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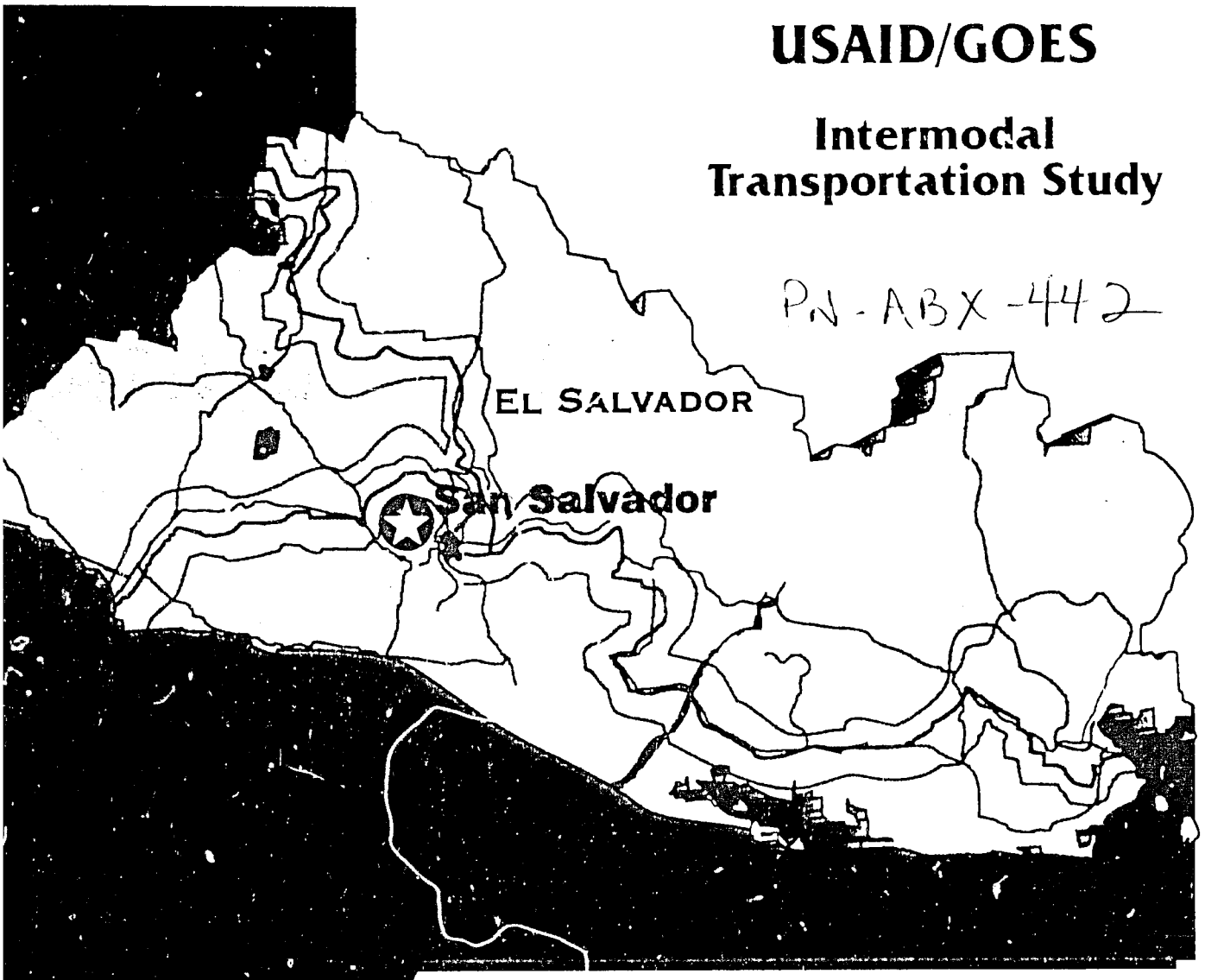

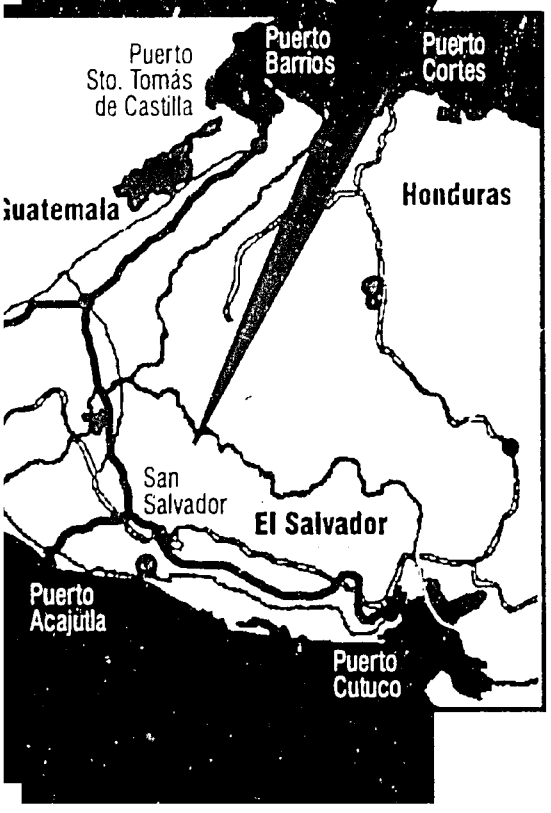

Executive Summary

prepared by

Frederic R. Harris, Inc.
in association with
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Sontay S.A. de C.V.

August, 1995

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GOVERNMENT OF
EL SALVADOR

NATIONAL RECONSTRUCTION PLAN

EL SALVADOR INTERMODAL TRANSPORTATION STUDY

Prepared by:
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Financed by:
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

SAN SALVADOR, AUGUST 1995

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HARRIS

San Salvador, August 15, 1995

Mr. Ernesto Girón, CTO
USAID Mission to El Salvador
San Salvador

Ref.: Intermodal Transportation Study
Contract No. 519-0394-C-00-4112-00
Executive Summary

Dear Mr. Girón:

In compliance with Section C.3.7 of above-referenced Contract, enclosed herewith are ten (10) copies in English and twenty (20) copies in Spanish of the Executive Summary prepared for the Intermodal Transportation Study. The submission of the ten-volume Final Report was made in June/July 1995. Although the contract calls for the submission of only ten copies in each language, we are delivering twenty in Spanish, trying to satisfy some of the projected demand for this report.

This submission completes the implementation of this Study and we hope it satisfies both USAID and GOES expectations.

Once again, we wish to thank USAID, the GOES, the Study's Technical Committee and the private sector for their wonderful cooperation during the implementation of the Study.

We wish to express our satisfaction for this opportunity to carry out this Study and hope to renew this opportunity in the near future.

Very truly yours,

José H. Cosío, P.E.
Team Leader

ACKNOWLEDGEMENTS

This Study was prepared under contract No. 519-0394-C-00-4112-00, between USAID/El Salvador and Frederic P Harris, Inc.

The Consultant wishes to thank USAID for the generous assistance provided during the execution of this Study and its excellent coordination with the GOES.

We also wish to thank the Government of El Salvador, through the following institutions and others not mentioned here, for the extensive cooperation given to the Study and to our Specialists, not only to collect data but by participating actively with their valuable contributions, suggestions and comments:

Ministerio de Obras Públicas, Vivienda y Desarrollo Urbano
Ministerio de Coordinación y Desarrollo Social
Secretaría Nacional de Reconstrucción
Viceministerio de Obras Públicas
Viceministerio de Transporte
Dirección General de Caminos
Comisión Ejecutiva Portuaria Autónoma
Ferrocarriles Nacionales de El Salvador

Our special thanks to the Study Technical Committee, which shared their valuable time at very frequent meetings to discuss the progress of the Study in detail, its results and recommendations and to guide us towards successful presentations of the Study before high Government Officials.

Finally, we wish to thank representatives of private industry for the information provided to us as well as the sharing of their concerns related to the transport industry in El Salvador.

Nevertheless, the Consultant remains solely responsible for all data, opinions, conclusions and recommendations given in this Study.

ABSTRACT

ABSTRACT

The most important conclusions and recommendations coming out of this Study are briefly noted for easy reference to the body of this executive summary.

OBJECTIVE

The objective of the Intermodal Transportation Study is to help optimize the intermodal transportation system in El Salvador with:

- An intermodal analysis of critical infrastructure, legal, institutional, regulatory and operational problems affecting the sector now and through the year 2015;

- Recommendations for a more efficient, intermodally coordinated system, and policies for a more favorable investment environment, improved organizational efficiency (including privatization and decentralization), sector integration, and investment priorities.

The Study covers sector management and intermodal coordination, intermodal traffic analysis, interurban transport, roads, the railroad, ports and air transport.

TRANSPORT SECTOR MANAGEMENT AND COORDINATION

Transport sector management and intermodal coordination is now concentrated in the Ministry of Public Works (MOP), divided in two areas, public works and transportation services, without the structure nor the capacity for their coordination and planning.

This Study conceives the development of sector management and intermodal coordination in two phases: *a transition phase*, to define MOP's strategic objective and scope, while building management capacity; and *a new MOP implementation phase*, following a modernization study, to carry out strategic decisions and consolidate its management capacity.

In the *transition phase*, the Consultant proposes establishing and providing the needed resources for:

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- A *Transport Committee* to facilitate decision-making, consensus building and intermodal coordination.

- A *General Directorate of Planning* to carry out sector-wide planning.

- A transitory *Planning Unit* at the Vice-Ministry of Transport (VMT) to develop national plans and policies for improved transport services.

- Enhanced technical and administrative capacity at the VMT to improve regulations, controls and development, including a *Ground Transport Regulatory Commission* guaranteeing independent decisions on key issues.

- Until the proposed planning units are established, the Technical Study Committee could monitor Study implementation and advise upper MOP management in sector planning.

In the *new MOP implementation phase*, GOES should reorganize MOP, merge the specialized vice-ministries and integrate planning capabilities.

To increase transport planning knowledge, the capacity of the sector's professionals, and a national capability in this area, the GOES should arrange for in-country short-term training and technical assistance in transportation planning.

INTERMODAL TRAFFIC ANALYSIS

The Consultant applied the TRANUS model to El Salvador's intermodal transportation network by estimating origin and destination matrices and defining an intermodal network. This intermodal approach provides a view of all the modes and their relationships. Future demand is estimated using GOES population and macroeconomic projections. Passenger traffic is expected to grow at the average rate of 6.7% per year from 1992 to 2015, general cargo at 5.4% and containers at 10.3%. This demand is assigned among the modes and modal projections lead to the intermodal identification of these sub-sector investment needs which complement each other effectively.

INTERURBAN TRANSPORT

Passenger and cargo fleets and terminals are inadequate, requiring additional financing for the private sector from the existing credit program, including concessions to build bus terminals.

The diesel subsidy bus operators receive is costly, inefficient and prone to irregularities, and should be eliminated.

Responsibility for fare policy should be transferred to the VMT and technified. The VMT should also develop transport legislation, let bus terminal concessions and promote the self-regulation of public transit service standards.

The proposed independent *Ground Transport Regulatory Commission* should assure that concessions are granted based on technical, competitive and transparent criteria.

The *General Directorate of Ground Transport* should obtain technical assistance to organize a management information system and data base, and re-engineer its procedures. The balance between the supply and demand of bus services should be analyzed to determine the need to increase and simplify existing routes and re-engineer its cumbersome public transit regulations. It should promote organized firms to provide passenger and freight services.

HIGHWAY STUDIES

The Consultant proposes a routine and periodic maintenance program for the existing paved highway network which will cost ¢3,184 million colones from 1995 to 2014, with an average internal rate of return of 108%, that reduces future financial requirements for network rehabilitation and minimizes total maintenance costs, but demands higher funds in the initial years. Assurance of maintenance financing is essential. A special highway maintenance account should be set up, funded by fuel taxes according to a pre-approved formula by type of road.

Routine maintenance can be carried out by promoting micro-enterprises to absorb unskilled MOP personnel. Periodical maintenance can be contracted with established construction firms. Concessions and highway management contracts may also be considered on selected highways along with the reintroduction of tolls. Technical assistance to enhance maintenance is recommended.

Road reconstruction recently completed, underway and planned will require unprecedented financial resources. These construction costs, together with the proposed maintenance and reduced revenues due to lower duties result in projected highway sector revenue deficits (costs higher than revenues or user charges) for the next ten years.

Three additional investment programs are proposed for the main corridors:

- Two urban bypasses around San Salvador to be built beginning in 2005 to overcome the only capacity constraints identified through the year 2015, which could be partly financed by special property assessments. The North Bypass would cost about ¢1,013 million and the South Bypass about ¢520 million.

- ➔ The Northern East-West Highway and its access roads, thus developing the North, estimated to cost about ¢3,150 million, is not completely feasible when considering only transport cost savings, and merits further study as part of a regional development plan.

Highway improvements outside of the main corridors are not studied.

Benefits of axle weight control are not clear. The existing system should be maintained but not expanded while being evaluated further.

RAIL STUDIES

The Consultant recommends the complete closure of the El Salvador National Railways (FENADESAL). None of the rehabilitation scenarios studied are financially feasible. The economic benefits are not sufficient to justify retaining part of the system. With heavier urban congestion, the economic analysis indicates rehabilitation of the Metapán and Acajutla services would be marginally feasible.

However, if GOES considers that total closure is not socially or environmentally acceptable and elects to retain sections of the railroad network, it should:

- ➔ Establish FENADESAL as a government, owned-commercial company, possibly by the Autonomous Executive Port Commission (CEPA) with effective management, a flexible regulatory environment and clear independence.

- ➔ Rehabilitate sections of Districts 2 and 3 (to Metapán and Acajutla) at a cost of at least ¢183 million, plus annual maintenance of about ¢20 million, with funds from the national treasury.

- ➔ Provide fixed subsidies as Public Service Obligation (PSO) grants to pay for government-mandated deficit services, or justified by forecasted economic benefits.

In addition, to continue operation:

- ➔ The two key users should firmly commit to use rail services.
- ➔ All funds should be available for the needed railroad investments.

In the event the GOES does not decide whether to rehabilitate or close the railway based upon the results of this study, a two-to-three month final review could further analyze the key issues. If GOES decides to rehabilitate, design work would be required.

PORT STUDIES

The Port of Acajutla's operating inefficiencies can be remedied by implementing the proposed improved operations and setting gang incentives per ton handled.

After overcoming several constraints to privatization, the Consultant recommends that CEPA establish Acajutla as a landlord port authority which would let concessions, following proposed bidding procedures, for integrated services in the handling of break bulk cargo, dry bulks, and containers as well as pilot, tug and docking services. The port authority should concentrate on: marketing the Port's services, promoting competition among concessionaires, developing master plans and building the port's facilities. Training on privatization would also be needed for CEPA port labor and professional staff.

Acajutla will need two multi-purpose cranes with an estimated total capacity of 500,000 tons of containers per year, and 4 more hectares of container yard, costing about ¢179 million; a grain terminal which would cost about ¢132 million; and a specialized container terminal estimated at ¢700 million, before the crane capacity is exceed.

The Consultant recommends that GOES hand over *The Port of Cutuco* to CEPA to proceed with its rehabilitation, including highway access, which would cost roughly ¢44 million and require design. CEPA should complete a feasibility study to build a new container terminal at Cutuco. This terminal would cost about ¢437 million.

AIR TRANSPORT STUDIES

CEPA should institutionally market abroad the services of the International Airport of El Salvador (AIES) towards the goal of becoming an air cargo hub for Central America.

Delays in customs processing of imported cargo and inappropriate handling charges reduce the warehouse's dynamic capacity. Cargo handling and customs procedures should be streamlined by developing and implementing the appropriate operating and information systems. Graduated rates should be applied to improve cargo flow and minimize on-airport storage time. These improvements will defer facility investments to future years.

There is a need for an overall review and update of air cargo tariffs.

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The Consultant recommends carrying out a Master Plan for the AIES including an inventory of existing facilities and planned expansion, a computerized cargo management system, concession policies, and plans to expand the cargo terminal by about 2005 at an approximate cost of ¢29 million for the highest demand scenario. Long-term strategies for the development of the airport's area of influence should also be updated.

The General Directorate of Air Transport (DGTA), a government department, directly manages Ilopango Airport, an activity which is naturally a function of a private or government-owned company. The Consultant recommends this responsibility be passed on to CEPA and Ilopango's fees be updated.

ENVIRONMENTAL REVIEW

This review was undertaken to pre-evaluate a list of projects, identify main conflicts and foreseeable problems and not as an environmental impact study (EIS) for any of these.

The criteria used for environmental assessment are based on World Bank Technical Papers also applied by the IDB and compatible with Environment Executive Secretariat (SEMA) criteria. Projects identified in the Study are classified at three levels of environmental impact: low, moderate and high. Among those with high impact are railroad rehabilitation in urban areas, and new highway, railway and port construction.

The Consultant prepared specific guides and recommends they be adopted and fully applied under the supervision of MOP's Sector Environment Unit (UAS). Estimates are made of the cost of environmental impact studies for each type of project.

For all projects on new lands, archeological prospections should be carried out or the opinion of the General Directorate of Cultural Patrimony should be requested.

The Consultant reviewed the draft Environment Protection Law currently being discussed in the Assembly, finds it generally well conceived and proposes the following modifications:

- ➜ Environmental permits should be issued only by SEMA following EIS reviews by the UAS. Each UAS should have no more than 4 to 5 staff.

- ➜ SEMA should coordinate directly rather than through multi-sector committees, which would not be operational.

Also, policies are proposed to reduce fuel consumption and pollution.

