source of expense is that which occurs when the guerrillas announce a transportation stoppage. The trains dare not move. While some of the workers can be put to doing other tasks, some are without work; the union agreement stipulates that they be paid. Note that these have been substantial amounts since 1984.

The railway has had 22 employees killed during attacks or when dynamite blew up equipment. Their widows and children receive a death payment that allows them to continue their lives. (Soldiers have also been killed, but the military does not release that number; 17 passengers have also lost their lives.)

These items, although many appear small in any one year, have caused a total expenditure of US$1.2 million to the railway. That is a sizeable sum for an institution experiencing financial problems.

Still another category of eventual loss must be added to the already alarming figures for a small enterprise: the costs of deferred maintenance to the equipment and to the tracks. Because of its unfavorable financial situation, it has postponed every bit of maintenance not absolutely needed to keep the trains in operation. In other words, they have "patched" up locomotives, rolling stock, support vehicles, motorized cars, rails and ties, and even bridges - just to the extent that freight and passengers can be moved. Their budget simply will not allow more. There are many box cars, cabooses, trucks, and other equipment set aside until such time as the money will allow their repair. The tracks are in sore need of substantial overhaul in many sections. This deferred maintenance is calculated, at 1980 prices (and they will not be done this year) at about one million US dollars. At some time in the future, this investment will have to be made.

### 3. Lost Revenues Brought About by the Violence

The previous presentations on cargo and passengers transported gave a clear picture of the revenue structure of the railways at the beginning of the violence period. Taking 1980 as the base year and simply projecting that FENADESAL would have maintained its loads, not even increase them - and they were in a period of increase for both cargo and passengers, the calculated loss of revenue is US$31,140 million for the period. That figure, added to the revenues achieved, is sufficient to have given a small profit margin for the railways under normal conditions.

### 4. Past Investments and Future Investment Needs

When the two private railway companies were taken over by the government, only a few of the past records were transferred to the receiving agencies. It would have been helpful to know the investments made during the 1960s but those figures are not available. Soon after the two sets of lines were brought into CEPA, the administration recognized some deficiencies and immediately began to improve the lines. While the early investments were relatively small, they were important to the operation. From 1977 through 1980, more than a million US dollars was invested each year, adding equipment and further improving the tracks and other facilities.

| | |
|---|---|
| 1974 | US$ 200,000 |
| 1975 | 390,770 |
| 1976 | 1,678,640 |
| 1977 | 1,325,858 |
| 1978 | 1,108,411 |
| 1979 | 1,318,679 |
| 1980 | 1,215,160 |
| 1981 | 915,464 |
| 1982 | 291,452 |
| Total | 8,144,435 |

Even in 1981, when substantial damage had been incurred by many parts of the system, CEPA-FENADESAL continued a high level of investment, over US$900,000. From that point on, however, the cost of repairing the vast amount of damage inflicted by the rebels was so great that it consumed all of the budget except for personnel. The investment fell nearly to zero except for the US$4 million supplied by AID for parts, which hardly qualifies as investment, even though it saved the lines.

FENADESAL, because of the extensive damage to the system and because of its small budget, has learned how to make repairs "out of nearly nothing." The mechanics and electricians in the shops restore parts, manufacture parts, and adapt still others so that they function. Too, they have become very inventive in other ways. The security platform in front of the locomotives is a case in point; replacing wood with metal is another. The engineers have designed concrete ties and had them produced because they could not obtain lumber. During an inspection by the consultant, a mass of twisted wreckage, that had been a locomotive, was towed in. It appeared a complete loss but the shop supervisor described what would be done and assured the consultant that the old engine would be back on the rails within two months. In that spirit, CEPA-FENADESAL updated its "future" investments, fully cognizant that it is impossible at this time to suggest when those could be made. Those very conservative estimates are presented in Table VII.6, with the amounts stated in 1988 United States dollars.

The first important observation about the five year plan is that it affects many vital service replacements almost as soon as the investments begin. (See annual details in Annex G.5.) At the end of tthe first year, 1989 if conditions were to allow, the system could haul nearly 25% more cargo. It is anticipated that this would primarily serve the cement industry since those enterprises have requested trains as they now pay nearly three times rail shipment rates via trucks. By the end of the five years, the freight capacity would be fully restored. As increases in cargo warrant, future investments would continue the improvement of these services.

Tank cars for liquid shipments have been less damaged, but some

replacements are required. Parts to repair some of the damage will be needed from foreign suppliers. Cabooses have been particularly hard hit during the violence. Ten were totally destroyed and must be replaced. Four others, with some foreign parts, can be placed into service with just repairs. Although less expensive, the support equipment destroyed (or carried away by the rebels) must be replaced. These purchases must be made in the United States since they are not available locally.

As soon as security allows, passenger services can be restored completely on the San Salvador-Acajutla route where only a part of the line is now being serviced. There are several passenger cars available for immediate use with just some minor cleanup and repair. Beyond that route, however, there are only a few undamaged coaches that can be utilized. There are ten that have been dynamited and in need of many repairs. Some chassis parts were ruined in the blasts and replacements or parts for rehabilitation must be purchased in hard currency, not now available to CEPA-FENADESAL.

In addition, just over US$ one million per year will be required for restoration of the tracks to their proper condition.

5. Financial and Operations Management

Throughout the report on the damages and investments on the railway system, several references have been made to both management and operations of FENADESAL. The consultant worked intensively with both CEPA, the parent organization, and with FENADESAL, the operations office for the railways, sometimes called a division. One of the first observations is that these two work closely and well together. The working relationship is cordial but effective. Beyond this generalization, there are several important characteristics of the two together and FENADESAL particularly that make it possible for the railway system to operate within the intense incidents of violence. They also denote some qualities necessary in any program of continuing to maintain the rail services, to effect needed repairs and maintenance, and to restore and/or rehabilitate the system in the future.

(1) FENADESAL is a technical operations institution in which concrete specializations among the staffs of management and operations are indespensable to running the system; those abilities are evident in:

- Overall supervision of the system;
- Completeness and accuracy of the statistics;
- Accuracy of the accounts;
- Speed of response to emergencies;
- Ability and dedication of the train crews;

- Abilities, inventiveness, and dedication of the shop personnel; and

- Assistance given to other members of CEPA and other organizations in accommodating operations and in producing parts and repairs for other institutions outside the CEPA system.

FENADESAL performs, separately and in partnership, effectively and efficiently.

TABLE VII.6: FIVE YEAR INVESTMENT COSTS FOR RESTORING THE RAILWAY SYSTEM TO ITS PREWAR LEVEL (US$ 000)

| Description | Quantity | Labor | Local Purchase | Foreign Purchase | Total |
|---|---|---|---|---|---|
| Locomotives | | | | | |
| Purchase | 6 | 0 | 0 | 9,000 | 9,000 |
| General repair | 2 | 80 | 100 | 800 | 980 |
| Engine repair | 2 | 20 | 5 | 0 | 25 |
| Overhaul | 10 | 16 | 0 | 240 | 256 |
| Platforms | | | | | |
| Purchase | 40 | 384 | 96 | 1,120 | 1,600 |
| Repair | 24 | 26 | 44 | 74 | 144 |
| Boxcars | | | | | |
| Purchase | 50 | 150 | 216 | 2,884 | 3,249 |
| Repair | 75 | 150 | 225 | 225 | 600 |
| Passenger Coaches | | | | | |
| Repair | 10 | 40 | 120 | 70 | 230 |
| Tank Cars | | | | | |
| Repair | 8 | 8 | 11 | 13 | 32 |
| Cabooses | | | | | |
| Purchase | 10 | 20 | 50 | 370 | 440 |
| Repair | 4 | 16 | 20 | 40 | 76 |
| Other | | | | | |
| Cargo Loaders | 5 | 0 | 0 | 200 | 200 |
| Track Cars | 5 | 0 | 0 | 125 | 125 |
| Lathe | 1 | 0 | 0 | 75 | 75 |
| Universal | 1 | 0 | 0 | 80 | 80 |
| Car Loader | 1 | | | 40 | 40 |
| Five Year Total | | 910 | 887 | 15,356 | 17,152 |

Source: FENADESAL

(2) A special characteristic of FENADESAL is its ability to to attract dedicated personnel, train them in their jobs, and retain them for extraordinarily long periods of time. This greatly reduces the operational costs of the division. And this is achieved in the face of death of colleagues, almost constant danger to train crews, and long, difficult hours of work during emergencies.

(3) Although in reiteration, it must be noted in this section that FENADESAL has continuously reduced its personnel as it was forced to reduce its services. These cuts applied equally to managers, office staffs, and operations personnel. It demonstrates an attention to business principles seldom seen in this type of organization.

The consultant found the CEPA staff with which he worked to be knowledgeable in their fields and very interested in the divisions and their problems. Capability was never called into question. It was not possible to make a study of the CEPA personnel and their functioning. It is easily seen, however, that there are many employees there. Too, the amounts of money charged to the divisions, unusually high for FENADESAL, seem too high. This "super" administration, on top of the regular FENADESAL managers, should be looked into.

They may all be necessary but that should be determined by an outside study with a view to making modifications if those are warranted.

The consultant found no important negative qualities within the administration. To the contrary, it is evident that FENADESAL is capable of efficiently and effectively managing resources and carrying out projects. Technically, CEPA will add a great deal to the supervision and guidance of this vital public service.

C. Ports

There are two important cargo ports in El Salvador: Acajutla and Cutuco. There is also a smaller facility, El Triunfo, that serves only small fishing and recreation boats. Acajutla is managed by a separate office within CEPA. Cutuco management is carried out by FENADESAL, which has operated the port in the past. In the future, a special CEPA office for Cutuco may be opened.

The ports of Acajutla and Cutuco have competition. The major one is the cargo port of Barrios on the Caribbean Coast of Guatemala. Many exports, especially fruit and vegetables, plus some lighter weight manufactured goods, are trucked to Barrios Port and then shipped to the Caribbean and Atlantic ports of the United States or other countries. Some imports are also brought in through Guatemala but they are of minor tonnage. Guatemala also has a small port on the Pacific Coast, Quetzal, very close to the

border with El Salvador. The tonnage destined to El Salvador is relatively small in amount during normal times but during the height of the violence, it profited from the greater security there. It is being modernized and could pose a greater threat in the future.

Overland trucking from the United States, Mexico, and occasionally Honduras accounts for some additional competition although to date that has been relatively minor. The chief component from the United States is vehicles: cars, trucks, and buses. A few containers of vegetables and melons have been sent overland to the US but that has been risky and of little importance so far.

Records of cargo shipments into and out of the Port of Acajutla exist from 1977. In that year, 1.6 million metric tons were registered; about 25% was exports and 75% imports. That was the largest annual tonnage for the period. The total declined gradually until 1982, when it took a sharp drop, recording only 740,335 metric tons. It climbed back to over a million the following year and has remained in that range ever since. Both imports and exports suffered equally across the period. Exports have gained proportionately less than imports.

Acajutla is the major entry point for grains and petroleum for the nation. It is estimated that at least 90% of the grains enter that port, with only small amounts coming overland from neighboring countries and via Cutuco. Grains usually account for about half the imported goods.

Surprisingly, considering the frequent attacks between San Salvador and La Union, the Port of Cutuco has remained active throughout the period of violence. The pier is small and all cargo must be loaded and unloaded manually, but in peaceful days, nea / 200 ships called there. Until 1982, Cutuco port handled more exports than imports. During the period of 1975 to 1987, the preponderance of exports was agricultural with coffee usually furnishing about half the tonnage, closely followed by cotton. Molasses was a distant third until 1980 when these shipsments declined drastically and have never recuperated.

The largest single import component at Cutuco has always been fertilizers, coming from Europe and the United States via passage through the Panama Canal. All of the ships arrive with bagged fertilizer, thus the manual operation of the port is not an undue hardship. Before the war, the Port of Cutuco normally accounted for about a quarter of a million metric tons, roughly a sixth of the tonnage through Acajutla. It is still vital as a port -- for shipments of agricultural products, imports of fertilizers, and as an alternative port for El Salvador when Acajutla is overcrowded and/or when it is economically advantageous because of the destination of the goods.

1. Direct Damage to Ports

Although there has been guerilla action very near the ports and considerable damage to railways and trucks serving them, no direct violence has been vented against them. In the case of Acajutla, the port police and the militarty have provided vigilence. At Cutuco in La Union, however, it has never been possible to maintain tight security. Despite this lack of security, no ships or port facilities have been sabotaged.

2. Indirect Damage to the Ports

Some of the equipment at the Port of Acajutla does not operate at all or functions slowly and inefficiently. The conditions emanate from two sources: electricity outages and/or low voltage, and maintenance that has been deferred because of inadequate budget provisions. As a generality, the smaller equipment (buses, pickups, loaders) has suffered the most from the lack of parts needed to repair them. Low and surge voltage has damaged the electric and electronic mechanisms of cranes, switches, and the central control panel. Lack of preventive maintenance has become a major problem for the access to the piers and has begun to be evidenced in the flooring of the piers themselves.

Special emphasis must be made on the condition of the cylindrical cells of the access ramp. These were constructed of metal, sunk deep into the sea floor, and filled with sand. Despite tetrapod barriers to slow the action of the waves, a great deal of abrasion has occurred. The cathodic protection to reduce corrosion has helped, but serious deterioration has occured and three cells are now losing sand from below the water line. The port personnel has refilled the cylinders, first with sand and then later with gravel and rock but the strong wave action continues to evacuate them. The preferred solution would be to fill the cylinders with concrete but that is very expensive, considering that the problem is not confined to just these three cells that are in the worst condition, but to some degree to all of the cylinders. Nevertheless, a solution must be found - and soon. If the access ramp to these piers collapsed, the port services would be seriously reduced. If the port is to continue to serve the needs of private sector imports and exports, immediate action must be taken.

The Government of West Germany paid for a preliminary study of the problems of the piers. The results published by the Salzgitten Consultants included a series of alternatives, encompassing not only the solution of concrete but some others of less permanent arrangement. That company insisted, too, that there is a need for more indepth studies before final decisions are made. The Japanese Technical Mission has expressed some interest in the cathodic protection system but no decision has been made on any assistance.

The electronic equipment has suffered seriously. One crane is inoperable and the other is slow and therefore very inefficient.

While CEL has two emergency generators in the area, there are two problems in keeping the voltage at a level that will deter damage to equipment. The first is that those generators come on line only when ordered by the central offices; necessarily, the order is not sent until it is sure that the outage is not a very temporary one. The second problem is that while one can be placed into operation in less than an hour, the steam generator takes several hours if it has not been functioning for some time. In either case, the port is left without power. And even when it does come on, it is often of too high or too low voltage, damaging the equipment. The CEL station, itself, has also been damaged by these problems. The frequent switching on and off has ruined some of the oil current breakers and they are out of service.

One of the obvious needs is to replace the breakers. That is dealt with in the report on CEL. Even with these, however, the port will suffer problems from outages. It is imperative that an emergency generator be installed at the port, not only reducing damage but also providing electricity to continue the operation of the port machinery during outages.

Only one crane, which has suffered harm from the previously mentioned defects, can now offload containers. Its primary purpose is to unload grains, the largest portion of the cargo at this port. A dual purpose crane needs to be located on another pier to serve both general cargo and containers. That would be a temporary measure, but it would greatly reduce the strain on the present equipment and furnish an alternative when there are problems of heavy traffic or large grain shipments. Eventually, of course, a small container pier must be installed. A project has been designed but present budget limitations forbid that investment.

The Port of Cutuco on the Gulf of Fonseca, as described earlier, is an important export, and to a lesser extent, import entry point. The damage sustained to that facility have derived from two sources:

- During some periods, the employees of FENADESAL, in charge of the port, could not effect substantial maintenance because of the threat of the guerrillas. That compounded the second problem.

- Because of the budget limitations, FENADESAL, as most other organizations, could not carry out routine maintenance.

The estimates for the rehabilitation of the pier utilized for loading and unloading at Cutuco include the repairs and probable costs for them, (listed in a later section).

The Acajutla shipping is regaining its former volume, and some new iinvestments will be required. One of these, the coastal signal system, was included in project 6 for Acajutla.

Additionally, all cargo handling at Cutuco is presently done manually. This means that containers, and even large crates, cannot be offloaded there. It is important that a plan be made to place a crane there that will handle such freight. At present prices, a medium load crane and its support equipment would cost about US$.8 million. Another half million would be required to reinforce the present structure to support the crane. Movable belts would add another US$ 200,000 to the cost. CEPA-FENADESAL does not see this as a high priority at the present time. It must, however, enter into the plans for the future.

3. Management of the Ports and Rehabilitation

The administrative and support functions of CEPA have already been described as of excellent capacity, but relatively expensive. Cutuco will remain in FENADESAL for the time being. It is more efficient to conduct the Port of Cutuco's affairs via the FENADESAL staff in that area.

With respect to the Port of Acajutla, the Port Commission has investigated alternatives for the equipment and the emergency generator at Acajutla. The responding firms gave the costs and the procedures that should be followed in determining the extent of the damage and possible solutions to rehabilitating the equipment. Similarly, CEPA obtained quotations on the required replacements and alternatives, thus providing concrete data on the needed investments. These are included in the project list below.

One other serious problem must be taken into account, that of the leaking roofs of the warehouses. Constructed many years ago of concrete, these are high arched structures in sections that join each other. The concrete, itself, has over time been eroded by the rains and the salt so that there is some filtration directly from the curved roofs. Second, as would be expected, the joints have suffered even greater erosion and corrosion, permitting the entrance of much water. Third, the joints come together over steel beams, which have also been corroded in many places. A cursory examination suggested that the beams had not yet been destroyed but destruction is in process. A detailed study of the damage was done in 1987 but the solutions are expensive. According to one of the Development Associates consultants, there are some probable less costly alternatives that should be explored, including a plastic skin over the outside of the roofs or a metal roof installed above them. He also suggested that the beams could probably be polished and strengthened after the outside problems have been resolved.

CEPA-Port of Acajutla has prepared a series of projects, with their priorities, that involve a great deal of data and cost breakdowns. Those projects are summarized herein, and their report with commplete quotations and details is being forwarded to USAID/IRD. A brief description of them with the overall costs follows (all costs in US$):

a. Port of Acajutla Repair/Rehabilitation

CEPA-Port of Acajutla prepared descriptions of the projects considered most important for the next two years. They obtained quotations on the major equipment and/or utilized prices they had obtained from other studies or appeals to SETEFE for financial assistance.

(1) Emergency Electricity Generating System US$1,000,000

The continuing damage to the electric and electronic systems must be stopped or the port machinery will soon be inoperative. Too, the delays incurred by ships and port operations are at times intolerable because of the lack of current. Some ships have already refused to wait for unloading/loading, proceeding elsewhere and causing much extra expense for the companies that were to send or receive shipments.

(2) Equipment Replacement/Repair 2,240,000

This project includes the replacement of equipment that cannot be repaired: cargo loaders, tractors, pickups. It also includes the purchase of spare parts to enable the repair of those disabled for lack of them. The project is for support equipment only.

(3) Technical Assistance, Redesign, Repair: Loading 1,200,000

This project requires technical assistance to work with the port personnel to redesign the loading areas, which would then be followed by repair and reorganization of the area, a crane, and the movable belts.

(4) Reconstruction/Repair of "A" Pier 10,000,000

This would necessarily involve nearly five years to effect. The technical assistance for the consultation and supervision would cost US$2 million of the listed amount.

The work involves the previously described damage to the access area and to the pier itself. It would rehabilitate or replace those cylinders that are failing and do preventive work on those remaining to avoid their failure. This, in the mind of the consultant, should be the top priority project since a tidal wave, or even a severe storm, could cause the pier to collapse, making a third of the cargo pier area unusable.

(5) Warehouse Roof Rehabilitation 600,000

The project, at this stage, would consist of placing a laminated metal roof above the existing one and would include the supports necessary to sustain the additional weight. The consultant suggests that the plastic skin be investigated before this construction, although because of availability of materials, the

metal roof may be the most practical solution under Salvadoran circumstances.

(6) Complete the Maritime Signal System 456,000

This is an important updating to the presently inadequate signal system and the project would benefit the Ports of Acajutla, El Triunfo (fishing, recreation), and Cutuco, giving ships adequate navigation warning and allow for the receipt of SOS and other signals from ships. The need for this modernization was highlighted in recent months with the loss of a US yacht and the disabling of a Costa Rican fishing boat, both of which occurred within signal range of Acajutla. There is no satisfactory system in place on the Pacific Coast of lower Mexico, Guatemala, El Salvador, Honduras, or Nicaragua. The system would also have an economic benefit since incoming vessels could give more advance notice of their arrivals.

(7) Purchase/Installation of Multipurpose Crane 9,400,000

Until such time as the new container pier can be constructed, the Port of Acajutla proposes to reinforce Pier "C" enough to allow the placement and operation there of an industrial crane that could both unload conventional general freight and containers. The present system of using the crane designated for grains, which occupies it a high proportion of the time, for containers is very inefficient. Almost always the container ships must wait a long time, causing extra costs which are passed on to the consumers, or they giv up and unload in Panama and the goods must be transhipped aft unloading. This measure not only increases the cost, but also puts the merchandise in danger of theft.

(8) Construction of a Container Terminal 11,400,000

This project is listed as a secondary priority and for some future investment. It would consist of the placement of piers and their supports, flooring, a container warehouse, and the purchase of the container crane and its support equipment. When constructed, the multipurpose crane proposed for Pier "C" would generally b freed for unloading other freight and greatly facilite freight movement. It would also be available when more than two container ships arrive at the same time.

Obviously, these projects would have to be done over many years, some immediately and others in progress but set for completion in the future, at least five years. This would also allow for better financing rates and multiple sources of funds for the separate projects.

The consultant is generally in agreement on the priority set by CEPA-Port of Acajutla. That is, these improvements that would bring immediate economic bernefits to the port and its customers are rated in the first priority group. He also points out, however, that some way should be found to install the coastal

signal system. The loss of lives so far in 1988 is at least seven for six months only. This small project, No. 6, should be brought to the attention of every possible donor in order to discover financing as soon as possible.

The consultant also wants to note that the present security system is inadequate. It consists of an outer perimeter of military, an unsatisfactory fence, and an inner perimeter of port police. Each shift of the police is comprised of 15 persons. That number cannot possibly guard the merchandise during unloading/loading and in the warehouse, plus guard the fence and the open beaches on either side of the port facilities. The port has been, so far, lucky on terrorism; it has not been so lucky on the theft of materials, tools, and merchandise. Port authorities have hired an expert in security and he will take charge soon. When a plan is developed for better security, it must be placed into effect. That system must include a better portable radio communications system; the one now under trial is not satisfactory for security or for intercommunications among the employees directing the operations work.

The Port of Acajutla projects presented herein include both those that would restore service that has had indirect damage from the violence and those that represent new but very important investment. The cargo handled at this port is already increasing, indeed, it is nearly reaching the prewar level. If the private sector is to progress appropriately, it is vital that this port be repaired and new investments be made to accommodate the rejuvenation of business, agriculture, and industry. Too many in the private sector depend on it.

b. Port of Cutuco Repair/Rehabilitation

The Port of Cutuco, as described previously, also requires some repairs to make up for the period when little could be done. Important in its own right as an import and export point, it also forms a crucial alternative should anything happen to Acajutla. In the past, security was questioned, even though no incidents occurred. There is no evidence that security will become more of a problem; indeed, it is probable that the threat will become less.

It is important, then, to protect the investment in that port with the rehabilitation that is required. Some weakening of the pier has occurred from lack of maintenance. That is the first priority for projects there.

(1) Repair/Rehabilitation of the Cutuco Pier 500,000

This task will involve the purchase of some pier materials, especially flooring and additional supports, and repair and maintenance equipment. Some pier supports require strengthening. Beyond these materials, labor will be the major cost.

(2) Purchase/Installation of Crane/Equipment 1,070,000

As this port regains its freight movement, and that is already beginning, an important future investment is the partial replacement of the present manual operation by a semi-mechanical one. A medium sized crane is needed, plus its support equipment and a movable beltway, to speed up the movement of merchandise. This will also entail strengthening the end of the pier so that it will sustain the weight of the crane.

D. Airports

Since the airports are managed by different agencies, and because none of the airports have suffered direct guerrilla damage, they will be dealt with as separate entities. This also simplifies the presentation of restoration and investment as their individual needs vary substantially.

1. El Salvador International Airport

The CEPA office for this facility has conducted exhaustive analyses of the problems and their possible solutions. In addition, the frequent inspections by the US FAA detail the needs according to their requirements. Currently the airport is on a conditional status with the FAA; and it is vital that the necessary improvements be made as soon as possible to avoid removal of the permission for US carriers to land at this facility.

A general history of passenger and cargo traffic from the International Airport was deemed unnecessary for this report since the conditions have varied so greatly during some years that the statistics are meaningless except as an expression of confidence (or lack of it) in the safety of the airport. The 1987 numbers, since they appear indicative for the present period, were:

Passengers: Entering = 180,469; leaving = 165,828

Additionally, 147,196 passengers entered the facilities in transit. Each of these numbers was said to be about 10% above those for 1986.

Cargo: Imports = 6,784,063 Kg; exports = 4,747,389 Kg

Imports were stated as an increase over 1986, perhaps 5%, but exports were about the same as the previous year.

Twenty airlines, including freight carriers, used the airport in 1987. This figure includes the domestic airlines that land there to make passenger connections with international flights.

The commercial traffic is led by TACA; PanAm is second, followed by Challenge and Eastern. Several US cargo carriers land as needed. Passenger traffic is dominated by US origin and

destination, 67%. Central American traffic makes up most of the rest.

It is crucial to understand that the airport suffers considerably from the threat of violence. Few planes overnight here. Most passenger service carriers will not take on food from this airport. Some airlines will not refuel here if they have enough to go elsewhere. Some lines have cut the number of flights to El Salvador and connecting flights must be arranged with other lines. All of this has had an adverse effect on the financial situation of this vital link to the other countries.

The indirect damages suffered by the airport stem from two sources:

- Machinery and equipment failure because of low voltage and electricity failures caused by damage to CEL by the rebels.

- Damage to the financial resources of the airport from the threat of violence, which in turn restricted airport improvement.

The combination of the two not only affect present operations, but also, in at least the medium term future adversely affects the economy of El Salvador.

The major categories of repairs (and some replacements) brought on by the voltage problems and by the budgetary limitations to effect adequate maintenance include the following with costs in US$:

AID furnished the airport with an emergency generator. It is helping a great deal but its output is insufficient to cover the power needs during outages and to reinforce low voltage.

(1) Supplementary Emergency Generator US$400,000

This would bring sufficient capacity to operate all systems. This, alone, would save many dollars worth of fresh fruit, shrimp, vegetables, and flowers lost each year in the cool and refrigeration rooms while waiting transit or pickup.

(2) Boarding Bridges Rehabilitation 40,000

This includes replacement of ruined parts and motors and their repair for proper functioning.

(3) Repairs to Baggage/Service Vehicles 33,115

This is entirely composed of parts for the repair of the several vehicles of service to the planes.

(4) Repairs to Generator Motor 9,750

This is an extra, small generator that could be placed into service for a part of the required system capacity.

(5) Repairs to Cargo Refrigeration 210,900

The costs of this project are high because the low voltage ruined two compressors and caused the need for excessive repairs to the others. Refrigeration losses are now huge.

(6) Mechanical Barrier (motorized) 21,000

This is a request for new equipment necessary for control of traffic.

(7) Restore Telephone System 36,000

The system has been severely damaged; temporary repairs have patched across parts of the system.

(8) Repair X-Ray, Other Vigilance Apparatus 41,240

These are indespensable to the security of passengers and planes; they were damaged by the low voltage. FAA considers the personal search substitute unacceptable.

(9) Repair/Replace Transceiver/Signal Generator 7,200

The tower system is malfunctioning, causing the need for relays and other unsatisfactory arrangements.

(10) Repairs/Replacements to Platform and Field Lights 28,570

Because of damages, the system has been patched and some parts are not functioning.

The total cost of these purchases and repairs is US$824,055. The estimates, when at all possible, were supported by actual quotations; the others were listed by catalog prices. It is expected that the work will be done by the airport personnel.

The examination of the management arrangement, including the support services by CEPA, showed no indication of weakness in the operation. As a generality, the study of the services revealed an acceptable (but needing improvement) level for those dealing with passengers (some of these were airline and government personnel, outside the control of the airport authority). Discussions with pilots emphasized that they have "no quarrel" with the management or the general services but that the government's inability to minimize the threat of violence and its inability to repair damaged equipment, cause them great concern.

## 2. Airports of Civil Aviation

It is important to distinguish between the two functions of the General Directorate for Civil Aviation:

Public: Supervision of the nation's airports, including those owned privately; inspection of all planes and airports; examination and licensing of pilots; control of civil aviation instruction.

Private: Operation of Ilopango and three other airports.

The Directorate is also charged with the general development of civil aviation services in the country in order to stimulate economic development and meet the air transport needs of the public.

This combination of functions complicates the operations of the agency, but at the same time it concentrates the many related activities into a single system. The functions are further complicated by the joint usage of Ilopango and the other airports by the military. The two coordinate their operations, but Civil Aviation has no say over military investment or movements.

Usage at Ilopango International Airport (so designated for small plane usage and as an alternative to El Salvador International Airport) is roughly 50% civilian. The records for the first part of 1988 illustrate this division:

Civil: landings = 5,629; takeoffs = 5,690

Military: landings = 4,986; takeoffs = 5,173

The military does provide some services, equipment, and repairs but only those that are exclusively for its use. It furnishes no assistance at the other national airports except security personnel.

No direct damage was inflicted by the guerrillas on the airports managed by Civil Aviation despite their control of areas surrounding some of them. Some private planes were destroyed or sabotaged but in every case, these were tied outside the airport areas.

The systems have, of course, suffered the same damages from the power outages, surges, and low voltage in electricity provided from CEL. Complex electronic equipment and electric machinery have been seriously hurt. And as with the other organizations primarily dependent on the government for funds and/or foreign currency exchange for the purchase of parts, Civil Aviation has been unable to carry out routine and special maintenance and repairs, to say nothing of replacing destroyed equipment.

Three private and DGCA civil airports, all with earthen strips, require restoration to ensure public safety and allow improved service to them. Those and the estimated costs (in US$) are listed by DGCA as:

| | | |
|---|---|---|
| (1) | Secondary Airport Restoration: | |
| | El Palmar | 20,000 |
| | Belen-La Union | 100,000 |
| | San Andres-La Libertad | 100,000 |
| (2) | Construction of Secondary Strips: | |
| | Chalatenango, Sensuntepeque, San Vicente | 1,200,000 |
| (3) | Rehabilitation of Ilopango: | |
| | Repaving of the landing field | 1,400,000 |
| | Rehabilitate field lights | 100,000 |
| | Improve the civil airport ramp | 100,000 |
| | Repair/replace control tower equipment | 20,000 |
| | Computerize air traffic, air information, meterological controls | 10,000 |
| | Purchase maintenance equipment | 200,000 |
| (4) | Improve instructional capacity of Aviation Club | 78,000 |
| (5) | Purchase navigation instruments for DGCA | 10,000 |
| (6) | Restoration work on the airports of Los Comandos, El Tamarindo, and Santa Ana | 90,000 |
| (7) | Purchase fire and rescue equipment | 200,000 |

The several fees finance only a small part of the operation of the Directorate; this is expected since so many of its functions are for the general public good and are not intended as revenue producing.

Civil Aviation did not list its projects in order of priority but the consultant urges immediate attention to (a) repair or rehabilitation of the airfield lights, (b) rehabilitation or replacement of the control tower electric and electronic equipment, (c) computerization of the information system, (d) purchase/repair the fire and rescue equipment, (e) buy navigation equipment for the two Civil Aviation planes, and (f) purchase maintenance equipment for the airport or designate some portion of that in the AID-MOP equipment for the airport use as needed.

The consultant was unable to inspect all of the airstrips suggested for rehabilitation; the one he did see merited at least some improvement. It would appear that at this stage of development and economic conditions, the construction of the three new fields should be placed as a future activity. It is also suggested that a dialogue be held with the military to

determine if more joint repair and maintenance could be effected at Ilopango. The repaving of the landing field, for example, might be jointly Ministry of Public Works and Ministry of Defense financed/conducted. Military use is equally deteriorating the runway, thus they should share in the betterment of it.

It is too early to comment on the new management arrangement with GDCA under the Ministry of Public Works. There is insufficient experience to determine its functioning. The small staff at the GDCA offices at Ilopango demonstrated their knowledge and dedication to their work. No special suggestions are made at this point.

E. Bus Transportation

Bus transportation in urban areas and among the departments is a private enterprise in El Salvador. The owners are organized in a cooperative, the Salvadoran Bus Enterprises Association that aids the owners through representation to the government and the financial institutions. The system is supervised by the Land Transportation Agency of the Ministry of Defense. There are about 1,600 units operating in the nation.

Government helps the enterprises by subsidizing their fuel, allowing 23 gallons per unit per day at the price of US$.30 per gallon (compared to US$1.05 cost to regular users). On the other hand, the government sets the fares: the price is US$.06 per person on the urban buses; interdepartmental fares are also low. Recently, microbuses have been allowed to charge US$0.20 in the urban area.

Used school buses are purchased for US$2,000 in the United States and driven to El Salvador. Here their engines are changed from gasoline to diesel, signs are installed, and painting is done as needed. The association estimated the usual cost for a road ready bus to be in the neighborhood of US$20,000 per unit.