GOES

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GLOSSARY

AADT	Average Daily Annual Traffic
AEAS	El Salvador Association of Bus Entrepreneurs
AIES	International Airport of El Salvador
AME	Machinery and Equipment Administration
ASETCA	Salvadorean Freight Transport Entrepreneurs Association
ATP	Association of Bus Passenger Transport Entrepreneurs
BCR	Central Reserve Bank
C.A.	Central America
CBR	California Bearing Ratio
CEL	Executive Commission of the Lempa River
CENDEPESCA	Fisheries Development Center
CEPA	Autonomous Executive Port Commission
CONAMA	National Environmental Council
DBE	Disadvantaged Business Enterprise
DGC	General Directorate of Highways
DGP	General Directorate of Planning (proposed)
DGT	General Directorate of Traffic
DGTA	General Directorate of Air Transport
DGTM	General Directorate of Maritime Transport
DGTT	General Directorate of Ground Transport
DI	Engineering Directorate (proposed)
EIS	Environmental Impact Studies
FENADESAL	National Railways of El Salvador

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FRA	United States Federal Railroad Administration
GDP	Gross Domestic Product
GOES	Government of El Salvador
HDM III	Highway Design Model Version III of the World Bank
IDB	Interamerican Development Bank
IRR	Internal Rate of Return
IVA	Value Added Tax
MIPLAN	Ministry of Planning
MIS	Management Information System
MOP	Ministry of Public Works
NLV	Net Liquidation Value
NPV	Net Present Value
OPAMSS	Office of Planning for the Metropolitan Area of San Salvador
PSO	Public Service Obligation
SEMA	Executive Secretariat for the Environment
SIAMV	Road Management and Maintenance System
SISAP	Salvadorean System of Protected Areas
SRN	National Reconstruction Secretariat
TRANUS	Transportation Planning Model
UAS	Sector Environmental Unit
USAID	United States Agency for International Development
VMOP	Vice-Ministry of Public Works
VMT	Vice-Ministry of Transportation
VOC	Vehicle Operating Costs

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Chapter 1

INTRODUCTION

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1 INTRODUCTION

This chapter contains a summary of the events which led to this Study, the conditions under which it was carried out, the characteristics of El Salvador which provided the framework for its implementation and general criteria conceived for optimization of the transportation sector.

1.1 Background

After twelve years of civil war, the Government of El Salvador (GOES) began an economic recovery and reform program to boost the post-war economy and support local and international private investors; and identified the transportation sector as one of the country's most important constraints to development.

The need for this Study was initially identified in 1989 when an Assessment of the Transport Sector was made as part of an Infrastructure Sector Assessment funded by USAID. Subsequently, The Interamerican Development Bank (IDB), took a special interest in this study, financing the preparation of its Terms of Reference in 1991. Furthermore, with its implementation, the GOES met one of the pre-conditions to disburse the second disbursement of IDB's Highway Rehabilitation and Maintenance Loan to El Salvador; and will meet one of the conditions for releasing the third disbursement as recommendations from this Study are implemented.

The GOES established a Technical Committee to review and approve the Study's terms of reference made up of representatives of the Ministry of Planning (MIPLAN), Ministry of Public Works (MOP), the Autonomous Port Executive Commission (CEPA) and the National Reconstruction Secretariat (SRN).

The United States Agency for International Development (USAID) agreed to finance the Study as part of its Peace and National Recovery Project (519-0394), part of the National Reconstruction Plan managed by SRN. The Technical Committee and USAID jointly decided to delegate contracting arrangements to USAID.

At USAID's invitation, several U.S. consultants submitted proposals for this Study in April 1994. The Technical Committee and USAID together selected **Frederic R. Harris, Inc.** to carry out the Study under Contract No 519-0394-C-00-4112-00 which was signed on August 15, 1994, with an implementation time frame of approximately ten months. The Study's Team Leader and Deputy Team Leader started to work in El Salvador September 21, 1994. The Study was carried out with the support of two sub-contractors, Tech International, Inc., the Delaware DBE firm which carried out the previous Infrastructure Assessment, and the Salvadorean firm, Sontay S.A. de C.V.

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1.2 Study Implementation

A work plan was prepared and approved by USAID and the Technical Committee.

The Consultant's study team consisted of ten (10) foreign professionals, home office support, four (4) Salvadorean professionals and administrative support. The stay of the foreign professionals in El Salvador varied according to the extent of their tasks.

To maintain the close participation of USAID and the GOES, the Consultant met frequently with the Technical Committee, including a USAID representative, submitted frequent reports and made presentations as the study progressed. USAID and GOES adhered to the time assigned them for report review, thus providing the Consultant with their valuable comments and observations.

On numerous occasions, GOES management participated in the presentations including representatives of the Presidency, the Ministers of Finance, Planning, Public Works, Vice-Ministers of Public Works and Transport, the National Secretary of the National Reconstruction Secretariat, General Manager of CEPA, etc.

The GOES also named a number of professionals to act as counterparts who, working jointly with the Consultant team, benefitted from the experience and provided for technology transfer within the resource constraints of the Study.

1.3 Characteristics of El Salvador Relevant to Transportation

The Consultant took into account key characteristics of El Salvador's geography, recent history and institutions in analyzing the future of its transportation sector, including:

1.3.1 Geographical Factors

- The concentration of economic activity in the areas around San Salvador.
- The Country's difficult topography. The topographical constraints include: the coastal area between Acajutla and La Libertad, the volcanoes and other mountains surrounding San Salvador, and the largely mountainous terrain in most of the northern region.
- Minimum cost routes for most traffic go through the San Salvador area.
- The Country's difficult access to the Caribbean and the Atlantic Ocean, where a large share of its markets are concentrated.

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- The importance of traffic with other countries in the region.

- The short distance of average trips, leading to a large proportion of small trucks and their sensitivity to small differences in distances, transport costs and travel times.

- The lack of a national port container service.

- The favorable location of the international airport.

1.3.2 Historical Factors

- The recent armed conflict which led to depopulation and declines in economic activity in major areas of the country.

- Current growth patterns, with people and businesses quickly filling this void, leading to a likelihood of regionally-concentrated growth patterns in the immediate future.

- The traditional under-investment in maintenance of transport facilities, worsened by the conflict, as well as delays or lack of rehabilitation.

1.3.3 Institutional Factors

- The historically personnel-heavy public agencies in the transport sector, carrying out numerous functions more effectively handled by the private sector.

- The constraint to decentralization represented by weak local governments and lack of regional governments which might otherwise be able to take on more transport sector responsibilities.

- The numerous tasks carried by government departments which, in lieu of privatization opportunities, could at least be delegated to autonomous bodies; and the excessively centralized autonomous bodies themselves.

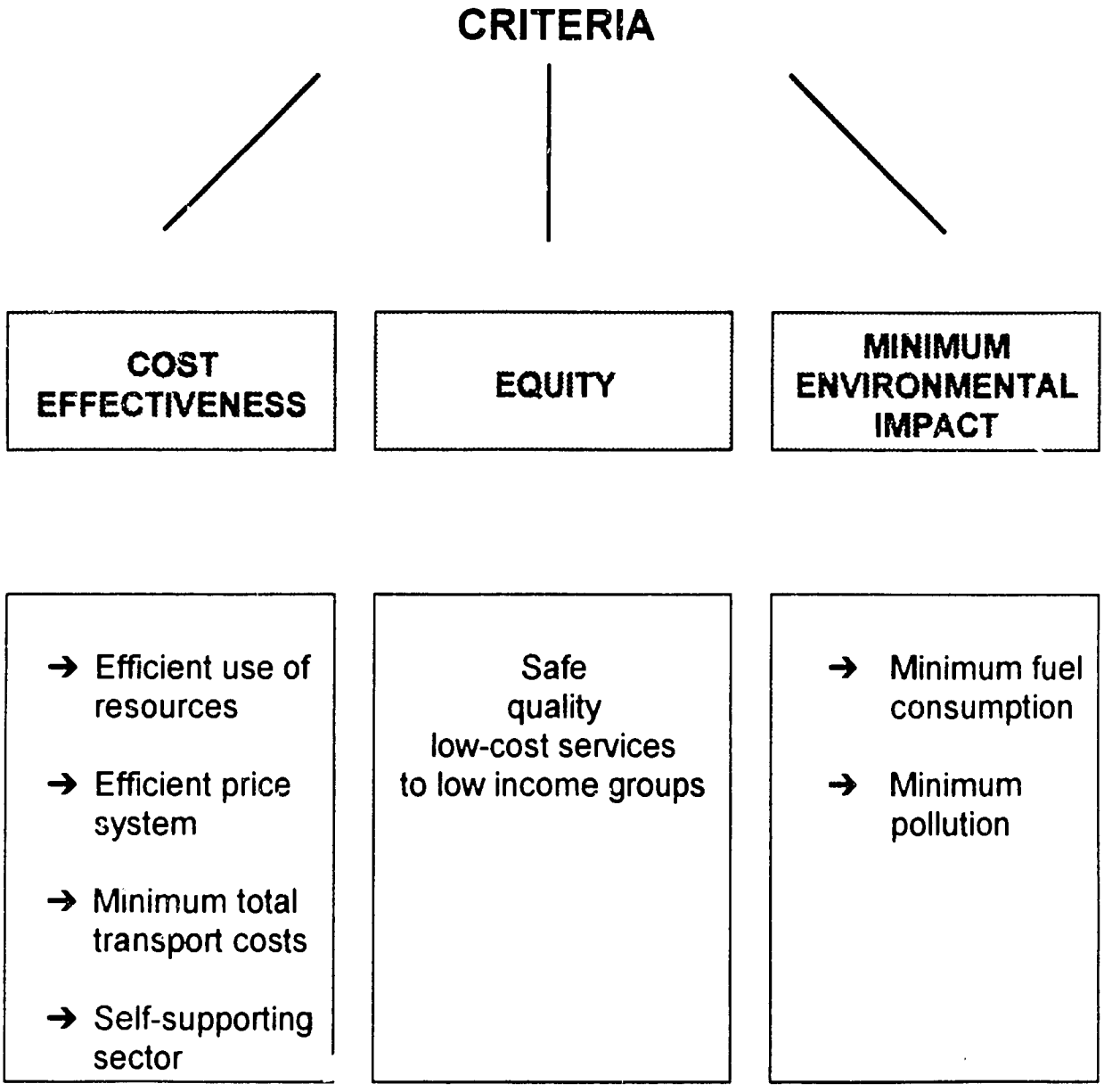
- The Government's efforts toward public sector modernization (decentralization, privatization, re-engineering, regulation and deregulation); to establish stable economic policies and the level of support that these efforts have received within government and the public at large.

These and other factors significantly affected the results obtained.

1.4 Transportation System Optimization Criteria

Figure 1.1 presents the Consultant's concept of transportation system optimization criteria according to its comprehension of GOES general transport system objectives.

FIGURE 1.1
Transportation System Optimization Criteria



Source: Frederic R. Harris, Inc.

GOES

Chapter 2

SCOPE OF WORK

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2 SCOPE OF WORK

2.1 Objectives

Within the framework of peace, national reconstruction and economic recovery, the objectives of the Intermodal Transportation Study in El Salvador are to:

- ➔ Optimize the intermodal transportation system.
- ➔ Identify opportunities for improved sector integration and coordination.
- ➔ Establish investment priorities.
- ➔ Identify opportunities for greater organizational efficiency through modernization, decentralization and privatization in a more favorable investment environment.

This is accomplished by analyzing the most critical infrastructure, legal, institutional, regulatory and operational constraints affecting the sector now and through the year 2015.

2.2 Organization of the Scope of Work

The study was arranged into five intermodal and five modal tasks. In accordance with the terms of reference, the studies in each mode are generally limited to the following:

2.3 Intermodal Tasks

The intermodal tasks are designed to assure effective intermodal coordination (sector management) and develop balanced proposals across modes (traffic analysis, regulatory and policy analysis, investment evaluation and environment review).

2.3.1 Sector Management and Coordination

Although not included in the scope of work, due to the importance of sector management changes being made by the GOES, especially the creation of the Vice-Ministry of Transport (VMT) as the sector's main regulator, the Consultant decided to also analyze the key aspects of sector management and intermodal coordination. Recommendations are made concerning objectives, institutional strengthening and management policies.

2.3.2 Traffic Analysis

Origin-destination matrices were developed and an intermodal transportation network of El Salvador was defined. Transport demand was projected through 2015. Although not

required in the terms of reference, the TRANUS model was applied to assign traffic under several scenarios.

2.3.3 Regulatory and Policy Analysis

The key legal, institutional, regulatory, financial, fiscal and tariff policy constraints were analyzed for the sector and for all modes based upon which policy recommendations were made.

2.3.4 Investment Evaluation

Standard procedures were applied across all modes to evaluate proposed investments from both economic and financial standpoints. Pre-investment needs were identified.

2.3.5 Environment Review

The projects considered in the Study are pre-evaluated to identify main conflicts and foreseeable environmental problems. It is not an environmental impact study.

2.4 Modal Tasks

The "modal" tasks cover interurban transport, roads, the railroad, ports and air transport.

2.4.1 Interurban Transport

An analysis of the organization, regulations, administrative procedures, and quality of service of inter-urban public transportation is included in the scope of work, along with the impact of the public transit fuel subsidy and an overview of freight transportation.

2.4.2 Highway Studies

The highway analysis is closely linked to the performance of the General Directorate of Highways (DGC), responsible for the administration of inter-urban paved road construction and maintenance covered by this Study, the application of road regulations and issues of highway financing. The main points analyzed are the following:

- Maintenance needs and the privatization of maintenance operations.
- A review of the axle weight control system.
- Analysis of road user charges.
- Determination of paved road investment needs.
- Financial projections for the road system.

2.4.3 Rail Studies

The railroad system is studied to determine whether it has a role in optimizing El Salvador's transportation system and to develop criteria for determining financial and economic feasibility. Rehabilitation and operating costs are carefully analyzed for operating the system under public or private management and financing.

2.4.4 Port Studies

The focus of the Study is an in-depth analysis of the prospects and means for improvements in operations and the privatization of the Port of Acajutla. It also covers the alternative or complementary use of ports in Guatemala and Honduras, as well as the upgrading of the Port of Cutuco as a possible container terminal for El Salvador.

2.4.5 Air Transport Studies

The Study emphasis is placed on cargo transport, its management and the possibility of transferring cargo facility management to the private sector, taking into consideration the growing role of air transport in carrying non-traditional Salvadorean exports. The Study also covers ongoing works at the International Airport of El Salvador (AIES) and the possibility of converting it into a cargo hub for Central America. Finally, the Ilopango airport is analyzed.

2.5 Study Phases

The study of each mode or sub-sector, with appropriate variations, is carried out in the following phases:

2.5.1 Assessment

All information pertinent to the sub-sector was collected including legal, institutional and regulatory constraints to greater efficiency and privatization; existing infrastructure, its physical condition, and degree of maintenance received; operational and financial issues (tariffs, user charges, etc.).

2.5.2 Analysis and Recommendations

During this stage of the study, each sub-sector was analyzed in-depth with emphasis on the key institutional, legal, regulatory, infrastructure, operational and financial issues. Recommendations are made in each of these areas, especially infrastructure upgrading cost estimates, investment needs, possible financing sources and related policies.

Given current public sector modernization policy, and to the degree applicable for each sub-sector, all possible actions towards modernization and transfer of operations to the private sector are analyzed.

After organizing the information for each mode, the proposed strategies, policies and programs are evaluated, according to the scope for each mode, from four perspectives as follows:

- ➔ Management effectiveness of privatization and institutional proposals;
- ➔ Economic efficiency of policies and programs;
- ➔ Financial returns and equilibrium by mode;
- ➔ Environmental impacts.

The scope of work is summarized visually in Table 2.1.

TABLE 2.1
Summary of Study Tasks

Intermodal Tasks	Modal Tasks
➔ SECTOR MANAGEMENT AND COORDINATION (1) ➔ TRAFFIC ANALYSIS ➔ REGULATORY AND POLICY ANALYSIS (2) ➔ INVESTMENT EVALUATION (2) ➔ ENVIRONMENTAL REVIEW	➔ **INTERURBAN SERVICES** • Organization and operations. • Subsidy and fares. • Regulations.
	➔ **HIGHWAY STUDIES** (Limited to key corridors) • Maintenance of paved highways. • Weight control system. • User charges. • New investment programs. • Financial projections for road sector.
	➔ **RAIL STUDIES** • System conditions. • Constraints. • Alternatives: 4 rehabilitation scenarios plus closure.
	➔ **PORT STUDIES** • Acajutla: Problems, improved operations, expansion and privatization. • Cutuco: Rehabilitation and expansion.
	➔ **AIR TRANSPORT STUDIES** • Cargo handling improvements. • Expansion / Master Plan. • Privatization opportunities. • Use of Ilopango. • Financial situation.

(1) Not included in terms of reference; added by the Consultant.
(2) Carried out as intermodal tasks; results organized by mode in this Study report.
Source: Frederic R. Harris, Inc.

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MOP

Chapter 3

SECTOR MANAGEMENT AND COORDINATION

HARRIS

3 SECTOR MANAGEMENT AND COORDINATION

3.1 Institutional Assessment

After analyzing present transport sector management, the Consultant concludes:

- ➔ In terms of its organization:
  - ✓ The responsibilities for the sector are concentrated in MOP, which is responsible for coordinating three specialized vice-ministries.
  - ✓ Transportation management is divided into two areas, the VMT and VMOP, both responsible for providing an efficient transport system.
  - ✓ The MOP has taken on more responsibilities, with a more complex structure.
  - ✓ Planning functions are assigned to each vice-ministry without defining the MOP's overall planning functions.
- ➔ As for institutional coordination and planning capacity:
  - ✓ Interinstitutional and intermodal coordination is informal and insufficient.
  - ✓ Technical transport planning capacity is limited and dispersed.

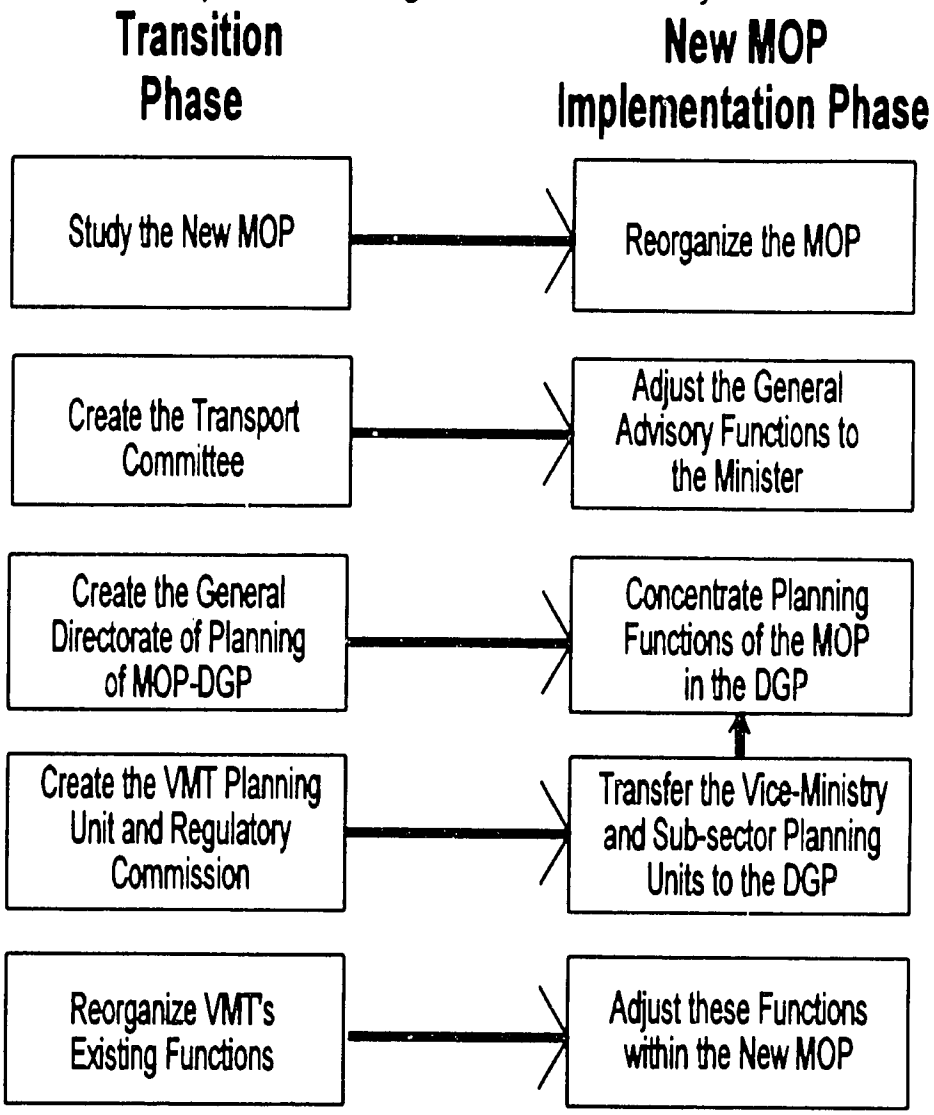
3.2 Transport Sector Organization Proposal

To unify transport sector functions and modernize the transport sector, the Consultant has conceived the development of sector management and intermodal coordination in two phases:

- ➔ *A transition phase*, while MOP's strategic objective and scope are being defined and the sector still lacks adequate management structure and capacity.
- ➔ *A new MOP implementation phase*, in which strategic decisions are carried out and the transport sector's management capacity is consolidated. One of the decisions being considered is the elimination of the specialized vice-ministries.

Figure 3.1 illustrates the proposed steps to be taken in this two-phased process. The organizations referred to in the figure are specified below:

FIGURE 3.1
Transport Sector Organization Process by Phase



Source: Frederic R. Harris, Inc.

3.2.1 Transition Phase

Due to insufficient structures and procedures to promote close coordination among the government and private institutions, the Consultant proposes to create an advisory *Transport Committee* to more effectively facilitate consensus building, intermodal coordination and support in taking decisions regarding sector strategies, plans, programs, policies and operations. It would be headed by the Minister of Public Works along with the Vice-Ministers of Public Works and Transport and the President of CEPA. Representatives of other ministries, agencies and private sector associations would also be invited as needed.

There is an urgent need to establish and mobilize resources for transportation planning, a basic government function. This decision requires courage and determination in a period of reduced government. As there is presently no sector-wide planning unit, the Consultant proposes establishing the *General Directorate of Planning - DGP*, reporting directly to the Minister, made up of full-time professionals, achieving a critical-mass planning capacity in one integrated unit, with the following key functions:

- ➔ Prepare transport sector studies, strategies, plans, programs and policies.
- ➔ Coordinate the activities of other planning units of the vice-ministries and general directorates; unify planning methods and procedures.
- ➔ Prepare and monitor the MOP budget.

While the vice-ministries are not yet merged, to transitorily fulfill its planning functions, the Consultant proposes to create a *Planning Unit*, within VMT, to carry out functions including: to plan the development of national policy for ground, maritime and air transport services, design and coordinate an integrated national urban transport program with the participation of municipalities and international support, as well as a national bus terminal concession program.

The Consultant also proposes to establish a new ground transport technical and administrative capacity at the VMT to improve regulation, control and development.

- ➔ Create a *Ground Transport Regulatory Commission* to guarantee independent and transparent decisions on key issues. Public transit concessions and routes should be granted based upon an independent, technified and transparent process, requiring the participation of more than one institution and of highly qualified and reputable professionals.
- ➔ Transfer the *General Traffic Directorate* to the *General Ground Transport Directorate*, concentrating the administrative activities of serving the public in one unit.
- ➔ Create an *Engineering Directorate*, increasing the VMT's technical capacity to modernize traffic services and engineering, and develop municipal implementation capacity.

Figure 3.2 shows a possible organization chart illustrating these proposals. So as not to expand VMT structure, this proposal would reduce the number of General Directorates by one while adding one Directorate and one Regulatory Commission (without the need for full-time staff).

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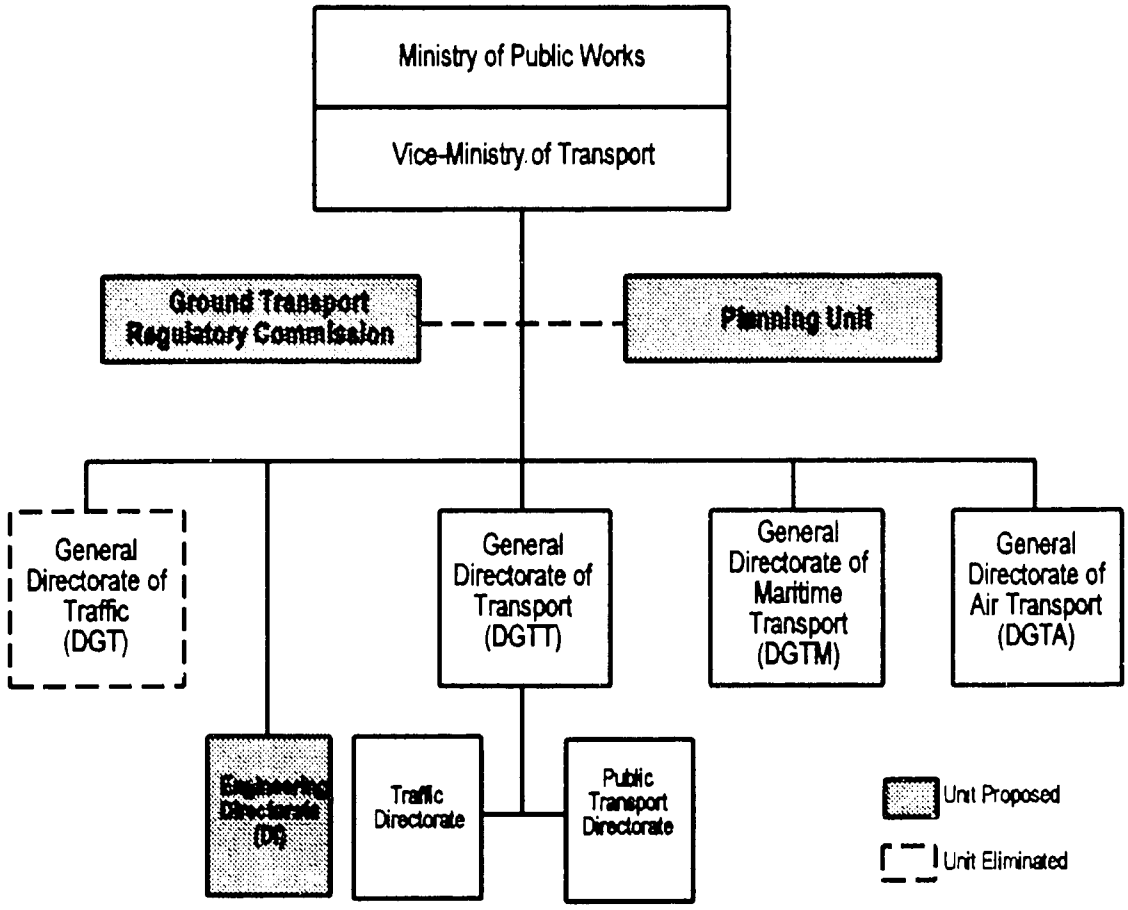
FIGURE 3.2
Proposed Organization of VMT - Transition Phase



Source: Frederic R. Harris, Inc.

Until the proposed planning units are established, the Consultant suggests temporarily maintaining the functions of the Technical Study Committee to monitor Study implementation as well as advise upper MOP management in general on sector planning.

3.2.2 The New MOP Implementation Phase

Once the strategic objective and scope of the new MOP is defined, the Consultant proposes that GOES reorganize MOP, merge the specialized vice-ministries as well as integrate planning by transferring the vice-ministry and general directorate planning units to DGP.

Figure 3.3 illustrates the proposed MOP goal for transport sector organization in the medium term: An integrated ministry, facilitating the coordination of various transport sector concerns, consisting of ministry management (minister and vice-minister), one autonomous commission (CEPA), two staff units (DGP and legal advisory), administrative and financial support units and line units, including the indicated general directorates.

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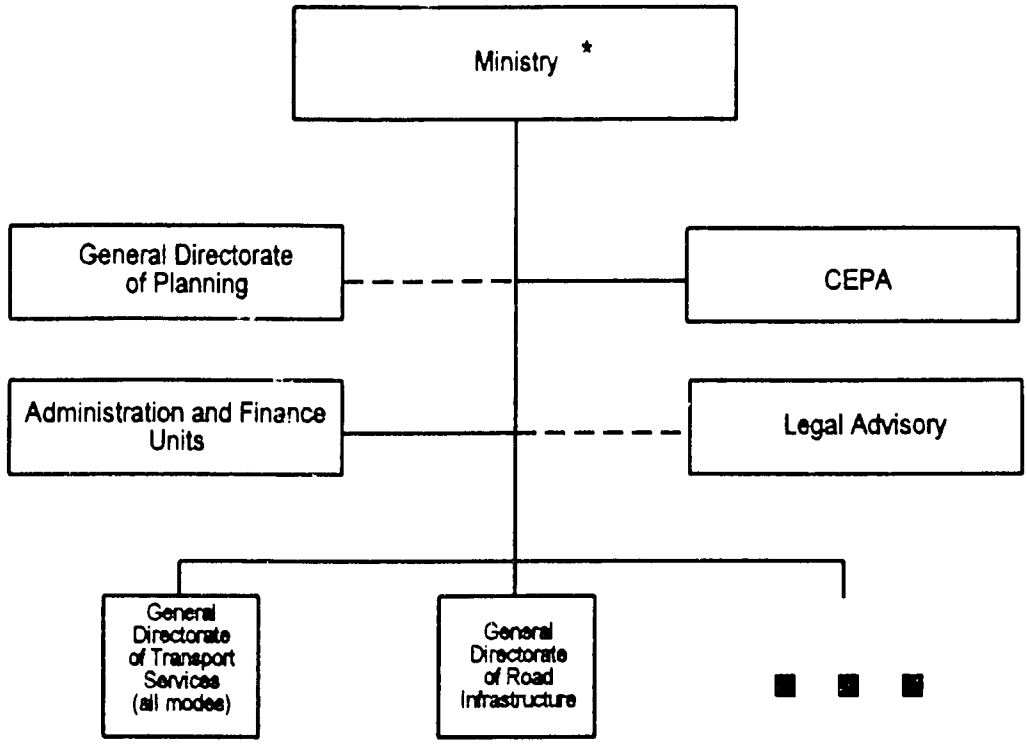
FIGURE 3.3
Preliminary Concept of Organization of the Transport Sector
in the Context of the New MOP



* Name based upon the strategic objective selected, with only one vice-minister.

Source: Frederic R. Harris, Inc.

- - - Staff Unit

3.3 Technical Assistance and Training Programs

To increase transport planning knowledge, the capacity of sector professionals, and guarantee a national capability in this area, the Consultant's key recommendations are:

- ➔ Briefly study MOP and CEPA specialized human resources and needs.
- ➔ Conduct short-term, in-country training in transport planning based upon the TRANUS model.
- ➔ Hold consensus-building seminars on sector development and coordination among the institutions.
- ➔ Implement a technical assistance program to support the development of the DGP's first planning activities.

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Chapter 4

TRAFFIC ANALYSIS

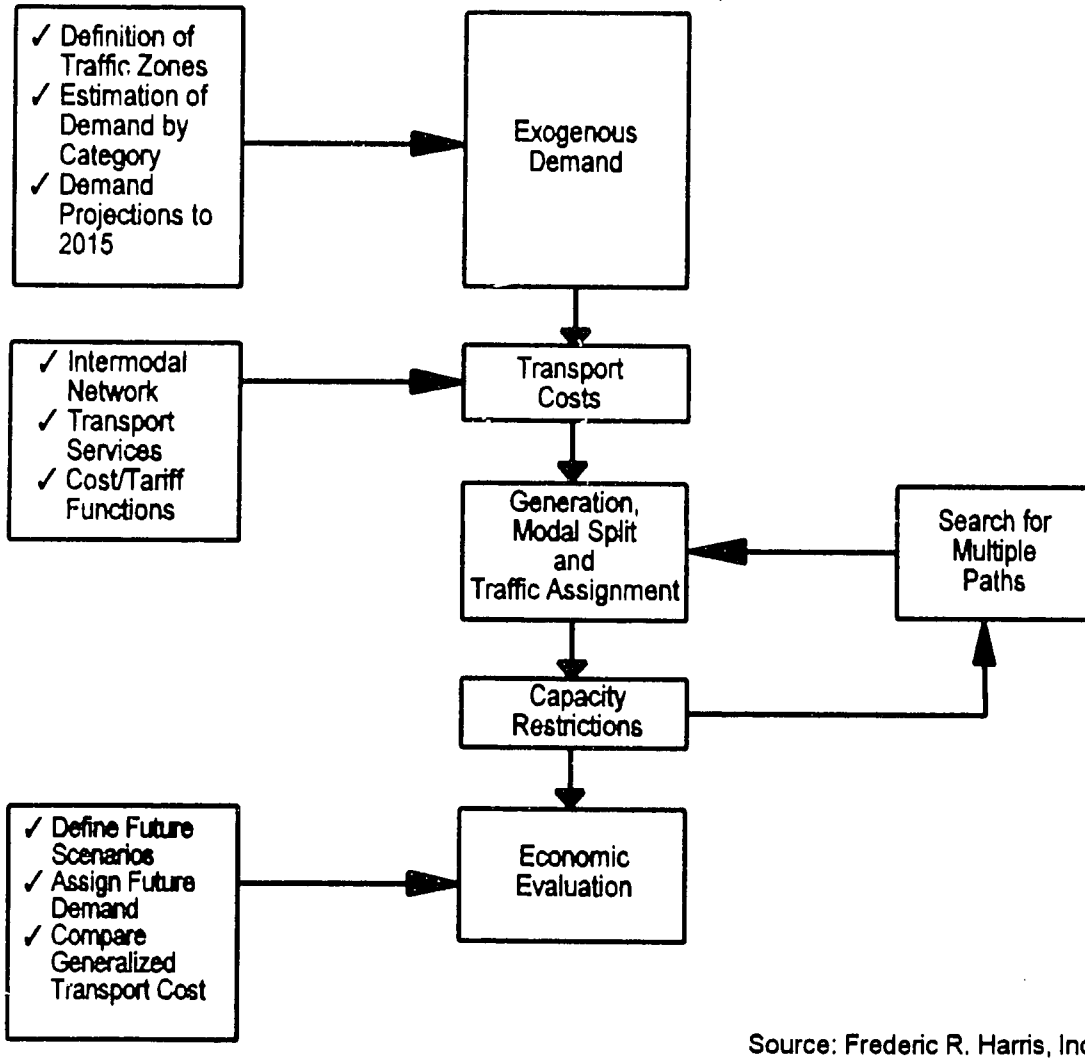
4 TRAFFIC ANALYSIS

In this chapter, the method is summarized, base year traffic and intermodal transport supply characteristics are estimated and traffic projections are completed through 2015. This approach provides an integrated view of all the sub-sectors and their interrelationships. Traffic projections by mode are presented in the modal chapters.

4.1 Application of the TRANUS Model

The Consultant applied the TRANUS model to El Salvador's intermodal transportation network, carrying out the activities indicated in Figure 4.1.

FIGURE 4.1
Application of the TRANUS Model to
El Salvador's Intermodal Transport Network



Source: Frederic R. Harris, Inc.