The direct damage suffered by the urban buses has been the burning of a few, punctured tires, and others of relatively minor cost, though the loss from being out of service is an important item, especially for small fleet owners who cannot easily put substitute buses into service.

The association reported that interdepartmental buses, on the other hand, have had substantial direct damage. Since 1979, 886 units have been damaged or destroyed, with a value placed by the association at US$31.5 million. Repairable damage was set at US$3.3 million of that.

The association also pointed out that the transportation stopages have also had a negative economic effect; it estimated the loss of revenues at US$22.7 million for the 343 days when the threat of violence to the system caused a shutdown. This indirect damage cost is a substantial drain on the bus owners. Interest (18%) continues, adding to the losses.

Since each owner manages his own buses, no conclusion was attempted on the management of the enterprises. The bus owners association appeared to be knowledgeable about the problems and produced the statistics. Its officers stated that the owners feel that the system should be declared a "public service," which would qualify them for assistance of various kinds. They are particularly interested in a subsidized interest rate (they now pay 18% for capital and operating funds). There was a view expressed that "the system is in shambles," since they have little protection and few benefits from providing the services.

The consultants found it difficult to formulate concrete recomendations about the bus system. It obviously does provide a public service, but still it is apparently profit making or the owners would not continue in business. It would be nearly impossible for the military to provide sufficient security to affect the damages suffered. It is suggested that this part of the transportation system be included in the overall, detailed transport study of the country. From that study, it may be clear what, if anything, should be done for these owners other than what is being done now.

The specific suggestions for the inclusion of bus transportation in the study are:

- Cost of operation of the buses must be calculated; audited accounts or volunteer accounting inspections will be required.

- Total value of the subsidy on fuel must be included.

- Appropriate fares, with and without the subsidy, must be determined from the above.

In addition, the possibility of making insurance available for the busses, including the rates, should be investigated.

F. Transportation of Freight by Truck

One hundred owners of freight trucks organized themselves into a cooperative, ACOSETCA, in July 1986. There are now 200 members. The multiple service organization has a savings fund and will later offer credit from it. It also buys materials, furniture, and consumer goods for the benefit of the members. It intervenes with government agencies and financial institutions to help the truckers obtain assistance.

Financial assistance has primarily come from the companies that supply their needs. Bank loans have also been obtained, generally at 21%. The association appealed to the Ministry of Planning, Coordination, and Economic and Social Development for assistance due to truck damage because of the rebels. The Ministry did a brief study and recommended that the Central Reserve Bank set up a fund in FIGAPE, Fund for Investment and Guarantees for Small Businesses, to help truck owners finance

replacements and repairs. ACOSETCA proposed that it be given a 40 year loan with a 10 year grace period in order to then serve the needs of the truckers. The proposal has not yet been funded.

ACOSETCA provided information on both direct and indirect damage to the freight trucks. The data on direct damages to the equipment, global for 1982-June 1988, consist of:

| | |
|---|---|
| Trucks destroyed | Value US$1,080,000 |
| Repairable damage | 640,000 |

The association did not provide individual details of the date and location of damage but by the year, their numbers were (destroyed, damaged): 1982 (15, 30); 1983 (12, 35); 1984 (0, 2); 1985 (3, 10); 1986 (0, 4); 1987 (4, 5); 1988 (8, 12) for a total of 42 destroyed and 98 with repairable damage.

Apparently the value of the cargo was included in the destroyed group since the figure is greater than for the trucks alone.

ACOSETCA also considered the damage to trucks caused by bad road conditions to be an indirect cost of doing business during the period. Their report placed a cost of those repairs at US$170,000. it also reported 329 days of work stoppage during those years and set the lost income at US$740,250. Driver salaries during stoppages totalled US$16,450.

As with the buses, it is difficult to determine the total impact of the direct and indirect losses. The price is high. The truckers must be included in the overall transportation study and the data required to make concrete judgments are:

- Costs of operation (including depreciation, interest)
- Income from the business
- Profit as a total and as a percentage of investment

As with the bus owners, an investigation into providing a reasonably priced insurance policy appears warranted.

## G. Conclusions and Recommendations

The study of freight and passenger transportation revealed many problems caused directly by the violence. Too, indirect damage resulted from violence induced failures in other institutions and when budgetary limitations did not allow repairs and replacements. The Salvadoran Government has an enormous problem in that the damages are great and the resources few. The study showed that some vital services are inadequately funded and some are in danger of being lost. At least some priority items are not being budgeted. This leads to two general recommendations on the transportation of passengers and freight.

Conslusion: System Concers

The system of transportation is complex, involving many public, quasi-governmental, and private institutions. Two transportation studies were found but neither addressed all of the concerns for GOES nor for donors helping the country.

Recommendations:

A national study of the transportation system should be conducted and it must include all of the institutions, the cost for services rendered, the cost of substituting for a lost service, costs of remaining repairs and replacements, and project the improved services if these investments were made.

When the study is complete, the Government of El Salvador should set priorities for investment in repairs, replacements and maintenance, and new investments. These are needed to effect an efficient transportation system and to allocate its budget to accomplish its priorities.

Conclusions: Infrastructure Supporting the Economic Base

One of the major goals of the country is that of stablizing the economy. Much of the growth of business, industry, and agriculture depends on resources from the public services and transportation is one of the most crucial. Certain portions of the transportation services are functioning poorly and some are in danger of still further deterioration from unrepaired direct and indirect insurgency damage.

Recommendations

The access pier at the Port of Acajutla must be rehabilitated beginning immediately; if it collapses, the functioning of the port will be seriously impaired.

A system of voltage regulators must be installed at the CEL installation near or directly within the Port of Acajutla to protect the remaining equipment from further surge and low voltage damage; the equipment is already damaged and further problems will impede port functions.

- The Port of Acajutla should be furnished with an emergency generator that would allow it to function during power outages and while the CEL generators are being brought up to full power.

The electric/electronic control panel and some pieces of the equipment must be repaired or rebuilt; they are functioning slowly and sporadically, seriously delaying loading/unloading and raising the price of goods to the consumers.

The railway should receive two new locomotives and the parts

to restore four others as soon as possible; this will allow that system to increase the tonnage hauled of cement and fertilizers, particularly, and freight in general.

The parts and equipment necessary to rehabilitate the Civil Aviation traffic control tower to proper operation should be provided as soon as possible. The computer system to improve its efficiency should be installed. The heavy civilian traffic there cannot be reasonably shunted elsewhere.

An emergency generator should be provided at Ilopango to assure services to civilian passengers.

The El Salvador International Airport, to perform its economic functions properly, should be placed on a high priority list for acquisition/rehabilitation of the following:

- add another emergency generator;
- repair the control tower instruments;
- repair the cool rooms and refrigeration for air cargo

The airport is in danger of losing the landing permits for US carriers because the security X-ray machines and surveilance systems are damaged. That loss would be a serious economic blow.

Three of the civilian airports managed by the DGCA (Santa Ana, El Tamarindo, Los Comandos) urgently require some inexpensive rehabilitation; that should be funded since they are important to the movement of businessmen and industrialists to those areas.

The pier at the Port of Cutuco should be strengthened to allow this important secondary port to function satisfactorily.

The railway should be furnished funds to make the repairs necessary to rolling stock; rehabilitation of some passenger cars will be required as that service is restored.

The acquisition/rehabilitation of the railroad support equipment will allow FENADESAL to continue its increase in freight transport.

Support equipment must be rehabilitated at the Port of Acajutla, Ilopango Airport, and El Salvador International Airport for their services to the private sector.

<u>Conclusion:</u> <u>Safety and Security</u>

Although these recommendations impact on economic recovery, they

also are required to protect human life and property. Improperly functioning equipment or the lack of it is a direct danger at the present time.

Recommendations

The FAA considers the present personal search of persons at El Salvador International Airport to be unsatisfactory and must be replaced by the installation of sufficient emergency generation capacity and the repair of the X-ray apparatus to protect passengers and airline personnel.

The previously noted control towers at International and Ilopango must be rehabilitated to protect life and planes.

Ilopango Airport has nearly no fire and rescue equipment and that must be remedied.

The communications systems at International and Ilopango are malfunctioning and must be repaired in order to assure security of persons and property.

The emergency receptors and communications equipment needed at the Port of Acajutla are vital to search and rescue operations all along the Pacific Coast.

Conclusions: Restoration of Transportation Services

Although the repair of damage caused by the continuing violence will be needed for some time, it is vital that plans be made, funded, and carried out to effect restoration of the transportation services in the future.

Recommendations:

The most immediate requirement is for funded maintenance, to assure that the present deterioration does not continue, placing all of the services in a malfunction condition.

As security improves, a step by step plan for the improvement and restoration of the services must be effected to assure their proper operation and the appropriate contribution to the national economy.

The extension of transportation services through new investments, although destined for the future, must be rationally planned with their accompanying financial arrangements.

Much of the transportation system has been intensively attacked by the insurgents; much of the rest of it has suffered from indirect damage occasioned by the failures in power and from the diversion of repair/maintenance funds. The economic recovery of El Salvador cannot progress to its fullest potential unless these services receive short, medium, and long term attention.

## CHAPTER VIII. FINANCIAL ANALYSES AND ECONOMIC IMPLICATIONS

The total population of El Salvador was calculated at about 4,934,000 for 1987. Urban residents made up 40% of that number. Just over 25.6% (1.1 million) of the total resided in the Department of San Salvador; the Departments of Santa Ana and San Miguel followed, each with fewer than 460,000 people each. The San Salvador population grew nearly 15% from 1983 to 1987 while that of the next two departments grew only about 5%. In 1983 and 1984, the population growth was less than 1% (many were still leaving the country), but it then increased over the next three years to 1.8% growth in 1987. (Economic Indicators 1983-1987 from Central Reserve Bank of El Salvador.)

### A. Economic Indicators

El Salvador suffered some heavy economic losses during the early years of the insurgency, not only from the losses incurred from the direct and indirect damages to infrastructure, but also the effects on the economic behavior of many productive sectors. The violence was not the only factor in economic variations. Production dropped for some agricultural commodities in part due to prices. Some parts of agriculture and light manufacturing declined in production due to increased costs in relation to revenues. Flight of capital and trained personnel harmed many economic sectors in the early period, but some of that has been remedied.

In its report covering 1979-1985, Development Associates calculated a loss of 11.8% in real gross domestic product for the period. Beginning in 1983, the Central Reserve Bank of El Salvador (BCR) shows annual growth from that year through 1987, amounting to just over 7% for the five years (using constant 1970 prices). The bank's calculations, in millions of US dollars:

| | | |
|---|---|---|
| 1983 | 1148.1 | na |
| 1984 | 1174.2 | 2.2% |
| 1985 | 1197.5 | 2.0% |
| 1986 | 1205.0 | 0.6% |
| 1987 | 1236.9 | 2.6% |

These calculations, of course, do not take into consideration "where El Salvador would have been without the war." Instead, they simply accept the reality of war and show how the economy is performing during this part of the insurgency.

Still another encouraging indicator is that of the formation of fixed capital. The BCR's 1983 figure was US$125.4 million; that had grown to US$164.4 for 1987, an increase of nearly 24%.

Two other encouraging indicators are that per capita income has increased over the period and while per capita consumption climbed upward, it remains below income (although it is growing at a faster rate).

Several of the chapters on services concluded that some infrastructure restoration and construction is needed because of the economic bases it supports. To set the stage for some of the discussion in the economic implications section of the present chapter, Table VIII.1 lists the Central Reserve Bank (BCR) gross internal product figures for a five year period (1983-1985 to show the trend). While their performance varied within the five years, most registered overall growth.

TABLE VIII.1: GROSS INTERNAL PRODUCT FOR SELECTED SECTORS: 1983-1987 (IN US$ MILLIONS)

| Sector | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|
| Agriculture | 290.7 | 300.4 | 297.1 | 287.9 | 295.1 |
| Mining and Quarries | 1.5 | 1.5 | 1.5 | 1.5 | 1.6 |
| Industrial Manufacturing | 196.2 | 198.8 | 206.2 | 211.3 | 217.6 |
| Public & Private Construction | 36.9 | 34.8 | 36.4 | 37.3 | 42.6 |
| Electricity, Water, Sewers | 41.9 | 43.0 | 45.2 | 46.3 | 47.2 |
| Transport, Storage, Communic. | 68.4 | 70.2 | 71.5 | 71.9 | 73.2 |
| Commerce | 191.2 | 194.8 | 195.8 | 196.4 | 200.5 |
| Housing | 56.0 | 56.9 | 57.8 | 57.9 | 58.8 |

Source: Central Reserve Bank of El Salvador, June 1988

It is important to note that all of the indicators have grown, although not at the same rate, and have done so with intense attacks on public services. Had those services not been repaired sufficiently to function, as will be discussed in more detail later, that could not have occurred. As the introduction pointed out, more of the nation is relatively secure and that factor has helped spur improvement in the economy. It must also be noted that government services grew faster than any of the other sectors, increasing by 15%. A part of that increase is directly due to the insurgency and an increment in services to the population; some portion, however, may represent a drain on private sector development.

Foreign commerce, although encouraging during some years, has not been able to maintain positive trends. Table VIII.2 gives the overall trade numbers. Exports went down (except for the banner 1986 year) and imports have moved upward, but with substantial variations.

TABLE VIII.2: EXPORTS AND IMPORTS FROM 1983 THROUGH 1987 (IN US$ MILLIONS)

| Trade | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|
| Exports FOB | 758 | 726 | 695 | 755 | 573 |
| Imports CIF | 893 | 977 | 961 | 935 | 975 |

Source: Central Reserve Bank, June 1988

Four of the listed exports declined overall across the period although some performed better in 1986 than before or after: coffee, cotton, sugar, and "others." Only shrimp ended at a higher shipped value than it began; the 1987 figure, however, was equalled in 1984.

There were some encouraging signs among the imports. Imported capital goods increased dramatically while consumer products declined by a small percentage. Petroleum varied a great deal but the net result was downward, while other intermediate goods rose.

When reviewing these economic indicators, it must be borne in mind that a devastating earthquake occurred in 1986. Some of the sectors were affected severely while others, because of their nature or their distance from the central damage, suffered little. Much of the reconstruction was funded via grants and thus had only small effects on debt service and other costs. The earthquake was a factor, however, and produced some negative effects on the economy.

The devaluation in January 1986 (from 2.5 to 5 Colones per US$) had differential effects on the public services; some suffered and others gained. The effect depended primarily on the ability to adjust costs and fees during the transition period.

Total Salvadoran debt was reported by the BCR to have risen through 1985 and then declined, almost to where it began. Most of this decrease was due to reductions in the private and banking sectors. Public sector debt grew every year and recorded an overall increase of 24%.

## B. Financial Perspectives

The assessment team inquired into four aspects of the financial status of the several institutions providing public services:

- Apparent capability of the institution to manage its resources;
- Prospects for the accomplishment of the goals of repair,

maintenance, and new infrastructure from the earned revenues, government subventions, loans, and grants;

- Probable capability to extend the services to more clients while meeting recurring costs;

- Relative cost effectiveness of the damage repairs and in so far as possible, of certain components of reconstruction.

Obviously, there were severe limitations to the achievement of these objectives. The team necessarily based its inquiries on secondary data sources, as directed by the contract, and on tentative assessments about management capacity and future developments, not only within each institution but also on the likelihood and severity of continuing violence. The reviews expressed herein must therefore be considered as provisional until such time as more indepth audits and and management studies can be conducted. They do furnish an interim framework within which to design the research and financiacial/management studies as needed for future action.

The financial information presented in this section was derived from the latest audit reports of the institutions and the April 26, 1988 cable of the American Embassy El Salvador, summarizing the conditions of the state enterprises. The updating from the final reports of the agencies only marginally changed some of the Embassy figures.

1. Electricity: CEL

CEL, the nation's electric utility, currently serves 432,871 residences (9.5% rise from 1985), 48,540 commercial establishments (+6.5%), and 5,447 industrial plants (+5.6%). Government users and public lighting, combined, have decreased by 3.6% during the period.

It is important to emphasize that four major situations affected the CEL financial accounts: terrorism, devaluation, two dry years (causing increased use of costly fuels), and the 1986 earthquake. CEL installations, especially high tension line towers and substations, remained the primary target of the guerrillas during the period - indeed, that agency and the railway are the only ones that have felt an increase of attacks during late 1987 and early 1988. The cost of the temporary repairs is extraordinarily high for the electric utility, and even with assistance from AID, is a serious drain on its finances. Devaluation compounded CEL finance problems by raising its debt service while rate increases were insufficient to cover the additional costs.

The assets of the utility were calculated at US$ 500 million at the end of 1987. It employs 2,804 persons throughout its operations, a number that could be reduced were it not for the damage repairs.

The overall picture of CEL's financial status is shown in Table VIII.3. The increase in electricity sales over the three years amounts to 24%, a surprising proportion considering all of its problems. Petroleum costs and damage repair, on the other hand, have raised the costs so that CEL had a negative current account balance in both 1986 and 1987.

TABLE VIII.3: CEL CURRENT ACCOUNT STATUS: 1985-1987
(IN US$ MILLIONS)

| Credits | 1985 | 1986 | 1987 | Debits | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| Electricity Sales | 85.7 | 44.5 | 53.6 | Operations | 41.0 | 27.3 | 35.1 |
| Petroleum Sales | .2 | 5.6 | 4.6 | Depreciation | 16.3 | 12.0 | 12.2 |
| Other | 10.7 | 10.9 | 2.2 | Other | 26.5 | 30.2 | 19.3 |
| Total | 96.7 | 61.0 | 60.4 | Total | 83.8 | 69.5 | 66.6 |
| Total Net | 12.9 | -8.5 | -6.2 | | | | |

Source: CEL audited accounts

The first six months of 1988, with stepped up violence and the probability of more during the rest of the year and the 1989 presidential campaign, are not likely to show a favorable balance for this year either. Damage repair and higher fuel costs simply are too great for the utility to show a profit margin.

In terms of cost effectiveness, however, the utility must be credited with maintaining service to most of the industries and businesses during most of the time. While no definitive study has been done on their losses during power outages, it is obvious from the aforementioned income surges of these two, especially when factored with the construction and service agencies, all of which are necessary, that the repairs to CEL are cost effective. That is to say, had CEL collapsed, and that would have happened without the repairs and other emergency assistance, the progress would have been slim indeed. One example alone is sufficient to provide the evidence: industrial output grew more than 11 million dollars between 1986 and 1987; that more than covers the 6.6 million dollar loss of CEL.

The consultants found no indication of weaknesses in CEL's management. The agency had kept careful records and accounts, its ratio of personnel to service is about average, and, had it not been responsive, the almost constant damage could not have been effectively repaired. Too, there was no direct evidence that the CEL management operates with a "violence" mentality as appeared to be the case in some other utilities. With any movement toward greater security, CEL is expected to regain its

positive financial position and continue to add to its service clientele.

There is, of course, a substantial social benefit to the extension of electricity to the villages. While the calculation would be purely theoretical, its effects on the USAID goal of spreading the benefits of development should be noted.

2. Water and Sewers: ANDA

The National Administration for Water and Sewers, ANDA, is a government entity. As such, it is charged with both the financial and social responsibilities for these services. The final accounts for 1987 have not yet been published so this section of the chapter is based solely on 198 information.

The 1986 financial report showed the following results:

| | | |
|---|---|---|
| Total sales | US$14.7 million | |
| Discounts on sales | 7.3 | Net US$ 7.4 million |
| Operations expenses | 20.7 | |
| Finance costs | 2.0 | Total 22.7 |
| Overall loss | | 15.3 |

Source: ANDA Memoria, 1986

ANDA had 3,550 employees, in 1986. Those served 2.1 million persons, for an average of 596 per employee, considerably lower than the approximate 1,000 expected from such services. The utility has averaged about 14,500 new connections for each of the past two years, for an average increase per year of 0.7%.

The GOES provided a subsidy of about 3.2 million dollars and AID donated US$4.1 million.

ANDA has had no serious violence damage during this period although it formerly did. It has suffered a considerable loss from ruined electrical equipment due to both surges and low voltage of the current furnished by CEL. The utility has been able to repair and replace some of this lost equipment, for the most part, and has little carryover expense from that quarter.

The consultants and several government sources express some concern for the operation and management efficiency of the utility. Some maintenance appears to have been unnecessarily deferred. Records and accounts are in arrears (ANDA was the only agency that did not provide complete 1987 data). There is also a huge uncollected debt owed ANDA by many clients over a period of

years. No direct evidence of efforts to collect this was seen and, indeed, there seemed to be little concern about it.

The utility, of course, does perform social purposes and a portion of the uncollected water charges can be attributed to that. As with most water agencies, there is the need to subsidize rural water installations, at least at the beginning stages, (although eventually the subsidy should be eliminated). Since there are few meters in small towns and villages, it is difficult to see how that initial cost could be recuperated. It appears that the subsidy continues long after installation.

The GOES subsidy and the AID donation, when seen as a part of the 1986 accounts, serve to "soften" the eventual blow of the recurrent costs. Should the economy totally recover, whether the Government of El Salvador can and chooses to subsidize water and sewers to such an extent, remains to be seen. The consultants, however, register their concerns about these costs and the ability of the nation to pay them in the future.

3. Telecommunications: ANTEL

ANTEL continues to suffer violence damage, especially to its switching centers, but the amount has lessened somewhat from other years. It also experiences indirect damage to its equipment when the current fails, surges, and the voltage drops. Its progress is also deterred from lack of access to foreign exchange even though it generates a great deal.

The utility had more than 111,000 telephone customers by mid 1987, just over 1,000 telex connections, telegraph services all over the nation, and provides some other special telecommunications services. In addition, it owns and operates a hospital for its employees and their families. It receives interest from its bank accounts and from bonds in its portfolio. Its total assets were reported as in excess of US$210 million.

Table VIII.4 displays the operations income and costs (including the hospital); the taxes begun by GOES in 1986, are noted as a part of the operations expense. (Note that the figures given here are extracts from the ANTEL records since they do not take into account donations and some movements of capital assets among the accounts.) One of the obvious points from the table is that ANTEL, as did most of the other services, realized lowered income when the service charges to users were adjusted after the 1986 devaluation.

One of the important results of the utility's operations is that it was able to make contributions to its working capital every year because it had an operations surplus. This was true even though the hospital operated at a loss as a service to its personnel. These surplusses plus the donations made it possible for ANTEL to increase its service to clients despite violence, the earthquake, devaluation, and equipment losses due to CEL power problems. It is an unusual status and the progress is a

TABLE VIII.4: ANTEL ACCOUNTS STATUS FOR 1985-1987
(IN US$ MILLIONS)

| Income | 1985 | 1986 | 1987 | Expense | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| Telecom. | 77.5 | 64.5 | 74.4 | Telecom. | 52.7 | 38.7 | 43.2 |
| Interest | 5.6 | 5.9 | 7.7 | Debt service | .6 | 1.8 | 1.8 |
| Hospital | .5 | .3 | .3 | Hospital | 2.6 | 1.4 | 1.8 |
| Other | .5 | .4 | 2.2 | Tax | 0 | 8.1 | 8.5 |
| Total | 84.1 | 71.1 | 84.6 | Total | 55.9 | 50.0 | 55.3 |
| Total Net | 28.2 | 21.1 | 29.3 | | | | |

Source: ANTEL audited accounts

Note: Other includes property incomes but excludes donations.

credit to the vigorous activities of the personnel in repair and construction, in pursuit of new customers, and a windfall from the increased international telecommunications traffic occasioned by the war and the earthquake.

Relating communications to economic growth is tenuous at best even though it is obvious that many kinds of enterprises depend heavily on them for efficient operation. In the ANTEL case, since it operated with a surplus, there is no doubt about its effectiveness. Exporters and importers depend upon up to date information about prices and in buying/selling. The substantial air traffic between the United States and El Salvador demands effective communications for aeronautical information, connections, and reservations. Intragovernmental negotiations would often be ineffective without rapid communications, i.e., the earthquake information and the swift responses to it.

The benefits, as appear in the latter example, extend beyond the economy. Emergency relief, health arrangements, and pure social discourse are facilitated through the ANTEL system.

4. Roads and Highways: MOP

The Ministry of Public Works had 17,675 employees in its several agencies that directly or indirectly support the work on roads, highways, and bridges. The nation, by the end of 1987, had approximately 12,500 kilometers of roads, of which about 100 kilometers were constructed in 1986 and 1987.

MOP utilized US$52.6 million in 1986 and US$57.3 in 1987. It realized some revenues from tolls and services, but these were insignificant within the overall budget even though useful to

certain departments. In both these years, the ministry still was repairing roads directly and indirectly damaged from the insurgency; it had been unable to work on some of these until security was such that entry could be gained.

When all road services are combined (construction, repair, restoration, maintenance), the 1987 MOP funds would represent about US$4,584 per kilometer of roads, highways, and bridges. The total personnel, divided by the number of kilometers of roads, gives 1.4 employee per kilometer. Sabotage damage, of course, raises the personnel requirements. On the other hand, the relation among the classes of roads and those roads that received little or no work, suggest some inefficiencies.

The problem of recurring costs for roads and highways has been raised in several instances. The consultant engineers calculate, for example, an annual minimum maintenance budget of about US$40 million; had that been done, and much of it was not, maintenance alone would represent nearly 70% of the MOP costs. The USAID/MOP machinery and equipment program, AME, is a strong move toward keeping the equipment functioning so that the maintenance can be done. The ability of the government to meet even the recurring maintenance costs is doubtful, but further study is required to provide the answer.

Cost effectiveness for the road program, as already noted, is in question. The present costs are very high.

The benefits, which have not been calculated, can be ascribed at least in qualitative terms. One vital benefit is the use of the roads and highways in the government's efforts to bring peace to the nation. A simple look at the places where the rebels presently are shows that when reasonable roads do not exist, the military has not been able to root them out. A great deal of literature exists on the benefits of rural access and farm to market roads on agriculture. These allow more and less costly inputs to the farms, and less expensive transportation of the products out to the markets. Health, education, and political stability are favored when residents can quickly communicate with service centers.

5. Transportation: CEPA

The Autonomous Executive Port Commission, as described in Chapter VII, administers three parts of the transportation system: the Port of Acajutla, El Salvador International Airport, and the National Railways of El Salvador (which includes the Port of Cutuco). The accounting is done separately for each division (including proportional costs of the CEPA management), and the Port of Cutuco.

The services of the several divisions have been detailed in their respective sections of the transportation chapter. They are not reiterated herein except to emphasize that all three increased

TABLE VIII.5: SUMMARY OF FINANCIAL STATUS FOR CEPA AND ITS DEPENDENDIES: 1987 (IN US$ MILLIONS)

| Concept | Acajutla | Airport | Railway | Cutuco |
|---|---|---|---|---|
| Income | 10.2 | 4.9 | 1.9 | .3 |
| Operations costs | 9.4 | 3.5 | 5.4 | .7 |
| Operations balance | + .8 | +1.4 | -3.5 | -.4 |
| Other costs** | 1.0 | 4.9 | .3 | .1 |
| Final balance | - .2 | -3.5 | -3.8 | -.5 |

* Costs not ascribable to the divisions.

** Proportion of CEPA administration, accumulated loss or surplus, and financing costs.

Source: CEPA audited accounts, 1987

their revenue bearing operations from 1985 through 1987: freight, passengers, and other services.

The cost of running the central offices of CEPA, as noted earlier, are proportioned to the divisions. Its own accounts balanced for the year.

The total of the losses for all the divisions was US$8 millions. The operational losses, however, were US$1.7; most of this from the railway. The Port of Acajutla and the El Salvador International Airport showed positive results from the operations.

The tonnage handled by the Port of Acajutla has risen each of the last three years. The overall loss was due to:

- The tonnage, and thus the service fees, have not yet risen enough to cover the finance, CEPA administrative portion, and the high cost of repairing and/or circumventing the indirect damages caused by the electrical failures and the access pier problem.

El Salvador International Airport El Salvador was born in the early stages of the war and it suffered problems of operation from the beginning. Its overall loss stems from:

- Low number of flights and carriers not overnighting.

- Excessive indirect damage due to electrical failures, with repairs and substitute arrangements very expensive.

- Its finance charges are more than one million dollars per year.

The national railway has received, in proportion to its fixed assets, more direct damage than any other utility in the nation. When indirect damages are added, the total is devasting to a relatively small utility. Its financial difficulties arise through:

- Extremely high repair costs.

- Expensive security arrangements for the locomotives and the rolling stock.

- Inability to haul more freight because its destroyed equipment has not been replaced.

- Disproportionately high administrative charges from CEPA in relation to its income.

The Port of Cutuco has, in general, suffered more from the reduced freight movement there than from any other cause. With approximately the same facilities and staff, it could handle enough to at least break even should the tonnage continue to increase as it has the last two years.

As a principal part of this review, it is vital to state from the start that:

> <u>These transportation enterprises are indespensable to the economy of El Salvador because they provide basic services to the productive private sector economy</u>

The total loss for 1987, about US$ 0 millions, is insignificant in relation to the services they provide to agriculture, industry, commerce -- to say nothing of the elevated costs that would have accrued had the enterprises not been functioning.

The cost effectiveness of the repairs and replacements made to these public service entities is high. First, very little was done for them so they could operate more efficiently. Thus "service minus cost" results in a very positive position for them. Of course, this continued neglect will eventually have a very harmful effect. Indeed, if the Port of Acajutla is allowed to collapse, as it is in danger of doing, the cost to the private sector economy will not only be enormous in terms of finding alternate transportation (every alternative is at least double the cost and some will be five times) will cause some enterprises to lose their cost-price advantage, putting them out of business, reducing gross domestic product, and sharply elevating unemployment.

The El Salvador International Airport must operate. The alternate airport, Ilopango, cannot handle the large planes nor is it in a position to furnish the services required. Some organization must keep the international airport going. Unfortunately, the repairs and replacements necessary to make it more attractive to carriers are not being made. As pointed out in an earlier discussion, the airport is in danger of losing its US carriers because of failure to meet FAA requirements.

Some observers point to the railway as "obsolete" and with little hope of performing its previous services in the future. The railroad has demonstrated its ability to perform under extremely difficult conditions - violence damage and lack of repair/replacement - and increase its services and earnings. The cement, fertilizer, and agricultural product sectors prefer this mode of transportation. The present fees are too low, averaging about half the price of ton per kilometer by trucks. And the railway is not tearing the roads up with overloads. Serious consideration must be given in the recommended transportation study to determining the probable scope of the railway's future business and then deciding rationally on its destiny.

The Port of Cutuco, though much less active than Acajutla, stands as an alternate port; that function, alone, is sufficient to merit some investment. Its increases in tonnage during the last three years, while starting from a very low ebb, are encouraging. The investment needed to make the port even more attractive for shipping is small and with any recuperation of the economy in that part of the country, can pay for itself in a short time.

6. Ilopango Airport: Civil Aviation

Domestic flights, the major civilian traffic in Ilopango, are still very restricted in comparison to the probable passenger travel in more tranquil times. Industrial and commercial development is concentrated in San Salvador rather than spread out to the other departments. The present social costs, alone, of providing sufficient services to the capital are staggering. A rational development plan for a small country would move more to the other cities and traffic to and from them would increase.

7. Bus and Truck Transportation

There is no doubt about the necessity of keeping these two transportation services operating efficiently. Too, their cost to the government for subsidies for them is not high. Their services, while by no means satisfactory at this point in time, function. Both have suffered direct and indirect damages due to the violence. Since some of the owners are small businessmen, some of the losses have been financial disasters for them.

The consultants did not have access to the financial records of the many enterprises and thus are unable to make statements about cost effectiveness. Their associations feel that since these [illegible] perform public services, they should be classed as such and

receive more assistance from the GOES. As noted in the sections on them, they should be included in the transportation study, especially to determine if the subsidies to them in comparison to subsidized passenger and freight transportation, and the railroad is the viable solution. To conclude, the bus and truck companies continue in business despite the problems they face and it is assumed that they do so with at least enough profit to stimulate continuance. They would not appear to merit some unusual government or donor expenditures from the cursory examination of these sectors.

## C. Economic and Socio-Political Benefits

Although mostly in reiteration, a summary examination of the benefits from the economic considerations of the public services is useful in the conclusion of this report. Some of the benefits are so obvious that they demand little discussion. Others, while important, require some attention to the efficiency of their operations.

### 1. Economics and Efficiency

Economics, the first benefit, was treated in various ways within the financial section although the benefits were not quantified. Many of these were emphasized and some comparative information was given to highlight both the benefits from their present operation and the enormous harm that would come should they be allowed to collapse. The investment made so far in the private sector would not have been successful except for the emergency repairs to CEL. That utility is indispensable, not only to maintenance of the achieved progress but also to its growth. In the same vein, the two ports, the airports, and the railway directly serve the private sector: commerce, industry, and agriculture. The entrepreneurial community states that it cannot conceive continued operations without them. Bus and truck transport enjoy that same positive opinion. Equally positive, and in need of little or no government expenditures, are the telecommunications services. Despite all of its problems with violence, ANTEL has been able to increase services and to do almost all of it without posing a drain on the economy.

Roads and highways play a vital part in some aspects of the economy; there is no doubt about that. There are questions about the relative economic benefits from the vast investment made in MOP during the last several years - not about the work of keeping the roads and bridges open - but about the relative cost of the entire operation. And these questions become particularly sharp when the deterioration of many roads continues because of insufficient or inadequate maintenance. This sector has a definite economic benefit; inquiries into its operations must be made as plans progress for the future.