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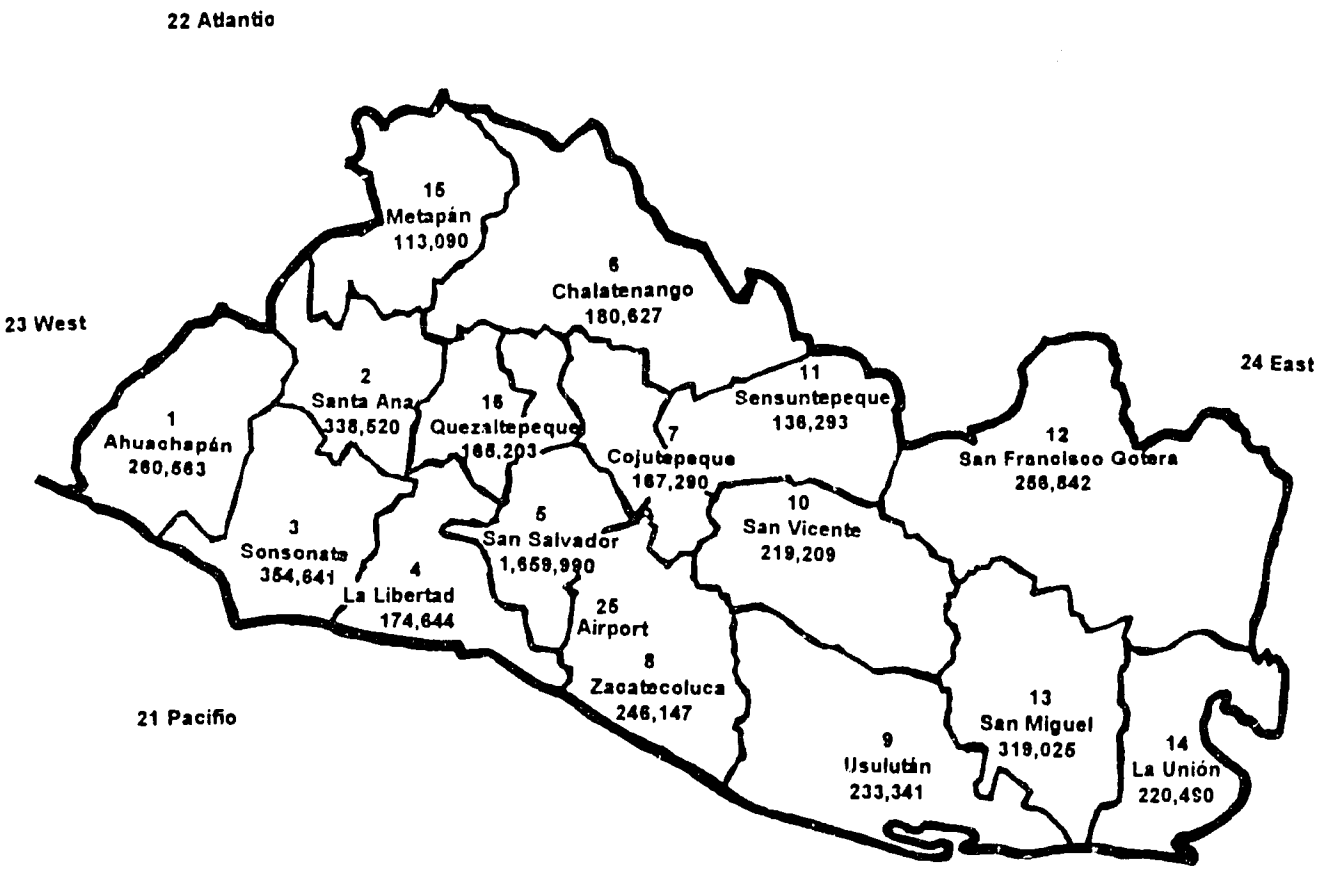
4.2 Current Demand

Current passenger and cargo demand, accelerating since the peace process started, is served by a deteriorated intermodal network, leading to higher transport costs due to bottlenecks, (especially in the San Salvador metropolitan area) and the need to use alternate routes and ports.

To calculate current demand, the consultant defined traffic zones, compiled and compared information from various sources and estimated origin and destination matrices of freight and passengers for the 1992 base year. This year was chosen as it was the last year for which analyzed traffic counts were available at the beginning of the Study.

The country was divided into 16 traffic zones, adapted from the areas of the departments. Five external zones were also defined for their significance in determining internal flows. These traffic zones are presented in Figure 4.2.

FIGURE 4.2
Traffic Zones, Centroides and Population



Source: Frederic R. Harris, Inc.

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Demand estimates were prepared by origin and destination to facilitate the analysis of the modal split between road and rail, for the following categories:

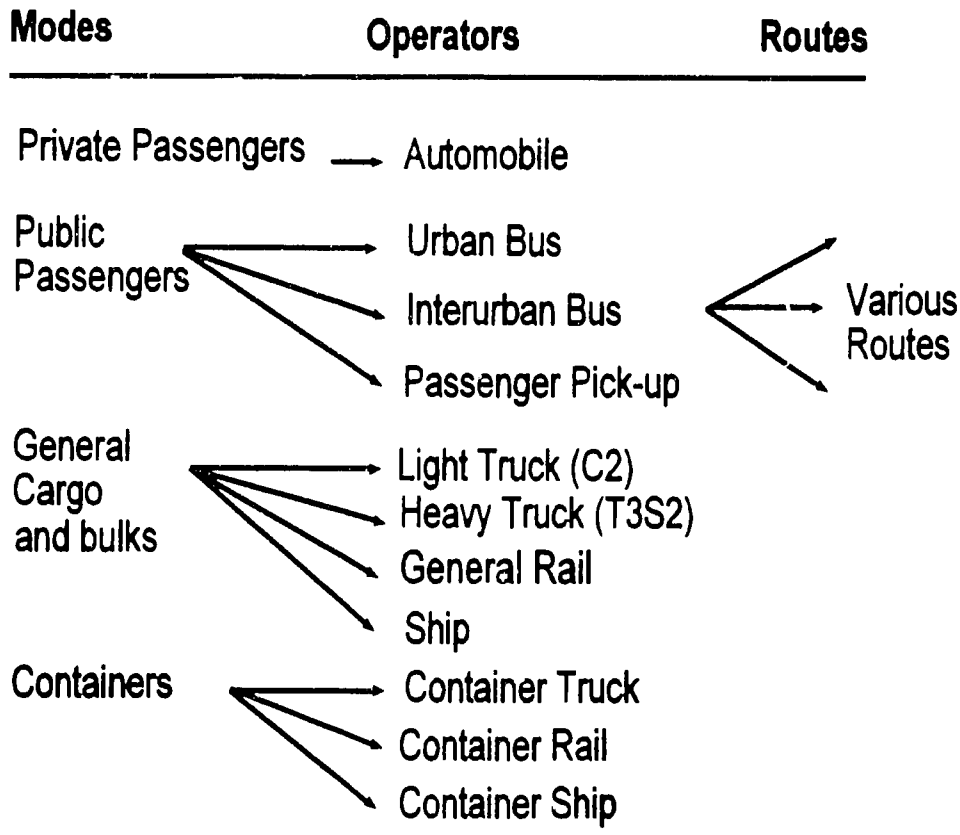
Passengers
General cargo and bulks
Containers and
Low-value cargo

Port and airport demand analyses were detailed outside the model.

4.3 Current Supply

Transport supply is defined for the model in three categories: modes, operators and routes as shown in Figure 4.3.

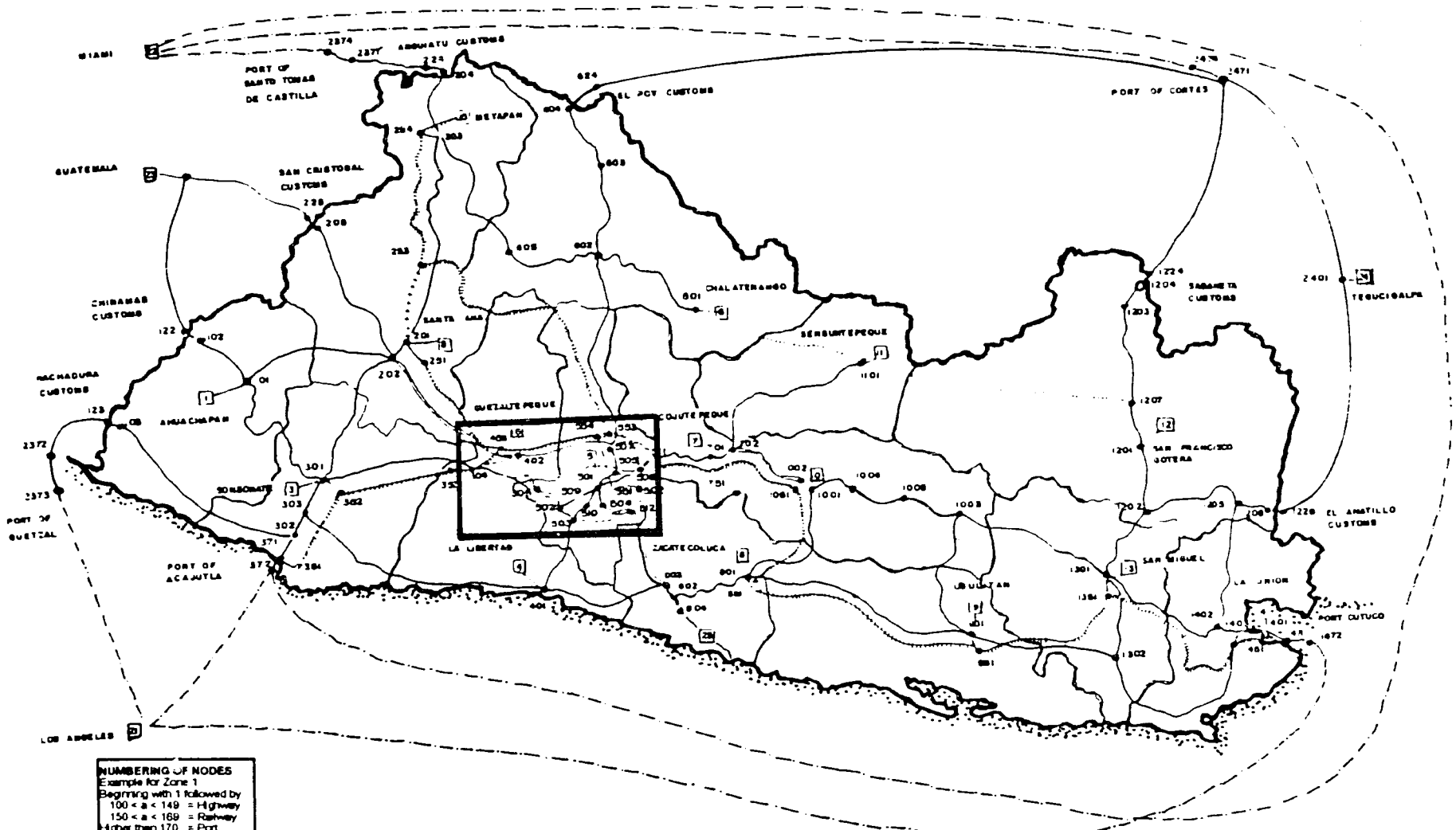
FIGURE 4.3
TRANUS Supply Categories



Source: Frederic R. Harris, Inc.

Figure 4.4 shows the inter-modal network. A total of 276 one directional links were coded, that correspond to 698 km of highway and 424 km of railroad. Simple representations of the main sea routes, ports, customs posts and the international airport are also included.

FIGURE 4.4
Intermodal Coded Network



Source: Frederic R. Harris, Inc.

For each operator, operating cost and tariff functions were estimated. Automobile, bus and truck operating costs were estimated with the World Bank VOC model supplied by the DGC according to specified travel speeds and average occupancy rates. Rail costs were estimated as a function of fixed cost per rail-km and variable cost per ton-km. Maritime rates, port charges and customs charges were estimated by freight category.

4.4 Demand Projections

Although macro-economic time series and traffic flows are available for demand analysis, the preceding periods were not normal due to the armed conflict. There is also a lack of information regarding the geographic distribution of economic activities, by indicators such as domestic product by department (or traffic zone).

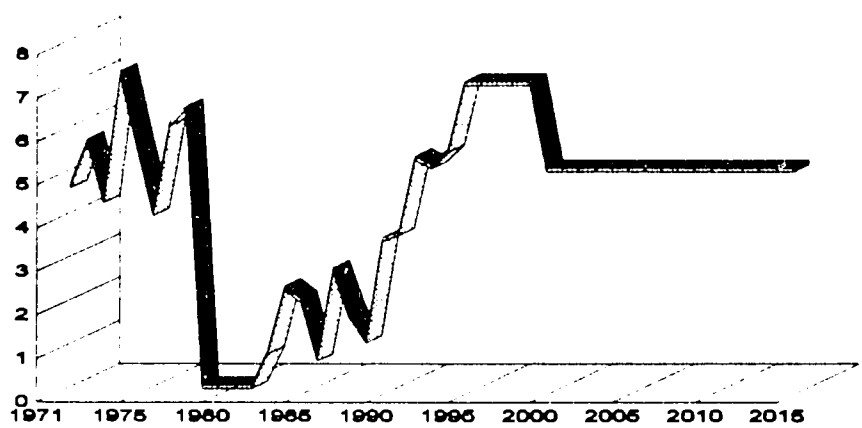
The Consultant therefore estimated future demand using GOES population and macro-economic projections, distributing them geographically in a logical and reasonable manner. The following simple formula is adopted to project passenger and cargo demand:

$$d = n + \in y$$

where *"d"* corresponds to the growth rate in the demand for the transport service, *"n"* to the demographic growth rate, *"y"* to the growth in per capita income and "$\in$" to the income-elasticity of demand for each service (passenger and cargo).

Figure 4.5 illustrates the rate of growth in gross domestic product from 1971 and projected to 2015.

FIGURE 4.5
GDP Annual Rate of Growth
1971-1993 and Projection to 2015



Source: Central Bank (BCR). Projections by Frederic R. Harris, Inc.

From this figure it can be observed that the rate of growth averaged 2% from 1971 to 1994 and about 5.3% from 1991 to 1994. Central Bank projections of around seven per cent per year are applied through 1999, normal for a post-war period of economic recovery and reform. For the next 15 years, a growth rate of 5% per year is applied. These growth rates are entirely possible within the policy context of economic stability, reduced budget deficit, export orientation, accelerated entry into an American Free Trade Area, increased savings and investment, reindustrialization, technological change, increased employment and productivity, modernized government, etc.

Population projections were based on studies of the Office of Census and Statistics and the Office of Population of the Ministry for Planning. Preliminary 1992 population census results were used to calculate the population by traffic zone for the base year. National growth rates are based upon population projections to 2020 estimated prior to the census. Estimates by department and municipality were used to adjust the projections by traffic zone.

Table 4.1 summarizes population projections for the period of 1992-2015 by traffic zone.

TABLE 4.1
1992-2015 Population Projections by Traffic Zone

Zone	Growth Rate	Projected Population
1 Ahuachapán	1.46	363,648
2 South of Santa Ana	1.46	468,932
3 Sonsonate	1.46	494,945
4 South of La Libertad	1.55	246,941
5 San Salvador	2.55	2,964,564
6 Chalatenango	1.64	262,716
7 Cuscatlán	1.64	243,317
8 La Paz	1.64	358,012
9 Usulután	1.64	339,386
10 San Vicente	1.64	318,832
11 Cabañas	1.64	198,233
12 Morazán	1.60	373,568
13 San Miguel	2.28	535,829
14 La Unión	1.64	323,604
15 North of Santa Ana	1.46	175,315
16 North of La Libertad	1.55	237,258
Total	1.96	7,905,100

Source: Frederic R. Harris, Inc.

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The average growth rate for the period of 1.96% is based on GOES national projections. The 2015 national population is projected at 7,905,100. This is a little less than the 8,436,833 projected by the Office of Census and Statistics, as it has been adjusted with the preliminary results of the 1992 census.

The geographic distribution of population growth assumes:

- ➔ Urbanization will continue with greater growth rates in the metropolitan area of San Salvador and the zone of San Miguel;
- ➔ The East, should grow more rapidly than the West, compensating for previous depopulation
- ➔ Cuscatlán and La Paz should grow a little faster due to industrialization and proximity to the capital.

With these GDP and population projections, income per capita growth rates were estimated for each period and traffic zone. The average growth rates from 1992-2015 are estimated from 3 to 3.2% in the Central and Western regions, and from 3.9 to 4.0% in the East and San Salvador. Growth is projected to be higher in the capital and East because of:

- ➔ The tendency in Latin America for concentration of revenues in the capital and
- ➔ Government policies which favor development in areas most affected by the armed conflict.

The income elasticity of demand for freight transport was estimated as 1 and for passengers as 1.3.

Table 4.2 shows the projected growth rates in total trip demand in daily persons or tons over the entire intermodal network. The sub-sector chapters describe assigned traffic for each mode which allow balanced investment needs to be identified by sub-sector.

TABLE 4.2
Rates of Growth in Trip Demand for the Intermodal Network
(% growth per year of persons or tons)

Category	1992-2000	2000-2005	2005-2015
Passengers	8.2	7.0	5.7
General Cargo and Bulks	6.6	5.7	4.1
Containers	11.2	12.2	9.3

Source: Frederic R. Harris, Inc.

VMT

Chapter 5

INTERURBAN SERVICES

HARRIS

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5 INTERURBAN SERVICES

This chapter analyze the organization of the public transportation sector, institutional and legal aspects, current regulations, route operation, enterprises, vehicle fleet, tariffs, fuel subsidies, operating costs and others.

5.1 Organization and Regulations

5.1.1 Organization of Public Transit

a. Institutions

The General Directorate of Ground Transport (DGTT) of the Vice-Ministry of Transport (VMT) is the institution in charge of regulating the public transport of passengers nation-wide. Tariffs are established by the Ministry of Economy. Driver licenses, vehicle registration and other are dealt with by the General Directorate of Transit (DGT). Road safety and patrolling is carried out by the National Civil Police of the Ministry of Public Safety.

b. Type of Bus Operators

Statistics from 1994 show that 99.6% of the bus owners are individual entrepreneurs, 0.3% corporations and 0.1% cooperatives. Of the 1,903 entrepreneurs, 1,817 (that is 95.4%) were owners of less than 5 buses, and only 2 had 17 or more buses. *This industry atomization has not produced good results, neither for the operators nor the users.* In the case of individual operators the owners frequently are also the drivers. In other cases the owner pays fixed daily salaries to his employees without fringe benefits, or rents the vehicle at a fixed rate. They often do not keep accounts, statistics or records.

c. Existing Associations

The majority of urban and interurban bus owners are affiliated to two associations: The El Salvador Association of Bus Entrepreneurs (AEAS) and the Entrepreneur Association of Bus Passengers Transport (ATP). Although both associations have accumulated a lot of experience and knowledge about public passenger transport, they have small, incipient technical organizations which reduce their possibilities to contribute positively to sector development and improvement.

d. Micro-buses and Pick-up Trucks

As a result of the armed conflict of the 80's, many buses were attacked and stopped. To supply this unmet demand, informal and illegal micro-buses and pick-ups made their appearance. From 1983, GOES started giving route permits to micro-buses, which persist to this date.

5.1.2 Passenger Transport Regulations

The VMT was created in 1993 and textually attributed its main ground transport functions as: to plan, analyze and carry out national (ground transport) policies; to promote the creation of organizations or businesses to develop the transport system; to determine the vehicle fleet needs of the sector; to give and cancel authorizations to utilize the transport network; to give and cancel authorizations for transport businesses, in the different modes; to guarantee ground transport efficiency and security.

The main legal document which regulates and governs all traffic aspects nation-wide is the General Traffic Regulation which dates from 1946 and includes everything related to traffic, use of roads and highways. There are also complementary laws and regulations. In 1956 the government enacted a Provisional Transport Regulation, concerning all subjects related to ground transport and public transport for passengers. This transitory regulation has been modified in several instances. In spite of being very old, it is fairly complete for issues related to public transport of passengers by bus.

Accord No. 11 of April 1961 establishes minimum conditions for urban transport vehicles. No specific legal document was found that regulates interurban bus conditions.

The VMT has written a proposed Traffic Law, which at present is under consideration by the Assembly. There is also a proposal to regulate and further specify functions to be carried out by the DGTT; it includes general regulations of public transport, traffic and highway development. The proposal was analyzed and found to be incomplete.

5.2 Operations, Routes and Tariffs of Passenger Interurban Transport

5.2.1 Current Bus Route System

At the time of this Study (December 1994) there were 496 numbered routes with full information, distributed by geographical area as shown in Table 5.1. In addition there were 120 operating routes with no information.

TABLE 5.1

Layout of Numbered Routes with Information by Geographical Area

Routes by Geographical Area	
Central	161
West	91
East	80
Other (1)	164
Total	496

(1) It includes routes with O-D in secondary settlements.

Source: Frederic R. Harris, Inc.

The country's central zone (which includes San Salvador) has the most routes in operation. Table 5.2 gives an estimate of daily trips made by passengers using the interurban system.

TABLE 5.2
Estimated of Total Daily Person Trips Generated in Public Transportation

Routes Origin	Trips per Day	Percentage of Total
Central Zone		
San Salvador	88,140	44.00%
Cojutepeque	3,270	1.64%
Chalatenango	660	0.33%
San Vicente	1,380	0.69%
Santa Tecla	4,080	2.04%
Sensuntepeque	510	0.25%
Zacatecoluca	2,910	1.45%
Subtotal	100,950	50.40%
Western Zone		
Ahuachapán	3,570	1.79%
Santa Ana	18,990	9.48%
Sonsonate	11,370	5.67%
Subtotal	33,930	16.95%
Eastern Zone		
La Unión	5,490	2.74%
San Miguel	18,510	9.24%
Usulután	5,850	2.92%
Morazán	0	0.00%
Subtotal	29,850	14.90%
Subtotal	164,730	82.24%
Other	35,580	17.76%
Total	200,310	100.00%

Source: Frederic R. Harris, Inc.

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If this estimate is correct, and assuming an average fare of ¢7.60 per trip, this would imply a daily income of ¢1,522,356 for the operators, that is ¢511.5 million per year. Considering the 120 unnumbered routes, the demand and income would be even higher.

5.2.2 Bus Fleet Characteristics

In 1994, the nation's interurban fleet had 3,434 buses operating on predetermined routes. The age of these buses varied between 1 and 45 years, with an average of 19.9 years; 52.8% of the buses were between 15 and 20 years old and 97.7% more than 8 years old, which shows the need for an intensive fleet renewal. The buses in general are not comfortable for interurban services taking into consideration the type of seats, upholstery, cleanliness, ventilation, high step at doors, etc.

5.2.3 Tariff Levels

Interurban transport tariffs were traditionally regulated by the DGTT when this department, now under to the MOP, was part of the Ministry of Economy. Currently they are still regulated by the Ministry of Economy.

From 1977 to 1992, while the consumer price index had increased by 739%, interurban transport fares had increased by 282%. This may be due in part to the fuel subsidy given to buses used for public transportation. At time of the Study the average fare was about ¢0.08/passenger-kilometer and the average fare for interurban transportation is ¢7.60; the last fare increase was dated September 1992.

5.2.4 Operating Permits and Creation of Routes

According to regulations, to create a route and give a new line permit requires a bid and a feasibility study to ascertain the needs. In the same way, to give a line permit to existing routes, supply and demand analysis is needed. Although the regulation is correct, its application leaves much to be desired. The results are often observed in excessive permits for some existing routes and not enough for other routes. The new DGTT wants to introduce order to these procedures.

5.2.5 National Coverage - 115 Municipalities Affected by the Armed Conflict

An analysis of the current coverage of interurban routes lead to the following:

- ➔ All main cities and towns of the country are currently served by at least one line.
- ➔ Origin-destination pairs served in terms of high frequency and low frequency were identified.
- ➔ Of the 115 municipalities most affected by the armed conflict, 103 currently have at least one bus route that joints them to a larger town; there are 12 municipalities without transport service.

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5 2.6 Interurban Bus Terminals

From visits made to the bus terminals, it can be stated that existing terminals in the country, except the International Terminal in San Salvador, are very deficient and do not supply the minimum services to users, operators and workers.

5.3 Analysis of Fuel Subsidy Program

5.3.1 Subsidy Legal Basis

In 1974, GOES implemented a fuel subsidy for public transport vehicles, without any legal basis. In 1981, by Accord No. 862, the system was modified with a better card control. This subsidy is given to the operator through a lower price (at the time of the study ¢1.87/gal) than to the public (¢8.05/gal). The government recovers this subsidy by charging more on the price of all fuels to the public in accordance with three related decrees. Finally, Accord 46, of January 1994, sets as the maximum fuel volume to be allocated to subsidy at 2,900,000 gallons/month. Table 5.3 indicates the number of public transport units benefitted by the subsidy in 1994.

TABLE 5.3
Beneficiaries of Current Fuel Subsidy

Category (1)	Total Subsidized	Subsidized Urban	Subsidized Inter-Urban	Total Non-Subsidized	Non-Subsidized Urban	Non-Subsidized Inter-Urban
A	24	10	14	1,188	1,084	104
B	572	111	461	58	25	33
C	4,045	1,646	2,399	370	175	195
Pref.					714	
Spec.					83	
Total	4,641	1,767	2,874	2,413	2,081	332

(1) Categories defines number of seats per unit.
Source: DGTT

5.3.2 Subsidy Management Mechanisms - DGTT Role and Controllers

The subsidy is managed by the DGTT by means of a double card system and a number of "delegates" (controllers) appointed by the DGTT but paid by the transport industry. There are many irregularities in the distribution, use and control of the subsidized diesel, in favor of transporters and other persons, increasing industry's operating costs by as much as ¢80 million per year, according to figures given by AEAS. Table 5.4 shows the subsidized diesel volume and value in the last five years.

TABLE 5.4
Volume and Diesel Subsidy Value

Year	Diesel	Subsidized Gallon (¢) (1)	Price Difference (¢) (1)	Total Amount of Subsidy (¢)	Variation in Relation to Former Year (%)
1990	6.60	1.70	4.90	231,565,734	
1991	7.00	1.70	5.30	220,005,688	(5.00)
1992	7.00	1.70	5.30	188,872,585	(14.15)
1993	7.10	1.70	5.40	196,971,598	4.29
1994	7.40	1.70	5.70	160,587,948 (2)	(18.31)

(1) Without IVA.
(2) Forecast based on data up to September 1994.
Source: Ministry of Economics.

5.3.3 Alternatives to Subsidy System

To solve the problems created by the subsidy system, the following alternatives are proposed:

a. Total Elimination of the Current Subsidy

The total elimination of the subsidy will have to be accompanied by a revision of fares after a careful study of operating costs, route lengths and other factors.

b. Gradual Elimination of the Subsidy

Under this alternative, older buses would be taken out of the subsidy system and others when reaching a certain age. This would be an incentive to fleet replacement.

These two alternatives should be evaluated by the VMT for their economic, political and social impacts.

c. "Transport Ticket" System

Under this alternative, employers pay the employees a part of their monthly transport cost, the Government subsidizes transport for students, the unemployed, informal sector workers, the elderly and physically handicapped.

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Regardless of the alternative chosen, from the technical and economic point of view, the government should eliminate the diesel subsidy. Surveyed bus operators have indicated that they would also prefer to have the subsidy system eliminated and tariffs revised.

The Study analyzed the impacts of the diesel subsidy for old and new buses and, in a very preliminary way, gives some ranges of changes in costs. Any tariff modification will require an in-depth study.

5.4 Interurban Freight Transport

5.4.1 Sector Organization and the Role of the DGTT

The planning, analysis and implementation of truck transport policy are among the new VMT's functions. That covers: creation of enterprises, equipment import needs, permits and the establishment and control of freight terminals, etc. The VMT could carry out all these functions through the DGTT. On the other hand, the MOP through the DGC has controlled and regulated weight per axle since 1973.

The 1946 General Traffic Regulation includes freight transport and all aspects related to freight vehicles. As could be determined in this study, national freight rates have not been historically regulated The only exceptions, fuel and cement, were regulated until January 1994.

There does not seem to be any explicit GOES policy related to freight transport. It is a totally "deregulated" sector in which there is free competition. The trucking industry is totally managed by the private sector. The DGTT does not have detailed records of trucking firms or vehicle fleet. The Salvadorean Freight Transport Entrepreneurs Association (ASETCA) includes 518 firms that represents approximately 90% of organized July 30, 1995 businesses in the country.

ASETCA indicated that there is unfair freight competition from other Central American shippers on backhaul cargo and irregularities in the crossing of international borders.

No available information on the operating costs of freight transport enterprises was found. However, the Highway Studies include vehicle operating costs (VOC) processed using the HDM III Model.

5.5 Recommendations

There are numerous significant policy decisions needed in the area of interurban ground transportation in order to improve service to users. Private sector investments are required in fleet replacement and terminal construction, as well as related pre-investments.

5.5.1 Policies

The proposed reorganization of the Vice-Ministry of Transport is summarized. Then the constraints and policy measures needed to improved ground transportation are reviewed by agency.

a. Organization

As summarized in Chapter 3, the Consultant proposes that the *Vice-Ministry of Transport* be reorganized to better carry out existing and proposed policies. A temporary *Planning Unit* would be established to develop transport service plans and policies; a *Regulatory Commission* would be set up with independent members to technically study public transit concessions and tariffs in coordination with the General Directorate of Ground Transport - DGTT; an *Engineering Directorate* would be set up to strengthen national traffic engineering capacity; and the DGTT would absorb the *General Directorate of Traffic*.

b. Constraints and Policy Proposals

The new *VMT Planning Unit* should plan for, in coordination with other ministries:

- → The elimination of the diesel subsidy.
- → Additional funding for passenger and freight fleet renewal.
- → Develop transport legislation and policy.
- → Let bus terminal concessions.
- → Promote the self-regulation of public transit service standards.

The new, independent *Ground Transport Regulatory Commission* should, in cooperation with the DGT:

- → Assure a technical, competitive and transparent public transit concession granting process.
- → Develop and implement a technical tariff policy.

The *DGTT* should also:

- → Promote organized firms.
- → Develop performance-based concession policies.
- → Re-engineer cumbersome regulations and control procedures.

The key constraints and policy measures for better interurban ground transportation are reviewed in Table 5.5 by the agency which would be responsible based upon the above organization proposal.

TABLE 5.5
Constraints and Policy Proposals - Interurban Transport Subsector

Institution and Constraint	Policies and Proposals
VMT Planning Unit	
Costly, complex and inefficient control of public transit diesel subsidy from gasoline surcharges, with irregularities	*Fiscal, Financial and Rate Reforms:* Totally eliminate subsidy in one step or gradually.
Delayed investment in public transit fleet and bus terminals. Due to conflict and inappropriate policies, average bus is almost 20 years old. Bus terminals are inadequate.	Additional funding program for fleet renewal. Need for bus terminal concession plan.
Salvadorean cargo fleet inadequate and not competitive in C.A. No plans for freight terminals to promote containerization.	Renew cargo fleet with expansion of existing financing. Work with freight associations to evaluate/promote terminal needs.
Lack of a clear legal and regulatory framework and of a national ground transport policy. Public transit regulations are from 1956 with numerous updates, adequate coverage, but outdated and disorganized. Subsector objectives, strategies and policies are undefined.	*Modernization: Regulation* Approve public transit legislation, and update regulations. Define interurban transport policy, including functions by vehicle type.
Insufficient development of private operator associations. The associations are dedicated to the defense of their members, they do not have roles in self-regulation of service quality and development.	*Modernization: Self-Regulation* Support the development of these associations so that, jointly with the DGTT, they may: a) Set and self-regulate service standards and b) plan bus terminals.
Ground Transport Regulatory Commission	
Existing public transit regulations not followed in granting concessions, renewed regardless of performance.	*Modernization: Regulation* Establish independent regulatory committee within VMT to grant concessions on competitive basis.
DGTT and Regulatory Commission	
Deficient transit fare policy development capacity. Transfer of DGTT to VMT did not include fare analysis. Fare negotiations largely based upon association increase requests.	*Rate Reforms* Carry out fare studies, independent committee review and propose adjustments. Establish technical tariff policy which provides for: a) Adequate returns b) Incentives for fleet replacement and improved service
DGTT	
Barriers to efficient public transit companies. Prevalence of individual ownership due to failure of 70's co-operative policy.	*Modernization: Deregulation* Promote organized firms, eliminating requirement of individual firms, while avoiding monopolies. Develop performance-based concession policies.
Public transit procedures too bureaucratic and without technical basis. Some operate without permits.	Re-engineer procedures. Develop data base and public transit management information system.
Engineering Directorate	
Lack of highway safety/security. Theft and accidents are prevalent.	*Development* Technical highway safety standards, stricter truck licensing, patrols, accident records, truck radios.
Municipalities currently lack transport planning capacity.	Institutionally strengthen municipalities to assume their urban transport functions.

Source: Frederic R. Harris, Inc.

5.5.2 Investments

The private sector needs to make interurban service investments to replace the passenger and modernize the cargo fleet, as well as to build bus and cargo terminals using an existing credit program.

The VMT should review the procedures including possible adjustments to expand firm eligibility, while continuing to require debt and management capacity.

If the existing program were to replace 3,000 buses over the next five years, it would cost approximately ¢1,500 million. This does not include bus fleet expansion which the VMT should estimate in coordination with the associations, considering productivity improvements as well as the expansion of interurban trips, projected to multiply 3.3 times from 1992 to 2015.

5.5.3 Pre-Investments

The Consultant recommends the following pre-investment activities in interurban public transportation:

- → Technical assistance in the organization of a management information system and data base, and its use in re-engineering regulation implementation procedures.
- → An analysis of the supply of bus services, passenger demand and their balance, the need for increases in services and simplification of the existing route system.
- → A national bus terminal concession plan, consisting of approximately 10 terminals, 3 in San Salvador and 7 in other cities, to guide the GOES, bus associations and interested investors in determining needs, concession procedures and preliminary costs.

These are summarized in Table 5.6.

TABLE 5.6
Interurban Transport Pre-Investment Program

Program	Pre-Investment Type	Proposed Year
Public Transit: → Re-Engineering and MIS (1) → Supply - Demand Balance	Technical Assistance and Studies	1997
Bus Terminal Concession Plan	Study	1997

(1) MIS: Management Information System
Source: Frederic R. Harris, Inc.

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Chapter 6

HIGHWAY STUDIES

HARRIS

6 HIGHWAY STUDIES

The thrust of this chapter is to assess and analyze this transport mode in six aspects:

- → Institutional
- → Truck axle weight control
- → Condition and maintenance of the network
- → User charges
- → Traffic projections
- → Additional infrastructure programs.

The Study concentrates on the paved interurban road network.

6.1 Assessment

6.1.1 Institutional Assessment

The Vice-Ministry of Public Works (VMOP), through the General Directorate of Roads (DGC) and the Machinery and Equipment Administration (AME), is in charge of providing the country with a network with the lowest possible transport costs. At present there is limited capacity for long-term investment planning and a lack of tools to implement systematic analysis.

Emergency and routine road maintenance is carried out by the DGC through its Sub-Directorate of Ordinary Budget, but the shortage of budget allocations for these operations makes the task impossible.

6.1.2 Weight Control System

The size and the frequency of the repetitive loads that commercial vehicles transmit to the pavement are essential to define construction and maintenance investment needs. To control the loads, the DGC has a system of 7 weight control stations around the country and has a program to increase them to 18, all with new equipment. Consultant's spot verifications of each existing weighing station proved that their operation is not reliable at all, making the system ineffective.

6.1.3 Road Inventory

The last road network inventory was taken in 1991 and partially updated in 1993. The total road network has about 9,800 kilometers of which about 2,000 are paved.