Water and sewers do have some utility to business and industry. That part of the operation, however, is relatively small in comparison to the social benefits: convenience and health. Some

questions have been posed about the efficiency of ANDA and even about its effectiveness in providing the services. The services are needed - but can efficiency of operation be effected?

2. Socio-Political Considerations

Neither of these factors, together nor separately, was demanded from the present study. It is impossible, however, to delve exclusively into the financial and economic aspects without taking the socio-political situation into account.

A prime consideration in this portion of the discussion is security. No one doubts that security is required. Nor is it doubted that in some ways, all of the public services now make some contribution to security and eventually will make more. Too, the public services have benefitted from the improved security and will reap even more benefits as security improves still further. Security, then, is crucial to all considerations of benefits: economic, social, or political.

There is also little or no doubt that an improved economy will have substantial social benefits. GOES and USAID have recognized this in their programs and were very specific in announcing a goal of "spreading the benefits of development to the entire population." Thus it is that any economic benefits caused or fostered by the public services will in turn better the lot of the vast majority of the population, the poor.

While not stated nearly so directly, it is obvious from many of the investments that improving the standard of living of the population through lights, water, sanitary services, roads, and transportation is seen as an important social benefit. And as that social benefit finds acceptance, it helps foster political stability. It is not the function of this report to delve definitively into the quantitative possibilities of this factor. Nor is there really any need. The vast inadequately served portion of the population knows about these services and expects that they will be provided, at least sometime in the future. In the case of access road maintenance and potable water, the demand is for much better service now.

There could also be negative aspects of the provision of the public services if that is done at the expense of the economy or if, in the future, the services could not be supported. A careful investigation into the ability of the economy to support continued investment, to pay recurring costs, and to thus stabilize the socio-political situation is demanded.

## IX. SUMMARY: CONCLUSIONS AND RECOMMENDATIONS

### A. General

#### 1. Conclusion

The public service agencies have suffered losses due to guerrilla activity. The losses can be classified as follows:

a. Direct damage, directly attributed to repair of damage inflicted by overt attack, and includes replacement or reconstruction of facilities damaged by overt attack.

b. Loss of income, or revenue, by the revenue producing utilities because facilities are out of service due to attack, or due to the general decrease in economic activity caused by guerrilla action.

c. Indirect damage is secondary, or "ripple effect" damage, caused by guerrilla activity, to facilities not under direct attack. Indirect damage can be further classified as:

(1) Damage to equipment of one agency due to attack on another agency, as when interruption of electric power causes electrial equipment not under attack to be burned out due to voltage surges or low voltage.

(2) Damage caused by natural deterioration due to lack of maintenance. The lack of maintenance in this case must be attributed to insurgency: Affected facilities may lie in contested areas where work cannot be done, or government funds may be diverted to national defense leaving inadequate resources for performing maintenance.

#### Recommendation

Under Project No. 279 or subsequent projects the USAID should address indirect damage as well as direct damage. On a selective case-by-case basis repair or renovate those facilities essential to functioning of the economy and to the public health and welfare.

#### 2. Conclusion

The determination of the insurgents to destabilize the economy has not diminished. Numbers of attacks on infrastructure have increased dramatically during the first six months of 1988 on electric power, telephone, and railroad facilities. All agencies will continue to need assistance with damage repair for some indefinite period to be determined by the end of the insurgency.

#### Recommendation

USAID should retain an ability to react to needs for assistance

by the infrastructure agencies, including one or more helicopters for CEL, until sabotage incidents end.

3. Conclusion

Stocks of materials and parts on hand in agencies other than CEL are such that it should be possible to provide support while using standard procurement procedures. CEL losses are so large, so important to the economy, and so unpredictable that emergency requirements can arise quickly and unexpectedly for the electric grid.

Recommendation

In any future projects, the Mission should retain emergency procurement authority for CEL materials and equipment. If emergencies should arise in other areas, waivers should be sought on a case-by-case basis.

4. Conclusion

It is probable that the level of violence will remain at or above the current high level at least until the national election in March, 1989.

Recommendation

The Mission should retain the ability to react to emergency repair and restoration situations at the present level at least until the autumn of 1989, or winter of 1990, at which time the projects and program should be re-examined.

5. Conclusion

The public service agencies, with the possible exception of MOP which is not being as severely tested at this time, and the ports and airports, which have not been attacked, have the capability with USAID assistance to respond quickly to sabotage incidents, and to restore services with minimum delay.

Recommendation

AID should continue to support the agencies with material and equipment.

6. Conclusion

Both active and passive security measures adopted by the most seriously affected agencies appear to have reduced the number of attacks on major installations, and to have reduced the total cost of losses on other facilities.

Recommendation

The Mission should examine security initiatives from the agencies

and support those which have probability of success with economic use of resources, e.g., radios and trip wire cars ahead of the locomotive on the railroad.

7. Conclusion

Transportation studies to date have been limited in scope and of little use in making investment or development decisions. A detailed national transportation study of the relative economy of the various modes of transportation will be required in order to determine transportation development priorities and to recommend a national transportation policy. The government has a great number of laws which affect transportation, but not a coherent national policy.

Recommendation

The Mission should attempt to have a transportation study done before a final decision on the fate of the railroad is made; and before priorities for development of ports, airports, and the road system are decided. (Given the fact that the railroad exists and that all vehicles and fuel must be imported, the railroad may be an important economic asset in the post-insurgency period.)

8. Conclusion

When compared to the other agencies, the Ministry of Public Works management and organization systems appear to be in need of technical assistance. A management audit and re-organization may be the only way to develop the required maintenance organizations, especially in the field. The same condition and requirement to develop a field organization exist in ANDA to a lesser degree.

Recommendation

When reconstruction of Public Works facilities begins, the Mission should include as a subproject a study of the Ministry, if the Ministry personnel recognize their need and agree to cooperate. The same arrangement should be made with ANDA, especially since it will be necessary to differentiate the roles of ANDA's Management Unit for the rural water project and PLANSABAR. Otherwise, assistance should be minimized to prevent waste of resources. (The management audit and reorganization of MOP should begin as soon as possible, without waiting for reconstruction if feasible.)

9. Conclusion

Utility and transportation system charges to users are based on other than cost-of-providing-service data, and in some cases do not reflect all costs of services, (excluding consideration of damage by violence).

Recommendation

User charges for public services should be based on the total true cost of providing the service. Utility rates, including water, should reflect this concept. Subsidies to the transportation sector should be minimized, and if not eliminated then established for specific reasons in accord with national transportation policy.

10. Conclusion

The total resource needs for maintenance, reconstruction, economic development, new infrastructure investment, and extension of services into the countryside will far exceed the assistance, both loan and grant, which can be expected to be available over the next ten years.

Recommendations

a. Development of maintenance systems should be given high priority. Maintenance organizations, with future funding reasonably assured, should be in place and operating before new investment is made in order to delay the need for new investment as long as possible and to protect all new investment.

b. Reconstruction of damaged facilities should be carefully considered, with reconstruction projects selected in order of priority. (Temporary bridges and some wood pole transmission repairs should serve for several years, for instance, while resources are devoted to higher priority needs throughout the economy.)

11. Conclusion

The nature and cost of indirect damages which result from guerrilla activity are real and extensive. They are not being adequately addressed by the GOES or assistance programs.

Recommendation

Repair of indirect damage should be considered on a par with direct damage in the USAID programs. Selective repairs should be made to facilities which threaten commerce or which prevent the infrastructure agencies from performing their assigned functions.

12. Conclusion

Experience during the insurgency has shown that a productive economy cannot be maintained without the services and facilities provided by effective infrastructure organizations. (Production losses due to interruption of power supply and transportation have been large.)

Recommendations

a. In support of Mission development objectives, the Mission should begin selective reconstruction of damaged infrastructure for the purpose of speeding economic recovery and growth.

b. AID should consider funding high profile infrastructure projects when it can be demonstrated that they contribute to economic development (as opposed to being "economically feasible" only) or directly support other Mission programs or objectives. (Examples: Small town and rural water systems; small town electric distribution; rural roads; electric transmission lines and substations to serve industrial areas; railroad sidings to new or expanding industries.

B. Conclusions and Recommendations - CEL

1. Conclusion

CEL has demonstrated the ability to respond to sabotage damage incidents, to make repairs effectively; and to restore reliable service quickly.

Recommendation

USAID should continue support of CEL at the present level. At least one helicopter will be required into the indefinite future.

2. Conclusion

CEL sometimes must burn oil at the Acajutla steam plant, or utilize diesels, when transmission lines which run from the hydroelectric or geothermal plants are damaged. This is significant cost which CEL must absorb since there is no fuel cost adjustment clause in the CEL rate structure.

Recommendation

CEL should be permitted to pass the extra fuel cost to their customers, in the form of a surcharge on the cost per kilowatt hour to equal the cost of fuel burned. The surcharge would vary from C. 0.005 to C. 0.015 per KWH.

3. Conclusion

The rated capacity of CEL generating plants is 650.9 megawatts, but due to malfunction of part of the geothermal field and condition of other units, the actual capability is more nearly 458 megawatts, and at the rate of growth demonstrated in recent years, the peak load will exceed 458 MW in three to five years. And that load will be carried using the oil fired plants a large percentage of the time, requiring import of more oil.

Recommendations

a. CEL should repair the geothermal field installation as quickly as possible to regain lost capacity, which should be approximately 50 MW. That is the fastest and cheapest way to add to the present system capability, and will reduce oil consumption. (CEL is discussing this work with CABEI, and prospects are that it may be funded in 1989.)

b. Planning and financing of new generating plants, preferably geothermal, should go forward as quickly as possible, because in the best of circumstances it probably will be eight to ten years before major new generating capacity can be planned, financed, built, and put on line. (France and Belgium will build two small plants, but much larger ones will be needed soon.)

4. Conclusion

CEL is managing or "intervening" in all of the separate distribution systems in the country to keep them in repair and operating. There is no obvious way that this could have been avoided. The long term effect of this intervention and the configuration of the electric power industry in El Salvador is not certain, but is understood to be under study.

Recommendation

No recommendation is made on this topic, but if CEL assumes ownership of these systems, most of which were near bankrupcy when intervened, it should simplify financing, reconstruction, and system expansion.

5. Conclusion

Transmission line towers have been severely damaged, and three (of 26) transmission lines are out of service completely. Many towers will have to be completely replaced. Others can be repaired by cannibalizing damaged towers. In some locations, however, wood pole structures installed in making repairs to sabotage damage can continue to serve for several years.

Recommendation

When rebuilding of transmission lines begins, work should be carefully planned to make maximum use of the wood structures where possible in order to reduce the rate of expenditure on reconstruction.

6. Conclusion

In the reconstruction period not all facilities will be of the same priority. Repair of transmission lines from geothermal and hydroelectric generating centers will reduce the need to burn oil, and the reliability of the system must be assured to prevent service interruptions and further damage to the equipment.

Restoration of distribution systems out of service in rural areas can go forward simultaneously provided funds are available.

Recommendation

The reconstruction program should be planned to perform the work in order of priority, and scheduled to cover a period of at least five, up to ten, years to make resources available for other needs.

7. Conclusion

CEL has projected a program to add 550 m.w. by 1998. Such a time table is not realistic, either from the point of view of available financing nor the physical ability to do the work that quickly. Nevertheless, CEL will need to add generating capacity as quickly as possible to stay ahead of the system demand, especially if economic growth and rural electrification occur simultaneously. At this time, however, only about 70% of installed capacity is usable.

Recommendations

a. CEL should give immediate priority to restoring to service all generating capacity presently installed, with priority given to the geothermal plant.

b. Plans should proceed for the new generating stations on a more realistic time table.

8. Conclusion

There are relatively secure areas where rural distribution lines can be built with minimum to moderate risk.

Recommendation

Rural electrification systems should be rebuilt and extended in rural areas where feasible; especially in areas where electric power will increase or improve efficiency of agricultural production and processing.

C. Conclusions and Recommendations - ANDA

1. Conclusion

ANDA, while implicitly formed as a national water utility, does not have the autonomy and strong organization of CEL and ANTEL. For this, and possibly other reasons, it is not as strong and not nearly so self-sufficient as the other two utilities. There seems to be confusion as to whether it is in fact primarily a business utility or primarily a social service organization. The two need not be mutually exclusive. Its apparent change of mandate over the years and present confusion in the water supply and sewer sub-sectors reflect this dichotomy. It appears that

the greatest insurgent inflicted damage to ANDA has been indirect damage to ANDA as an institution.

Recommendations

a. ANDA should be given greater autonomy and its nationwide duties clearly defined.

b. ANDA should be evolving into a true national water and sewer utility, to include service and financing for rural programs; possibly supplying water at wholesale rates to individual systems which ANDA does not take over directly.

c. A rate, or tariff, study should be performed and rates structured and adopted which will make ANDA financially self sufficient, at least for operations and maintenance costs, while at the same time protecting low income users and rural systems from costs which they cannot afford. (Such rate structures can be formulated, although it implies cross subsidy from city, industrial, commercial, government, and affluent private users.)

2. Conclusion

A great many ANDA customers still are without meters.

Recommendations

a. The program to install meters on all users should be intensified, with meter reading and periodic billing established, or strengthened where they already exist.

b. Meter maintenance shops, stocks of meters, and repair parts centers should be established in all ANDA regional offices.

3. Conclusion

ANDA appears to be primarily an engineer oriented organization. Any utility, including ANDA, should be headed and operated by management oriented, not technically oriented personnel.

Recommendation

Technical assistance and short term management training for ANDA personnel will be required as a part of any program for reorganization and upgrading of the organization.

4. Conclusion

ANDA systems have been repaired as necessary to keep them functioning, so a major post-insurgency program to repair sabotage damage has not been identified. The need for improvements and expansion of all systems will be large in the aggregate, but the needs of each water system must be determined on a system by system study.

Recommendation

ANDA should be preparing estimates for upgrading of systems in outlying towns and cities in preparation for submission of them to international donors or lenders.

5. Conclusion

ANDA has three regional offices outside San Salvador, but, so far as can be determined without visit to the sites, these offices are of limited utility; they are poorly staffed and equipped.

Recommendation

ANDA should continue to decentralize operations, especially in the maintenance and operation area. Function, organization, and equipment of the regional offices should be examined, and their duties and responsibilities increased. They are going to be critical in maintenance of small town and rural systems in the long term.

D. Conclusions and Recommendations - ANTEL

1. Conclusion

ANTEL gives the impression of being a well run utility whose earnings in both local and foreign exchange are increasing steadily. The system is loaded, however, and in need of major expansion. Foreign exchange, since all parts and equipment must be imported, is the major constraint on expansion at the present.

Recommendation

ANTEL should continue to look for financing from multilateral agencies for its expansion program.

2. Conclusion

Much of ANTEL sabotage has been repaired using their own revenues and resources. They need to import approximately US$10 million in new equipment to replace small central station equipment damaged or destroyed during the insurgency, although not all of it could be installed until after the end of the insurgency.

Recommendation

The Mission should review proposed reconstruction needs on a case by case basis and consider funding equipment for those stations which can be shown to contribute directly to rural or economic development, or other Mission programs.

3. Conclusion

AID could give valuable assistance to ANTEL by arranging for a dollar advance or sale to be repaid in local currency. Another

option would permit ANTEL to retain part of the foreign currency generated by their international operations. It should not be done, however, until the system is reviewed by a telecommunications management expert, with agreement reached and an informed decision made as to exactly how the funds are to be used.

Recommendation

If USAID assistance to ANTEL beyond the reconstruction of guerrilla inflicted damage becomes an issue, the Mission should request the services of a telecommunications team to review the system and assist in determining how funds should be most economically used.

E. Conclusions and Recommendations - Ministry of Public Works

1. Conclusion

The bridges of the country suffered heavy losses in the insurgency, but in recent years most damage has been to culverts and other small drainage structures. The major bridges have been replaced with Bailey bridges, and traffic moves over them more or less normally. With proper maintenance the Bailey bridges should last for several years; if necessary, they could be restored in kind.

Recommendation

Make major bridge reconstruction a low priority during the reconstruction period. So long as presently existing replacements are serving traffic needs, to replace them with major permanent structures would divert resources from more urgent needs.

2. Conclusion

Several hundred kilometers of roads have been inassessable for even minimum maintenance. All of these roads will have deteriorated, some by as much as 50 percent of their original cost. A major reconstruction effort eventually will be required.

Recommendation

Plan a labor intensive reconstruction program in the post-insurgency period for roads which have been inaccessible. It will generate employment, and will minimize the need for imported equipment, vehicles, and fuel.

3. Conclusion

Management, organization, and practices in the Ministry and its various components seem to be weaker than in the other public service agencies. Success of other agencies indicates that there is capability in El Salvador to improve performance in the

Ministry under proper conditions. Technical assistance in management, organization, and control therefore should be productive if the Ministry is willing to accept and use it.

Recommendation

The attitude toward management technical assistance of GOES, and MOP in particular, should be explored. If conditions for success are indicated, a program should be undertaken before any major reconstruction program is initiated. If not, post-insurgency assistance should be minimal and very closely monitored by USAID.

4. Conclusion

Deterioration of the MOP road maintenance organization appears to have been an indirect damage casualty of the insurgency. Inability to work without unacceptable risk in some areas and general lack of maintenance budget have caused that organization, especially its field forces, to degenerate. That has caused management capability to degenerate as well. Proper maintenance is essential to the life of any road; but it does not just happen and cannot be assumed. Proper maintenance must be funded, and then properly planned and managed.

Recommendations

a. The Mission should assure that the road maintenance organization is properly staffed and organized, and that an acceptable levels of funding is assured, before funding more than stop-gap assistance to MOP.

b. MOP should develop and review with USAID a sound maintenance program as a prerequisite before future assistance for reconstruction, other than opening of rural roads now closed, is provided.

c. The USAID/SETEFE local currency program should focus on maintenance of existing roads rather than construction of new roads except in direct support of specific economic or industrial development projects.

F. CEPA and Civil Aviation

1. Railway

Conclusion

The railroad is an integral part of the national transportation system, although the relative economy of its operation in the post-insurgency environment cannot be predicted with confidence. It will depend to a great degree on the rate of economic recovery, the rate of cement production and consumption, and the volume of international trade going to and from the ports. Given the need to import all trucks and fuel, however, it is possible that the railroad will be a freight carrier of economic choice in

the recovery period. However, not all existing lines will necessarily produce high economic benefits.

Recommendation

Heavy investment completely restoring the railroad cannot be recommended at this time, but it should be maintained as well as possible. Future rehabilitation decisions should be based on the transportation study recommended elsewhere in this report.

Conclusion

The railroad has been heavily damaged; its track, bridges, cars, and locomotives all have been subject to attack. Sabotage incidents have increased in number during the first half of 1980.

Recommendation

No recommendation is offered under this conclusion.

Conclusion

The railroad is well managed although held closely in check by CEPA. It is frugal in its management of resources. It has prepared a five year investment plan that appears reasonable in its statement of need and intent, and will need to be funded if the railroad is to be an important freight carrier in the recovery era.

Recommendation

As stated above, major new investment should be delayed. A low level of assistance from some source should be continued nonetheless to permit the railroad to maintain itself until major policy decisions can be made.

2. Airports

Conclusion

The airports have suffered indirect damage, primarily as a result of loss of electric power when CEL electric lines have been sabotaged and service interrupted. The airports have not been attacked directly.

Recommendation

Indirect damage should be accepted as guerrilla-induced, and repaired on the same basis as direct damage when that damage threatens life and safety, causes economic loss, or threatens commerce and trade.

The El Salvador International Airport (Comalapa), should be given strong consideration for USAID assistance for the most critical items. Examples are power generation, control tower instruments,

refrigerator rooms for air cargo, baggage X-ray machines, and communications equipment. The Ilopango tower should be repaired.

Conclusion

Three small airports managed by the General Directorate of Civil Aviation (GDAC) and utilized by private business men are reported to be in need of some inexpensive rehabilitation, the nature of which is not known.

Recommendation

A visit to the airports should be made in company of a GDAC official to determine the nature of the repairs, and to determine whether a way can be devised to have the work done before it becomes more expensive to repair at a later date.

3. Ports

Conclusion

The piers and the equipment at Acajutla are deteriorating seriously due to lack of maintenance. This is in part due to lack of budget; in part due to difficulty in obtaining foreign currency for anything except that which is recognized by higher authority as an immediate emergency. Much of the equipment is inoperative and that which is operating is in danger of failing. The piers themselves are failing and the situation at Acajutla was considered to be a near emergency when visited by two members of the Damage Assessment team. The port is handling cargo much more slowly than normal, primarily due to the condition and availability of equipment.

Recommendation

The Mission should consider the possibility of rendering assistance to at least the main port at AcajutLA, to relieve the most immediate problems.

Conclusion

Critical heavy lifting equipment and other electrical installations including the central control panel are reported to be damaged by power surges and low voltage due to outages on the CEL system. If the equipment fails completely the capacity of the port will be reduced even further, and some cargo, such as containers, it will not be able to handle safely.

Recommendation

The extent of the damage should be evaluated by a qualified electric power engineer to determine the exact nature and extent of the damage, the probability of complete systems failure, and whether stop gap measures short of complete replacement or

reconstruction can alleviate the problem until a more permanent solution can be effected.

G. Technical Assistance and Training

1. Conclusion

As noted elsewhere, management of MOP, and to a lesser degree ANDA, are observed to be less effective than that in the other infrastructure agencies. In the opinion of the team, neither will be able to meet its responsibilities without significant outside intervention. To a degree, each is being intervened now, with AME in the MOP and the Management Unit for the rural water program in ANDA.

Recommendation

Serious thought should be given to management studies and reports covering both agencies, followed by technical assistance and training to carry out the recommendations of the report. Unless something of this nature is done, USAID should provide only stop-gap assistance to either agency because works tuned over to poorly managed agencies soon fail for lack of maintenance.

2. Conclusion

Both CEL and ANTEL have strong management that has performed well through the insurgency to date. Nevertheless, they have been involved in crisis management for several years, and may find return to efficient peacetime conditions a difficult transition.

Recommendation

Determine the interest of management of ANTEL and CEL of sending several upper and mid-management personnel on short term (a few weeks) tours of modern utilities to determine where training might be profitable, or if current practices of value could be transferred directly without out-of-couNtry training. Technical, as opposed to management, training is not envisioned.

3. Conclusion

As a result of the proposed management studies of MOP and ANDA the need for training may be developed. In particular, ANDA personnel should profit from education in utility management, utility accounting, and modern professional personnel practices and methods; classification, evaluation, compensation plans, grievance procedures.

Recommendation

Be prepared to provide professional training to MOP and ANDA personnel following reorganization, but not before. Prior to that time, training should be confined to short term technical training for well defined responsibilities.

4. Conclusion

The railroad has five coal burning steam locomotives in good condition it would like to use. Coal is not available and wood as fuel is a poor substitute, scarce and expensive. The railroad wants to convert the locomotives to oil burning but does not know how to do it. They are confident they could make the conversions in their own shops, which are quite good; probably they would need some imported parts. They have asked for a technical advisor to evaluate the practicallity of the proposal, and to advise them on how to do it.

Recommendation

If a qualified individual can be found, he should be put under a short term contract to come to San Salvador and advise the railroad on this proposal.

5. Conclusion

CEPA, as a management unit, charges large costs to its dependency divisions.

Recommendation

Some consideration should be given to a study combined with technical assistance in management, for CEPA. Some economies may be possible.

PN-ABB-768

# PUBLIC SERVICES INFRASTRUCTURE

# DAMAGE ASSESSMENT REPORT

1988

ANNEXES

Under Contract No. PDC-1096-I-00-6098-00

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## ANNEX A

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACOSETCA | Asociacion de Cooperativas de Aprovisionamiento de Ahorro, Credito y Servicios Mutualistas de Transporte de Carga; Association of Cooperatives for the Provision of Savings, Credit, and Mutual Services for Cargo Transport |
| AEAS | Asociacion de Empresas de Autobuses Salvadorenas; Salvadoran Bus Enterprises Association |
| AID | Agencia Internacional para el Desarrollo; Agency for International Development |
| AME | Administracion de Maquinaria y Equipo (MOP); Machinery and Equipment Administration |
| AMSS | Area Metropolitano de San Salvador; San Salvador Metropolitan Area |
| ANDA | Administracion Nacional de Acuaductos y Alcantarillados; National Administration for Water and and Sewer |
| ANTEL | Administracion Nacional de Telecomunicaciones; National Administration for Telecommunications |
| BCIE | Banco Centroamericano de Integracion Economica; Central American Bank for Economic Integracion (CABEI) |
| BID | Banco Interamericano de Desarrollo; Inter-American Development Bank (IDB) |
| BIRF | Banco Interamericano de Reconstruccion y Fomento; InterAmerican Bank for Reconstruction and Development (IBRD) |
| CABEI | See BCIE. |
| CASALCO | Camara Salvadorena de la Construccion; Salvadoran Chamber of Construction |
| CEL | Comision Ejecutiva Hidroelectrica del Rio Lempa; Executive Commissiion for Lempa River Hydroelectricity |
| CEPA | Comision Ejecutiva Portuaria Autonoma; Autonomous Executive Port Commission |
| CIG | Centro de Investigaciones Geotecnicas; Center for GeoTechnical Research |

| | |
|---|---|
| DGC | Direccion General de Caminos; General Directorate for Roads |
| DUA | Direccion de Urbanismo y Arquitectura (MOP); Office of Urban Works and Architecture |
| FENADESAL | Ferrocarriles Nacionales de El Salvador; National Railways of El Salvador |
| FIGAPE | Fondo de Inversiones y Garantias para Pequeñas Empresas; Fund for Investments and Guarantees for Small Businesses |
| GCA | Direccion General de Aviacion Civil; General Directorate for Civil Aviation |
| IDB | See BID. |
| IBRD | See BIRF. |
| IGN | Instituto Nacional Geografico; National Geographic Institute |
| IRCA | International Railway of Central America |
| IRD | Infrastructure and Regional Development (USAID) |
| KV | Kilovolt |
| KW | Kilowatt |
| KWH | Kilowatt hour |
| MOP | Ministerio de Obras Publicas; Ministry of Public Works |
| MSPAS | Ministerio de Salud Publica y Asistencia Social; Ministry of Public Health and Social Assistance |
| MV | Megawatt |
| PLANSABAR | Plan Nacional Sanitario Basico Rural; National Rural Basic Sanitation Plan |
| SETEFE | Secretaria de Tersoreria y Financiamiento Externo; Secretariat for Treasury and Foreign Finance |
| USAID | (Used interchangably with AID.) |

ANNEX B

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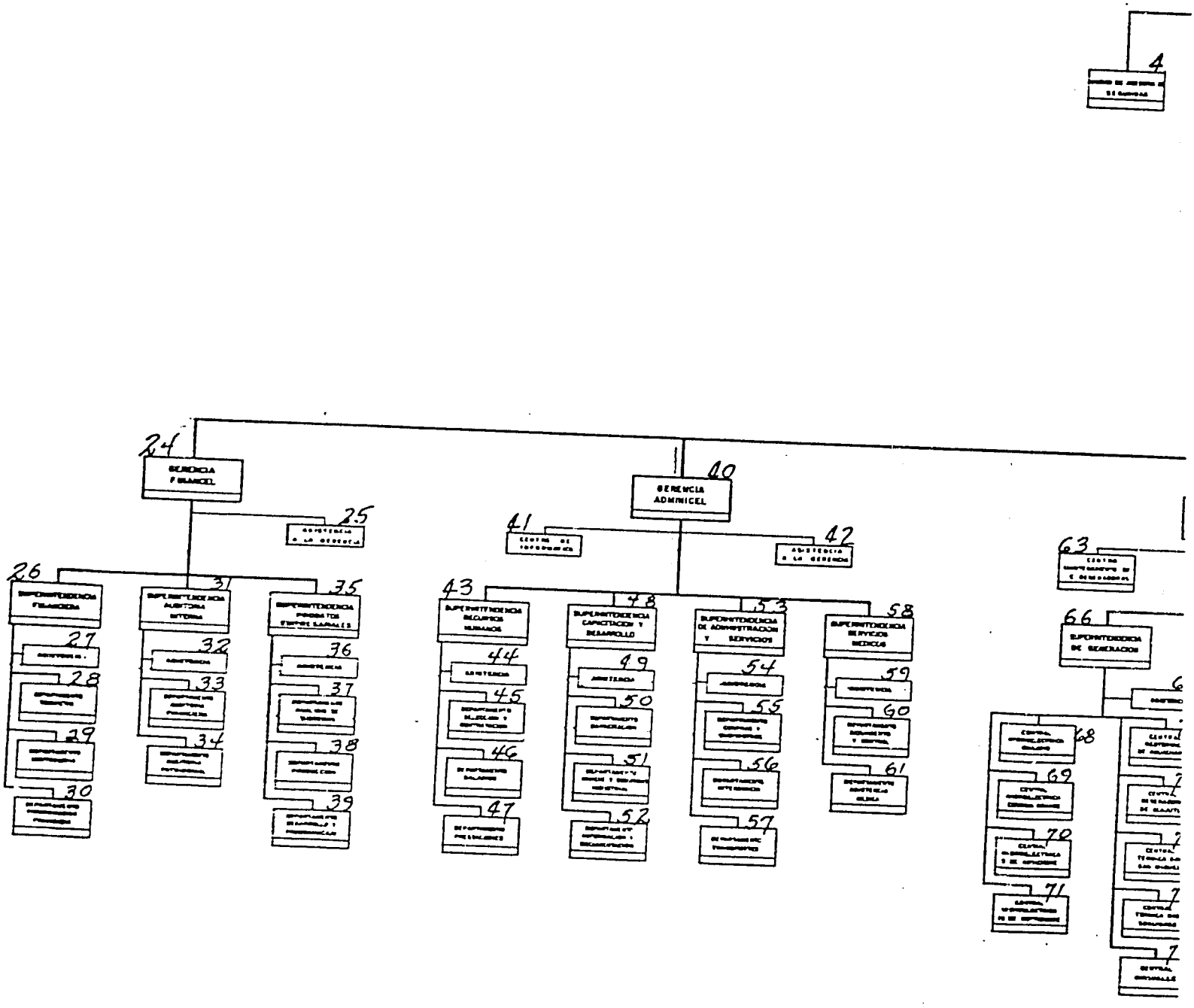
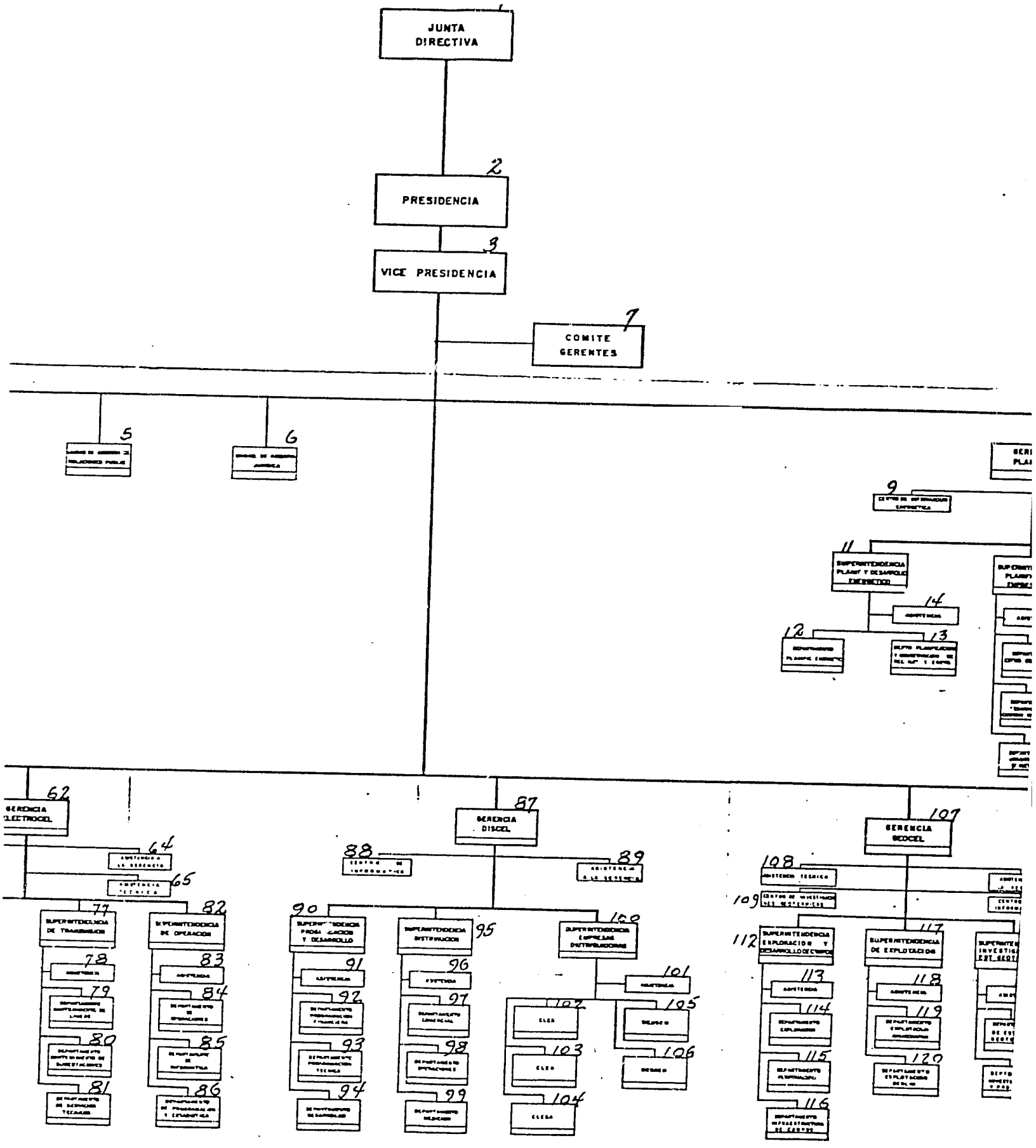
EL SALVADOR C. A.