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According to the 1991 and 1993 road inventory, it was found that:

➔ In terms of surface condition:

- ✓ 30% of the paved network was in fair condition and 38% in bad condition.
- ✓ 39% of the primary roads and 47% of the secondary were in bad condition.
- ✓ 30% of the non-paved roads were in fair condition and 37 % in bad or very bad condition.

➔ Regarding structural characteristics of paved roads:

- ✓ 40% of deflection measures showed critical conditions.
- ✓ 47% of strength measures in terms of CBR indicated weak sub-bases.
- ✓ Existing pavement thicknesses indicated they are under-designed for future traffic demand.

The inventory of structures along the road network indicates that about 25% of the steel and concrete structures are in fair condition.

6.1.4 User Charges

As part of a highway questionnaire requested by the International Road Federation, the DGC estimated that for 1992, the income originated from road use, except fuel taxes (about 100 million colones), was 356.39 million colones. The total highway expenses in that year was 375.3 million colones. Therefore, 1992 highway transport revenue (including fuel taxes) exceeded expenditures. However, highway revenues go to a central account; and budget allocations are not made in proportion to revenues to meet highway needs.

6.2 Highway Analysis

The detailed road analysis comprises an overview of road maintenance problems, the evaluation of investment needs on the paved network, privatization options of road maintenance and truck weight control.

6.2.1 Road Maintenance

In El Salvador, as in most developing countries, highway maintenance does not receive proper attention. Besides the armed conflict, which prevented proper care of the road infrastructure, other causes are:

- ➔ Lack of road maintenance financing in the national budget.
- ➔ The budget defines administrative expenses as maintenance costs. Thus, during 1993 to 1995, about 90% of DGC's maintenance budget was assigned to salaries.
- ➔ Little attention given to the fact that roads in bad condition raise substantially vehicle operating costs.
- ➔ Wrong pavement design considering a limited pavement life and full rehabilitation thereafter, instead of reinforcing the pavement before deterioration.
- ➔ Inefficiency of works under government agency responsibility.

6.2.2 Proper Road Maintenance

The establishment of a proper road maintenance program is key to preserving investments in highway construction. Maintenance avoids road structure deterioration which will later need rehabilitation or reconstruction. The two basic steps in a maintenance program are:

- ➔ Define the best type of intervention, from an economic point of view, according to road characteristics and traffic volume.
- ➔ Identify the most appropriate time to carry it out.

6.2.3 Analysis of Maintenance Strategies

The HDM III Model was used to define a MOP road use and maintenance policy and propose the actions to be followed. The model requires the following information:

- ➔ Present vehicle fleet operating conditions with regard to loads transmitted to the road structures.
- ➔ The physical condition of the paved road network.
- ➔ Traffic levels and road lengths.
- ➔ Road maintenance standards or regulations.
- ➔ Financial and economic unit costs of road maintenance and reconstruction.
- ➔ Financial and economic costs of vehicle inputs.

Groups of maintenance strategies are defined for beginning traffic above and below 1,500 vehicles per day. They are thoroughly detailed in the main report.

6.2.4 Road Maintenance and Reconstruction Unit Costs

Maintenance and reconstruction unit costs of paved roads were analyzed for all these activities as carried out by the DGC. Unit prices were broken down into materials, labor and equipment; financial and economic prices for vehicle inputs were also determined; shadow prices were used for the economic evaluations.

6.2.5 Road Maintenance Programs and Priorities

Current lack of definition about funding sources and the availability of resources for maintenance foresees that initially it will not be possible to maintain all roads.

Roads have been analyzed and prioritized by the savings that the proposed maintenance strategy will produce per colon invested. Table 6.1 indicates the selected maintenance standards by type of road and traffic level. The most efficient maintenance investment should be directed towards those roads with greater traffic volumes and which were most recently reconstructed or rehabilitated.

TABLE 6.1
Selected Maintenance Standards by Type of Road and Traffic Level

Type of Road	Average Daily Traffic	Recommended Maintenance Standard (1)
All	> 3,300 (2)	7 cm overlay, when IRI reaches 4m/km.
	< 200	Only routine maintenance and reconstruction when IRI reaches 8.5 m/km.
Primary or Secondary	200-600	3 cm overlay, when IRI reaches 5.4 m/km.
	600-1300	5 cm overlay, when IRI reaches 5.4 m/km.
	1300-3300	5 cm overlay, when IRI reaches 4m/km.

(1) All assume routine maintenance, 100% patching and reconstruction of roads when IRI exceeds 6.5 m/km.
(2) Special roads all have one way initial traffic greater than 3500 vehicles per day.
IRI International Roughness Index.
Source: Frederic R. Harris, Inc.

6.2.6 Road Maintenance Funding Needs

The resource needs computed per year by type of maintenance for the total paved road network showed that periodic maintenance needs are highest during the first two years and that a considerable reduction of funding needs may be achieved with a proper maintenance program: On the order of US$520 million over a 20-year period, justifying first priority to the adoption of a well-guided maintenance program.

6.2.7 Road Maintenance Privatization

The maintenance deficiencies of the Salvadorean road network, the funding difficulties and the limited institutional experience with road maintenance privatization indicate that efficient maintenance is not likely under present work schemes. The Consultant proposes the privatization of road maintenance as an alternative.

a. Necessary Conditions to Privatize

A successful maintenance privatization process requires:

- ➔ A legal definition of sufficient and permanent funding sources to be attractive to the private sector.
- ➔ A state organization with resources and technical capacity to manage the road network, plan works in advance, contract works implementation and control and evaluate the results.

b. Routine Maintenance Privatization Alternatives

Routine maintenance presently receives the least attention within the DGC budget, even though the agency has more than the necessary personnel to cover the total network under its responsibility. Therefore, where maintenance resources are almost exclusively applied to salary payments, the option to assure routine maintenance appears to be to reduce DGC personnel and privatize the works. There are two alternatives:

- Contracting Micro-Enterprises

  Micro-enterprises, which have proven successful in some Latin American countries, have the following characteristics:

  - ➔ Their members live in the area of the road under contract.
  - ➔ They belong to low-income and educational strata.
  - ➔ The majority of the members are rural laborers without special skills.
  - ➔ The number of members should not exceed 18 persons.

  In the case of El Salvador, the micro-enterprises could be promoted among employees being separated from the DGC through legal severance or retirement plans. The Study gives details on the creation of associative micro-enterprises, contracting methods, size and duration of contracts, operating systems, contract supervision and control.

- Contracting with Private Construction Companies

This is another possibility, not considered as attractive and not recommended.

c. Periodical Maintenance Privatization

The transfer of periodical maintenance responsibility to the private sector can be partial or total. In the first case, it would be limited to well defined maintenance works to guarantee their quality. In the second case, the road is given in concession to the private sector to make the necessary investments to keep the road in excellent condition for an extended period, in exchange for direct collections from users, usually through tolls.

d. Road Management and Administration Contracts

Through this type of contract, the government transfers total responsibility for managing a highway to a third party who must provide the necessary works to maintain them in good quality and functioning condition. The contract terms should clearly define the funding sources, form of payment, period of contract, responsibilities, guarantees, etc.

The final report provides extensive details about the advantages and disadvantages of each alternative and the entire process of contract tenders and awards, as well as contract supervision and control.

6.2.8 Additional Infrastructure and Investment Needs

With international financing, the MOP, through the DGC, plans to construct works for a total amount close to US$486 million, during 1995-1999. There are 417 km of paved road rehabilitation projects with committed resources and finished feasibility studies.

The Consultant carried out traffic projections on the interurban corridors to 2015 summarized in Table 6.2 and capacity analysis of the main corridors covering 698 km of highways, as shown in Figure 6.1 (2015 levels of service given committed highway improvement plans). Needs for additional infrastructure programs to satisfy traffic demand were identified from:

- ➔ DGC proposals without secured international financing.
- ➔ Roads planned by the Office of Planning for the Metropolitan Area of San Salvador (OPAMSS), even though they do not have preliminary studies.
- ➔ Needs identified by the TRANUS Model.

TABLE 6.2
Trend Scenario Highway Traffic Projections - (AADT)

Corridor/Section	1992	2000	2005	2010	2015
Panamerican					
1 Santa Ana - Sitio del Niño (CA-1)	5,456	9,448	13,890	17,300	22,456
2 Sonsonate - Las Moras (CA-8)	3,942	8,718	13,608	19,606	29,172
3 Apopa - Sitio del Niño	3,356	7,150	12,322	18,436	24,134
4 Ilopango - Cojutepeque (CA-1)	9,598	17,864	29,736	396,628	54,944
5 El Triunfo - San Miguel (CA-1)	2,540	4,404	7,846	10,402	13,360
6 San Miguel - km 18 (CA-7)	2,348	5,128	9,056	11,060	14,424
7 San Miguel - Sirama (CA-1)	1,990	3,856	5,308	10,564	11,486
North - South Central					
8 San Salvador - La Libertad (CA-4)	2,022	3,602	6,890	8,852	16,304
9 San Salvador - AIES	3,118	7,852	9,638	13,448	20,988
10 San Salvador - Apopa (CA-2)	4,246	8,570	14,616	21,674	29,492
Coastal					
11 Zacatecoluca - San Luis (CA-2)	1,938	5,836	7,096	10,698	21,346
12 Zacatecoluca - Usulután (CA-2)	1,168	3,636	4,550	6,558	10,986

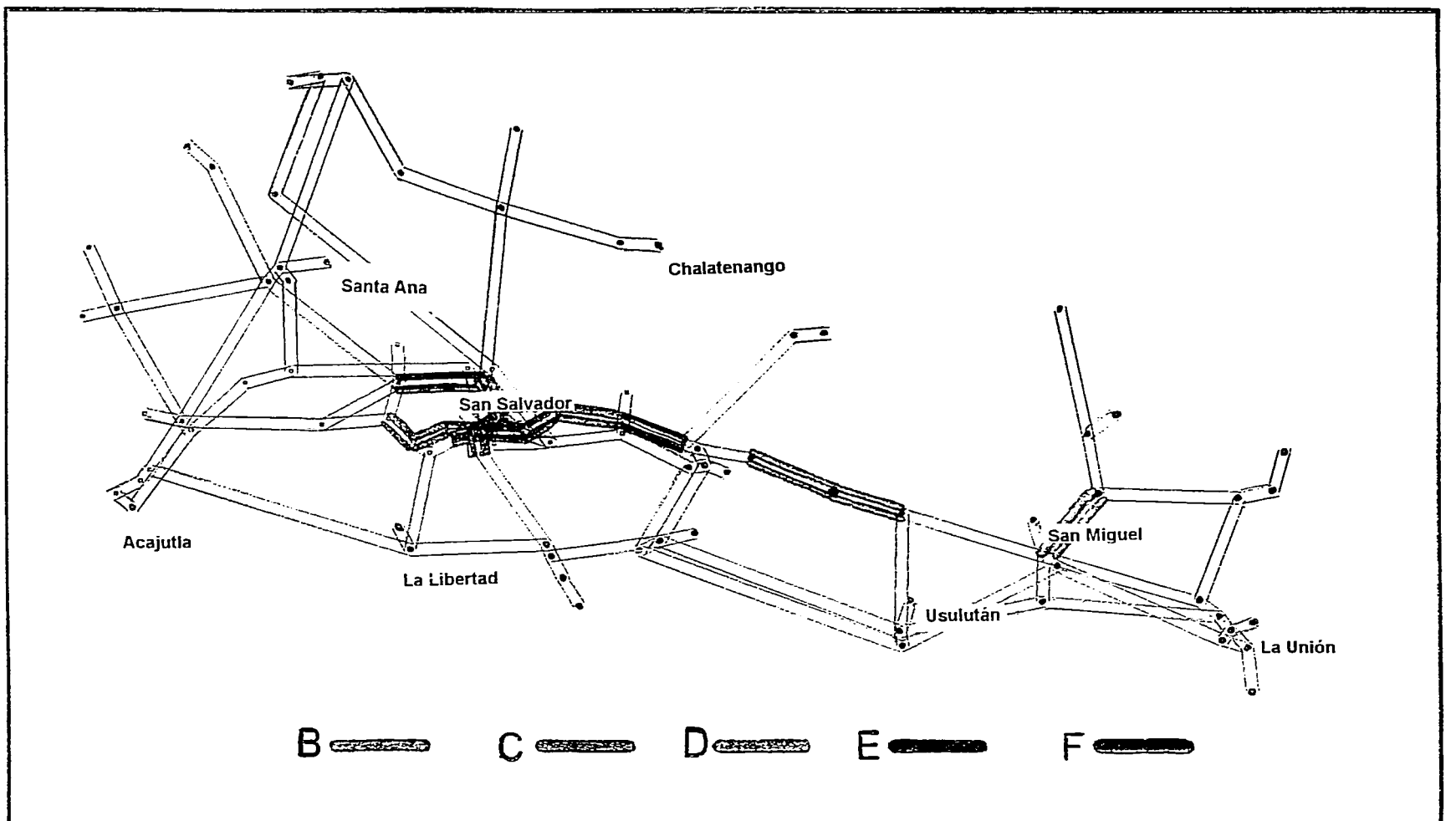
AADT Average Annual Daily Traffic
Source: Frederic R. Harris, Inc. Simulation results.

Roads thus identified at a pre-feasibility level have been grouped into three programs for analysis (See Figures 6.2 and 6.3):

- ➔ Northern San Salvador Bypass road, with three alternatives.
- ➔ Southern San Salvador Bypass road, with three alternatives.
- ➔ Northern East-West Highway, with two complementary sections.

The Northern Bypass, a natural truck route, seems to have higher priority. The Southern Bypass is much more complex because it crosses heavily populated areas and of more difficult topography. The forecasted traffic for the Northern East-West Highway only justifies considering a secondary road.

FIGURE 6.1
Level of Service - Highways - 2015



Source: Frederic R. Harris, Inc.

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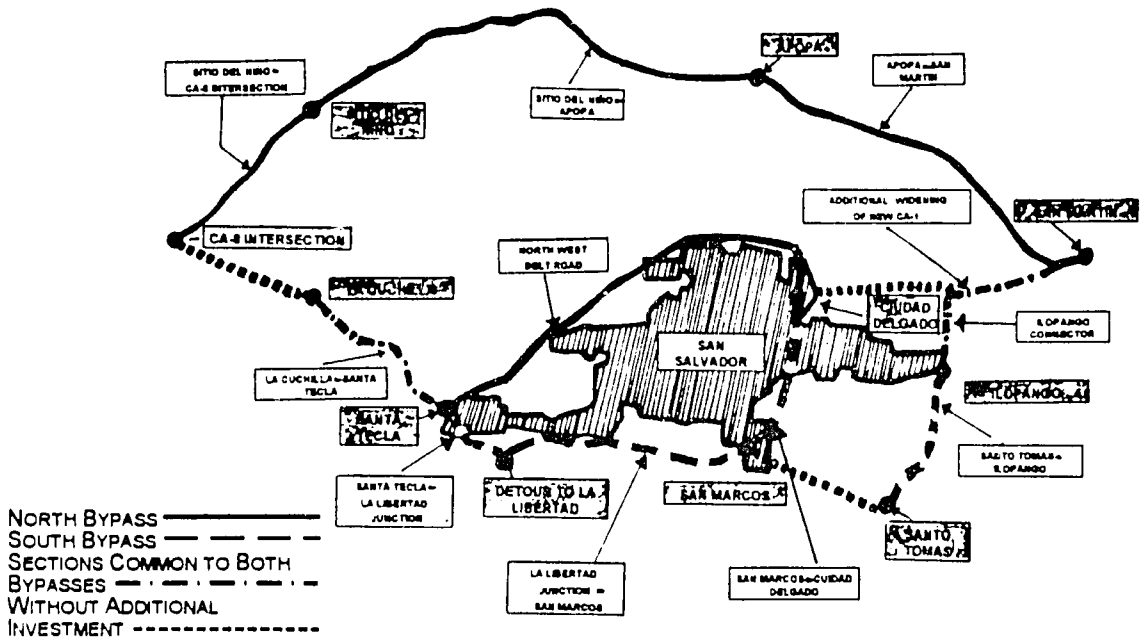
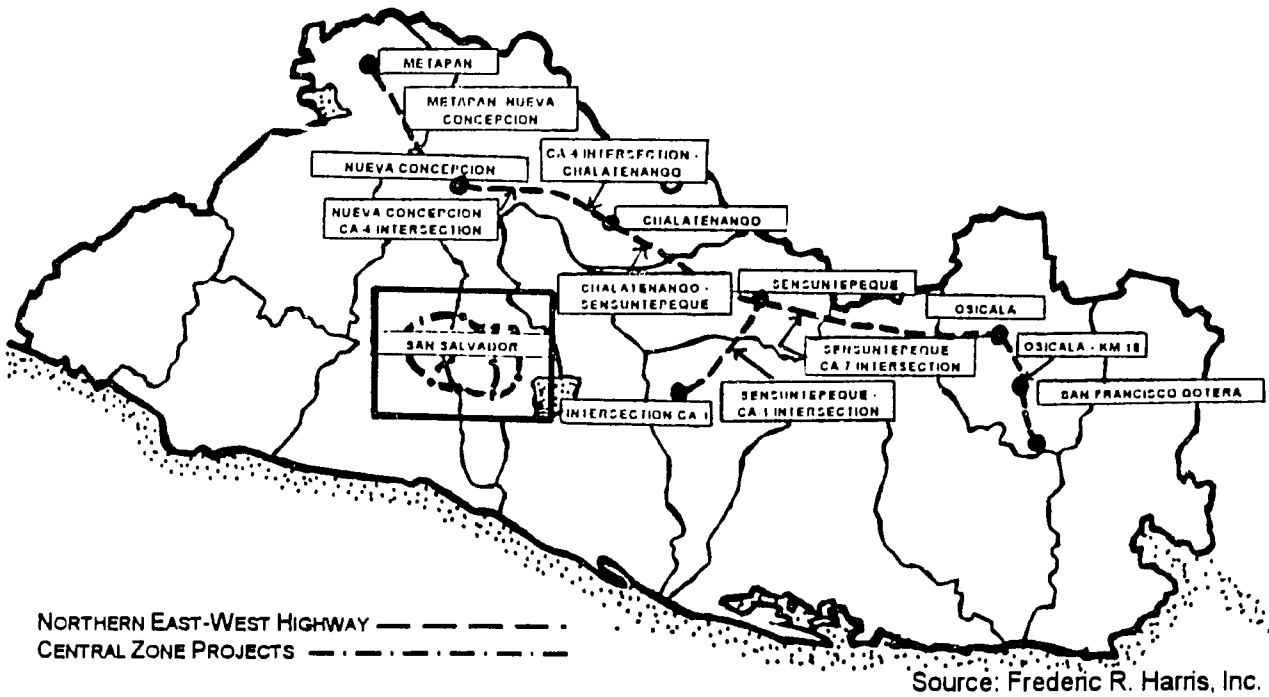
FIGURE 6.2
Bypass Roads



Source: Frederic R. Harris, Inc.