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VICE PRESIDENCIA
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COMITE GERENTES
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GERENCIA ELECTROCEL
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GERENCIA DISCEL
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GERENCIA GEOCEL
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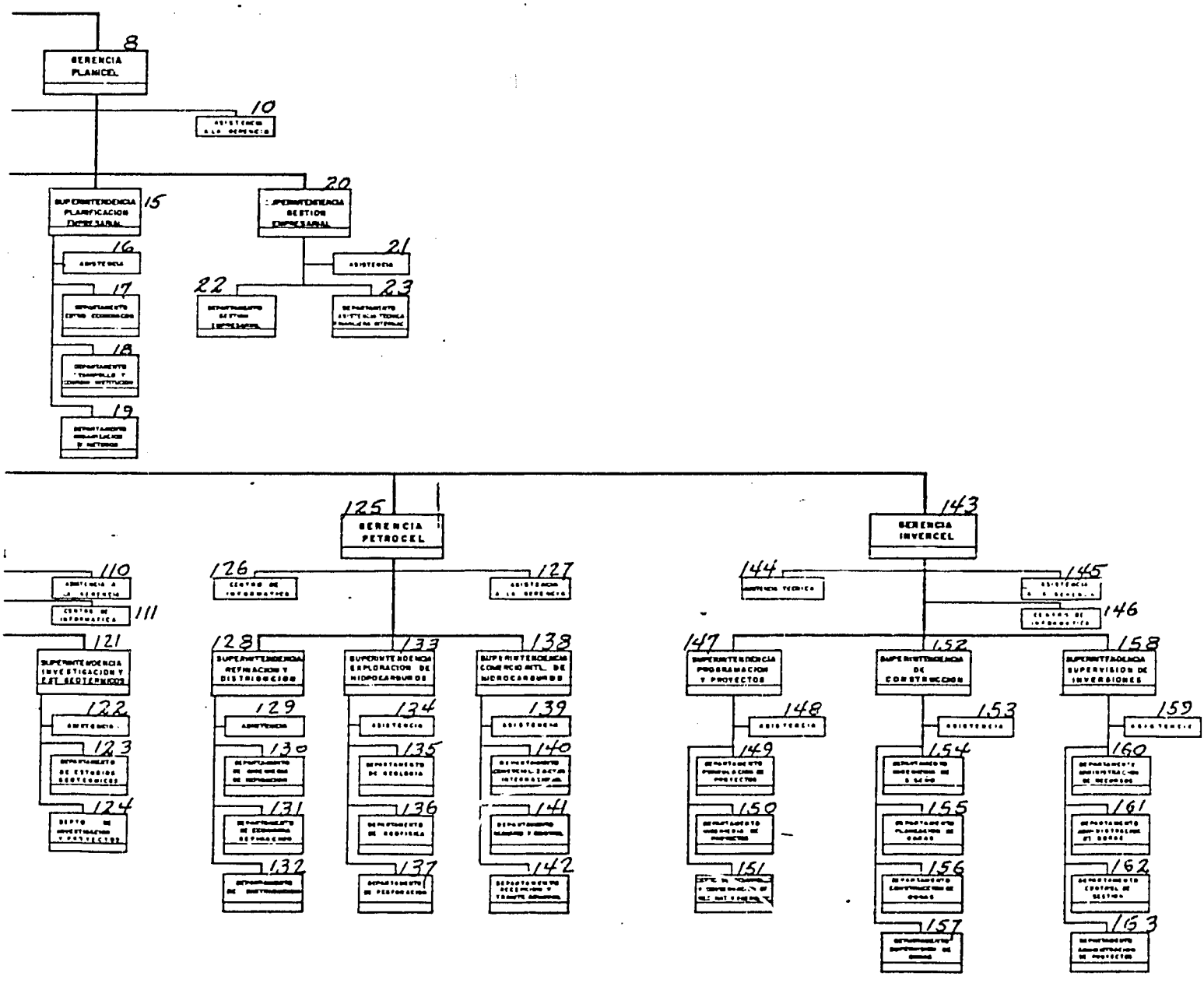
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GERENCIA PLANCEL
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GERENCIA PETROCEL
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GERENCIA INVERCEL
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ANNEX C

EXECUTIVE HYDROELECTRIC COMMISSION

OF

RIO LEMPA

CEL

1. Organization Chart of CEL (Spanish)

2. English Key to the Organization Chart

3. CEL - Sistema de Generacion y Transmision

4. Informe Annual de Daños al Sistema
   De Transmision y Subtransmision de CEL
   (1980 - 30 June, 1988)

5. Lineas Primarias Completamente Destruidas
   en el Sistema de Distribucion

6. Lineas de Transmision Fuera de Servicio
   Debido a Atentados
   (Y Lineas de Subtransmision)

7. Costos Helicopteros

8. Proposal to Restore/Rehabilitate
   CEL Electrical Transmission System, 1989-1993
   (Foreign Exchange Component)

9. Proposal to Restore/Rehabilitate
   CEL Electrical Transmission System, 1989-1993
   (Local Currency Component)

10. Status of CEL Accounts, 1979-1987

## 2. English Key to the CEL Organization Chart

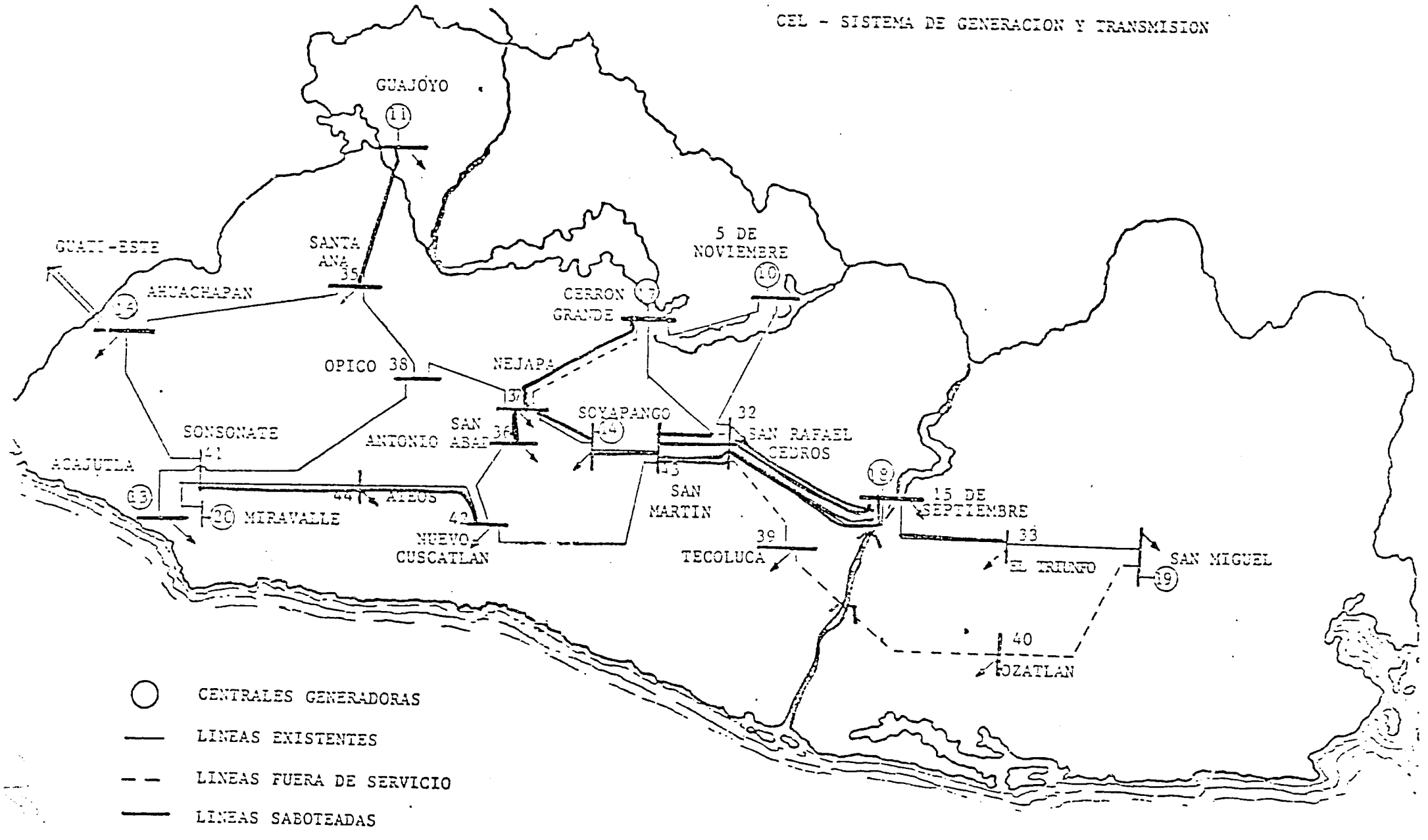
1. Board of Directors
2. President
3. Vice President
4. Security Advisor
5. Public Relations Advisor
6. Legal Advisor
7. Management Committee
8. Manager of Planning
9. Energy Information Center
10. Assistant to Manager of Planning
11. Superintendent of Planning and Development
12. Department of Energy Planning
13. Department of Planning for Natural Resources and Energy
14. Assistant to Superintendent
15. Superintendent of Business Planning
16. Assistant to Superintendent
17. Department of Economic Studies
18. Department of Institutional Coordination and Development
19. Department of Organization and Methods
20. Superintendent of Business Development
21. Assistant to Superintendent
22. Department of Business Development
23. Department of International Technical Assitance and Finance
24. Financial Manager
25. Assistant to the Manager
26. Superintendent of Finance
27. Assistant to the Superintendent
28. Department of Treasury
29. Department of Comptroller
30. Department of Financial Programming
31. Superintendent of Internal Audit
32. Assistant to Superintendent
33. Department of Financial Audit
34. Department of Auditor of Assets
35. Superintendent of Business Information
36. Assistant to Superintendent
37. Department of Systems Analysis
38. Department of Production
39. Department of Development and Production
40. Manager of Administration
41. Information Center
42. Assistant to the Manager
43. Superintendent of Human Resources
44. Assistant to the Superintendent
45. Department of Selection and Contracting
46. Department of Salaries
47. Department of Benefits
48. Superintendent of Training and Development
49. Assistant to the Superintendent
50. Department of Training
51. Department of Industrial Health and Security
52. Department of Information and Documentation
53. Superintendent of Administration and Service

54. Assistant to the Superintendent
55. Department of Purchasing and Supplies
56. Department of Supervision
57. Department of Transport
58. Superintendent of Medical Services
59. Assistant to the Superintendent
60. Department of Follow-up and Control
61. Department of Medical Assistance
62. Manager of Generation
63. Center for Maintenance of Generators
64. Assistant to the Manager
65. Technical Assistant
66. Superintendent of Generation and Transmission
67. Assistant to the Superintendent
68. Hydroelectric Center at Gauajoyo
69. Hydroelectric Center at Cerron Grande
70. Hydroelectric Center at 5th of November
71. Hydroelectric Center at 15th of September
72. Geothermal Center at Ahuachapan
73. Generating Center at Acajutla
74. Gas Turbine at San Miguel
75. Gas Turbine at Soyapango
76. Generator at Miravalle
77. Superintendent of Transmission
78. Assistant to the Superintendent
79. Department of Line Maintenance
80. Department of Substation Maintenance
81. Department of Technical Services
82. Superintendent of Operations
83. Assistant to the Superintendent
84. Department of Operations
85. Department of Information
86. Department of Programs and Statistics
87. Manager of Distribution
88. Center for Information
89. Assistant to the Manager
90. Superintendent of Program and Development
91. Assistant to the Superintendent
92. Department of Financial Programs
93. Department of Technical Programs
94. Department of Development
95. Superintendent of Distribution
96. Assistant to the Superintendent
97. Commercial Department
98. Operations Department
99. Metering Department
100. Superintendent of Distribution Enterprises
101. Assistant to the Superintendent
102. CLES - at Sonsonate
103. CLEA - at Ahuachapan
104. CLESA - at Santa Ana
105. DEUSEM - at Usulutan
106. DESSEM - at Sensuntepeque
107. Manager of Geothermal Resources
108. Technical Assistant

109. Center for Geothermal Investigation
110. Assistant to the Manager
111. Center for Information
112. Superintendent for Exploration and Development of Fields
113. Assistant to the Superintendent
114. Exploration Department
115. Drilling Department
116. Department of Field Infrastructure
117. Superintendent of Field Exploitation
118. Assistant to the Superintendent
119. Department of Exploitation, Ahuchapan
120. Department of Exploitation, Berlin
121. Superintendent of Geothermal Investigations and Studies
122. Assistant to the Superintendent
123. Department of Geothermal Studies
124. Department of Investigation and Projects
125. Manager of Petroleum Fuels
126. Center of Information
127. Assistant to the Manager
128. Superintendent of Refining and Distribution
129. Assistant to the Superintendent
130. Department of Refining Engineering
131. Department of Refining Economics
132. Distribution Department
133. Superintendent of Exploration for Hydrocarbons
134. Assistant to the Superintendent
135. Department of Geology
136. Geophysical Department
137. Drilling Department
138. Superintendent of International Trade in Hydrocarbons
139. Assistant to the Superintendent
140. Department of International Trading
141. Department of Registration and Control
142. Department of Receipt and Custom Clearance
143. Manager of Investment
144. Technical Assistant
145. Assistant to the Manager
146. Center for Information
147. Superintendent for Programs and Projects
148. Assistant to the Superintendent
149. Project Preparation Department
150. Project Engineering Department
151. Department for Development and Conservation of Natural Resources and Energy
152. Superintendent of Construction
153. Assistant to the Superintendent
154. Department of Design Engineering
155. Department of Works Planning
156. Construction Department
157. Department of Supervision of Works
158. Superintendent for Supervision of Investment
159. Assistant to the Superintendent
160. Department for Administration of Resources
161. Department for Administration of Works
162. Department for Control of Procedure

163. Department for Administration of Projects

CEL - SISTEMA DE GENERACION Y TRANSMISION



GERENCIA DE ELECTROCEL
SUPERINTENDENCIA DE TRANSMISION

# INFORME ANUAL DE DAÑOS AL SISTEMA DE TRANSMISION Y SUBTRANSMISION DE CEL.
( 1980 - 30 JUNIO DE 1989 )

| PERIODO 1980 - 30 JUNIO 1989 | ATENTADOS SUBTRANS | TRANSMISION (T.N) | TRANSMISION (E) | TRANSMISION (T.A) | COSTOS (COL) SUBTRANSMISION | TRANSMISION | INSTALACIONES | COMBUSTIBLE | TRANSPORTE | OTROS | TOTAL PERIODO | ACUMULADO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1980 | 4 | 46 | 2 | 48 | 10,500.00 | 1,334,200.00 | 437,855.00 | 2,546,594.00 | 0.00 | 0.00 | 4,328,149.00 | 4,328,14 |
| 1981 | 17 | 124 | 61 | 185 | 38,400.00 | 7,012,400.00 | 161,495.00 | 13,247,392.00 | 0.00 | 0.00 | 20,459,688.00 | 24,787,837 |
| 1982 | 171 | 91 | 104 | 195 | 554,800.00 | 5,524,700.00 | 2,314,500.00 | 17,267,635.00 | 699,000.00 | 217,938.00 | 27,578,575.00 | 52,366,512 |
| 1983 | 114 | 67 | 137 | 204 | 406,000.00 | 6,780,500.00 | 1,539,105.00 | 12,908,029.00 | 110,000.00 | 175,719.00 | 21,917,353.00 | 74,283,865 |
| 1984 | 163 | 77 | 173 | 250 | 489,500.00 | 9,284,500.00 | 3,934,005.00 | 14,826,760.00 | 0.00 | 35,727.00 | 28,570,492.00 | 102,854,357 |
| 1985 | 339 | 54 | 311 | 365 | 1,714,035.00 | 9,273,000.00 | 258,740.00 | 26,905,812.00 | 0.00 | 125,094.00 | 38,276,652.00 | 141,131,009 |
| 1986 | 173 | 52 | 330 | 382 | 848,000.00 | 53,407,632.00 | 1,980,540.00 | 27,810,665.00 | 0.00 | 511,803.00 | 84,558,641.00 | 225,689,650 |
| 1987 | 182 | 46 | 226 | 272 | 1,006,500.00 | 10,236,500.00 | 208,835.00 | 4,063,390.00 | 145,000.00 | 390,141.00 | 16,040,367.00 | 241,730,017 |
| 1988(HASTA 30 JUNIO) | 152 | 57 | 191 | 248 | 1,031,500.00 | 12,257,500.00 | 4,500,000.00 | 4,899,991.00 | 100,000.00 | 242,654.00 | 23,041,655.00 | 264,771,672 |
| TOTALES ACUMULADOS | 1,320 | 614 | 1,535 | 2,149 | 6,099,205.00 | 116,120,932.00 | 15,335,077.00 | 124,473,329.00 | 1,054,000.00 | 1,689,128.00 | 264,771,672.00 | 264,771,672 |

T.N : TORRES o ESTRUCTURAS NUEVAS

E : ESTRUCTURAS NO NUEVAS

T.A : TOTAL DE ATENTADOS

* NOTA : TODAS LAS CANTIDADES ESTAN DADAS EN COLONES

LINEAS DE TRANSMISION FUERA DE SERVICIO DEBIDO A ATENTADOS (LINEAS 115 KV)

| Línea | Kilométros de Línea |
|---|---|
| San Rafael Cedros - Tecoluca | 27.62 Km. |
| Tecoluca - Ozatlán | 37.56 Km. |
| Ozatlán - San Miguel | 43.57 Km. |

Estas Lineas normalmente abastecen de energía a varias poblaciones del Oriente del país; pero debido a que estan fuera de servicio, dichas poblaciones son abastecidas a través de otras líneas.

LINEAS DE SUBTRANSMISION FUERA DE SERVICIO DEBIDO A ATENTADOS (LINEAS 46 KV)

| Línea | Kilómetros de Línea |
|---|---|
| San Vicente - Tecoluca - Zacatecoluca | 22.4 Km. |
| Chapeltique - Ciudad Barrios | 16.4 Km. |
| Gotera - Jocoaitique | 27.2 Km. |

Estas Lineas normalmente abastecen de energía a varias poblaciones del del país; pero debido a que estan fuera de servicio, dichas poblaciones son abastecidas a través de otras líneas.

## LINEAS PRIMARIAS COMPLETAMENTE DESTRUIDAS EN EL SISTEMA DE DISTRIBUCION

| ZONA 8 | FASES EN KILOMETROS | | | | ESTRUCTURAS | | | |
|---|---|---|---|---|---|---|---|---|
| CIRCUITOS | 1Ø | 2Ø | 3Ø | LUGARES AFECTADOS | Pend. | Dañ. | Repard. | Saldo |
| Chapeltique-Guatajiagua | - | - | 5.8 | - | - | 1) | 2) | - |
| Chapeltique-Sesori | - | - | 15.0 | - | - | 1) | 2) | - |
| Chapeltique-Ciudad Barrios | - | - | 15.0 | - | 37 | - | 2) | 37 |
| Guatajiagua-Yamabal | - | - | 3.4 | - | - | 1) | 2) | - |
| Yamabal-Sensembra | - | - | 2.0 | - | - | 1) | 2) | - |
| Ciudad Barrios-S/E C.Barrios | - | - | 2.8 | - | - | 1) | 2) | - |
| San Luis de La Reina-San Gerardo. | | 7.9 | - | San Gerardo | - | 1) | - | - |
| San Gerardo-Nueve Eden de - San Juan. | - | 9.7 | - | Nueve Eden de San Juan | - | 1) | - | - |
| Desvío San Luis de La Reina-Carolina. | - | 5.3 | - | Carolina | - | 1) | - | - |
| Carolina-San Antonio de El-Mosco. | - | 6.7 | | San Antonio de El Mosco | - | 1) | - | - |
| TOTAL | - | 29.6 | 44.0 | TOTAL DAÑADAS Y REPARADAS: 119 | | | | |
| ZONA 9 | | | | | | | | |
| San Fco.Gotera-Desv.Cacaopera | - | - | 2.2 | - | - | 1) | 2) | - |
| Desv.Cacaopera-Lolotiquillo | - | 2.3 | - | - | - | 1) | 2) | - |
| Lolotiquillo-Cacaopera | - | 3.6 | - | - | - | 1) | 2) | - |
| Desv.Cacaopera-Yoloaiquin | - | - | 8.0 | - | - | 1) | 2) | - |
| Yoloaiquin-Delic./Concepción | - | - | 3.0 | | | | | |
| Delic./Concepción-Osicala | - | - | 3.0 | - | - | 1) | 2) | - |
| Osicala-Gualococti | 7.0 | | | - | - | 1) | 2) | - |
| Gualococti-San Simón | 2.4 | - | - | - | - | 1) | 2) | - |
| San Simón-San Isidro | 2.9 | - | - | - | - | 1) | 2) | - |
| Osicala-Meanguera | - | 5.3 | - | Meanguera | - | 1) | - | - |
| Meanguera-S/E Jocoaitique | - | 16.3 | | Jocoaitique | - | 1) | - | - |
| Desvío hacia El Rosario | 5.4 | - | - | El Rosario | - | 1) | - | - |
| S/E Jocoaitique-Perquín | - | - | 6.0 | Perquin | - | 1) | - | - |
| Jocoaitique-Arambala | - | 1.6 | - | Arambala | - | 1) | - | - |
| Arambala-Joateca | - | 11.0 | - | Joateca | - | 1) | - | - |
| Perquín-Sabanetas | 15.9 | - | - | Sabanetas | - | 1) | - | - |

Pasa.....

Cont.-ZONA 9

| C I R C U I T O S | 1Ø | 2Ø | 3Ø | LUGARES AFECTADOS | Pend. | Dañ. | Repard. | Saldo |
|---|---|---|---|---|---|---|---|---|
| Percuín-San Fernando | 4.0 | - | - | San Fernando | - | 1) | - | - |
| San Fernando-Torola | 7.3 | - | - | Torola | - | 1) | - | - |
| Sociedad-Cantón El Tablón | 5.0 | - | - | - | - | 1) | 2) | - |
| Yoloaicuín-Osicala | - | - | 7.0 | - | - | 1) | 2) | - |
| TOTAL | 49.9 | 40.1 | 29.2 | TOTAL DAÑADAS Y REPARADAS: (SE DESCONOCE) | | | | |
| ZONA 10 | | | | | | | | |
| Cantón El Algodón-Anamorós | - | - | 19.2 | - | - | 1) | 2) | - |
| Anamorós-Nueva Esparta | - | 5.9 | - | - | - | 1) | 2) | - |
| Nueva Esparta-Polorós | - | 5.8 | - | - | - | 1) | 2) | - |
| Polorós-Monteca | - | 5.0 | - | - | - | 1) | 2) | - |
| Monteca-Las Marías | - | 3.3 | - | - | - | 1) | 2) | - |
| Monteca-Crío.Cerro Las Peñas | - | 3.0 | - | - | - | 1) | 2) | - |
| Lisligue-Corinto | - | 15.0 | - | - | - | 1) | 2) | - |
| Anamorós-Lisligue | - | 10.0 | - | - | - | 1) | 2) | - |
| Desv.Mojones-El Sauce | - | 7.5 | - | - | - | 1) | 2) | - |
| El Sauce-Concepción de Ote. | - | 15.0 | | - | - | 1) | 2) | - |
| TOTAL | - | 70.5 | 19.2 | TOTAL DAÑADAS Y REPARADAS: 68 | | | | |
| ZONA 11 | | | | | | | | |
| Desvío El Espino-El Espino | - | 28.0 | - | - | - | 1) | 2) | - |
| Carret.al Espino-Ctn.Anchila | - | 5.2 | - | - | - | 1) | 2) | - |
| Desvío Jucuarán-Jucuarán | - | 12.0 | - | - | - | 1) | 2) | - |
| TOTAL | - | 45.2 | - | TOTAL DAÑADAS Y REPARADAS: 152 | | | | |

NOTA: 1) Se desconoce por ser zona altamente conflictiva.

2) Reparadas y habilitadas una fase por la comunidad.

## COSTOS HELICOPTEROS

| CONTRATO | DURACION | APORTE AID | APORTE CEL |
|---|---|---|---|
| CEL-1344 | 7/Dic./81-7/Feb./83 | $ 1,500,000.00 | ¢ 1,000,000.00 |
| CEL-1377 | 8/Feb./83-6/Mar./84 | $ 914,766.00 | ¢ 900,000.00 |
| Ordenes Especiales de CEL | 7/Mar./84-25/Jul./84 | ---- | $ 90,000.00/mes (incluyendo los ¢) |
| AID 4051 | 26/Jul./84-25/Ago./87 | $ 2,861,407.00 | ¢ 2,900,000.00 |
| AID 5068 | Julio/85 - Oct./86 | $ 1,122,417.00 | ¢ 400,000.00 |
| AID 7597 | 26/Ago./87-25/Ago./88 | $ 1,095,866.00 (cónt.895,866.00 + horas extras 200,000) | ¢ 1,000,000.00 estimad |

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GAA/amum.-

PROPOSAL TO RESTORE/REHABILITATE CEL ELECTRICAL TRANSMISSION SYSTEM 1989 - 1993
( $ 44.7 MILLION )

INTRODUCTION

The proposed budget to finance restoration/rehabilitation of demaged CEL transmission system during the period of project has been determined considering the expectation of a reduction in guerr·lla activities. The implementation plan has been - prepared in accordance to the CEL capability to carry out this plan. Any modification will be adjusted depending on the availability of funds.

The proposed budget is as follows:

| A C T I V I T Y | 1989 | 1990 | 1991 | 1992 | 1993 | TOTAL |
|---|---|---|---|---|---|---|
| I. REHABILITATION PROGRAM | | | | | | |
| A. Transmission Line System | 5.95 | 3.50 | 3.50 | 3.36 | 2.70 | 19.01 |
| B. Substations | 0.1 | 0.22 | 2.32 | 0.11 | 0.44 | 3.19 |
| C. Micro Wave System | - | 0.3 | - | - | - | 0.3 |
| D. Technical Asistance | - | 0.1 | 0.1 | 0.1 | - | 0.3 |
| E. Tecnical Training | - | 0.1 | 0.1 | - | - | 0.2 |
| F. Program Support | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.8 |
| SUB TOTAL | 6.15 | 4.42 | 6.22 | 3.77 | 3.24 | 23.8 |
| II. RESTOTRATION PROGRAM | | | | | | |
| A. Rural Re-electrification | 1.5 | 1.3 | 0.8 | 0.5 | 0.3 | 4.3 |

PROPOSAL TO RESTORE/REHABILITATE CEL ELECTRICAL TRANSMISSION SYSTEM 1990 - 1994
(¢ 131.2 MILLION)

INTRODUCTION

The proposed budget to finance restoration/rehabilitation of damaged CEL transmission system during the period of project has been determined considering the expectation of a reduction in querrilla activities. The implementation plan has been prepared in accordance to the CEL capability to carry out this plan. Any modification will be adjusted depending on the availability of funds.

The proposed budgest is as follows:

(Million Sal ¢)

| ACTIVITY | 1990 | 1991 | 1992 | 1993 | 1994 | TOTAL |
|---|---|---|---|---|---|---|
| I. REHABILITATION PROGRAM | | | | | | |
| A. Transmission Line System | 19.9 | 6.8 | 14.6 | 3.26 | 4.55 | 49.11 |
| B. Substations | 0.1 | 0.22 | 2.32 | 0.11 | 0.44 | 3.19 |
| C. Micro Wave System | -- | 0.2 | -- | -- | -- | 0.2 |
| SUB-TOTAL | 20.0 | 7.22 | 16.92 | 3.37 | 4.99 | 52.5 |
| II. RESTORATION PROGRAM | | | | | | |
| A. Rural Re-electrification | 17.5 | 14.0 | 9.5 | 5.8 | 3.0 | 49.8 |
| B. Transmission Line Repair | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 2.5 |
| C. Distribution Line Repair | 7.5 | 6.0 | 4.0 | 2.7 | 1.4 | 21.6 |
| D. Transmission System | 2.8 | - | - | - | - | 2.8 |
| E. Helicopter | 1.0 | 1.0 | - | - | - | 2.0 |
| Sub Total | 29.3 | 21.5 | 14.0 | 9.0 | 4.9 | 78.7 |
| GRAND TOTAL | 49.3 | 28.72 | 30.92 | 12.37 | 9.89 | 131.2 |

PROPOSAL TO RESTORE/REHABILITATE CEL ELECTRICAL TRANSMISSION SYSTEM 1989 - 1993
( $ 44.7 MILLION)

| | | | | | | |
|---|---|---|---|---|---|---|
| B. Transmission Line Repair | 2.9 | 2.4 | 1.4 | 1.0 | 0.5 | 8.2 |
| C. Distribution Line Repair | 0.9 | 0.8 | 0.5 | 0.3 | 0.2 | 2.6 |
| D. Transmission System | 2.0 | - | - | - | - | 2.0 |
| E. Helicopter Lease | 1.0 | 1.0 | 1.0 | - | - | 3.0 |
| F. Emergency Generators | 0.4 | 0.3 | 0.2 | - | - | 0.9 |
| Sub-Total | 8.7 | 5.8 | 3.90 | 1.8 | 1.0 | 20.9 |
| GRAND TOTAL | 14.89 | 10.22 | 10.12 | 5.57 | 4.24 | 44.70 |

Table III.4 Status of CEL Accounts, 1978-1987 – In Thousands of U. S. Dollars

| Description | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|
| Operations Income | | | | | | | | | | |
| Electric Sales | 42,384.60 | 49,494.10 | 54,264.60 | 51,222.20 | 50,970.20 | 55,634.10 | 73,940.40 | 85,742.40 | 44,477.20 | 53,587.30 |
| Petroleum Sales | 0.00 | 0.00 | 0.00 | 4,678.70 | 13,540.00 | 26,798.60 | 656.90 | 233.20 | 5,585.90 | 4,482.80 |
| Other Income | 11.60 | 101.30 | 39.80 | 833.80 | 1,293.00 | 1,780.10 | 8,164.40 | 10,731.50 | 10,884.30 | 2,147.60 |
| Total Income | 42,396.20 | 49,595.40 | 54,304.40 | 56,734.70 | 65,803.20 | 84,212.80 | 82,761.70 | 96,707.10 | 60,947.40 | 60,217.70 |
| Operations Expense | | | | | | | | | | |
| Production | 3,133.60 | 3,850.60 | 4,594.60 | 6,368.60 | 6,758.70 | 6,168.30 | 7,376.40 | 6,278.20 | 6,734.90 | 7,204.40 |
| Fuel | 3,774.20 | 335.80 | 1,069.20 | 4,634.40 | 6,528.70 | 5,098.40 | 5,863.10 | 10,709.60 | 4,697.30 | 10,655.90 |
| Transmission | 1,160.90 | 1,724.90 | 2,302.80 | 3,422.80 | 3,741.90 | 3,710.40 | 2,781.60 | 3,463.00 | 1,990.40 | 2,181.60 |
| Distribution | 459.90 | 826.70 | 1,173.30 | 1,637.60 | 1,734.30 | 1,612.30 | 1,852.50 | 2,116.00 | 1,397.50 | 1,364.50 |
| Energy Purchase | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2,674.60 | 200.80 |
| Administration | 1,656.20 | 2,367.80 | 4,121.30 | 6,090.40 | 6,897.10 | 5,512.70 | 12,990.60 | 16,475.40 | 9,769.80 | 13,032.40 |
| Total Op. Cost | 10,184.80 | 9,105.80 | 13,261.20 | 22,153.80 | 25,660.70 | 25,102.10 | 30,864.20 | 41,042.20 | 27,264.50 | 35,122.60 |
| Results | 32,211.40 | 40,489.60 | 41,043.20 | 34,580.90 | 40,142.50 | 59,110.70 | 51,897.50 | 55,664.90 | 33,682.90 | 25,095.10 |
| Depreciation | 6,261.60 | 7,225.30 | 7,400.20 | 8,750.90 | 8,796.40 | 10,048.80 | 15,526.80 | 16,315.10 | 12,032.80 | 12,235.10 |
| Results Depreciat. | 25,949.80 | 33,264.30 | 33,643.00 | 25,830.00 | 31,346.10 | 49,061.90 | 36,368.70 | 39,349.80 | 21,654.10 | 12,860.20 |
| Interest Cost | 10,502.30 | 10,394.70 | 10,391.90 | 11,170.40 | 13,635.80 | 11,982.70 | 26,464.40 | 26,432.40 | 23,987.70 | 22,164.70 |
| Pa to Superavit | (1,124.10) | 125.20 | (113.70) | (28.20) | 222.40 | | (615.30) | (110.50) | (1,216.20) | 2,653.00 |
| TOTAL NET * | 14,323.40 | 22,994.80 | 23,137.40 | 14,631.40 | 17,932.70 | 37,079.20 | 9,289.00 | 12,806.90 | (5,549.30) | (6,441.50) |