FIGURE 6.3
Road Projects



Source: Frederic R. Harris, Inc.

6.2.9 Road Investment Cost Estimates

The cost estimates for the additional programs evaluated are shown in Table 6.3.

TABLE 6.3
Cost of Evaluated Additional Road Programs
(in million colones of 1994)

Program	Length in km	Cost
Northern Bypass		
Alternative 1	75.35	1,013.41
Alternative 2	56.51	894.08
Alternative 3	107.95	1,504.70
Southern Bypass		
Alternative 1	21.80	354.31
Alternative 2	38.20	551.70
Alternative 3	32.60	438.55
Northern East-West Highway	239.60	2,680.58
Complementary Roads	59.00	469.15

Source: Frederic R. Harris, Inc.

6.2.10 Weight Control for Cargo Vehicles

The Consultant's opinions concerning the weight control of cargo vehicles are:

- ➔ Weight controls are generally very expensive, difficult to control, ineffective and lead to irregularities in developing countries. El Salvador is no exception.
- ➔ It is better to design and strengthen pavements to bear heavier truck loads consistent with modern truck manufacturing.
- ➔ Economic analysis is needed to compare the decrease in maintenance cost because of the weight control against the cost of operating more vehicles with smaller allowable loads.
- ➔ Strict weight controls are justified if the legal load limits are high, which is not the case in El Salvador.
- ➔ Loads levels in Salvadorean trucks, according to weighings verified by the Consultant, indicate that a real overload problem which could accelerate the road deterioration process does not exist.

Therefore, the GOES should abstain from building and equipping the additional weight control stations until their need is economically evaluated.

a. Privatization of Weight Control

In case the Government decides to carry out its program to modernize the weight control system and increase the present seven to 18 weighing stations, all with new equipment, the operation should be privatized.

Among the different alternatives to transfer the system's responsibility to the private sector are

- ➔ Grant the concession to construct, equip, operate and maintain the system, freeing the government from these costs.
- ➔ Build and equip the stations and bid their operation and maintenance.

If the DGC were committed to build and equip the stations, the second alternative would be followed. The Study extensively covers the contracting process.

6.2.11 User Charges and Road Costs

Efficient highway expansion, improvement, rehabilitation and maintenance programs need annual flows of funds which guarantee these programs. The Consultant projected and compared highway fiscal revenues and costs for the 1995-2014 period as shown in Table 6.4. Fiscal revenues (user charges) include registration fees, vehicle and spare part import duties and value added taxes, fuel surcharges, and other revenues. Costs include current expenses (MOP transport-related costs, and emergency maintenance costs) and capital costs (for ongoing and proposed, urban and interurban unpaved and paved road maintenance and construction as well as debt service). Fuel subsidies are also taken into consideration.

TABLE 6.4

Projections of Fiscal Revenues and Costs for the Road Sector 1995-2014
(values in million colones at 1994 prices)

Item	1995	1996	1997	1998	1999	2000-2004	2005-2009	2010-2014	Total 1995-2014
Fiscal Revenues	724.58	613.69	674.44	739.89	810.35	5,392.50	8,222.38	12,361.34	29,539.17
Costs									
Current C.	204.50	214.73	225.47	236.74	248.58	1,442.19	1,840.61	2,349.15	6,761.97
Capital C.	750.21	767.66	772.20	822.47	852.19	4,479.83	6,578.92	7,134.74	22,158.21
Total C.	954.71	982.39	997.67	1,059.21	1,100.77	5,922.02	8,419.53	9,483.89	28,920.18
Surplus (Deficit)	(230.13)	(368.70)	(323.23)	(319.32)	(290.42)	(529.52)	(197.15)	2,877.45	618.99

Source: Frederic R. Harris, Inc.

With the proposed routine and periodic maintenance program for the existing highway network, future financial requirements for network rehabilitation are reduced but more funds are required in the initial years. Also, road reconstruction requires unprecedented financial resources substantially increasing debt service obligations. These costs, together with reduced revenues due to lower import duties result in projected costs higher than revenues for the next ten years.

6.3 Recommendations

Recommendations are summarized here regarding policies, investments and pre-investments.

6.3.1 Policies

The financial constraints to effective maintenance, as well as other policy restrictions and the Consultant's proposals to overcome them are summarized in Table 6.5.

TABLE 6.5
Highway Financial and Policy Constraints and Proposals

Constraint	Proposal
Lack of routine and periodic highway maintenance and a plan to fully implement it.	Prepare maintenance privatization plan, applying SIAMV and this study, including decentralization and possible concessions.
Unsecured funding for highway maintenance.	Use a special account for highway maintenance funded by fuel taxes according to a pre-approved formula by type of road.
Excessive personnel and insufficient qualified staff.	Help form micro-enterprises and absorb unskilled MOP personnel. Improve salaries and training.
Project cost overruns and delays due to late payments.	Accelerate preparation of MOP and Finance Ministry purchasing and disbursement procedures.
Benefits of weight control not clear.	Carry out cost-benefit analysis; meanwhile maintain but do not expand existing system.
Increasing administrative and debt service costs.	Reduce administrative costs through modernization and reduce maintenance costs through private contracting.
Projected costs exceed revenues in the next ten years due to increased maintenance and debt service and lower import duties.	In addition to the fuel surcharges, study reintroduction of tolls and concessions on selected highways; and special property assessments to finance new construction around main cities.

SIAMV Road Maintenance Management System.
Sources: Frederic R. Harris, Inc. MIPLAN, Pilot Study of the Vice-Ministry of Public Works.

6.3.2 Investments

Investments in paved highway maintenance are recommended as well as new investment programs for main corridors. Improvements of the other paved roads, as well as tertiary and rural roads were not studied.

a. *Highway Maintenance*

The maintenance of the existing paved highway network, as proposed above, has an average internal rate of return of 108%.

b. *Urban Bypasses*

Two urban bypasses around San Salvador are needed and feasible. Given the significant highway improvements underway and committed, these are the only capacity constraints identified through the year 2015.

c. *The Northern East-West Highway*

This penetration road to develop the North, the country's least developed region, was not found feasible as a complete program, when considering only transport cost savings. The Study did not consider the development impact that a penetration road such as this would have and did not analyze regional impacts.

The costs and results of the economic analysis for highway investments are shown in Table 6.6.

TABLE 6.6
Recommended Highway Investments
(costs in millions of 1994 colones)

Program	Action	Type	Cost	Years	NPV	IRR%
Maintenance of the Existing Network	Routine and Periodic Maintenance	Paved	3,184	1995-2014	4,687	108.7
		Unpaved	2,574	1995-2014	N.A.	N.A.
North Bypass (Alternative 1)	Widening and Construction	Primary and Special	1,013	2010-2015	4,574	33.1
South Bypass (Alternative 3)	Widening and Construction	Primary and Special	520	2010	7,222	43.3
Northern East-West Highway	Construction and Reconstruction	Secondary	3,150	2010-2015	(4,135)	4.8
		Total	10,441		12,348	

Source: Frederic R. Harris, Inc.

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6.3.3 Pre-Investments

In addition to the MOP modernization program, as well studies and design needed to implement projects with committed funds, the Consultant recommends pre-investments for:

- → Maintenance, privatization and decentralization.
- → Planning of the proposed additional highway programs.

a. *Maintenance, Privatization and Decentralization*

Technical assistance is needed to enhance DGC's capacity to:

- → Promote and contract micro-enterprises for routine maintenance.
- → Plan and implement maintenance decentralization.
- → Evaluate and plan highway concessions.

b. *Planning New Highway Programs*

Feasibility studies will be needed for the bypass programs. A traffic monitoring program is recommended for the Eastern CA-1 Highway to determine whether the services they will be providing will adequately service future demand. A regional development study of northern El Salvador is recommended including a feasibility and environmental impact study of the Northern East-West Highway and its access roads. The proposed pre-investment program is summarized in Table 6.7.

TABLE 6.7
Highway Pre-Investment Program

Program	Pre-investment Type	Proposed Years
Enhanced Highway Maintenance Capacity	Study and Technical Assistance	1996
Northern Bypass	Feasibility study	2002-2003
Southern Bypass	Feasibility study	2003-2004
Eastern Panamerican Highway	Traffic analysis	1999
Northern East-West Highway	Regional Development and Highway Feasibility	2005

Note: Does not include environmental impact studies recommended in Chapter 10.
Source: Frederic R. Harris, Inc.

CEPA

Chapter 7

RAIL STUDIES

HARRIS

7 RAIL STUDIES

The railway system was studied to:

- ➔ Determine present conditions of infrastructure and equipment, organization, finances, operations, regulations and traffic.
- ➔ Analyze the options of continuing rail services and their financial and economic costs and benefits.
- ➔ Recommend strategies for future railroad development should this mode of transport continue to operate.

7.1 Rail Assessment

7.1.1 Introduction

The system was built by two companies, the Salvador Railways operating between San Salvador and Acajutla with a branch to Santa Ana, and the International Railways of Central America from the Guatemalan Border to Cutuco, including the port of Cutuco. As a result of bankruptcy of both lines, in 1975 they were nationalized and merged as FENADESAL, administered by CEPA.

Railroad properties suffered extensive damage during the armed conflict, which prevented regular operation and resulted in substantial traffic decline. FENADESAL has recently undergone severe staff cuts, from over 1000 in 1992 to about 600 at present. Only 154 men are assigned to actual track maintenance for the 540 kilometers of track. A normal average is 1 man per kilometer of track.

7.1.2 Network Description and Condition

Present track conditions severely restrict train speeds and prevent FENADESAL from offering a competitive service. From 1975 to present, only emergency maintenance has been undertaken. A large portion of the system has high grades, reaching a maximum of 3.5 % and severe curves. Most of the rail is only 60 lb/yd. Other is 54 and 70 lb/yd. All the light rail requires immediate replacement; rail joints are in very bad condition. Sleepers are in deplorable condition requiring at least 75% replacement. Only 85 kilometers of the entire line has ballast and even so of bad quality. Derailments have increased in recent years due to the poor condition of the permanent way. In 1993 there were 597, of which 409 were due to the track conditions. Bridges are generally in good condition, but still many require strengthening or replacement. There are several sections where the embankment shows significant erosion damage and the section from km 246 to 255 near Apopa has an almost unsurmountable problem of river erosion and land slides, cutting service for long periods (the last one from August 1994 to June 1995). The rolling stock is old, but the locomotives in use are kept in good operating condition.

Encroachments into the right of way by squatters is another serious problem affecting not only the safety of the operations, but stability of the embankment and security.

7.1.3 Financial Analysis

Due to low traffic volume, El Salvador's rail system has operated at a substantial financial loss for many years, currently on the order of 25 million colones per year, which the Government has to subsidize.

At present, FENADESAL's operating costs are considered to be 93% fixed and 7% variable. For 1993 the average operating cost (including depreciation and amortization) was estimated as ¢0.9068 per ton-kilometer and the average revenue as ¢0.3078 per ton-kilometer. FENADESAL's present operating costs are extremely high when compared with other light density railroads and with other modes of transport. One reason is that the vast majority of railroad cargo consists of cement and imports from the ports, all one-way cargo. Marketing efforts must concentrate on finding return loads for wagons now moving empty.

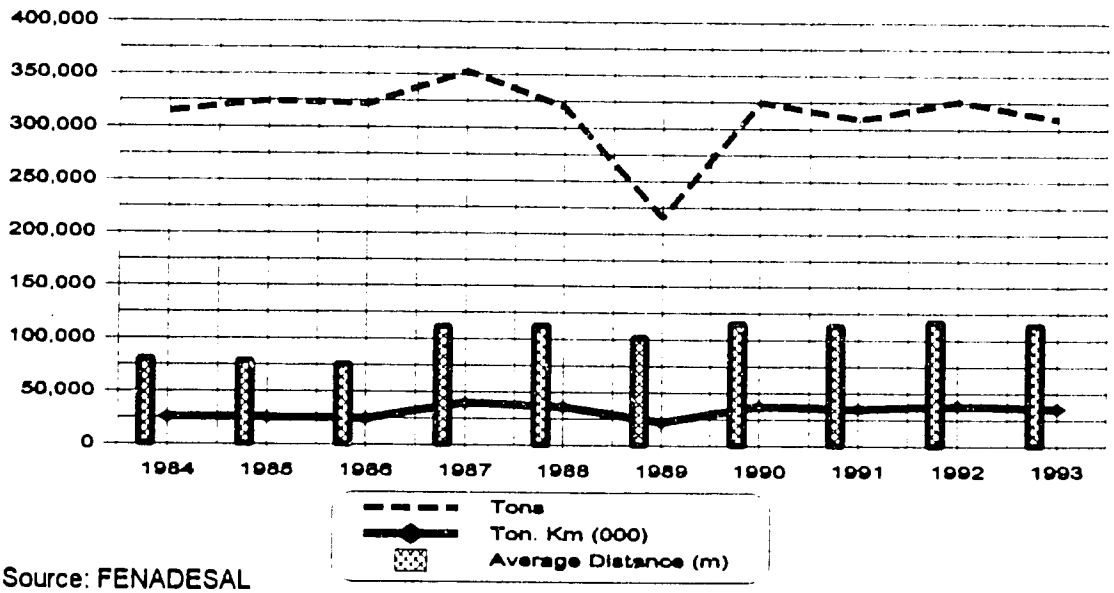
The basic accounting system currently follows the commonly known Form A of the United States Interstate Commission for U.S. Railroads which is an adequate system for determining the total costs for specific activities. However, under new Government regulations, FENADESAL will have to cease to use this accounting system.

7.1.4 Freight Traffic

Freight tons and ton-kilometers for the last ten years are shown in Figure 7.1.

FIGURE 7.1

Rail Traffic in Tons, Ton-kilometers and Length of Haul, 1984-1993



Source: FENADESAL

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Except for the section Sonsonate-Armenia, the system does not carry passengers. Major commodities being handled include cement from Metapán to San Salvador, San Miguel, La Toma and other destinations. Cement represents 59% of total rail tonnage and 77% of ton-kilometers. Steel imported through Acajutla represents 12% of total tonnage. Other low value cargo is transported from Acajutla. Coffee cargo mainly, from the Santa Ana area, is declining as it is now transported mostly in containers. The number of containers transported is insignificant. The major destination of all cargo is San Salvador.

Opportunities to increase traffic volume are limited. The extremely short length of hauls make successful competition difficult. Fuel for a new oil-fired power plant recently built in Nejapa is the most promising source of additional cargo.

7.1.5 Tariffs

CEPA's board is responsible for the approval of FENADESAL's tariffs. The policy is to establish rates at a level sufficiently below truck charges to maximize traffic volume and revenues. Operating costs are not considered in this decision. All rates are far below average full (including fixed) costs. The high operating expenses and the relative low tariffs result in the annual Government subsidy required to continue FENADESAL operations.

7.1.6 Institutions

The railroad has been owned by the Government of El Salvador and administered by CEPA since 1975. This was conceived as a provisional arrangement which requires that almost all decisions be made by GOES, CEPA and FENADESAL, despite being a part of a highly competitive market. Thus, management practices become complicated regarding budget development and implementation, rate setting and negotiations, service termination, property sales, purchases of goods and services, performance incentives, etc. FENADESAL is also insufficiently market-oriented.

7.2 Rail Analysis

7.2.1 Feasibility of Continuing Present Operations

Continuing the present railway operation does not appear feasible. There are no areas in which costs savings can be achieved sufficient to eliminate or make major reductions in subsidy requirements.

Adequate maintenance of the permanent way for the existing system would require a budget of about ¢47,400,000 per year. This is more than FENADESAL has been spending in total for all functions. This is not rehabilitation but the annual amount required to maintain the present route structure in satisfactory condition for long-term operation.

Present traffic volume is declining. This must be assumed to reflect the gradual deterioration of the railroad fixed facilities and the declining service standards which result. As traffic declines, revenue declines and operating losses increase. As operating costs are 93% fixed, they virtually cannot be cut.

7.2.2 Evaluation Criteria

In order to have an objective basis for evaluation of the various scenarios proposed for future rail development the following criteria have been used.

a. Rehabilitation Costs

The level of rehabilitation recommended for of the retained system is FRA Class 2 (US Federal Railroad Administration) to permit a 25 mph (40 kph) operating speed with a high level of safety. It is also recommended to increase the axle load from 16 to 20 tons. This would permit an increase in the maximum weight of locomotives and increase the tonnage hauling capacity of the locomotives by 25%. Locally made wood sleepers without treatment and good quality ballast for the retained system are recommended. No rail is included in the rehabilitation program. Specific bridge needs are discussed in the evaluation of each scenario. No replacement of wagons or locomotives is included.