*Excess to investment and debt service

CCL

ESTADOS DE RESULTADOS COMPARATIVOS

EJERCICIOS QUE TERMINARON EL 31 DE DICIEMBRE

(MILES DE COLONES)

| DESCRIPCION | 1978 | % | 1979 | % | 1980 | % | 1981 | % | 1982 | % | 1983 | % | 1984 | % | 1985 | % | 1986 | % | 1987 | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INGRESOS TOTALES | | | | | | | | | | | | | | | | | | | | |
| ENERGIA ELECTRICA | 105,981.5 | 100.0 | 123,735.2 | 99.4 | 135,661.4 | 99.9 | 128,055.6 | 90.3 | 127,420.6 | 77.5 | 139,065.2 | 66.1 | 184,851.1 | 85.3 | 214,356.1 | 96.7 | 222,386.2 | 73.0 | 267,936.5 | 89.0 |
| EXCED. HIDROCARBURO | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11,696.7 | 8.2 | 33,845.9 | 20.6 | 65,996.5 | 31.6 | 1,142.2 | 0.6 | 583.0 | 0.2 | 27,926.7 | 9.2 | 22,413.9 | 7.4 |
| OTROS INGRESOS(NETO) | 29.1 | .0 | 753.3 | 0.6 | 99.6 | 0.1 | 2,084.4 | 1.5 | 3,252.6 | 2.0 | 4,450.2 | 2.1 | 20,411.1 | 9.9 | 26,840.7 | 11.1 | 54,421.7 | 17.9 | 10,738.1 | 3.6 |
| TOTAL INGRESOS | 106,010.6 | 100.0 | 124488.50 | 100.0 | 135761.00 | 100.0 | 141036.70 | 100.0 | 164508.10 | 100.0 | 210031.93 | 100.0 | 206934.42 | 100.0 | 241767.77 | 100.0 | 304737.60 | 100.0 | 301088.10 | 100.0 |
| COSTOS Y GASTOS DE EXPLOTACION | | | | | | | | | | | | | | | | | | | | |
| PRODUCCION | 7,833.9 | 7.4 | 9,826.4 | 7.7 | 11,486.4 | 8.5 | 15,921.6 | 11.2 | 16,896.5 | 10.3 | 15,420.7 | 7.3 | 16,441.1 | 6.9 | 23,695.4 | 9.6 | 33,674.7 | 11.1 | 36,322.2 | 12.0 |
| COMERCIALIZ. | 9,435.4 | 8.9 | 835.4 | 0.7 | 2,542.3 | 1.9 | 11,585.2 | 8.2 | 16,321.6 | 9.9 | 12,746.0 | 6.1 | 14,657.7 | 7.1 | 26,774.1 | 11.1 | 23,486.9 | 7.7 | 53,194.5 | 17.7 |
| TRANSMISION | 2,932.3 | 2.7 | 4,312.3 | 3.5 | 5,757.0 | 4.2 | 8,557.1 | 6.0 | 9,354.6 | 5.7 | 9,276.3 | 4.4 | 6,954.1 | 3.4 | 8,657.6 | 3.6 | 9,255.3 | 3.3 | 10,[illegible] | 3.6 |
| DISTRIBUCION | 1,149.7 | 1.1 | 2,065.7 | 1.7 | 2,933.3 | 2.2 | 4,094.1 | 2.9 | 4,335.6 | 2.6 | 4,030.8 | 1.9 | 5,631.1 | 2.2 | 5,293.0 | 2.2 | 6,657.7 | 2.3 | 9,322.7 | 3.1 |
| COMPRA ENERGIA | | | | | | | | | | | | | | | | | 13,[illegible] | 4.4 | [illegible] | [illegible] |
| GASTOS GENERALES Y ADMINISTRACION | 4,140.4 | 3.9 | 5,919.6 | 4.8 | 10,363.2 | 7.6 | 15,220.1 | 10.7 | 17,242.7 | 10.5 | 21,291.7 | 10.1 | 32,476.6 | 15.7 | 41,188.4 | 17.0 | 43,[illegible] | 16.0 | [illegible] | [illegible] |
| TOTAL COSTOS Y GAST. | 25,491.7 | 24.0 | 22764.40 | 18.3 | 33022.20 | 24.3 | 55385.80 | 39.0 | 64151.70 | 39.0 | 62767.20 | 29.8 | 77160.70 | 37.3 | 102,605.44 | 42.4 | 136324.10 | 44.7 | [illegible] | [illegible] |
| RESULTADO | 80,518.9 | 76.0 | 101724.10 | 81.7 | 102738.80 | 75.7 | 86449.90 | 61.0 | 100356.40 | 61.0 | 147774.70 | 70.2 | 129773.72 | 62.7 | 139162.33 | 57.6 | 168413.40 | 55.3 | 125473.50 | 41.7 |
| DEPRECIACION | 15,654.0 | 14.8 | 18,063.3 | 14.5 | 18,500.6 | 13.6 | 21,877.4 | 15.4 | 21,990.9 | 13.4 | 25,122.2 | 11.9 | 30,822.1 | 15.0 | 40,767.8 | 16.9 | 60,154.1 | 19.7 | 61,175.3 | 20.3 |
| EXCEDENTES DE GASTOS FINANCIEROS | 64,894.9 | 61.2 | 83,660.8 | 67.2 | 84,238.2 | 62.0 | 64,572.5 | 45.5 | 78,365.5 | 47.6 | 122,652.5 | 58.3 | 98,921.7 | 47.8 | 98,374.5 | 40.7 | 108,259.3 | 35.5 | 64,[illegible] | 21.4 |
| GASTOS FINANCIEROS | 25,255.8 | 24.8 | 25,906.9 | 20.9 | 25,979.9 | 19.1 | 27,926.1 | 19.7 | 34,389.4 | 20.9 | 29,956.7 | 14.2 | 66,166.9 | 32.0 | 66,081.1 | 27.3 | 144,913.5 | 47.6 | 110,[illegible] | 36.5 |
| INTERESES OPERACION | | | | | | | | | | | | | | | | | | | | |
| APLICACIONES AL SUPERAVIT (NETO) | (2,610.2) | (2.7) | 313.1 | 0.3 | (284.2) | (0.2) | (70.5) | (.0) | 555.0 | 0.3 | 0.0 | 0.0 | (1,536.3) | (0.7) | (276.2) | (0.1) | (6,080.9) | (2.0) | 14,315.0 | 4.8 |
| EXCEDENTE DEL AÑO | 35,028.9 | 33.6 | 57,987.1 | 46.6 | 57,974.1 | 42.7 | 36,575.9 | 25.8 | 44,832.1 | 27.0 | 92,696.6 | 44.0 | 23,222.5 | 11.2 | 32,017.2 | 13.2 | (42,735.1) | (14.0) | (32,208.4) | (10.7) |
| INVERS. Y PAGO DEUDA | | | | | | | | | | | | | | | | | | | | |

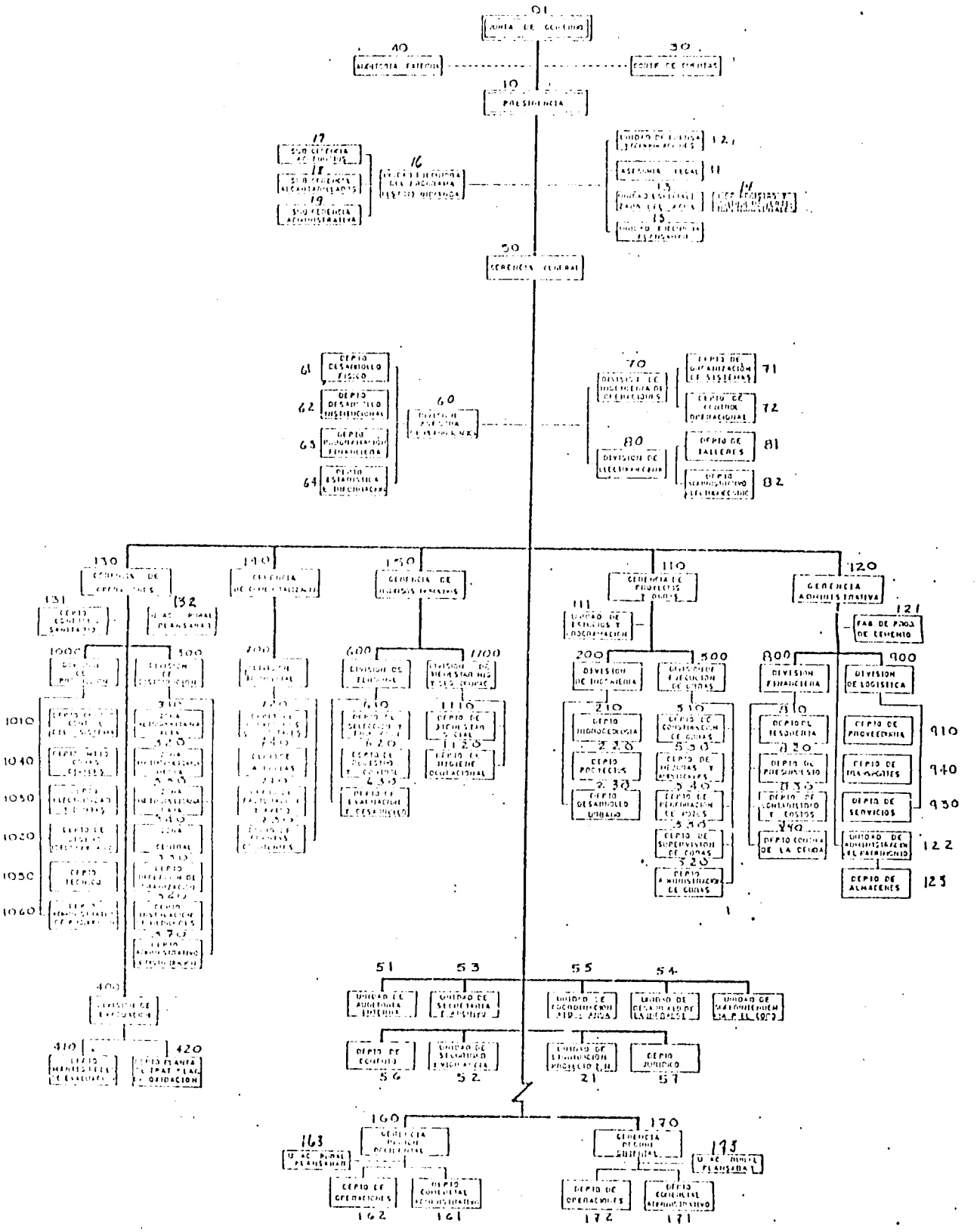
ANNEX D

ANDA

1. ANDA Organization Chart
2. English Key to the Organization Chart
3. Numeros de Servicios por Tipos de Tarifa 1988
4. Tarifa de Bloques de Consumo
5. Donaciones y Subsidios Periodo 1985-1988 (June)
6. Estado de Situacion de los Fondos Recibidos Durante el Periodo de 1985-1988 (June)

ADMINISTRACION NACIONAL DE ACUEDUCTOS Y ALCANTARILLADOS

ORGANIGRAMA DEPARTAMENTALIZADO DE ANDA




DEPTO. DESARROLLO INSTITUCIONAL

ENERO 1988

2. English Key to Organization Chart for the:

National Administration for Water and Sewers

01 Governing Board
10 Presidency
11 Legal Advice
12 Press and Communications Unit
13 Specialized Unit for Water
14 Industrial Users Registry and Control Unit
15 PLANSABAR Executive Unite
16 IDB/ANDA EL S 0079 Program Unit
17 Sub Office for Water Mains
18 Sub Office for Sewers
19 Sub Office for Administration

21 Unit for Liquidation Northern Zone Project

30 General Accounting Office

40 External Audit

50 General Management
51 Internal Audit Unit
52 Security and Vigilence Unit
53 Secretail and Files Unit
54 Infrastructure Development Unit
55 AID/ANDA Coordination Unit
56 Computer Department
57 Judicial Department

60 Planning Advice Division
61 Physical Development Department
62 Institutional Development Department
63 Financial Programming Department
64 Statistics and Information Department

70 Operations Engineering Division
71 Systems Organization Department
72 Operations Control Department
80 ElectroMechanics Division
81 Shops Department
82 ElectroMechanics Administrative Department

110 Projects and Works Office
111 Studies and Programming Unit

120 Office for Administration
121 Cement Products Factory
122 Assets Administration Unit
123 Warehousing Department

130 Office for Operations
131 Sanitary Control Department
132 Rural PLANSABAR Unit

140 Office for Marketing

150 Office for Human Resources

160 Office for the Western Region
161 Commercial Administrative Department
162 Operations Department
163 Rural PLANSADAR Unit

170 Office for the Eastern Region
171 Commercial Administrative Department
172 Operations Department
173 Rural PLANSADAR Unit

200 Engineering Division
210 Hydrogeology Department
220 Projects Department
230 Urban Development Department

300 Distribution Division
310 Upper Metro Zone
320 Middle Metro Zone
330 Lower Metro Zone
340 Central Zone
350 Urbanization Approval Department
360 Meter Installation Department
370 Distribution Administrative Department

400 Evacuation Division
410 Evacuation Network Maintenance Department
420 Treatment Plant and Oxydation Pond Department

500 Works Execution Division
510 Works Construction Department
520 Works Administrative Department
530 Improvement and Expansion Department
540 Well Drilling Department
550 Works Supervision Department

600 Personnel Division
610 Selection and Promotion Department
620 Registry and Control Department
630 Evaluation and Development Department

700 Commercial Division
710 Billing Department
720 Commercial Relations Department
730 Current Accounts Department
740 Agencies Department

800 Financial Division
810 Treasury Department
820 Budget Department
830 Accounting and Books Department
840 Debt Control Department

900 Logistics Department
910 Purchasing Department
930 Services Department
940 Transport Department

1000 Production Division
1010 Central Control of Systems Department
1020 Electromechanical Design Department
1030 Electricity and Pumps Department
1040 Civil Works Maintenance Department
1050 Technical Department
1060 Production Administrative Department

1100 Welfare, Hygiene and Occupational Security Division
1110 Social Welfare Department
1120 Occupational Hygiene Department

## NUMEROS DE SERVICIOS POR TIPOS DE TARIFA 1 9 8 8

| TIPO | TARIFA | NUMERO SERVICIOS | TOTALES |
|---|---|---|---|
| DOMICILIAR | 60% | 19,982 | |
| DOMICILIAR | 80% | 3,640 | |
| DOMICILIAR | 100% | 211,831 | 235,453 |
| COMERCIO | 60% | 1,555 | |
| COMERCIO | 80% | 474 | |
| COMERCIO | 100% | 16,743 | 18,772 |
| INDUSTRIAL | 60% | 158 | |
| INDUSTRIAL | 80% | 29 | |
| INDUSTRIAL | 100% | 1,664 | 1,851 |
| MESONES | 60% | 340 | |
| MESONES | 80% | 151 | |
| MESONES | 100% | 7,088 | 7,579 |
| GOBIERNO | 60% | 307 | |
| GOBIERNO | 80% | 66 | |
| GOBIERNO | 100% | 1,438 | 1,811 |
| AUTONOMAS | 60% | 109 | |
| AUTONOMAS | 80% | 12 | |
| AUTONOMAS | 100% | 314 | 435 |
| MUNICIPALES | 60% | 161 | |
| MUNICIPALES | 80% | 31 | |
| MUNICIPALES | 100% | 419 | 611 |
| MUNICIPALES GRATIS | 60% | 11 | |
| MUNICIPALES GRATIS | 80% | 0 | |
| MUNICIPALES GRATIS | 100% | 34 | 45 |
| A. MARGINALES | 60% | 17 | |
| A. MARGINALES | 100% | 431 | 448 |

| TIPO | TARIFA | NUMERO SERVICIO | TOTALES |
|---|---|---|---|
| CONDOMINIOS HABITACIONALES | 100% | 46 | 46 |
| INST. EDUCATIVAS | 60% | 7 | |
| INST. EDUCATIVAS | 100% | 158 | 165 |
| INST. ASISTENCIA SOCIAL | 60% | 14 | |
| INST. ASISTENNIA SOCIAL | 80% | 4 | |
| INST. ASISTENCIA SOCIAL | 100% | 73 | 91 |
| INDUSTRIAL NORMAL | 60% | 1 | |
| INDUSTRIAL NORMAL | 100% | 18 | 19 |

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

# TARIFA - DE - BLOQUES - DE - CONSUMO

| | TARIFA 100% | | | TARIFA 80% | | | TARIFA 60% | | |
|---|---|---|---|---|---|---|---|---|---|
| MT3 | ACUED | ALCAN | TOTAL | ACUED | ALCAN | TOTAL | ACUED | ALCAN | TOTAL |
| 15 | 4.00 | 0.80 | 4.80 | 3.20 | 0.64 | 3.84 | 2.40 | 0.48 | 2.88 |
| 16 | 4.40 | 0.88 | 5.28 | 3.52 | 0.70 | 4.22 | 2.64 | 0.53 | 3.17 |
| 17 | 4.80 | 0.96 | 5.76 | 3.84 | 0.77 | 4.61 | 2.88 | 0.58 | 3.46 |
| 18 | 5.20 | 1.04 | 6.24 | 4.16 | 0.83 | 4.99 | 3.12 | 0.62 | 3.74 |
| 19 | 5.60 | 1.12 | 6.72 | 4.48 | 0.90 | 5.38 | 3.36 | 0.67 | 4.03 |
| 20 | 6.00 | 1.20 | 7.20 | 4.80 | 0.96 | 5.76 | 3.60 | 0.72 | 4.32 |
| 21 | 6.40 | 1.28 | 7.68 | 5.12 | 1.02 | 6.14 | 3.84 | 0.77 | 4.61 |
| 22 | 6.80 | 1.36 | 8.16 | 5.44 | 1.09 | 6.53 | 4.08 | 0.82 | 4.90 |
| 23 | 7.20 | 1.44 | 8.64 | 5.76 | 1.15 | 6.91 | 4.32 | 0.86 | 5.18 |
| 24 | 7.60 | 1.52 | 9.12 | 6.08 | 1.22 | 7.30 | 4.56 | 0.91 | 5.47 |
| 25 | 8.00 | 1.60 | 9.60 | 6.40 | 1.28 | 7.68 | 4.80 | 0.96 | 5.76 |
| 26 | 8.40 | 1.68 | 10.08 | 6.72 | 1.34 | 8.06 | 5.04 | 1.01 | 6.05 |
| 27 | 8.80 | 1.76 | 10.56 | 7.04 | 1.41 | 8.45 | 5.28 | 1.06 | 6.34 |
| 28 | 9.20 | 1.84 | 11.04 | 7.36 | 1.47 | 8.83 | 5.52 | 1.10 | 6.62 |
| 29 | 9.60 | 1.92 | 11.52 | 7.68 | 1.54 | 9.22 | 5.76 | 1.15 | 6.91 |
| 30 | 10.00 | 2.00 | 12.00 | 8.00 | 2.00 | 10.00 | 6.00 | 1.50 | 7.50 |
| 31 | 11.00 | 2.75 | 13.75 | 8.80 | 2.20 | 11.00 | 6.60 | 1.65 | 8.25 |
| 32 | 12.00 | 3.00 | 15.00 | 9.60 | 2.40 | 12.00 | 7.20 | 1.80 | 9.00 |
| 33 | 13.00 | 3.25 | 16.25 | 10.40 | 2.60 | 13.00 | 7.80 | 1.95 | 9.75 |
| 34 | 14.00 | 3.50 | 17.50 | 11.20 | 2.80 | 14.00 | 8.40 | 2.10 | 10.50 |
| 35 | 15.00 | 3.75 | 18.75 | 12.00 | 3.00 | 15.00 | 9.00 | 2.25 | 11.25 |
| 36 | 16.00 | 4.00 | 20.00 | 12.80 | 3.20 | 16.00 | 9.60 | 2.40 | 12.00 |
| 37 | 17.00 | 4.25 | 21.25 | 13.60 | 3.40 | 17.00 | 10.20 | 2.55 | 12.75 |
| 38 | 18.00 | 4.50 | 22.50 | 14.40 | 3.60 | 18.00 | 10.80 | 2.70 | 13.50 |
| 39 | 19.00 | 4.75 | 23.75 | 15.20 | 3.80 | 19.00 | 11.40 | 2.85 | 14.25 |
| 40 | 20.00 | 5.00 | 25.00 | 16.00 | 4.00 | 20.00 | 12.00 | 3.00 | 15.00 |
| 41 | 21.00 | 5.25 | 26.25 | 16.80 | 4.20 | 21.00 | 12.60 | 3.15 | 15.75 |
| 42 | 22.00 | 5.50 | 27.50 | 17.60 | 4.40 | 22.00 | 13.20 | 3.30 | 16.50 |
| 43 | 23.00 | 5.75 | 28.75 | 18.40 | 4.60 | 23.00 | 13.80 | 3.45 | 17.25 |
| 44 | 24.00 | 6.00 | 30.00 | 19.20 | 4.80 | 24.00 | 14.40 | 3.60 | 18.00 |
| 45 | 25.00 | 6.25 | 31.25 | 20.00 | 5.00 | 25.00 | 15.00 | 3.75 | 18.75 |
| 46 | 26.00 | 6.50 | 32.50 | 20.80 | 5.20 | 26.00 | 15.60 | 3.90 | 19.50 |
| 47 | 27.00 | 6.75 | 33.75 | 21.60 | 5.40 | 27.00 | 16.20 | 4.05 | 20.25 |
| 48 | 28.00 | 7.00 | 35.00 | 22.40 | 5.60 | 28.00 | 16.80 | 4.20 | 21.00 |
| 49 | 29.00 | 7.25 | 36.25 | 23.20 | 5.80 | 29.00 | 17.40 | 4.35 | 21.75 |
| 50 | 30.00 | 7.50 | 37.50 | 24.00 | 6.00 | 30.00 | 18.00 | 4.50 | 22.50 |
| 51 | 31.00 | 7.75 | 38.75 | 24.80 | 6.20 | 31.00 | 18.60 | 4.65 | 23.25 |
| 52 | 32.00 | 8.00 | 40.00 | 25.60 | 6.40 | 32.00 | 19.20 | 4.80 | 24.00 |
| 53 | 33.00 | 8.25 | 41.25 | 26.40 | 6.60 | 33.00 | 19.80 | 4.95 | 24.75 |
| 54 | 34.00 | 8.50 | 42.50 | 27.20 | 6.80 | 34.00 | 20.40 | 5.10 | 25.50 |
| 55 | 35.00 | 8.75 | 43.75 | 28.00 | 7.00 | 35.00 | 21.00 | 5.25 | 26.25 |
| 56 | 36.00 | 9.00 | 45.00 | 28.80 | 7.20 | 36.00 | 21.60 | 5.40 | 27.00 |

POR CADA MT3 ADICIONAL A 40, SE COBRARA 1.40 A LAS INDUSTRIAS

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

## TARIFA - DE - BLOQUES - DE - CONSUMO

| | TARIFA 100% | | | TARIFA 80% | | | TARIFA 60% | | |
|---|---|---|---|---|---|---|---|---|---|
| MT3 | ACUED | ALCAN | TOTAL | ACUED | ALCAN | TOTAL | ACUED | ALCAN | TOTAL |
| 771 | 1,075.80 | 238.70 | 1,314.50 | 860.63 | 215.12 | 1,075.80 | 645.35 | 161.34 | 806.70 |
| 772 | 1,077.20 | 239.30 | 1,316.50 | 861.76 | 215.41 | 1,077.20 | 646.32 | 161.58 | 807.90 |
| 773 | 1,078.60 | 239.70 | 1,318.50 | 863.01 | 215.75 | 1,078.80 | 647.28 | 161.82 | 809.10 |
| 774 | 1,080.40 | 240.10 | 1,320.50 | 864.32 | 216.08 | 1,080.40 | 648.24 | 162.06 | 810.30 |
| 775 | 1,082.00 | 240.50 | 1,322.50 | 865.60 | 216.40 | 1,082.00 | 649.20 | 162.30 | 811.50 |
| 776 | 1,083.60 | 240.90 | 1,324.50 | 866.88 | 216.72 | 1,083.60 | 650.16 | 162.54 | 812.70 |
| 777 | 1,085.20 | 241.30 | 1,326.50 | 868.16 | 217.04 | 1,085.20 | 651.12 | 162.78 | 813.90 |
| 778 | 1,086.80 | 241.70 | 1,328.50 | 869.44 | 217.36 | 1,086.80 | 652.08 | 163.02 | 815.10 |
| 779 | 1,088.40 | 242.10 | 1,330.50 | 870.72 | 217.68 | 1,088.40 | 653.04 | 163.26 | 816.30 |
| 780 | 1,090.00 | 242.50 | 1,332.50 | 872.00 | 218.00 | 1,090.00 | 654.00 | 163.50 | 817.50 |
| 781 | 1,091.60 | 242.90 | 1,334.50 | 873.28 | 218.32 | 1,091.60 | 654.96 | 163.74 | 818.70 |
| 782 | 1,093.20 | 243.30 | 1,336.50 | 874.56 | 218.64 | 1,093.20 | 655.92 | 163.98 | 819.90 |
| 783 | 1,094.80 | 243.70 | 1,338.50 | 875.84 | 218.96 | 1,094.80 | 656.88 | 164.22 | 821.10 |
| 784 | 1,096.40 | 244.10 | 1,340.50 | 877.12 | 219.28 | 1,096.40 | 657.84 | 164.46 | 822.30 |
| 785 | 1,098.00 | 244.50 | 1,342.50 | 878.40 | 219.60 | 1,098.00 | 658.80 | 164.70 | 823.50 |
| 786 | 1,099.60 | 244.90 | 1,344.50 | 879.68 | 219.92 | 1,099.60 | 659.76 | 164.94 | 824.70 |

## TARIFA - DE - BLOQUES - DE - CONSUMO

| | TARIFA 100% | | | TARIFA 80% | | | TARIFA 60% | | |
|---|---|---|---|---|---|---|---|---|---|
| MT3 | ACUED | ALCAN | TOTAL | ACUED | ALCAN | TOTAL | ACUED | ALCAN | TOTAL |
| 267 | 311.80 | 77.95 | 389.75 | 249.44 | 62.36 | 311.80 | 187.08 | 46.77 | 233.85 |
| 268 | 313.20 | 78.30 | 391.50 | 250.56 | 62.64 | 313.20 | 187.92 | 46.98 | 234.90 |
| 269 | 314.60 | 78.65 | 393.25 | 251.68 | 62.92 | 314.60 | 188.76 | 47.19 | 235.95 |
| 270 | 316.00 | 79.00 | 395.00 | 252.80 | 63.20 | 316.00 | 189.60 | 47.40 | 237.00 |
| 271 | 317.40 | 79.35 | 396.75 | 253.92 | 63.48 | 317.40 | 190.44 | 47.61 | 238.05 |
| 272 | 318.80 | 79.70 | 398.50 | 255.04 | 63.76 | 318.80 | 191.28 | 47.82 | 239.10 |
| 273 | 320.20 | 80.05 | 400.25 | 256.16 | 64.04 | 320.20 | 192.12 | 48.03 | 240.15 |
| 274 | 321.60 | 80.40 | 402.00 | 257.28 | 64.32 | 321.60 | 192.96 | 48.24 | 241.20 |
| 275 | 323.00 | 80.75 | 403.75 | 258.40 | 64.60 | 323.00 | 193.80 | 48.45 | 242.25 |
| 276 | 324.40 | 81.10 | 405.50 | 259.52 | 64.88 | 324.40 | 194.64 | 48.66 | 243.30 |
| 277 | 325.80 | 81.45 | 407.25 | 260.64 | 65.16 | 325.80 | 195.48 | 48.87 | 244.35 |
| 278 | 327.20 | 81.80 | 409.00 | 261.76 | 65.44 | 327.20 | 196.32 | 49.08 | 245.40 |
| 279 | 328.60 | 82.15 | 410.75 | 262.88 | 65.72 | 328.60 | 197.16 | 49.29 | 246.45 |
| 280 | 330.00 | 82.50 | 412.50 | 264.00 | 66.00 | 330.00 | 198.00 | 49.50 | 247.50 |
| 281 | 331.40 | 82.85 | 414.25 | 265.12 | 66.28 | 331.40 | 198.84 | 49.71 | 248.55 |
| 282 | 332.80 | 83.20 | 416.00 | 266.24 | 66.56 | 332.80 | 199.68 | 49.92 | 249.60 |
| 283 | 334.20 | 83.55 | 417.75 | 267.36 | 66.84 | 334.20 | 200.52 | 50.13 | 250.65 |

POR CADA MT3 ADICIONAL A 400, SE COBRARA 1.40 A LAS INDUSTRIAS

ADMINISTRACION NACIONAL DE ACUEDUCTOS Y ALCANTARILLADOS

DONACIONES Y SUBSIDIOS RECIBIDOS PERIODO

1985-1988 (Junio)

| | 1985 | 1986 | 1987 | 1988 (Junio) | TOTAL | FUENTE | DESTINO |
|---|---|---|---|---|---|---|---|
| FINANCIAMIENTO | | | | | | | |
| - AID | | 15.882,430.00 | 18.157,604.12 | | 34.020,034.12 | A.I.D. | Donación de Equipo (Vehículos y Otros) |
| - Aportes Estado (SETEFE) Areas Urbanas | | | 2.795,252.00 | 3.393,628.71 | 6.188,880.71 | AID/SETEFE/MIPLAN | Introducción Agua Potable y Alcantarillado Sanitario a Areas Urbanas. |
| - Fondo Emergencia (SETEFE) | | | 5.784,491.90 | | 5.784,491.90 | AID/SETEFE/MIPLAN | Programa Recuperación del Terremoto. |
| - Aportes del Estado (Programa PL-480/87) Manejo de Aguas | | | 11,000.00 | | 11,000.00 | G.O.E.S. | Fondo de Actividades ANDA/OPEA |
| - PL-480/87 Monto Local | | | 2.000,000.00 | | 2.000,000.00 | SETEFE/MIPLAN | Proyectos Agua Potable a Comunidades Rurales. |
| - Py. AID-519-0331 Programa Recuperación del Terremoto. | | | 6.000,000.00 | | 6.000,000.00 | AID/SETEFE/MIPLAN | Programa Recuperación del Terremoto. |
| - Programa Balanza de Pagos LOP/87 Areas Rurales | | | 2.315,000.00 | 944,579.14 | 3.259,579.14 | SETEFE/MIPLAN | Introducción Agua Potable y Alcantarillado Sanitario a Areas Rurales. |
| - PL-480/84-85 | | | | 346,615.73 | 346,615.73 | AID/SETEFE/MIPLAN | Proyecto Agua Potable a Sihuacoop, Santa Ana. |
| Subsidios del Gobierno | | 20.634,484.20 | | | 20.634,484.20 | G.O.E.S. | Para Pago de la Deuda. |
| T O T A L E S | | 36.496,914.20 | 37.063,348.02 | 4.684,823.58 | 78.245,085.80 | | |

/gef

A.I.D. = Agencia Internacional para el Desarrollo
SETEFE = Secretaría Técnica del Financiamiento Externo
MIPLAN = Ministerio de Planificación y Coordinación del Desarrollo Económico y Social
GOES = Gobierno de El Salvador

ADMINISTRACION NACIONAL DE ACUEDUCTOS Y ALCANTARILLADOS

ESTADO DE SITUACION DE LOS FONDOS RECIBIDOS DURANTE EL PERIODO DE

1985-1988 (JUNIO)

| NOMBRE DEL PROYECTO | MONTO CONTRATADO COLONES | DESEMBOLSOS ACUMULADOS 1985 | 1986 | 1987 | 1988 (Junio) | FUENTE | PROPOSITO |
|---|---|---|---|---|---|---|---|
| LINEA EXTERNA | | | | | | | |
| FIDE-176-0 SAN | 54.000,000.00 | 6.570,168.97 | 2.414,563.65 | 2.213,081.31 | | BCIE | Abastecimiento Agua Potable Py. Zona Norte |
| LINEA INTERNA | | | | | | | |
| AID/PRONAVIPO/BANCAPI/UDI | 3.434,195.05 | -.- | -.- | 3.434,195.05 | | AID/PRONAVIPO/BANCAPI | Intr.Agua Pot.y Alcant. Col. Marginales |
| AID PRONAVIPO/BANCAPI/UDI | 2.574,300.00 | -.- | -.- | 2.149,700.00 | 424,600.00 | AID/PRONAVIPO/BANCAPI | Intr. Acueducto y Alcant. Col. Marginales |
| AID/SUTEPE/UDI | 5.000,000.00 | 1.000,000.00 | 800,000.00 | -.- | -.- | AID/SUTEPE/MIPLAN | Intr. Acueducto y Alcant. Col. Marginales |
| BCR-AO-10/85 | 1.269,995.72 | 1.269,995.72 | -.- | -.- | -.- | BANCO CENTRAL DE RESERVA | Cancelar Intereses Préstamo del B.C.I.E. |
| BCR-AO-12 85 | 3.379,977.21 | 3.379,977.21 | -.- | -.- | -.- | BANCO CENTRAL DE RESERVA | Cancelar Cuotas Adeudadas y Sgte/ol Préstamo BCIE |
| BCR-AO-10/84-24 Retiro | -.- | 2.250,000.00 | 16,940,582.78 (Refinanciam.) | -.- | -.- | BANCO CENTRAL DE RESERVA | Cancelar Int.Prést. BCR-AO-18/84, AO-10/85 y Bonos ANDA. |
| DIRECCION GRAL.TESORERIA | 1.500,000.00 | 1.500,000.00 | -.- | -.- | -.- | DIRECCION GRAL. TESORERIA | Pago Pasivos Personal ANDA. |
| BANCO AGRICOLA COMERCIAL (Crédito Rotativo) | -.- | 2.250,000.00 | 588,193.86 (Renov.Lin. Cdto.) | -.- | -.- | BANCO AGRICOLA COMERCIAL | Apertura y Financ. Cta.Crédito para Importación de Accesorios. |
| BANCO CUSCATLAN | 4.000,000.00 | 5.686,075.00 | 4.151,892.57 (Refinanciam.) | 4.000,000.00 (Refinanciam.) | -.- | BANCO CUSCATLAN | Refinanciar Saldos de Crédito. |
| FOSEP-ST-1/85 SUTEPE AID | 5.400,000.00 | | | | 359,880.00 | FOSEP/MIPLAN | Alcant.San.p/Area Metrop. de San Salvador II Etapa. |
| AREAS RURALES | -.- | -.- | -.- | -.- | 944,579.14 | AID /SUTEPE /MIPLAN | Py.Introd.Ac.y Alc.en Areas Rurales. |
| AREAS URBANAS | -.- | -.- | -.- | -.- | 3.598,618.71 | AID/SUTEPE/MIPLAN | Py.Introd.Ac.y Alc.en Areas Urbanas. |
| PE-4462/4465 | -.- | -.- | -.- | -.- | 346,916.73 | AID/SUTEPE/MIPLAN | Introducción Acueducto a Ahuachapán, Santa Ana. |
| SUTEPE BID PIO LAMA | -.- | -.- | -.- | -.- | 1.500,000.00 | BID/SUTEPE/MIPLAN | Prést.Trans.p/Cap.de Trabajo Py. Río Lempa |
| T O T A L E S | -.- | 22.843,164.43 | 24.893,232.86 | 11.796,976.36 | 6.489,083.58 | | |

BCIE = Banco Centroamericano de Integración Económica
PZN = Proyecto Zona Norte de ANDA
PRONAVIPO = Programa Nacional de Vivienda Popular
BANCAPI = Banco Capitalizador
UDI = Unidad del Desarrollo de la Infraestructura
BCR = Banco Central de Reserva
Dirección General de Tesorería, dependencia del Ministerio de Hacienda
FOSEP = Fondo Salvadoreño de Estudios de Preinversión (dependencia de MIPLAN)
BID = Banco Interamericano para el Desarrollo.

/gar

ANNEX E

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES

ANTEL

1. Organization Chart of ANTEL

2. English Key to the Organization Chart

3. Resumen de DaÑos a Instalaciones y
   Equipos por Acciones Terroristas
   (1979 a Mayo, 1988)
   (Includes Direct and Indirect Costs)

4. Costos Directos de DaÑos a Instalaciones
   de ANTEL por Acciones Terroristas
   Periodo 1979-1985 and Enero-Marzo, 1986

5. DaÑos a Instalaciones de ANTEL
   por Acciones Terroristas
   Costos Indirectos
   Monto 1979-1985 y Periodo Enero-Marzo, 1986

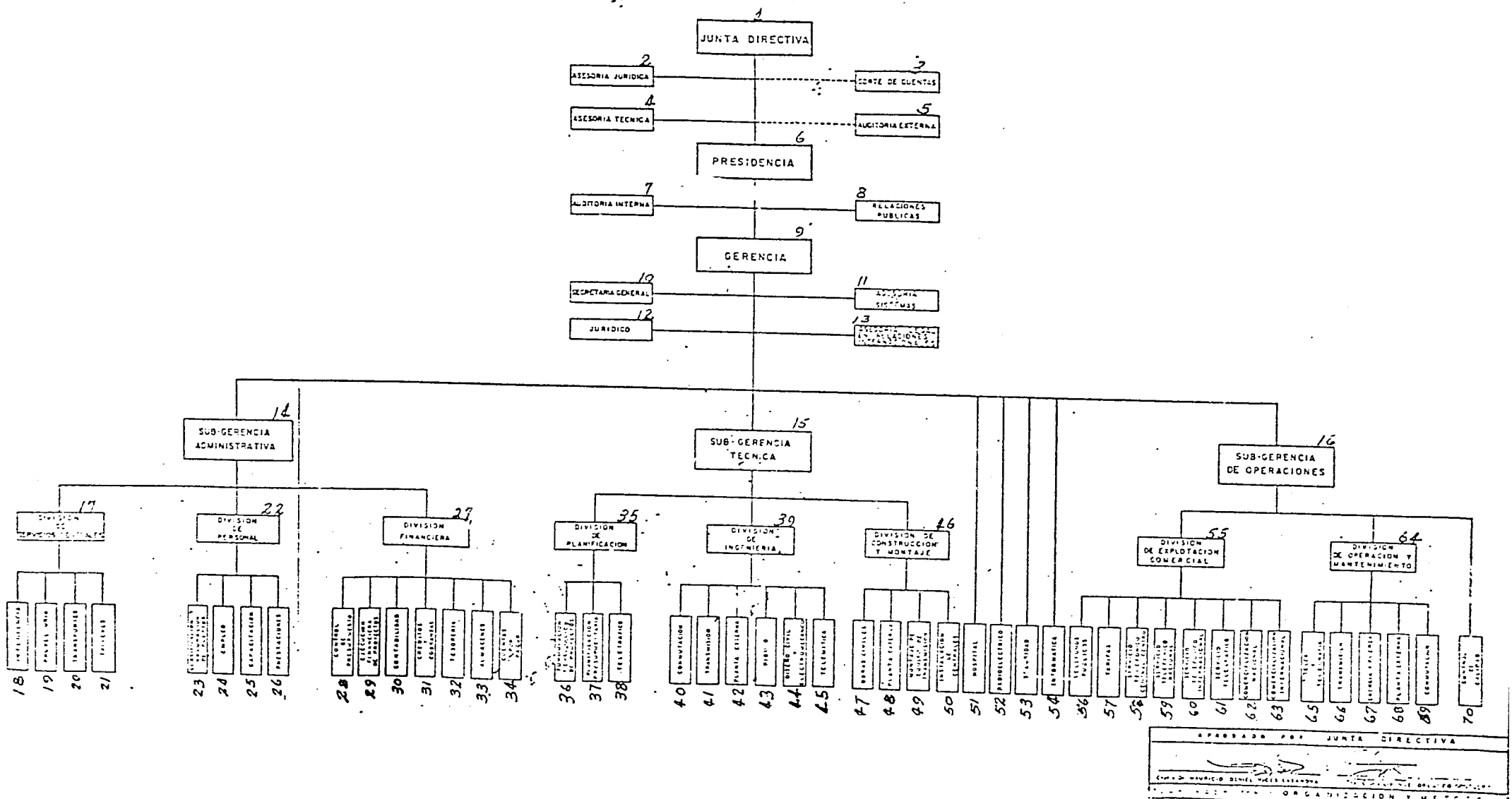
6. Estado de Origen y Aplicacion de Fondos
   del 1 de Enero al 31 de Diciembre de 1987

7. Balance General al 31 de Diciembre de 1987

8. Estados de Resultados
   del 1 de Enero al 31 de Diciembre de 1987

# ADMINISTRACION NACIONAL DE TELECOMUNICACIONES

## ORGANIGRAMA GENERAL 1988



## 2. English Key to ANTEL Organization Chart

1. Board of Directors
2. Legal Advisor
3. Investment Advisor
4. Technical Advisor
5. External Auditor
6. President
7. Internal Auditor
8. Public Relations
9. Manager
10. Secretary General
11. Systems Advisor
12. Legal Department
13. Legal Advisor in International Relations
14. Assistant Manager for Administration
15. Assistant Manager for Technical Affairs
16. Assistant Manager for Operations
17. General Services Division
18. Management Administration
19. Supply
20. Transportation
21. Shops
22. Personnel Division
23. Position Classification and Evaluation
24. Employment
25. Training
26. Benefits
27. Finance Division
28. Control of Budget
29. Execution of Financial Projects
30. Accounting
31. Credit and Collections
32. Treasurer
33. Stores
34. Bills for Payment
35. Planning Division
36. Prepare and Evaluate Projects
37. Budget Planning
38. Traffic
39. Engineering Division
40. Switching
41. Transmission
42. Outside Plant
43. Drafting
44. Civil and Electromechanical Design
45. Information and Statistics
46. Division of Construction and Assembly
47. Civil Works
48. Outside Plant
49. Assembly of Transmission Equipment
50. Installation of Central Station Equipment
51. Health and Medical
52. Radioelectric
53. Security

54. Information
55. Commercial Division
56. Public Telephones
57. Tariffs
58. Central Service Telephones
59. National Telephone Service
60. International Telephone Service
61. Telegraph Service
62. National Commerce
63. International Commerce
64. Operation and Maintenance Division
65. Telex and Telegraph
66. Transmission
67. Energy and Power
68. Outside Plant
69. Switching
70. Quality Control

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES.
DEPARTAMENTO DE CONTABILIDAD.
RESUMEN DE DAÑOS A INSTALACIONES Y EQUIPOS POR ACCIONES TERRORISTAS.

RECIBIDO
DIVISION DE PLANIFICACION
Fecha: 29 JUN. 1988
Hora:
Procedencia:

| RUBROS DAÑADOS. | | PERIODO. 1979 A ABRIL/88. | MAYO DE 1988 | TOTAL ACUMULADO. 1979 A MAYO/88 |
|---|---|---|---|---|
| COSTOS DIRECTOS. | | | | |
| 1. | EDIFICIOS E INSTALACIONES. | | | |
| 1.1 | Edificios. | ¢ 3.119.746 | ¢ 35.000 | ¢ 3.154.746 |
| 1.2 | Mobiliario y Equipo. | 2.434.069 | 10.400 | 2.444.469 |
| 1.3 | Conmutadores. | 1.047.402 | 4.000 | 1.051.402 |
| 1.4 | Armarios. | 3.460.000 | 305.000 | 3.765.000 |
| 1.5 | Pozos de Visita. | 421.200 | -.- | 421.200 |
| 1.6 | Circuitos Telefónicos. | 3.219.882 | 2.000 | 3.221.882 |
| 1.7 | Estaciones Repetidoras. | 10.602.279 | -.- | 10.602.279 |
| 1.8 | Plantas Telefónicas. | 1.000.000 | -.- | 1.000.000 |
| 1.9 | Teleimpresores. | 35.000 | -.- | 35.000 |
| 1.10 | Cables Telefónicos. | 323.039 | 6.000 | 329.039 |
| 1.11 | Misceláneos. | 96.255 | -.- | 96.255 |
| | | ¢ 25.758.872 | ¢ 362.400 | ¢ 26.121.272 |
| 2. | EQUIPO PESADO. | | | |
| 2.1 | Vehículos Pesados. | ¢ 142.640 | -.- | ¢ 142.640 |
| 2.2 | Motores Generadores. | 800.000 | -.- | 800.000 |
| 2.3 | Bancos de Batería . | 805.000 | -.- | 805.000 |
| | | ¢ 1.747.640 | -.- | ¢ 1.747.640 |
| 3. | EQUIPO LIVIANO. | | | |
| 3.1 | Vehículos Livianos. | ¢ 889.118 | | ¢ 889.118 |
| | | ¢ 889.118 | | ¢ 889.118 |

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES
ANTEL

DEPARTAMENTO DE CONTABILIDAD

| RUBROS DAÑADOS. | PERIODO. 1979 A ABRIL/88 | MAYO DE 1988 | TOTAL ACUMULADO. 1979 A MAYO/88 |
|---|---|---|---|
| **COSTOS DIRECTOS.** | | | |
| 4. OTROS. | | | |
| 4.1 Aparatos Telefónicos. | ¢ 26.588 | ¢ 3.200 | ¢ 29.788 |
| 4.2 Postes. | 130.533 | 15.600 | 146.133 |
| 4.3 Teléfonos Públicos. | 341.684 | 75.000 | 416.684 |
| | ¢ 498.805 | ¢ 93.800 | ¢ 592.605 |
| SUB-TOTAL. | ¢ 28.894.435 | ¢ 456.200 | ¢ 29.350.635 |
| **COSTOS INDIRECTOS.** | | | |
| 5. COSTOS DIVERSOS. | | | |
| 5.1 Ingresos no Recibidos. | ¢ 417.570.781 | ¢ 15.162.583 | ¢ 432.733.364 |
| 5.2 Seguridad Instalaciones. | 7.819.091 | 57.568 | 7.876.659 |
| 5.3 Aumento de Personal. | 4.516.580 | -.- | 4.516.580 |
| 5.4 Sobre Tiempo ( horas extras ) | 731.693 | -.- | 731.693 |
| 5.5 Entrenamiento de Personal. | 10.405 | -.- | 10.405 |
| 5.6 Costo de Transporte Aéreo. Adicional. | 91.604 | -.- | 91.604 |
| 5.7 Costo de Transporte Terrestre Adicional. | 40.820 | -.- | 40.820 |
| 5.8 Costo de Energía Adicional. ( Electricidad - Combustible ) | 1.414.623 | -.- | 1.414.623 |
| 5.9 Indemnización - Seguros. | 1.714.032 | -.- | 1.714.032 |
| 5.10 Otros. | 2.834.789 | 5.757* | 2.840.546 |
| SUB-TOTAL. | ¢ 436.744.418 | ¢ 15.225.908 | ¢ 451.970.326 |
| TOTAL GENERAL. | ¢ 465.638.853 | ¢ 15.682.108 | ¢ 481.320.961 |

MGGM/cgdm.

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES ANTEL

DEPARTAMENTO DE CONTABILIDAD

# COSTOS DIRECTOS DE DAÑOS A INSTALACIONES DE "ANTEL" POR ACCIONES TERRORISTAS

| | | PERIODO 1979 - 1985 | PERIODO ENERO-MARZO/86 | TOTAL ACUMULADO 1979-MARZO/86 |
|---|---|---|---|---|
| 1- | EDIFICIOS E INSTALACIONES | | | |
| 1.1 | Edificios | 2.143.469 | 23.206 | 2.166.675 |
| 1.2 | Mobiliario y Equipo | 2.145.700 | 11.936 | 2.157.636 |
| 1.3 | Conmutadores | 816.500 | 3.065 | 819.565 |
| 1.4 | Armarios | 1.490.000 | 580.000 | 2.070.000 |
| 1.5 | Pozos de Visita | 385.000 | -.- | 385.000 |
| 1.6 | Líneas Telefónicas | 3.162.525 | 1.046 | 3.163.571 |
| 1.7 | Estaciones Repetidoras | 5.902.279 | -.- | 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 | 297.449 | 600 | 298.049 |
| 1.11 | Misceláneos | 74.360 | 1.982 | 76.342 |
| | | 17.427.272 | 621.835 | 18.049.107 |
| 2- | EQUIPO PESADO | | | |
| 2.1 | Vehículos pesados | 142.640 | -.- | 142.640 |
| 2.2 | Motores Generadores | 800.000 | -.- | 800.000 |
| 2.3 | Bancos de Batería | 805.000 | -.- | 805.000 |
| | | 1.747.640 | -.- | 1.747.640 |
| 3- | EQUIPO LIVIANO | | | |
| 3.1 | Vehículos livianos | 480.782 | -.- | 480.782 |
| | | 480.782 | -.- | 480.782 |
| 4- | OTROS | | | |
| 4.1 | Aparatos Telefónicos | 3.400 | 1.946 | 5.346 |
| 4.2 | Postería | 108.360 | 1.408 | 109.768 |
| 4.3 | Teléfonos Públicos | 130.772 | -.- | 130.772 |
| | | 242.532 | 3.354 | 245.886 |
| | **TOTAL** | 19.898.226 | 625.189 | 20.523.415 |

24-06-86

EE/mdm.

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES
ANTEL
DEPARTAMENTO DE CONTABILIDAD

# DAÑOS A INSTALACIONES DE "ANTEL" POR ACCIONES TERRORISTAS

| | | MONTO 1979-1985 | PERIODO ENERO-MARZO/86 | TOTAL |
|---|---|---|---|---|
| 5. | COSTOS INDIRECTOS | | | |
| 5.1 | Ingresos no Recibidos | ¢ 59.353.435 | ¢ 17.145.480 | ¢ 76.498.915 |
| 5.2 | Seguridad Personal | -.- | -.- | -.- |
| 5.3 | Seguridad Instalaciones | 5.947.775 | 178.829 | 6.126.604 |
| 5.4 | Aumento de Personal | 4.516.580 | -.- | 4.516.580 |
| 5.5 | Sobretiempos (horas extras) | 727.853 | 3.840 | 731.693 |
| 5.6 | Entrenamiento de Personal | 10.405 | -.- | 10.405 |
| 5.7 | Costo de Transporte Aéreo Adicional | 83.480 | 1.440 | 84.920 |
| 5.8 | Costo de Transporte Terrestre Adicional | 40.000 | 820 | 40.820 |
| 5.9 | Costo de Energía Adicional (Electricidad-Combustible) | 1.414.623 | -.- | 1.414.623 |
| 5.10 | Costo de Equipo Pesado adicional | -.- | -.- | -.- |
| 5.11 | Costo Equipo Liviano adicional | -.- | -.- | -.- |
| 5.12 | Indemnizaciones - Seguros | 1.678.390 | 2.642 | 1.681.032 |
| 5.13 | Otros | 2.413.394 | 248.179 * | 2.661.573 |
| | | ¢ 76.185.935 | ¢ 17.581.230 | ¢ 93.767.165 |

* Esta cantidad representa el 10% de los Costos Indirectos calculados y reportados para el año 1985, exceptuando el rubro 5.1 Ingresos no Recibidos, y se incluye como estimación de los Costos Indirectos, que por alguna circunstancia no han sido considerados en este informe.

04-07-86
EE/mdm.

# ADMINISTRACION NACIONAL DE TELECOMUNICACIONES
## ESTADO DE ORIGEN Y APLICACION DE FONDOS
## DEL 1ro. DE ENERO AL 31 DE DICIEMBRE DE 1987

### ORIGEN DE FONDOS

| | |
|---|---|
| Resultados del Presente Ejercicio | ¢ 127.387.394 |
| Resultados no Aplicables al Presente Ejercicio | 22.822.919 CR |
| Depreciaciones | 19.816.761 |
| Donaciones | 570 |
| Total Origen de los Fondos | ¢ 124.381.806 |

### APLICACION DE LOS FONDOS

| | |
|---|---|
| Incremento en Planta en Operación | ¢ 44.056.875 |
| Incremento en Obras en Construcción | 6.836.512 |
| Aumento en Otros Activos | 324.397 |
| Disminución en Pasivo a Largo Plazo | 13.424.005 |
| Disminución en Otros Pasivos | 77.316 |
| Total Aplicación de Fondos | ¢ 64.719.305 |
| Incremento en el Capital de Trabajo | 59.662.501 |
| TOTAL | ¢ 124.381.806 |

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES

BALANCE GENERAL AL 31 DE DICIEMBRE DE 1987

## A C T I V O

| | | |
|---|---|---|
| **ACTIVO FIJO:** | | |
| Planta en Operación | | ¢ 396.399.906 |
| Menos: Depreciación | | 162.898.030 |
| | | 233.501.876 |
| Obras en Construcción | | 70.186.608 |
| Inversiones: | | |
| Títulos | ¢ 1.018.794 | |
| Cédulas Hipotecarias | 30.000.000 | 31.018.794 |
| | | 334.707.278 |
| **ACTIVO CIRCULANTE:** | | |
| Efectivo en Caja y Bancos | | 368.460.709 |
| Mercaderías en Tránsito | | 184.632.132 |
| Cuentas por Cobrar | ¢ 117.238.988 | |
| MENOS: | | |
| Provisión para Cuentas Incobrables | 2.247.393 | 114.991.595 |
| | | 668.084.436 |
| **OTRO ACTIVO:** | | |
| Cuentas por Cobrar Gobierno de El Salvador | | 29.070.451 |
| Cargos Diferidos | | 8.847.707 |
| | | 37.918.158 |
| **Total del Activo** | | ¢1.040.709.872 |
| **CUENTAS DE ORDEN DEUDORAS** | | ¢ 136.775.919 |

## P A T R I M O N I O Y P A S I V O

| | |
|---|---|
| **PATRIMONIO:** | |
| Resultados de Ejercicios Anteriores | ¢ 546.260.019 |
| Resultados del Presente Ejercicio | 127.387.394 |
| Resultados no Aplicables al Presente Ejercicio | 22.822.919 CR |
| Donaciones | 179.021 |
| Reserva para Reposición de Activos Fijos | 30.000.000 |
| | 681.084.114 |
| **PASIVO A LARGO PLAZO:** | |
| Préstamos del Exterior y Otros | 85.479.510 |
| **PASIVO CIRCULANTE:** | |
| Préstamos del Exterior | 14.430.000 |
| Cuentas y Gastos Acumulados por Pagar | 257.526.031 |
| | 271.956.031 |
| **OTRO PASIVO:** | |
| Gobierno de El Salvador adeudo por Traspaso de Activo Fijo | 278.736 |
| Cobros Anticipados y Retenciones | 1.188.159 |
| Otros Créditos Diferidos | 803.302 |
| | 2.270.297 |
| **Total del Patrimonio y Pasivo** | ¢1.040.709.872 |
| **CUENTAS DE ORDEN ACREEDORAS** | ¢ 136.775.919 |

Presidente

Jefe División Financiera

Contador

Auditor Interno

Delegado de la Corte de Cuentas

ADMINISTRACION NACIONAL DE TELECOMUNICACIONES
ESTADO DE RESULTADOS
DEL 1o. DE ENERO AL 31 DE DICIEMBRE DE 1987

| | | |
|---|---|---|
| **INGRESOS POR SERVICIOS:** | | |
| Telefonía | ¢ 336.534.906 | |
| Telegrafía | 3.851.069 | |
| Télex | 27.283.199 | |
| Otros Servicios de Telecomunicaciones | 4.554.844 | |
| TOTAL INGRESOS POR SERVICIOS | | ¢ 372.224.018 |
| **COSTOS POR SERVICIOS:** | | |
| Telefonía | ¢ 184.510.993 | |
| Telegrafía | 14.390.060 | |
| Télex | 14.573.974 | |
| Otros Servicios de Telecomunicaciones | 2.609.674 | |
| TOTAL COSTOS POR SERVICIOS | | 216.084.701 |
| UTILIDAD DE OPERACION | | ¢ 156.139.317 |
| **OTROS INGRESOS:** | | |
| Intereses Bancarios | ¢ 33.870.086 | |
| Intereses Cédulas Hipotecarias | 3.458.996 | |
| Ingresos Hospital | 1.224.253 | |
| Otros | 10.991.471 | |
| TOTAL OTROS INGRESOS | | ¢ 49.544.806 |
| **OTROS GASTOS:** | | |
| Intereses sobre Deuda a Largo Plazo | ¢ 8.949.788 | |
| Gastos Funcionamiento Hospital | 8.825.902 | |
| TOTAL OTROS GASTOS | | 17.775.690 |
| UTILIDAD NO DE OPERACION | | ¢ 31.769.116 |
| | | ¢ 187.908.433 |
| (-) AJUSTE POR DIFERENCIALES CAMBIARIOS | | 17.874.025 |
| UTILIDAD ANTES DE IMPUESTO SOBRE LA RENTA | | ¢ 170.034.408 |
| (-) PROVISION IMPUESTO SOBRE LA RENTA | | 42.647.014 |
| RESULTADOS DEL PRESENTE EJERCICIO | | ¢ 127.387.394 |
| RESULTADOS NO APLICABLES AL PRESENTE EJERCICIO | | 22.822.919 CR |
| DONACIONES | | 570 |
| UTILIDAD NETA | | ¢ 104.565.045 |

Presidente

Jefe División Financiera

Contador

Auditor Interno

Auditor Externo

Delegado de la Cte. de Ctas.

AUDITORIA INTERNA

INSCRIPCION 171

ANNEX F

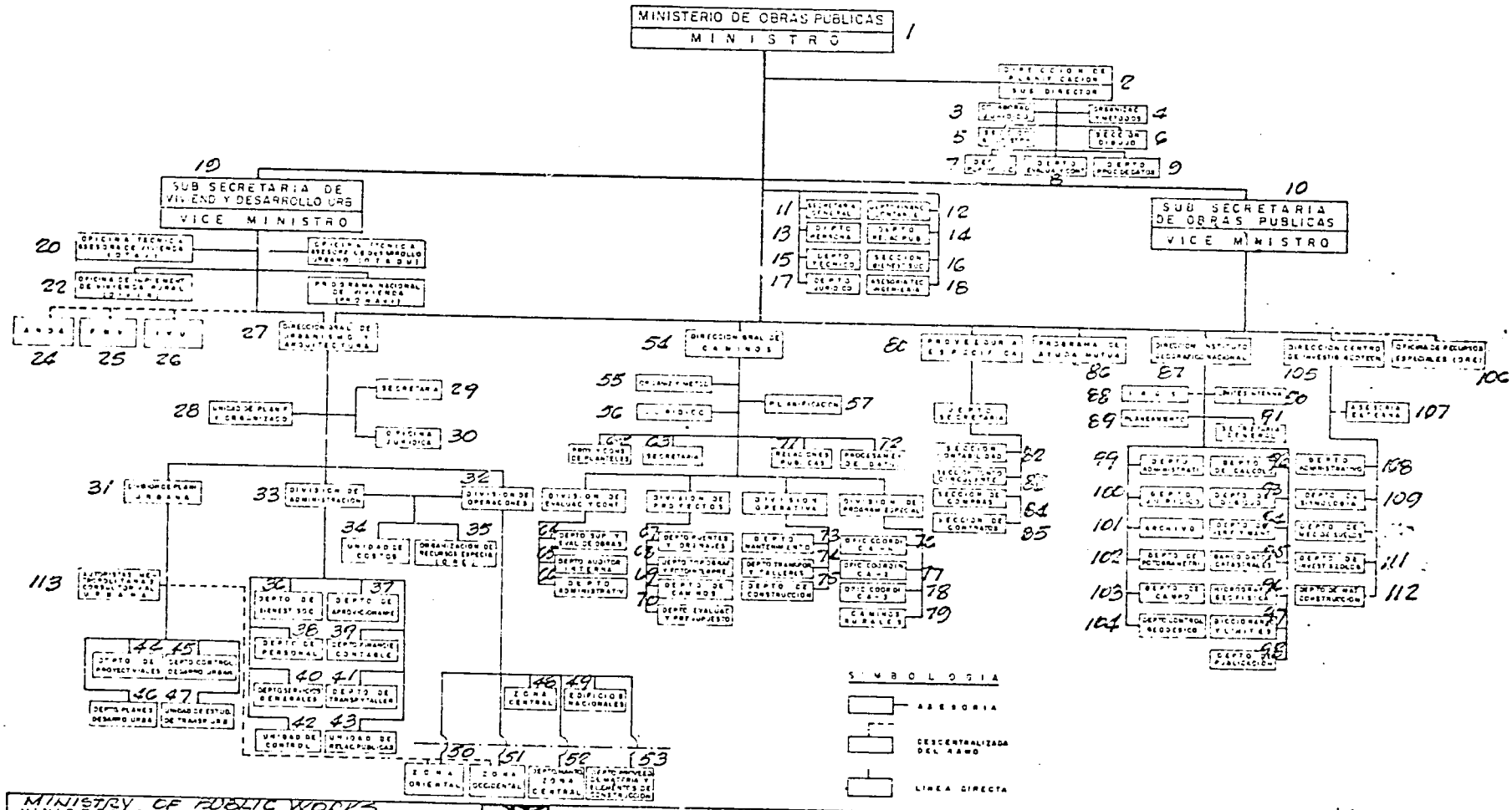
MINISTRY OF PUBLIC WORKS

1. Organization

2. English Key to Organization Chart

3. Classification and Length of the Roads and Highway Network of El Salvador

# MINISTRY OF PUBLIC WORKS ORGANIGRAM
## ORGANIGRAMA DEL MINISTERIO DE OBRAS PUBLICAS




MINISTRY OF PUBLIC WORKS
MINISTERIO DE OBRAS PUBLICAS
DIRECTORATE OF PLANNING
DIRECCION DE PLANIFICACION
EL SALVADOR C.A.

ELABORO: Doris by

UNIT OF ORGANIZATION AND METHODS
UNIDAD DE ORGANIZACION Y METODOS

AUGUST OF 1985
AGOSTO DE 1985.

DIBUJO: SECCION DE DIBUJO

2. English Key to Organization Chart for the:

Ministry of Public Works

1. Ministry
2. Directorate of Planning - Sub Director
3. Juridical Assessor
4. Organization and Methodology
5. Administrative Section
6. Drafting Section
7. Planning Department
8. Evaluation and Control Department
9. Data Processing Department
10. Sub-Secretary of Public Works - Vice Ministry
11. General Secretary
12. Finance and Accounting Department
13. Personnel Department
14. Public Relations Department
15. Technical Department
16. Social Welfare Department
17. Juridical Department
18. Technical Assessor of Engineering
19. Sub-Secretary of Housing and Urban Development - Vice Ministry
20. Technical Officer of Housing Assessory
21. Technical Office of Urban Development Assessory
22. Rural Housing Implementation Office
23. National Housing Program
24. ANDA - National Administration of Aqueducts and Sanitary Sewer
25. FNV - National Housing Fund
26. IVU - Institute of Urban Housing
27. DUA - Directorate of Urbanism and Architecture
28. Planning and Organization Unit
29. Secretary
30. Legal Office
31. Urban Planning Division
32. Operations Division
33. Administrative Division
34. Costs Unit
35. Special Resources Organization
36. Social Welfare Department
37. Supply Department
38. Personnel Department
39. Finance and Accounting Department
40. General Services Department
41. Transportation and Shop Department
42. Control Unit
43. Public Relations Unit
44. Road Projects Department
45. Urban Development Control Department
46. Urban Development Planning Department
47. Urban Transportation Studies Unit
48. Central Zone
49. National Buildings

50. Oriental Zone
51. Occidental Zone
52. Maintenance Department - Central Zone
53. Material Supply and Constructio Elements Department
54. General Directorate of Roads and Highways (DGC)
55. Organization and Methodology
56. Legal
57. Planning

59. Secretary
60. Public Relations
61. Data Processing
62. Evaluation and Accounting Division
63. Projects Division
64. Projects Supervision Department
65. Internal Auditory Department
66. Administrative Department
67. Bridge and Drainage Department
68. Topography and Terrestrial Photogrametry Department
69. Roads Department
70. Evaluation Department
71. Operative Division
72. Special Programs Division
73. Maintenance Department
74. Transportation and Shops Department
75. Construction Department
76. Coordination Office, CA-1 (Panamerican Road)
77. Coordination Office, CA-2 (Coastal Road)
78. Coordination Office, CA-3 (
79. Rural Roads
80. Specific Storage
81. Secretary Department
82. Accounting Section
83. Circulatory Funds Section
84. Purchasing Office
85. Contracts Section
86. Mutual Help Program
87. IGN - National Geographic Institute - Directorate
88. IAES
89. International Limits
90. Planning
91. General Secretary
92. Calculation Department (Structural)
93. Drafting Department
94. Verification and Maintenance Department
95. Cadastre Data Bank
96. Geophysic Hydrography
97. Dictionary and Limits
98. Publication Department
99. Administration Department
100. Legal Department
101. Archives
102. Photometry Department
103. Field Department
104. Geodesic Control Department

105. Geotechnical Investigation Center - Directorate
106. Special Resources Office
107. External Advice
108. Administrative Department
109. Sysmology Department
110. Soil Mechanics Department
111. Geology Investigation Department
112. Construction Materials Department
113. Metropolitan Speedways - Urban Roads Consultancy

# CLASSIFICATION AND LENGTH OF THE ROADS AND HIGHWAY NETWORK OF EL SALVADOR

| Depts. | Specials (A) | Primary (B) | Secondary (C) | Tertiary (D) | Rural "A" (E) | Rural "B" (F) | Vicinal (G) | Total (Kms) |
|---|---|---|---|---|---|---|---|---|
| Ahuachapan | ---- | 39.1 | 41.20 | 150.35 | 130.0 | 346.0 | 270.2 | 976.91 |
| Santa Ana | 24.79 | 59.90 | 104.26 | 52.14 | 176.8 | 360.0 | 367.5 | 1,145.39 |
| Sonsonate | ---- | 87.8 | 81.34 | 88.78 | 86.8 | 193.4 | 319.9 | 958.02 |
| La Libertad | 35.0 | 104.0 | 38.0 | 183.70 | 89.4 | 172.75 | 253.5 | 876.35 |
| Chalatenano | ---- | 37.0 | 59. | 149.66 | 165.8 | 348.6 | 261.2 | 1,022.06 |
| San Salvador | 27.4 | ---- | 129.1 | 62.15 | 92.4 | 255.1 | 72.7 | 638.85 |
| Cuscatlan | ---- | ---- | 51.7 | 83.65 | 79.43 | 377.33 | 140.31 | 732.42 |
| Cabañas | ---- | ---- | 42.52 | 117.66 | 82.90 | 364.80 | 236.40 | 844.28 |
| San Vicente | ---- | 14.4 | 82.55 | 154.40 | 76.65 | 184.50 | 121.40 | 633.90 |
| La Paz | 20.0 | 36.0 | 70.42 | 124.24 | 130.60 | 494.60 | 91.90 | 967.81 |
| Usulutan | ---- | 42.0 | 114.20 | 154.30 | 194.00 | 384.70 | 177.30 | 1,066.50 |
| San Miguel | ---- | 42.34 | 137.07 | 110.30 | 320.69 | 270.20 | 44.64 | 925.24 |
| Morazan | ---- | 14.00 | 58.20 | 125.50 | 22.90 | 230.85 | 68.35 | 519.90 |
| La Union | ---- | 101.10 | 42.70 | 153.40 | 62.20 | 316.30 | 267.60 | 943.30 |
| Total (Kms) | 107.24 | 577.20 | 1,053.06 | 1,710.23 | 1,710.57 | 4,299.13 | 2,692.90 | 12,150.83 |

ANNEX G

Railway, Airports, Ports

Supplementary Data

1. Railways
2. Airports
3. Ports

1. Railway*: Direct Damage Assessment

   a. Locomotives: Direct Damage

   b. Railroad Cars: Direct Damage

   c. Motor Vehicles: Direct Damage

   d. Bridges

   e. Support Equipment

   f. Lines and Stations

* All data provided by CEPA/FENADESAL (Autonomous Executive Port Commission/National Railway of El Salvador).

Note: The original costs were in Colones; they were converted to US$ as follows: 1980-1985 1=2.50; 1986 to present 1=5.00.

1. Railway

a. Locomotives

1980

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 08/14 | Km. 147.1 Sta. Cruz-Zacate | Loc. 865 | 60 | Machine gunned |
| 09/14 | Km. 298.17 Rio Sucio | Loc. 860 | 10,000 | Dynamited |
| 09/15 | Km. 162.13 Cañas-La Joya | Loc. 859 | 1,600 | Sabotage |
| 09/24 | Km. 186.12 San Vicente | Loc. 857 | 4,800 | Dynamited |
| 09/29 | Km. 297.12 Rio Sucio | Loc. 856 | 70,000 | Dynamited |
| 12/05 | Km. 161.4 La Joya-Los Cotos | Loc. 860 | 6,000 | Dynamited |
| 12/05 | Km. 298.5 Rio Sucio | Loc. 857 | 2,400,000 | Destroyed |
| | | Loc. 859 | 2,400,000 | Destroyed |
| 12/08 | Km. 298.9 Rio Sucio | Loc. 853 | 440,000 | Dynamited |
| 1980 | Total | | 5,332,460 | |

1981

| | | | | |
|---|---|---|---|---|
| 02/04 | Km. 130.8 California | Loc. 863 | 10,000 | Dynamited |
| 02/13 | Km. 166.3 Tehuacan-La Joya | Loc. 854 | 2,400,000 | Destroyed |
| 02/28 | Km. 170.18 Sta. Gertrudis-Tehuacan | Loc. 858 | 3,000 | Dynamited |
| 03/12 | Km. 170.16 Sta. Gertrudis-Tehuacan | Loc. 851 | 80,000 | Dynamited |
| 03/28 | Km. 298.5 Rio Sucio-Atiocoyo | Loc. 706 | 4,200 | Dynamited |
| 04/18 | Km. 12.5 El Pilon-La Union | Loc. 858 | 480 | Machine gunned |
| 06/24 | Km. 366.7 San Diego | Loc. 855 | 112,000 | Dynamited |
| 07/10 | Km. 170.17 Sta. Gertrudis-Tehuacan | Loc. 802 | 4.200 | Sabotage |
| 08/09 | Km. 171.4 Sta. Gertrudis-Tehuacan | Loc. 863 | 215,200 | Dynamited |
| 08/13 | Km. 79.8 Calle Nueva | Loc. 866 | 112,400 | Dynamited |
| 09/10 | Km. 362.13 Desague-San Diego | Loc. 858 | 8,000 | Dynamited |
| 10/18 | Km. 176.15 San Vicente- Los Obrajes | Loc. 852 | 1,600 | Dynamited |
| 11/12 | Km. 130.4 San Marcos Lempa-California | Loc. 860 | 5,200 | Dynamited |
| 12/13 | Km. 13.15 El Pilon-La Union | Loc. 863 | 164,000 | Dynamited |
| 12/16 | Jn, 13.9 El Pilon-La Union | Loc. 865 | 600,000 | Dynamited |
| 12/29 | Km. 173.19 Obrajes-Sta. Gertrudis | Loc. 862 | 4,800 | Dynamited |
| 1981 | Total | | 3,727,000 | |

1982

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 01/11 | Km. 02.11 Texis Juct.-Chilcuyo | Loc. 856 | 31,200 | Dynamited |
| 01/13 | Km. 66.18 San Miguel-El Amate | Loc. 863 | 102,400 | Burned |
| 01/31 | Km. 71.6 El Amate | Loc. 858 | 1,000 | Burned |
| 03/18 | Km. 164.2 Tehuacan-Cañas | Loc. 858 | 280,000 | Dynamited |
| 04/30 | Km. 170.7 Sta. Gertrudis-Tehuacan | Loc. 802 | 3,400 | Dynamited |
| 05/19 | Km. 75.15 Colombia-Quezaltepeque | Loc. 858 | 600,000 | Dynamited |
| 05/23 | Km. 171.9 Sta. Gertrudis-Tehuacan | Loc. 862 | 2,000 | Dynamited |
| 05/31 | Km. 195.16 Molineros-Sto. Domingo | Loc. 851 | 6.540 | Dynamited |
| 07/06 | Km. 171.6 Tehuacan-San Vicente | Loc. 851 | 4,000 | Dynamited |
| 07/16 | Km. 139.5 El Playon-San Marcos Lempa | Loc. 862 | 6,000 | Dynamited |
| 07/20 | Km. 170.12 Sta. Gertrudis-Tehuacan | Loc. 860 | 8,000 | Dynamited |
| 07/28 | Km. 277.1 La Toma-Guazapa | Loc. 863 | 200,000 | Dynamited |
| 07/30 | Km. 198.1 San Rafael-Molineros | Loc. 862 | 10,000 | Dynamited |
| 08/06 | Km. 130.2 California-San Marcos Lempa | Loc. 861 | 6,000 | Dynamited |
| 08/20 | Km. 163.8 Cañas-La Joya | Loc. 860 | 4,000 | Dynamited |
| 09/09 | Km. 90.9 Apopa-El Angel | Loc. 802 | --- | Burned |
| 10/14 | Km. 272.3 Apopa-Guazapa | Loc. 856 | 6,000 | Dynamited |
| 10/16 | Km. 170.13 Sta. Gertrudis- | Loc. 864 | 12,916 | Dynamited |
| 10/15 | Km. 347.15 Los Mangos-San Francisco | Loc. 860 | 7,304 | Dynamited |
| 10/30 | Km. 90.5 El Angel-Apopa | Loc. 802 | 80,000 | Dynamited |
| 11/10 | Km. 122 Del Pech | Loc. 864 | 60 | Machine gunned |
| 11/28 | Km. 121 California-Valle San Juan | Loc. 860 | 6,000 | Dynamited |
| 1982 | Total | | 1,378.820 | |

1983

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 01/11 | Km. 90.3 Apopa-El Angel | Loc. 860 | 167,000 | Dynamited |
| 04/06 | Km. 10.16 Jiquilisco-Valle San Juan | Loc. 864 | 452,000 | Burned |
| 04/27 | Km. 86.5 Nejapa-Apopa | Loc. 851 | 132,000 | Dynamited |
| 07/22 | Km. 86.14 Apopa-San Salvador | Loc. 863 | 288,000 | Dynamited |
| 09/09 | Km. 168.7 Tehuacan-Los Cotos | Loc. 856 | 20,000 | Dynamited |
| 11/15 | Km. 258.17 Apopa-Tonacatepeque | Loc. 861 | 10,000 | Dynamited |
| 12/29 | Km. 130.2 San Marcos Lempa-California | Loc. 860 | 18,000 | Dynamited |
| 1983 | Total | | 1,087,800 | |

1984

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 02/14 | Km. 119 Jiquilisco-Valle San Juan | Loc. 866 | 20,000 | Machine gunned |
| 02/22 | Km. 170.12 Obrajes-Sta. Gertrudis | Loc. 852 | 600,000 | Burned |
| 02/28 | Km. 155 Entre Rios-Los Cotos | Loc. 855 | 880 | Sabotage |
| 02/27 | Km. 295 Nueva Concepcion-Rio Sucio | Loc. 861 | 50,000 | Dynamited |
| | | Loc. 851 | 50,000 | Dynamited |
| 03/24 | Km. 78.7 Calle Nueva-San Miguel | Loc. 856 | 58,000 | Dynamited |
| 07/10 | Km. 275.2 La Toma-Guazapa | Loc. 858 | 2,400 | Dynamited |
| 07/14 | Km. 296.14 La Toma-Atiocoyo | Loc. 866 | 135,000 | Dynamited |
| | | Loc. 861 | 135,000 | Dynamited |
| 07/26 | Km. 30.7 Conejos-Olomega | Loc. 862 | 100,000 | Dynamited |
| 09/19 | Km. 71.8 El Amate-San Miguel | Loc. 865 | 2,000,000 | Destroyed |
| 11/03 | Km. 86.5 El Angel-Nejapa | Loc. 861 | 114,000 | Dynamited |
| 1984 | Total | | 3,265,280 | |

1985

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 01/25 | Km. 122.15 San Marcos Lempa-Usulutan | Loc. 866 | 1,600 | Dynamited |
| 02/11 | Km. 165.18 Tehuacan-Cañas | Loc. 855 | 6,000 | Dynamited |
| 03/02 | Km. 258.10 Apopa-Tonacatepeque | Loc. 856 | 260 | Dynamited |
| 03/13 | Km. 130.9 San Marcos Lempa-California | Loc. 858 | 460 | Dynamited |
| 05/21 | Km. 296.6 Nueva Concepcion-Rio Sucio | Loc. 858 | 50,600 | Dynamited |
| 06/21 | Km. 72.16 Km. 71-El Amate | Loc. 861 | 800 | Dynamited |
| 08/10 | Km. 90.6 El Angel-Apopa | Loc. 855 | 920 | Dynamited |
| 08/24 | Km. 77.12 El Amate-Calle Nueva | Loc. 862 | 320 | Dynamited |
| 10/05 | Km. 83.13 Quezaltepeque-Nejapa | Loc. 861 | 10,400 | Dynamited |
| 1985 | Total | | 71,300 | |

1986

| | | | | |
|---|---|---|---|---|
| 05/20 | Km. 30.4 Olomega-Conejos | Loc. 853 | 27,873 | Dynamited |
| 07/08 | Km. 77.16 Quezaltepeque-Colombia | Loc. 856 | 6,610 | Dynamited |
| 07/24 | Km. 83.3 San Salvador-Soyapango | Loc. 856 | 98,044 | Dynamited |
| 08/01 | Km. 71.9 El Niño-El Amate | Loc. 863 | 35 | Machine gunned |
| 09/08 | Km. 163.9 Cañas-Tehuacan | Loc. 855 | 6,460 | Dynamited |
| 10/03 | Km. 74.1 Km. 71-El Amate | Loc. 858 | 13,700 | Dynamited |
| 10/05 | Km. 122.17 Valle San Juan-Del Pech | Loc. 866 | 6,000 | Dynamited |
| 11/21 | Km. 167.16 Tehuacan-Cañas | Loc. 851 | 280 | Dynamited |
| 1986 | Total | | 109,980 | |

1987

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 01/05 | Km. 163.8 Cañas-Tehuacan | Loc. 863 | 20,000 | Dynamited |
| 02/09 | Km. 319.6 Los Doce Robles-Lagupeta | Loc. 858 | 60,000 | Burned |
| 03/16 | Km. 82.0 Calle Nueva-Piedra Pacha | Loc. 863 | 20,000 | Dynamited |
| 03/21 | Km. 163.16 Cañas-Tehuacan | Loc. 861 | 1,200 | Dynamited |
| 04/01 | Km. 85.5 Piedra Pacha-La Primavera | Loc. 862 | 400 | Dynamited |
| 04/26 | Km. 85.9 Piedra Pacha-La Primavera | Loc. 862 | 1,000 | Dynamited |
| 04/30 | Km. 163.9 Cañas-Tehuacan | Loc. 856 | --- | Dynamited |
| 05/21 | Km. 84.11 Nejapa-Quezaltepeque | Loc. 856 | 1,500,000 | Destroyed |
| 07/23 | Km. 170.1 San Vicente-San Cristobal | Loc. 851 | 57,000 | Dynamited |
| 08/12 | Km. 123.4 California-Del Pech | Loc. 863 | 7,000 | Dynamited |
| 08/26 | Km. 85.6 El Angel-Nejapa | Loc. 860 | 2,000 | Machine gunned |
| 09/16 | Km. 295.13 Nueva Concepcion-Modesto | Loc. 853 | 2,340 | Machine gunned |
| 09/22 | Km. 137.3 El Playon-San Marcos Lempa | Loc. 855 | 87,800 | Dynamited |
| 10/29 | Km. 137.4 El Playon-San Marcos Lempa | Loc. 853 | 79,500 | Dynamited |
| 11/20 | Km. 73.16 Km. 71-El Amate | Loc. 860 | 50,000 | Dynamited |
| 1987 | Total | | 1,878,240 | |

1988

| | | | | |
|---|---|---|---|---|
| 03/07 | Km. 350.14 San Francisco-Los Mangos | M. 853 | 7,050 | Dynamited |
| 03/22 | Km. 81.9 Calle Nueva-Piedra Pacha | M. 862 | 1,000 | Dynamited |
| 04/06 | Km. 162.18 Cañas-La Joya | M. 852 | 30,000 | Dynamited |
| 04/07 | Km. 85.9 Nejapa-Apopa | M. 858 | 1,200 | Dynamited |
| 04/18 | Km. 170.5 Tehuacan-Sta. Gertrudis | M. 861 | 5,600 | Dynamited |
| 04/18 | Km. 75.6 El Amate-Calle Nueva | M. 860 | 3,600 | Dynamited |
| 04/19 | Km. 166.1 Tehuacan-Cañas | M. 851 | 8,120 | Dynamited |
| 05/02 | Km. 170.2 Tehuacan-Sta. Gertrudis | M. 855 | 3,000 | Dynamited |
| 05/11 | Km. 165.13 Tehuacan-Cañas | M. 860 | 2,000 | Dynamited |
| 06/02 | Km. 350.9 Guajoyo-Los Mangos | M. 863 | 300 | Dynamited |
| 06/09 | Km. 161.4 La Joya-Los Cotos | M. 853 | 800 | Dynamited |
| 06/13 | Km. 377.5 Metapan-El Ronco | M. 855 | 10,400 | Dynamited |
| Jan./June 1988 | Total | | 73,270 | |

b. Railroad Cars

1980

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 02/07 | Km. 106.1 Jiquilisco-La | 17 Box | 114,583 | Dynamited |
| 09/15 | Km. 162.11 Cañas-La Joya | 2 Box | 13,480 | Sabotage |
| | | 3 Flat | 20,221 | Sabotage |
| 09/29 | Km. 297.12 Atiocoyo-Rio Sucio | 1 Box | 6,740 | Dynamited |
| 10/28 | Km. 170.17 Sta. Gertrudis- | 2 Box | 13,480 | Dynamited |
| | Tehuacan | 1 Box | 130,000 | Destroyed |
| 12/05 | Km. 298.5 Atiocoyo-Rio Sucio | 3 Box | 20,220 | Sabotage |
| 12/19 | Km. 162.10 Cañas-La Joya | 1 B.C. | 6,740 | Dynamited |
| 12/21 | Km. 166.11 Tehuacan-Cañas | 1 Coach | 6,740 | Dynamited |
| 1980 | Total | | | |

1981

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 02/04 | Km. 139.89 El Playon | 5 Box | 33,701 | Dynamited |
| 02/13 | Km. 166.3 Tehuacan-Cañas | 5 Box | 33,701 | Dynamited |
| | | 1 B.C. | 6,740 | Dynamited |
| | | 1 Coach | 170,000 | Destroyed |
| 02/23 | Km. 170.13 Sta.Gertrudis- | 9 Box | 60,662 | Dynamited |
| | Tehuacan | 1 Tank | 6.740 | Dynamited |
| | | 2 Coach | 13,480 | Dynamited |
| | | 1 B.C. | 140,000 | Destroyed |
| 03/12 | Km. 170.16 Sta. Gertrudis- | 5 Box | 33,701 | Dynamited |
| | Tehuacan | 1 Cab. | 120,000 | Destroyed |
| 03/28 | Km. 298.5 Rio Sucio-Nueva | 2 Box | 13,480 | Sabotage |
| | Concepcion | 1 Flat | 6,740 | Sabotage |
| 06/24 | Km. 366.7 San Diego | 1 B.C. | 140,000 | Destroyed |
| 07/10 | Km. 170.17 Sta. Gertrudis- | 1 Box | 6,740 | Sabotage |
| | Tehuacan | 1 Flat | 6,740 | Sabotage |
| 08/09 | Km. 171.4 San Vicente-San | 3 Box | 20,221 | Dynamited |
| | Cristobal | | | |
| 08/13 | Km. 79.8 Piedra Pacha-Calle | 1 Coach | 6,740 | Dynamited |
| | Nueva | | | |
| 09/10 | Km. 362.13 San Diego-Desague | 2 Box | 13,480 | Dynamited |
| 09/13 | Km. 163.9 Tehuacan-Cañas | 6 Box | 40,441 | Dynamited |
| 10/18 | Km. 175.15 San Cristobal-Los | 1 Box | 6,740 | Dynamited |
| | Obrajes | 1 Flat | 6,740 | Dynamited |
| | | 1 Tank | 6,740 | Dynamited |
| 11/12 | Km. 130.4 San Marcos Lempa- | 8 Box | 53,922 | Dynamited |
| | California | | | |
| 12/29 | Km. 173.19 Los Obrajes-Santa | 2 Box | 13,480 | Dynamited |
| | Gertrudis | 1 B.C. | 6,740 | Dynamited |
| 1981 | Total | | 967,672 | |

1982

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 01/11 | Km. 02.11 Chilcuyo-Texis Jct. | 2 Box | 13,480 | Dynamited |
| 01/13 | Km. 66.18 Km. 71-San Miguel | 3 Box | 20,221 | Burned |
| 03/18 | Km. 164.2 Tehuacan-Cañas | 5 Box | 33,701 | Dynamited |
| | | 1 Box | 130,000 | Destroyed |
| 04/30 | Km. 170.5 Sta. Gertrudis-Tehuacan | 4 Box | 26.961 | Dynamited |
| 05/19 | Km. 70.3 Colombia-Chanmico | 1 Box | 6,740 | Burned |
| 05/23 | Km. 121.15 Del Pech-Valle San Juan | 6 Box | 40,441 | Dynamited |
| | | 1 B.C. | 140,000 | Destroyed |
| 05/23 | Km. 171.8 Sta. Gertrudis-Tehuacan | 4 Box | 26,961 | Dynamited |
| | | 1 Flat | 6,740 | Dynamited |
| 05/31 | Km. 195.10 Sto. Domingo-Molineros | 4 Box | 26,961 | Dynamited |
| 06/26 | Km. 72.14 El Amate-Km. 71 | 2 Box | 13,480 | Burned |
| 07/06 | Km. 171.5 San Vicente-San Cristobal | 2 Box | 13,480 | Dynamited |
| 07/16 | Km. 139.5 El Playon-San Marcos Lempa | 5 Box | 33,701 | Dynamited |
| | | 1 Flat | 6,740 | Dynamited |
| 07/20 | Km. 170.12 Sta. Gertrudis-Tehuacan | 9 Box | 60,662 | Dynamited |
| 07/28 | Km. 271.1 Guazapa-La Toma | 1 Box | 6,740 | Dynamited |
| 07/30 | Km. 196.1 Sto. Domingo-Molineros | 3 Box | 20,221 | Dynamited |
| 08/08 | Km. 130.2 San Marcos Lempa-California | 8 Box | 53,922 | Dynamited |
| 08/20 | Km. 126.8 Tehuacan-Cañas | 1 Box | 6,740 | Dynamited |
| 09/09 | Km. 90.9 Apopa-El Angel | 1 Box | 6,740 | Dynamited |
| | | 1 Coach | 6,740 | Dynamited |
| | | 1 Cab. | 120,000 | Destroyed |
| 10/14 | Km. 272.3 Guazapa-Apopa | 8 Box | 53,922 | Dynamited |
| | | 1 Box | 130,000 | Destroyed |
| 10/15 | Km. 347.15 San Francisco-Los Mangos | 3 Box | 20,221 | Dynamited |
| | | 1 Flat | 6,740 | Dynamited |
| 11/09 | Km. 122.0 Del Pech-Valle San Juan | 10 Box | 67,402 | Dynamited |
| | | 1 Box | 130,000 | Destroyed |
| 11/29 | Km. 121.0 Valle San Juan | 12 Box | 80,882 | Dynamited |
| | | 1 Box | 130,000 | Destroyed |
| 1982 | Total | | 1,440,539 | |

1983

| Date | Location | Equipment | Costs US$ | Comments |
|---|---|---|---|---|
| 01/11 | Km. 90.3 El Angel | 5 Box | 33,700 | Dynamited |
| | | 1 Box | 130,000 | Destroyed |
| 04/06 | Km. 120.16 Del Pech-Valle San Juan | 11 Box | 74,142 | Burned |
| 04/27 | Km. 85.5 El Angel-Nejapa | 1 Box | 6,740 | Burned |
| | | 1 Cab. | 120,000 | Destroyed |
| 07/22 | Km. 86.14 El Angel-Nejapa | 9 Box | 60,662 | Dynamited |
| | | 5 Box | 650,000 | Destroyed |
| 08/09 | Km. 163.7 Cañas | 11 Box | 74,142 | Dynamited |
| | | 1 B.C. | 140,000 | Destroyed |
| 12/27 | Km. 130.12 San Marcos Lempa California | 2 Box | 13,480 | Dynamited |
| | | 2 Flat | 13,480 | Dynamited |
| 1983 | Total | | 1,316,348 | |

1984

| Date | Location | Equipment | Costs US$ | Comments |
|---|---|---|---|---|
| 02/22 | Km. 170.12 Sta. Gertrudis-Tehuacan | 1 Flat | 6,740 | Dynamited |
| | | 1 Cab | 6,740 | Dynamited |
| | | 1 Flat | 110,000 | Dynamited |
| 02/24 | Km. 78.7 Calle Nueva-El Amate | 13 Box | 87,623 | Dynamited |
| | | 2 Flat | 13,480 | Dynamited |
| 02/27 | Km. 295.0 Rio Sucio-Nueva Concepcion | 5 Box | 33,700 | Dynamited |
| | | 1 Coach | 6,740 | Dynamited |
| | | 1 B.C. | 6,740 | Dynamited |
| 02/28 | Km. 155.12 Entre Rios-Sta. Cruz | 1 Box | 6,740 | Sabotage |
| 07/10 | Km. 275.2 La Toma/Guazapa | 1 Box | 6,740 | Dynamited |
| | | 1 Box | 130,000 | Destroyed |
| | | 1 Cab | 6,740 | Dynamited |
| 07/14 | Km. 296.14 Rio Sucio-Nueva Concepcion | 3 Box | 20,221 | Dynamited |
| | | 5 Box | 650,000 | Destroyed |
| | | 1 B.C. | 6,740 | Dynamited |
| 07/26 | Km. 30.7 Olomega-Conejos | 7 Box | 47,181 | Dynamited |
| 08/03 | Km. 133.3 San Marcos Lempa | 1 Box | 6,740 | Burned |
| 09/19 | Km. 71.8 El Amate-Km. 71 | 3 Box | 20,221 | Dynamited |
| 11/03 | Km. 86.5 El Angel-Nejapa | 3 Box | 20,221 | Dynamited |
| 1984 | Total | | 1,193,309 | |

1985

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 01/25 | Km.122.15 Valle San Juan- | 1 Box | 6,740 | Dynamited |
| | Jiquilisco | 1 Tank | 6,740 | Dynamited |
| 02/11 | Km. 165.18 Tehuacan-Cañas | 4 Box | 26,961 | Dynamited |
| 03/02 | Km. 258.10 Apopa-Tonacatepeque | 4 Box | 26,961 | Dynamited |
| 05/21 | Km. 296.6 Rio Sucio-Nueva | 4 Box | 26.961 | Dynamited |
| | Concepcion | 1 Box | 130,000 | Destroyed |
| 06/07 | Km. 92.3 Ciudad Delgado-Apopa | 1 B.C. | 6,740 | Dynamited |
| 08/07 | Km. 72.16 El Amate-Km. 71 | 5 Box | 33,701 | Dynamited |
| 07/24 | Km. 77.12 El Amate-Km. 71 | 2 Box | 13,480 | Dynamited |
| | | 1 Flat | 6,740 | Dynamited |
| 08/10 | Km. 90.6 Apopa-El Angel | 1 Flat | 6,740 | Dynamited |
| 10/05 | Km. 83.13 Nejapa-Quezaltepeque | 3 Box | 20,221 | Dynamited |
| 1985 | Total | | 291,765 | |

1986

| | | | | |
|---|---|---|---|---|
| 05/20 | Km. 30.4 Olomega-Conejos | 5 Box | 13,860 | Dynamited |
| 07/08 | Km. 77.11 Quezaltepeque- | 2 Box | 6,000 | Dynamited |
| | Colombia | | | |
| 07/24 | Km. 83.3 San Salvador- | 2 Box | 140 | Dynamited |
| | Soyapango | | | |
| 09/08 | Km. 163.8 Tehuacan-Cañas | 3 Box | 306 | Dynamited |
| 10/03 | Km.74.1 El Amate-Km. 71 | 5 Box | 12,100 | Dynamited |
| | | 2 Flat | 2,080 | Dynamited |
| 11/21 | Km. 167.16 Tehuacan-Cañas | 2 Box | 550 | Dynamited |
| 1986 | Total | | 34,706 | |

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 1987 | | | | |
| 02/09 | Km. 319.0 Los Doce Robles-La Laguneta | 2 Box | 19,200 | Burned |
| | | 1 Cab | 8,000 | Burned |
| 04/26 | Km. 85.4 La Primavera-Piedra Pacha | 7 Box | 1,000 | Dynamited |
| 04/30 | Km. 163.9 Tehuacan-Cañas | 4 Box | 3,400 | Dynamited |
| 05/21 | Km. 84.10 El Angel-Nejapa | 1 Box | 700 | Dynamited |
| 08/23 | Km. 177.22 San Vicente-San Cristobal | 1 Flat | 400 | Dynamited |
| 08/12 | Km. 123.4 California-Del Pech | 1 Box | 200 | Dynamited |
| 09/09 | Km. 163.8 Tehuacan-Cañas | 2 Box | 6,960 | Dynamited |
| 09/22 | Km. 137.3 El Playon-San Marcos Lempa | 3 Box | 13,200 | Dynamited |
| 10/29 | Km. 137.4 El Playon-San Marcos Lempa | 3 Box | 3,250 | Dynamited |
| 11/20 | Km. 73.16 El Amate-Km. 71 | 3 Box | 13,000 | Burned |
| | | 1 Flat | 1,000 | Dynamited |
| 1987 | Total | | 70,310 | |
| 1988 | | | | |
| 03/07 | Km. 350.14 San Francisco-Los Mangos | 15206 | 4,800 | Dynamited |
| | | 15195 | 3,800 | Dynamited |
| | | 14087 | 120 | Dynamited |
| | | 15001 | --- | Dynamited |
| 03/22 | Km. 81.9 Calle Nueva-Piedra Pacha | 34059 | 9,400 | Dynamited |
| | | 14056 | 400 | Dynamited |
| | | 14005 | 40 | Dynamited |
| 04/18 | Km. 170.5 Tehuacan-Sta. Gertrudis | 25007 | 3,800 | Dynamited |
| | | 14007 | 3,100 | Dynamited |
| | | 15084 | 3,300 | Dynamited |
| | | 15131 | 2,960 | Dynamited |
| | | 1511 | 7,200 | Dynamited |
| 04/18 | Km. 75.6 El Amate-Calle Nueva | 44009 | 150 | Dynamited |
| | | 15188 | 60 | Dynamited |
| | | 15017 | 100 | Dynamited |
| 04/19 | Km. 166.1 Tehuacan-Cañas | 15113 | 120 | Dynamited |
| 05/11 | Km. 165.13 Tehuacan-Cañas | 390 | 2,500 | Dynamited |
| | | 15047 | 110 | Dynamited |
| 06/02 | Km. 350.9 Guajoyo-Los Mangos | 15199 | 70 | Dynamited |
| | | 15311 | 2,100 | Dynamited |
| 06/09 | Km. 161.4 La Joya-Los Cotos | 1668 | 5,400 | Dynamited |
| | | 14064 | 130 | Dynamited |
| | | 14089 | 25 | Dynamited |
| 06/09 | Km. 119.6 Jiquilisco-Valle San Juan | 15259 | 4,900 | Dynamited |
| 06/13 | Km. 377.5 Metapan-El Ronco | 15119 | 4,800 | Dynamited |
| | | 15087 | 100 | Dynamited |
| | | 15032 | 100 | Dynamited |
| | | 15034 | 70 | Dynamited |
| Jan./June 1988 | Total | | 59,655 | |

c. Motorized Cars

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| **1980** | | | | |
| 08/18 | Km. 85, San Salvador-Soyapango | S-652 | 42,392 | Destroyed |
| 09/24 | Km. 196.19, Acahuapa-San Cayetano | S-649 | 42,392 | Destroyed |
| 1980 | Total | | 84,784 | |
| **1981** | | | | |
| 01/07 | Km. 85.0, El Angel-Nejapa | S-605 | 9,396 | Burned |
| 04/11 | Km. 85.4, El Angel-Nejapa | S-620 | 8,196 | Burned |
| 07/22 | Km. 363.4, San Diego-Desague | S-612 | 2,159 | Sabotage |
| 08/27 | Km. 291.0, Nueva Concepcion-Modesto | S-603 | 6,000 | Burned |
| 09/14 | Km. 118.8, Valle San Juan-Jiquilisco | S-635 | 2,690 | Sabotage |
| 1981 | Total | | 28,441 | |
| **1982** | | | | |
| 05/26 | Km. 292.3, Nueva Concepcion-Modesto | S-637 | 42,392 | Destroyed |
| 06/07 | Km. 291.14, Nueva Concepcion-Modesto | S-622 | 42,392 | Destroyed |
| 07/27 | Km. 163.9, Cañas-La Joya | S-642 | 2,093 | Sabotage |
| 07/24 | Km. 71.9, El Amate-Km. 71 | S-603 | 9,300 | Burned |
| 10/07 | Km. 122.8, California-Del Pech | S-643 | 42,392 | Destroyed |
| 10/10 | Km. 175.0, San Cristobal-Los Obrajes | S-635 | 42,392 | Destroyed |
| 11/13 | Km. 74.3, Colombia-Chanmico | S-623 | 2,017 | Burned |
| 1982 | Total | | 182,978 | |

1983

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 04/12 | Km. 115.0, Valle San Juan-Jiquilisco | S-606 | 9,370 | Burned |
| 05/04 | Km. 120.4, Valle San Juan-Jiquilisco | S-608 | 7,400 | Burned |
| 05/29 | Km. 120.14, Valle San Juan-Jiquilisco | S-631 | 42,392 | Destroyed |
| 10/05 | Km. 71.14, El Amate-Km. 71 | S-603 | 6,314 | Dynamited |
| 11/25 | Km. 292.4, Nueva Concepcion-Modesto | S-629 | 42,392 | Destroyed |
| 1983 | Total | | 107,868 | |

1984

None

1985

| | | | | |
|---|---|---|---|---|
| 02/02 | Km. 298.4, Atiocoyo-Rio Sucio | S-625 | 38,200 | Dynamited |
| 10/04 | Km. 257.18, Apopa-Tonacatepeque | S-610 | 12,000 | Burned |
| 1985 | Total | | 50,200 | |

1986

| | | | | |
|---|---|---|---|---|
| 06/17 | Km. 262.17, Guazapa-Apopa | S-623 | 860 | Burned |
| 08/12 | Km. 84.11, Nejapa-Quezaltepeque | S-653 | 8,100 | Dynamited |
| 1986 | Total | | 8,960 | |

1987

| | | | | |
|---|---|---|---|---|
| 08/20 | Km. 198.4, Santo Domingo-Molineros | S-662 | 25,000 | Destroyed |
| 1987 | Total | | 25,000 | |

1988

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 02/25 | Km. 82.0, Piedra Pacha-Calle Nueva | S-650 | 25,000 | Destroyed |
| Jan./June 1988 | Total | | 25,000 | |

d. Bridges

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 1980 | | | | |
| 12/05 | Rio Sucio, Km. 298 | Bridge | 260,000 | Reassemble |
| 1981 | | | | |
| None | | | | |
| 1982 | | | | |
| 04/04 | Chilcuyo, Km. C-3 | Bridge | 22,400 | Repair |
| 04/05 | Km. 71, Dist. 1 | Bridge | 3,102 | Temporary repair |
| 07/03 | Km. 71, Dist. 1 | Bridge | 3,173 | Temporary repair |
| 10/12 | Km. 71, Dist. 1 | Bridge | 3,079 | Temporary repair |
| 11/13 | Km. 71, Dist. 1 | Bridge | 18,846 | Reconstruct |
| 08/06 | Km. 118, Dist. 1 | Bridge | 6,119 | Repair |
| 08/26 | Km. 350, Dist. 1 | Bridge | 10,354 | Repair |
| 09/18 | El Burro, Km. 166 | Bridge | 1,990 | Repair |
| 10/10 | El Burro, Km. 166 | Bridge | 50,643 | Repair |
| 1983 | | | | |
| 01/25 | Km. 134, Dist. 1 | Bridge | 4,168 | Repair |
| 05/03 | Km. 122, Dist. 1 | Bridge | 3,114 | Repair |
| 09/18 | Km. 122, Dist. 1 | Bridge | 1,620 | Repair |
| 08/19 | El Burro, Km. 166 | Bridge | 154,703 | Temporary replaced |
| | | Bridge | 134,758 | Reconstruction |
| 05/26 | Km. 93, Dist. 1 | Bridge | 70,834 | Repair |
| 09/03 | Km. 61, Dist. 1 | Bridge | 40,019 | Repair |
| 1984 | | | | |
| 12/03 | Km. 122, Dist.1 | Bridge | 1,734 | Repair |
| 12/25 | Km. 122, Dist.1 | Bridge | 15,679 | Repair |
| 1985, 1986 | | | | |
| None | | | | |
| 1987 | | | | |
| 07/26 | Km. 302 | Bridge | 10,000 | Repair |
| Total Bridge Damage | | | 816,33 | |

e. Support Equipment

| Date | Location | Equipment | Cost US$ | Comments |
|---|---|---|---|---|
| 1981 | | | | |
| 03/20 | Km. 298, Rio Sucre | Ind. Crane | 60,000 | Replace |
| 06/01 | Tehuacan | Pickup | 14,000 | Replace |
| 09/14 | San Marcos Lempa | Electric welder | 4,000 | Replace |
| 09/14 | San Marcos Lempa | Electric winch | 20,000 | Replace |
| 10/15 | San Marcos Lempa | Platform scale | 5,000 | Replace |
| 1982 | | | | |
| 03/25 | San Miguel Station | Platform scale | 10,000 | Replace |
| 03/27 | Usulutan Station | Platform scale | 10,000 | Replace |
| | | Electric welder | 4,000 | Replace |
| 06/29 | Km. 248, Soyapango | Front loader | 100,000 | Replace |
| 10/30 | Km. 166 | 2 Electric welders | 8,000 | Replace |
| 1983 | | | | |
| 05/04 | Km. 120-4/5 | Electric welder | 4,000 | Replace |
| 1984 | | | | |
| 02/22 | Km. 170 | Front loader | 100,000 | Replace |
| Total Support Equipment | | | 339,000 | |

f. Lines and Stations

| Date | Location | Type | Cost US$ | Comments |
|---|---|---|---|---|
| 1980 | | | | |
| 11/30 | Tehuacan | Station | 10,000 | Burned |
| 1981 | | | | |
| 09/14 | San Marcos Lempa | Station | 35,520 | Burned |
| 04/17 | Usulutan | Station | 25,988 | Burned |
| 1982 | | | | |
| 11/21 | Ciudad Arce | Station | 4,000 | Burned |
| 1983 | | | | |
| 05/21 | Valle San Juan | Station | | |
| 07/23 | Km. 91, Apopa | Rails | 6,000 | Dismantled |
| | | Ties | 2,000 | Dynamited |
| 08/09 | Km. 163, Tehuacan | Rails, ties | 4,000 | Dynamited |
| 09/09 | Km. 91, Apopa | Rails, ties | 200 | Displaced |
| 12/26 | Km. 130-2/1, S. Marcos | Rails | 540 | Dynamited |
| | | Ties | 653 | Burned |
| 1984 | | | | |
| 01/02 | Km. 298-8/9 | Rails | 200 | Displaced |
| | | Ties | 216 | Burned |
| 02/22 | Km. 170, S. Gertrudis/ | Rails | 600 | Displaced |
| | S. Vicente | Ties | 120 | Burned |
| 02/27 | Km. 295, Nueva Concepcion | Rails | 400 | Dynamited |
| | | Ties | 120 | Burned |
| 04/24 | Km. 75-7/14, Calle Nueva | Rails | 10,000 | Dynamited |
| | | Ties | 16,000 | Dynamited |
| 07/14 | Km. 296-10/14, Atiocoyo | Rails | 8,000 | Dynamited |
| | | Ties | 2,000 | Dynamited |
| 07/26 | Km. 30-7/10, Olomega | Rails | 1,200 | Dynamited |
| | | Ties | 2,400 | Burned |
| 11/03 | Km. 86-5/4, El Angel | Rails | 2,400 | Displaced |
| 1985 | | | | |
| 01/03 | Km. 118-15/17, Dist. 1 | Rails, ties | 400 | Displaced |
| | Km. 126-11, Dist. 1 | Rails, ties | 200 | Dynamited |
| | Km. 123, Dist. 1 | Rails, ties | 280 | Dynamited |
| 01/25 | Km. 130, Dist. | Rails, ties | 400 | Dynamited |
| | Km. 94-16/17, Dist. 1 | Rails, ties | 280 | Dynamited |
| | Km. 122-15/16, Dist. 1 | Rails, ties | 600 | Dynamited |
| 02/02 | Km. 197, Dist. 1 | Rails, ties | 280 | Displaced |

| Date | Location | Type | Cost US$ | Comments |
|---|---|---|---|---|
| 1985 (continued) | | | | |
| 02/02 | Km. 248-4/5, Dist. 2 | Rails, ties | 1,800 | Dynamited |
| 02/11 | Km. 165-18/10, Dist. 1 | Rails, ties | 600 | Dynamited |
| 03/02 | Km. 258-10/11, Dist. 1 | Rails, ties | 600 | Dynamited |
| 03/03 | Km. 71-5/6, Dist. 1 | Rails, ties | 3,400 | Dynamited |
| 05/21 | Km. 236-6/7, Dist. 2 | Rails, ties | 2,000 | Dynamited |
| 06/07 | Km. 92-3/4, Dist. 1 | Rails, ties | 1,000 | Dynamited |
| 06/21 | Km. 72-16/17, Dist. 1 | Rails, ties | 1,400 | Dynamited |
| 08/10 | Km. 90-6/7, Dist. 1 | Rails, ties | 1,400 | Dynamited |
| 10/05 | Km. 83-13/14, Dist. 1 | Rails, ties | 1,800 | Dynamited |
| 1986 | | | | |
| 05/20 | Km. 30-8/9. Dist. 1 | Rails, ties | 1,400 | Dynamited |
| 06/17 | Km. 262-17/18, Dist. 1 | Rails, ties | 1,440 | Dynamited |
| 07/08 | Km. 17-16/15, Dist. 1 | Rails, ties | 1,200 | Dynamited |
| 07/24 | Km. 8-3.3/4, Dist. 1 | Rails, ties | 1,260 | Dynamited |
| 08/13 | Km. 167-2/3, Dist. 1 | Rails, ties | 119 | Displaced |
| 08/14 | Km. 84-11/12, Dist. 1 | Rails, ties | 477 | Burned |
| 09/08 | Km. 163-8/9, Dist. 1 | Rails, ties | 245 | Burned |
| 10/03 | Km. 74-1?5, Dist.1 | Rails, ties | 1,600 | Dynamited |
| 1987 | | | | |
| 01/05 | Km. 163-8/9, Dist. 1 | Rails, ties | 40 | Displaced |
| 02/09 | Km. 319-6, Dist. 2 | Rails, ties | 140 | Burned |
| 03/16 | Km. 82, Dist. 1 | Rails, ties | 660 | Dynamited |
| 03/21 | Km. 163-16, Dist. 1 | Rails, ties | 300 | Dynamited |
| 04/01 | Km. 85-5/6, Dist. 1 | Rails, ties | 300 | Dynamited |
| 04/26 | Km. 85-4/6, Dist. 1 | Rails, ties | 1,000 | Dynamited |
| 04/30 | Km. 163-8/9, Dist. 1 | Rails, ties | 300 | Dynamited |
| 05/21 | Km. 84-11/12, Dist. 1 | Rails, ties | 700 | Dynamited |
| 07/23 | Km. 172-22, Dist. 1 | Rails, ties | 800 | Dynamited |
| 08/12 | Km. 123-4/5, Dist. 1 | Rails, ties | 2,462 | Dynamited |
| 08/20 | Km. 198-4/5, Dist. 1 | Rails, ties | 500 | Dynamited |
| 09/26 | Km. 85-6/8, Dist. 1 | Rails, ties | 140 | Burned |
| 09/05 | Km. 61-9/10, Dist. 1 | Rails, ties | 500 | Dynamited |
| 09/09 | Km. 163-9/9, Dist. 1 | Rails, ties | 200 | Dynamited |
| 09/16 | Km. 295-13/14, Dist. 2 | Rails, ties | 180 | Dynamited |
| 09/22 | Km. 137-4/5, Dist. 1 | Rails, ties | 6,000 | Dynamited |
| 11/20 | Km. 73-16/17, Dist. 1 | Rails, ties | 500 | Dynamited |
| 1988 | | | | |
| Various - Various | | Rails, ties | .8,724 | Dynamited |

FUNDS REQUIREMENTS FOR THE REHABILITATION OF THE RAILWAY
(000)

| ITEM | DESCRIPTION | QUANTITY | 1 9 8 9 LABOR | LOCAL BUY | FOREIGN BUY | SUB TOTAL | 1 9 9 0 LABOR | LOCAL BUY | FOREIGN BUY | SUB TOTAL | 1 9 9 1 LABOR | LOCAL BUY | FOREIGN BUY | SUB TOTAL | 1 9 9 2 LABOR | LOCAL BUY | FOREIGN BUY | SUB TOTAL | 1 9 9 3 LABOR | LOCAL BUY | FOREIGN BUY | SUB TOTAL | TOTAL LABOR | LOCAL BUY | FOREIGN BUY | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 LOCOMOTIVE | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) Purchase | | 6 | | | 4,500 | 4,500 | | | 4,500 | 4,500 | | | | | | | | | | | | | | | 9,000 | 9,000 |
| b) Repair | | 2 | 80 | 100 | 800 | 980 | | | | | | | | | | | | | | | | | 80 | 100 | 800 | 980 |
| c) Repair Engins | | 2 | 20 | 5 | | 25 | | | | | | | | | | | | | | | | | 20 | 5 | | 25 |
| d) Overhaul | | 10 | 10 | | 144 | 154 | 6 | | 96 | 102 | | | | | | | | | | | | | 16 | | 240 | 256 |
| 2 PLATFORMS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) Purchase | | 40 | 96 | 24 | 280 | 400 | 96 | 24 | 280 | 400 | 96 | 24 | 280 | 400 | 48 | 12 | 140 | 200 | 48 | 12 | 140 | 200 | 384 | 96 | 1,120 | 1,600 |
| b) Repair | | 24 | 13 | 22 | 37 | 72 | 13 | 22 | 37 | 72 | | | | | | | | | | | | | 26 | 44 | 74 | 144 |
| 3 BOX CARS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) Purchase | | 50 | 75 | 108 | 1,442 | 1,625 | 75 | 108 | 1,442 | 1,625 | | | | | | | | | | | | | 150 | 216 | 2,884 | 3,250 |
| b) Repair | | 75 | 30 | 45 | 45 | 120 | 30 | 45 | 45 | 120 | 30 | 45 | 45 | 120 | 30 | 45 | 45 | 120 | 30 | 45 | 45 | 120 | 150 | 225 | 225 | 600 |
| 4 PASSENGER COACHES | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) Repair | | 10 | 16 | 48 | 28 | 92 | 12 | 36 | 21 | 69 | 12 | 36 | 21 | 69 | | | | | | | | | 40 | 120 | 70 | 230 |
| 5 TANK CARS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) Repair | | 4 | 6 | 8 | 10 | 24 | 2 | 3 | 3 | 8 | | | | | | | | | | | | | 8 | 11 | 13 | 32 |
| 6 CABOOSES | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) Purchase | | 10 | 10 | 25 | 185 | 220 | 10 | 25 | 185 | 220 | | | | | | | | | | | | | 20 | 50 | 370 | 440 |
| b) Repair | | 4 | 16 | 20 | 40 | 76 | | | | | | | | | | | | | | | | | 16 | 20 | 40 | 76 |
| 7 VARIOUS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) Cargo Loaders | | 5 | | | 120 | 120 | | | 80 | 80 | | | | | | | | | | | | | | | 200 | 200 |
| b) Line Cars | | 5 | | | 125 | 125 | | | | | | | | | | | | | | | | | | | 125 | 125 |
| c) Roundabout | | 1 | | | 75 | 75 | | | | | | | | | | | | | | | | | | | 75 | 75 |
| d) Universal | | 1 | | | 80 | 80 | | | | | | | | | | | | | | | | | | | 80 | 80 |
| e) Other Equipment | | 6 | | | 40 | 40 | | | | | | | | | | | | | | | | | | | 40 | 40 |
| TOTAL | | | 372 | 405 | 7,951 | 8,728 | 244 | 263 | 6,687 | 7,194 | 138 | 105 | 346 | 589 | 78 | 57 | 185 | 320 | 78 | 57 | 185 | 320 | 910 | 887 | 15,356 | 17,153 |

4. Organization Charts and English Key for CEPA and its Dependencies, and CAA

   a. CEPA (Autonomous Executive Port Commission)

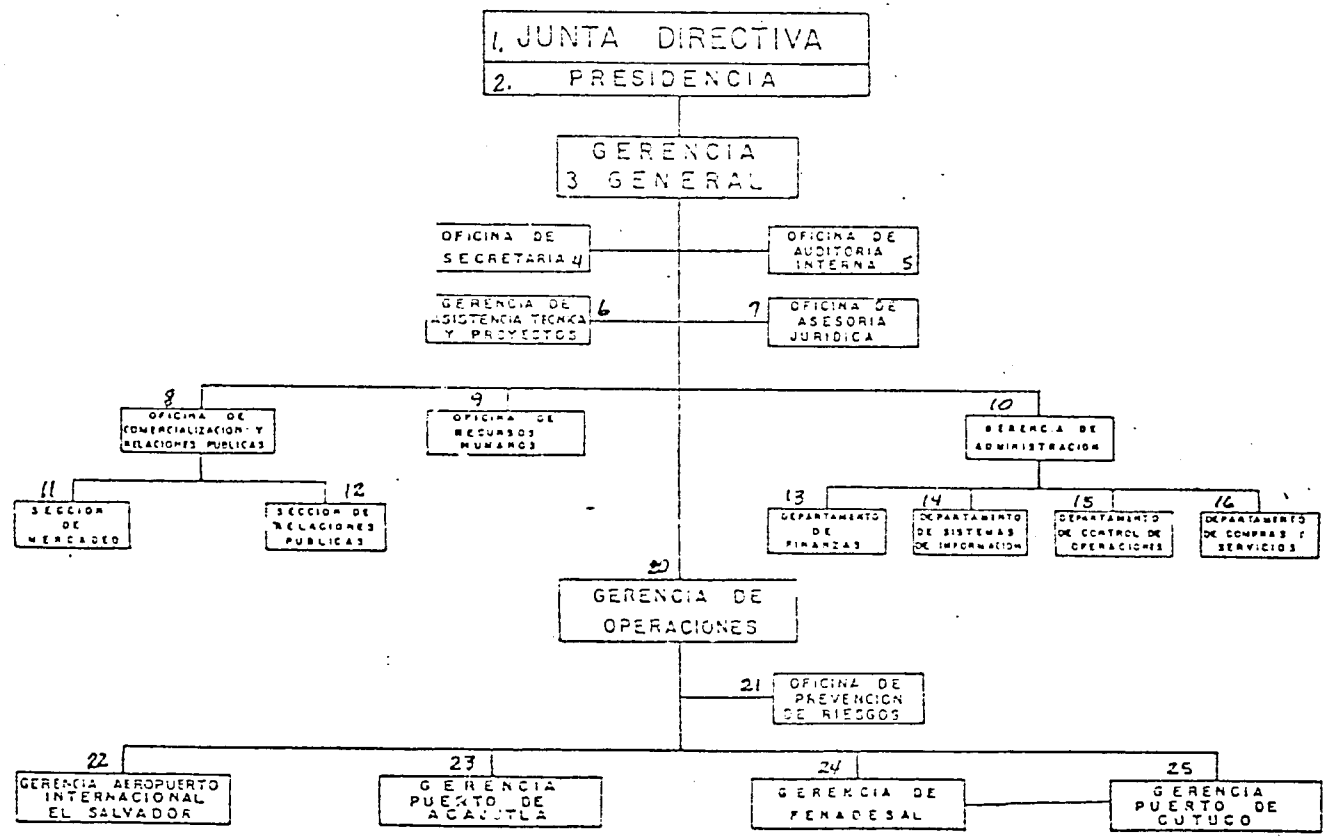
   b. Airports Division (International Airport of El Salvador)

   c. Acajutla Port Division

   d. National Railways of El Salvador

   e. General Directorate for Civil Aviation (MOP)

# ORGANIGRAMA DE LA COMISION EJECUTIVA PORTUARIA AUTONOMA

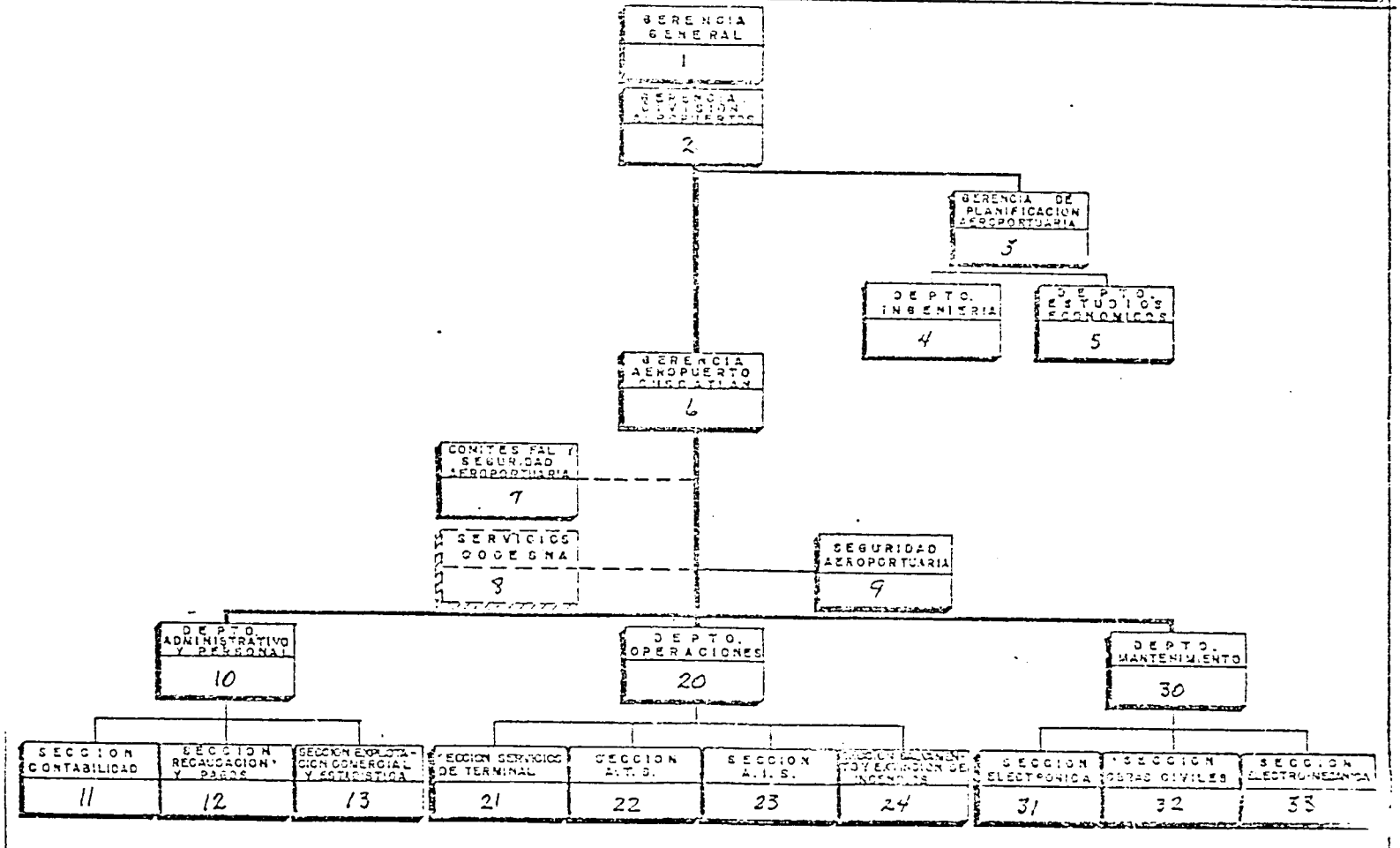


English Key to CEPA Organization Chart

1. Board of Directors
2. Presidency
3. General Administration
4. Secretarial Office
5. Internal Audit Office
6. Office of Technical Assistance and Projects
7. Judicial Advice Office
8. Office of Marketing and Public Relations
9. Office for Human Resources
10. Office for Administration
11. Marketing Section
12. Public Relations Section
13. Finance Department
14. Information Systems Department
15. Operations Control Department
16. Purchasing and Services Department

20. General Office for Operations
21. Office for Risk Prevention
22. Office for International Airport El Salvador (Division)
23. Office for the Port of Acajutal (Division)
24. Office for the National Railway of El Salvador (FENADESAL)
25. Office for the Port of Cutuco (proposed division)

# COMISION EJECUTIVA PORTUARIA AUTONOMA
## DIVISION DE AEROPUERTOS
## ORGANIGRAMA GENERAL DEL AEROPUERTO INTERNACIONAL "CUSCATLAN"

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English Key to Organization Chart of:

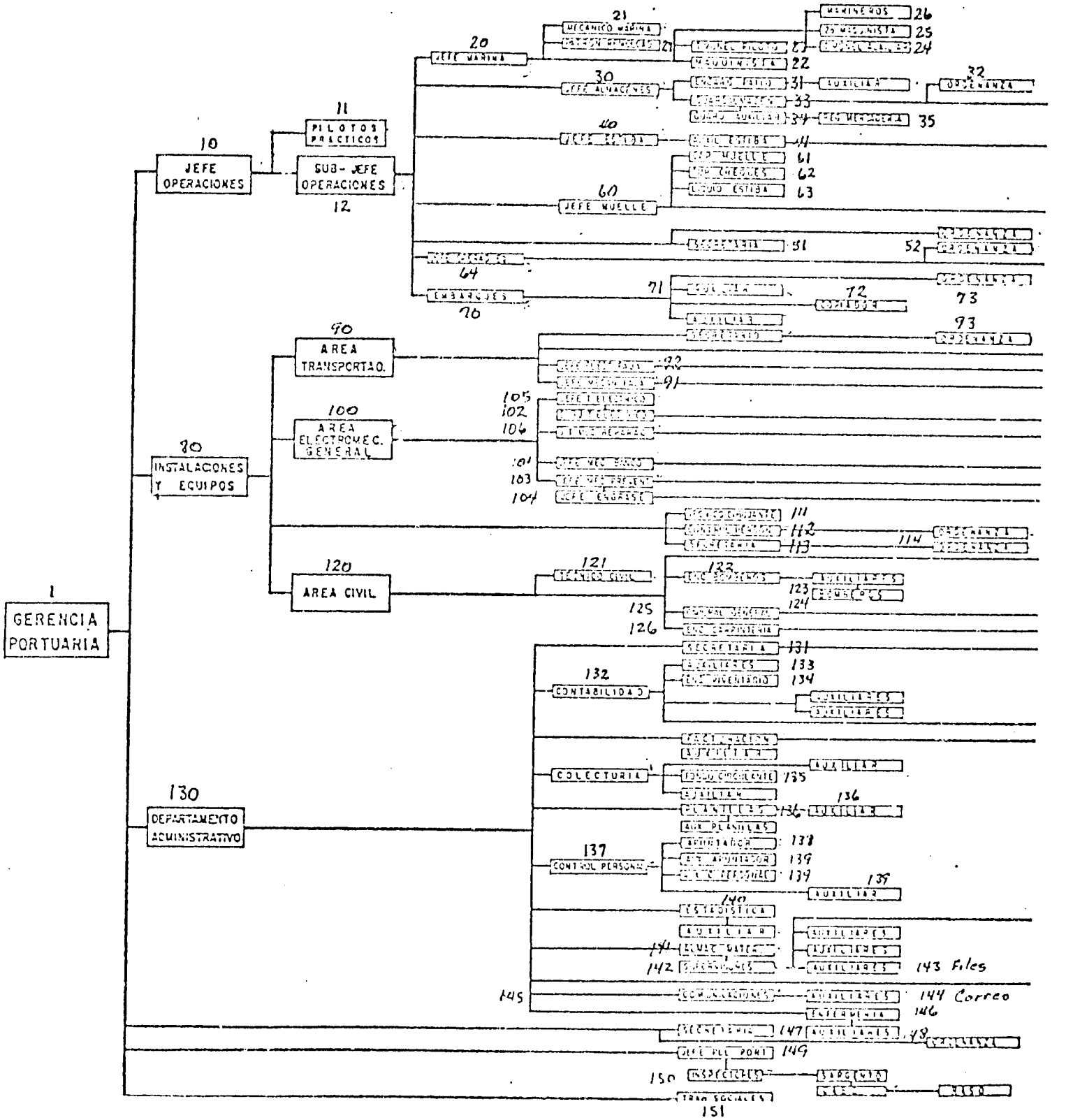
Airports Division (International Airport EL Salvador)

1. General Office for Administration
2. Divisional Office for Airports
3. Office for Airport Planning
4. Engineering Department
5. Economic Studies Department
6. International Airport Management Office
7. Air Force and Airport Security Committees
8. Food Services
9. Airport Security
10. Administration and Personnel Departments
11. Accounting Section
12. Fees and Payment Section
13. Commercialization and Statistics Section

20. Operations Department
21. Services for the Terminal Section
22. Air Transport Services Section
23. Air Information Services Section
24. Rescue and Fire Section

30. Maintenance Department
31. Electronics Section
32. Civil Works Section
33. ElectroMechanics Section

# PORT OF ACAJUTLA



English Key to Abbreviated Organization Chart for the:

Office (Division) for the Port of Acajutla

1. Office (Division) for Port Management

10. Chief of Operations
11. Practical Pilots
12. SubChief of Operations

20. Marina Chief
21. Marine Mechanics
22. Machinists
23. Pilots
24. Auxiliary Pilots
25. Machinists 2nd
26. Sailors

30. Chief of Warehousing
31. Patio (Wharf) Supervisor
32. Storage Janitors
33. Warehouse Guards
34. Auxiliary Guards
35. Merchandise Registry

40. Chief of Stevedores
41. Auxiliary Chief

51. Secretarial Services
52. Janitors

60. Pier Chief
61. Pier Captain
62. Checking Supervisor
63. Stevedore Payments

70. Embarcations
71. Auxiliary
72. Copier
73. Janitors
80. Installations and Equipment
90. Transportation Area Administration
91. Chief, Belt Mechanics
92. Chief, Belt Electronics
93. Janitors

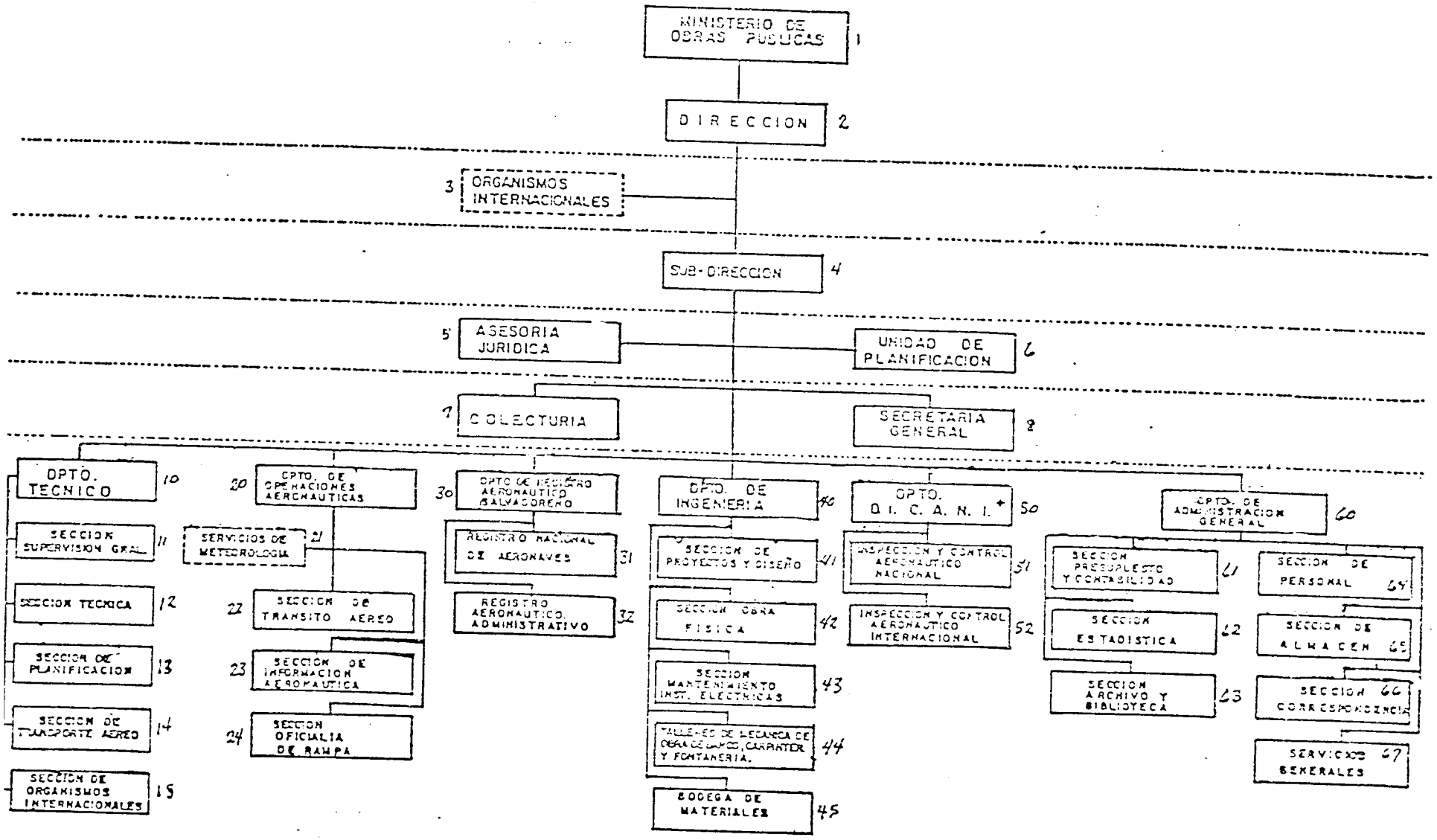
100. General ElectroMechanics Area
101. Chief, Bench Mechanics
102. SubChief
103. Chief, Mechanics Safety
104. Lubrication Chief

111. Technical Drawing
112. Personnel Control
113. Secretarial Services

114. Janitors
120. Civil Area
121. Civil Works Technician
122. Firefighting Section
123. Auxilliaries
124. Firefighters
125. General Supervisor
126. Carpentry

130. Administrative Department
131. Secretarial and Assistant Services
132. Accounting Office
133. Auxiliaries
134. Inventory
135. Rotating Fund
136. Payroll
137. Personnel Control
138. Time Keeper
139. Assistants
140. Statistics
141. Material Storage
142. Supervisors and Assistants
143. General Files
144. Post Office
145. Communications
146. Health Clinic
147. Secretarial Services
148.
149. Chief, Port Police
150. Inspectors, Seargent, Corporal, Privates
151. Social Workers

GENERAL DIRECTORATE FOR CIVIL AVIATION



English Key to Organization Chart of the:

General Directorate for Civil Aviation

1. Ministry of Public Works
2. GDCA Directorate
3. International Organizations (International Civil Aviation Organization, Central American Air Navegation Services Corporation, Latin American Civil Aviation Commission)
4. SubDirectorate
5. Judicial Advice
6. Planning Unit
7. Billing
8. General Secretarial Services

10. Technical Department
11. General Supervision Section
12. Technical Section
13. Planning Section
14. Air Transport Section
15. International Organizations Section

20. Air Operations Department
21. Meteorological Services
22. Transit Flight Section
23. Air Information Section
24. Ramp Service Station

30. Salvadoran Aeronautics Registration Department
31. National Registry
32. Registry Administration

40. Engineering Department
41. Projects and Design Section
42. Physical Works Section
43. Electrical Instrument Maintenance Section
44. Mechanics, Carpentry and Metal Shops
45. Materials Storage

50. National and International Aeronautics Inspections and Control Department
51. National Inspection and Control
52. International Inspection and Control

60. General Administration Department
61. Budget and Accounting Section
62. Statistics Section
63. Files and Library Section
64. Personnel Section
65. Warehousing Section
66. Correspondence Section
67. General Service (Radio, Telephone, Drivers, Janitors, Automotive Shops