The cost of the rehabilitation program has been estimated as ¢424,350 per kilometer.

b. Development of Operating and Maintenance Costs

Operating costs have been developed from FENADESAL monthly and annual expense reports. Permanent way maintenance costs are calculated on a "normalized" basis which assumes that the railroad will remain in operation indefinitely with regular track replacement. Annual maintenance cost has been estimated as ¢80,500 per kilometer.

c. Net Liquidation Values (NLVs)

NLVs are estimated based on the market values of railroad properties in case of abandonment of service, assuming all properties are sold for their "highest and best use".

A recent property appraisal determined a value of ¢221,020,000 for FENADESAL's commercial properties. This includes station sites, yards, workshops and properties located in urban areas. Other properties such as right of way are estimated as ¢6,000,000.

d. Severance Payments

All of the scenarios involve the abandonment of all or a part of the existing rail system. This event, as well as efficiency improvements, may require staff reductions. FENADESAL has developed a computer program which calculates severance costs at any time, based

on the National Labor Code, and has recommended a figure of ¢23,000,000 to cover increases from the present to actual time of termination. Payments to be made depend upon the specific scenario.

e. Projected Traffic

Traffic analysis has projected that, without rehabilitation and even with some improvement in service, no traffic will move via rail in the future. Projected rail traffic is shown in Table 7.1. The projection assumes that, with rehabilitation, FENADESAL will retain the cement movement from Metapán, and steel and other low value commodities from Acajutla, as well as attract a substantial portion of the fuel oil required for the new Nejapa Power Plant and for the cement plants in Metapán. Services to Metapán and Nejapa represent over 90% of potential rail tonnage for 2015.

TABLE 7.1
Projected Rail Traffic
(in thousands of metric tons per year)

Origin	Destination	Commodity	Year			
			2000	2005	2010	2015
Metapán	San Salvador	Cement	251	342	433	525
Ciudad Arce	Metapán	Puzzolana (1)	135	173	222	284
Acajutla	Metapán	Fuel Oil	44	57	73	94
Acajutla	Nejapa	Fuel Oil	156	156	156	156
Acajutla	San Salvador	Steel/Misc.	45	57	73	107
		Total	631	785	957	1,166

(1) Puzzolana is a volcanic material used in cement manufacturing. An alternative demand scenario with less puzzolana and more cargo from Acajutla was also studied.

Source: Frederic R. Harris, Inc.

Although the modal traffic analysis shows that container volume at the port of Acajutla will increase substantially between now and 2015, none of this cargo has been assigned to the railroad. This is understandable as most container cargo is relatively high value and requires rapid, dependable door-to-door transit. Present levels of railroad service do not meet the requirements for this type of cargo.

f. Financial Projections

Revenue projections are made based on the specific cargo which is expected to be transported under each of the scenarios. Cost estimates are based upon the train operating plans detailed for each scenario.

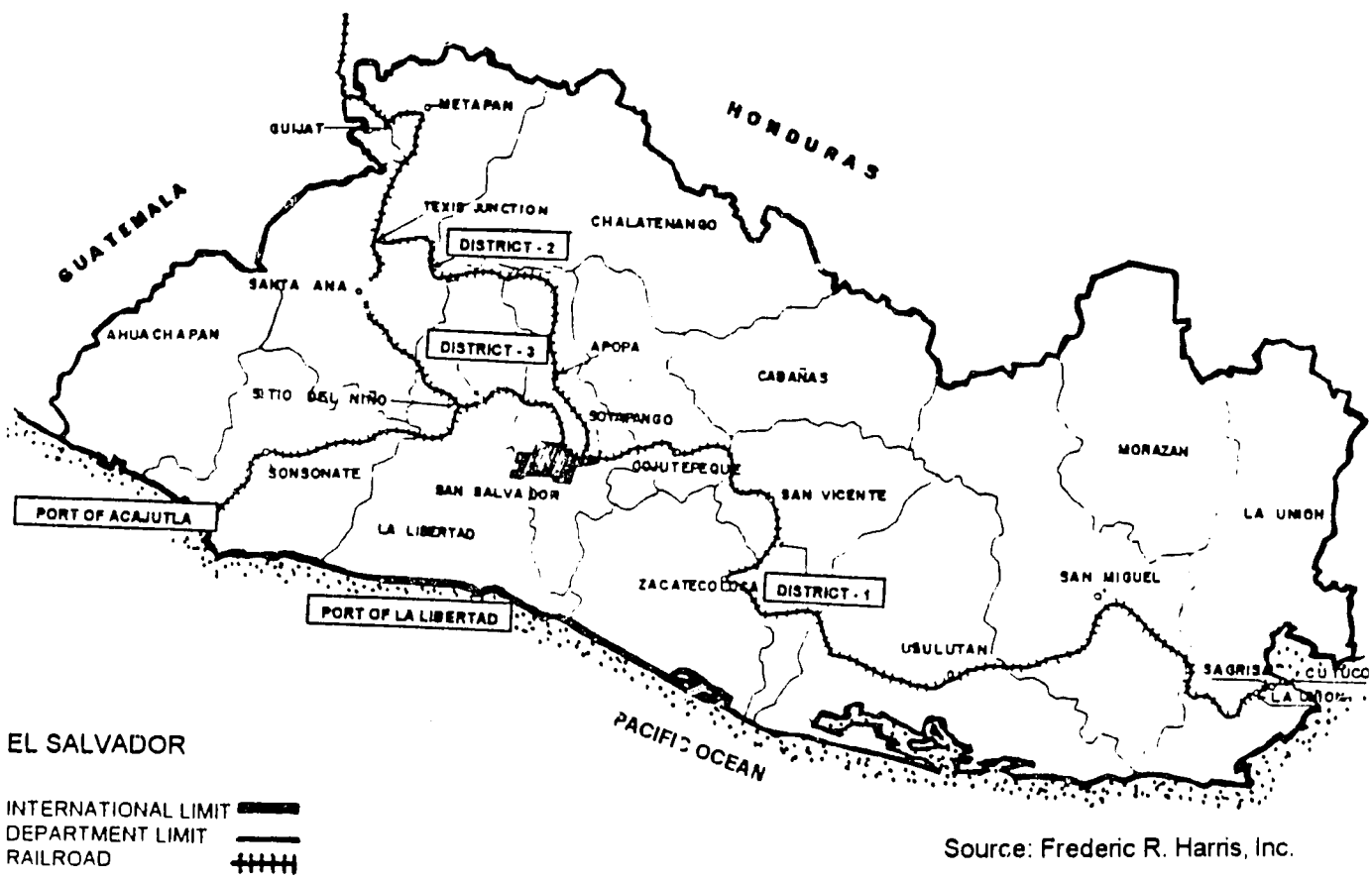
g. Investment Requirements

All scenarios will require track rehabilitation, depending upon the route distance which is to be retained. The rehabilitation of the permanent way will also require the clearing of all encroachments, estimated at an average of ¢2,926,000 per kilometer.

7.2.3 Evaluation of Scenarios

Five future scenarios were considered for the existing rail network (Figure 7.2), which are:

FIGURE 7.2
Study of Scenarios



Source: Frederic R. Harris, Inc.

a. Scenario 1: Acajutla-San Salvador

This option only retains service between Acajutla and San Salvador, with all the other routes of the railway abandoned. The basic modal analysis projects that the rehabilitated railway will transport only low value commodities, including steel, between Acajutla and El Salvador. The only investment initially required for this scenario is the rehabilitation of the 103 kilometers between Acajutla and San Salvador, including the replacement of one large bridge, repair of other small ones and clearing of encroachments.

The Nejapa Power plant fuel traffic is considered highly likely to move via rail. The operating costs for the basic 2015 traffic projections are estimated at ¢16,596,000. The Nejapa Power Plant traffic adds 156,000 tons per year and an incremental operating cost of ¢1,743,000.

The financial analysis of these alternatives shows high operating losses in all cases through out the forecast period. Other alternatives studied under this scenario included retaining the Sitio del Niño-Santa Ana branch and the San Salvador-Soyapango/Ilopango sector. The studies show that the additional investments for rehabilitation and annual maintenance to retain these sections far exceed the revenues. This entire Scenario 1 is not feasible.

b. Scenario 2: Retain Metapán-San Salvador

This option's objective is to preserve service for the cement traffic to San Salvador. There are three ways in which this may be done:

- Using the existing route through Soyapango and the problem section between kilometers 246 and 255;
- Constructing the Apopa connection to avoid this problem section; and
- Constructing the Santa Ana connection (operating trains between Metapán and San Salvador via Texis Junction, Santa Ana and Sitio del Niño), with different operating and maintenance costs.

The Santa Ana connection was discarded in this scenario because of higher operating costs due to severe grades and sharp curves.

The only traffic would be cement from the two plants near Metapán. With the abandonment of District 1, it is assumed that cement to points served by this line will no longer be transported by train.

Construction requirements vary significantly between the options of retaining the existing line (¢62,675,000) and building the Apopa connection (¢80,763,000), excluding design costs.

Rail operations proposed to be retained under this scenario continue to lose money throughout the forecast period. Assuming steady traffic growth and present pricing policies, this rail operation can not be expected to be profitable in financial terms.

c. Scenario 3: Combines Scenarios 1 and 2

This scenario continues rail service between Acajutla, Metapán and San Salvador. For service from Metapán, the same three options analyzed in Scenario 2 are restudied. Inclusion of service to Acajutla affects the economics of constructing the Santa Ana connection.

Traffic flows are the same as those of scenarios 1 and 2 plus additional traffic consisting of :

- ➔ Movement of fuel oil from Acajutla to Metapán either via Santa Ana or via Apopa; and

- ➔ The construction of the Santa Ana connection which may permit FENADESAL to transport Puzzolana from Ciudad Arce to Metapán.

d. Scenario 4: Includes San Salvador-Cutuco

This scenario assumes that all or part of Districts 2 and 3 are continued in operation and evaluates adding District 1 to that system. The objective is to determine if continued operation of District 1 improves the feasibility of the rail system.

No traffic is assigned to this line, even with rehabilitation. It is extremely circuitous when compared with the highway route, with long transit times. Even extremely low value commodities such as cement would not be transported by rail because of the transit time. Some traffic is currently moving but in very low volume and is declining rapidly.

If the Eastern area of the Country develops quickly and Cutuco becomes a container port, a study could be made on building a new, more direct line between Cutuco and San Salvador.

e. Scenario 5: Total Closure

This approach assumes that all rail operations are abandoned, the staff is given separation payments and the assets are sold. The Port of Cutuco is excluded from this analysis. It is assumed it would be transferred to CEPA, including present employees, and remain in operation.

This scenario would lead to:

- → Severance payments on the order of ¢23,000,000, excluding Cutuco employees;
- → End of the annual subsidy received from the Government on the order of ¢25,000,000 per year;
- → Total Net Liquidation Value estimated as ¢249,807,000. Disposal of the saleable land would require about three years; sale of the usable locomotives and other assets, within two years.

f. Summary

Table 7.2 summarizes the analyzed scenarios, including projected traffic and estimated investments.

TABLE 7.2
Scenario Analysis Summary
(in million 1994 colones)

Scenario	Length in km	Traffic 2015 (1000 t)	Investment Costs				
			Construction and Equipment (1)	Right of Way	Severance Pay	NLV	Total
1 Acajutla-San Salvador	103.0	263.0	78.0	17.6	13.9	(6.8)	102.7
2A Metapán-San Salvador (existing)	136.0	525.0	69.0	18.0	13.0	(5.9)	94.1
2B Metapán-San Salvador (via Apopa)	135.5	525.0	88.8	18.0	13.6	(6.1)	114.3
3B Both services with Apopa Connection	234.0	881.8	162.6	20.0	5.4	(5.0)	183.0
3C Both Services with Santa Ana Connection	215.0	1,160.0	210.0	26.0	5.4	(5.2)	236.2
5 Total Closure	0.0	0.0	0.0	0.0	23.0	(249.8)	(226.8)

(1) Includes Nejapa service investment in Scenarios 1 and 3, track repair, bridge replacement/repair, new construction, related designs and wagons for Puzzolana in 3C.

Source: FENADESAL and Frederic R. Harris, Inc.

7.3 Recommendations

The Consultant recommends the complete closure of FENADESAL. However, if GOES elects to maintain sections of the railroad network in operation, policy changes and rehabilitation would be essential as summarized below.

7.3.1 Policies

In the event GOES elects to retain and rehabilitate sections of the railroad, it should seriously consider changing FENADESAL's inflexible regulatory environment which prevents effective management practices. In order to compete, it would be essential to delegate to FENADESAL the freedom to make decisions to:

- ➔ Develop and manage its own budgets.
- ➔ Set and negotiate freight rates.
- ➔ Establish, divest or terminate services.
- ➔ Sell property or purchase equipment.
- ➔ Contract for construction and maintenance.
- ➔ Establish work performance incentives.

As this cannot be achieved under current administrative procedures, in the event some railroad operations are retained, the Consultant recommends that:

- ➔ GOES establish, with appropriate legislation:
  - ✓ A government (possibly CEPA) owned commercial company with clearly established independence on the above issues.
  - ✓ Fixed subsidies as Public Service Obligation (PSO) grants to pay for government-mandated deficit services, or justified by forecasted economic benefits.
- ➔ Also, regarding marketing and tariff policy:
  - ✓ FENADESAL should work closely with clients to provide the best service possible and make strong efforts to attract new cargoes. Rates for present traffic should be increased to the maximum which the competitive situation will permit. This will require marketing research to determine exact levels of highway carrier rates and service.

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7.3.2 Investments

The key economic benefits which retained rail operations would provide are reduced road congestion, air pollution and foreign exchange needs. The economic analysis indicates that rail rehabilitation is not feasible given all potential traffic. The historical neglect of the rail system and recent construction of competing roads play important roles in this conclusion. With heavier urban congestion, rehabilitation according to Scenario 3 would be marginally feasible, either via Apopa or Santa Ana. In this case, it may be more cost-effective to alleviate this congestion by other policy or investment measures.

The financially preferred alternative is to close the system down. If total closure is not socially or environmentally acceptable, retaining one service minimizes total outlay. Retaining both Acajutla and Metapán services requires the highest investment outlay but provides the highest operating margin; operating subsidies would diminish over time and positive operating margins, projected by the year 2008, would not still allow for investment recovery.

Based on these results, summarized in Table 7.3, the Consultant proposes to:

- ➔ Close the railroad system and sell all assets at their best possible market value.

If total closure of the system is not socially or environmentally acceptable and GOES decides to continue with railroad service, most of the following conditions should be met:

- ➔ The two key users firmly commit to use rail services.
- ➔ All funds are made available for the needed railroad investments.
- ➔ Funds are unlikely by 2005 for the proposed San Salvador highway bypasses.
- ➔ The relocation of families encroached on rail right-of-way is socially feasible.
- ➔ The GOES attributes great importance to mitigating future increases in air pollution, risk of accidents and certain non-economic criteria.

There would be limited funding sources for any railroad rehabilitation scheme. Needed investments are intensive in local resources, with limited possibilities of external funding.

Given the poor financial performance of the railroad, privatization is, for now, not a viable option. There are slim possibilities for joint government-shipper-railroad financing.

- ➔ Therefore, funding for rail investments would have to be made mainly by the national treasury.

TABLE 7.3
Economic and Financial Analysis of Rail Scenarios
(in million 1994 colones)

Scenario	Economic Analysis		Financial Analysis				
	IRR %	NPV	2015 Op. Costs	2015 Op. Rev.	2015 Op. Margin	Rev./Cost Ratio	NPV
1. Acajutla-San Salvador	-8.85	-196	18.3	11.8	-6.5	0.42	-123
2A. Metapán-San Salvador (existing)	4.07	-87	26.1	19.5	-6.6	0.42	-142
2B. Metapán-San Salvador (via Apopa)	5.31	-75	21.2	19.5	1.7	0.43	-134
3B. Both Services with Apopa Connection	6.25	-134	37.0	37.0	0.0	0.43	-229
3C. Both Services with Santa Ana Connection	6.15	-144	49.0	37.0	12.0	0.49	-223
5. Total Closure	N.A.	N.A.	0.0	0.0	0.0	7.79	174
Sensitivity Analysis 3C. Heavier Urban Congestion	12.04	8	49.0	37.0	12.0	N.A.	N.A.

N.A. = Not Available.
Sources: FENADESAL and Frederic R. Harris, Inc.

7.3.3 Pre-Investments

In the event the GOES does not decide whether to rehabilitate or close the railway based upon the results of this study, a two-to-three month final review would complete the analysis of the key issues. If GOES decides to rehabilitate, design work would be required.

CEPA

Chapter 8

PORT STUDIES

HARRIS

8 PORT STUDIES

8.1 Port Assessment

8.1.1 Introduction

This sections describes and analyzes the current situation of the Country's port sector to identify restrictions that affect the development of ocean transport in El Salvador.

The port sector in El Salvador consists of only two ports: Acajutla and Cutuco. Acajutla is by far the most important, handling in 1993 more than a million and a half tons of cargo, or 97% of the Country's total port traffic.

This traffic, however, does not represent all El Salvador foreign trade. The Atlantic ports of Guatemala and Honduras are also used. Recently, Salvadorean container cargo, because of better facilities and schedules, has been substantially diverted to Puerto Quetzal in Guatemala.

8.1.2 Institutional Structure

The Commission Ejecutiva Portuaria Autónoma (CEPA) was established in 1952 by the government to develop the Port of Acajutla and meet the demands of El Salvador international trade. Acajutla's management is a field office which reports to CEPA's central management. As a result the Acajutla port does not have real autonomy, making the management process slow and cumbersome.

Until 1994 when the Dirección General de Transporte Marítimo was created, there was no specialized agency in the Country involved in the regulation, control and promotion of maritime transport. El Salvador is not a signatory to most of the international maritime agreements. It is expected that this new organization will fill a void that is retarding the growth of this activity in El Salvador.

8.1.3 Port of Acajutla

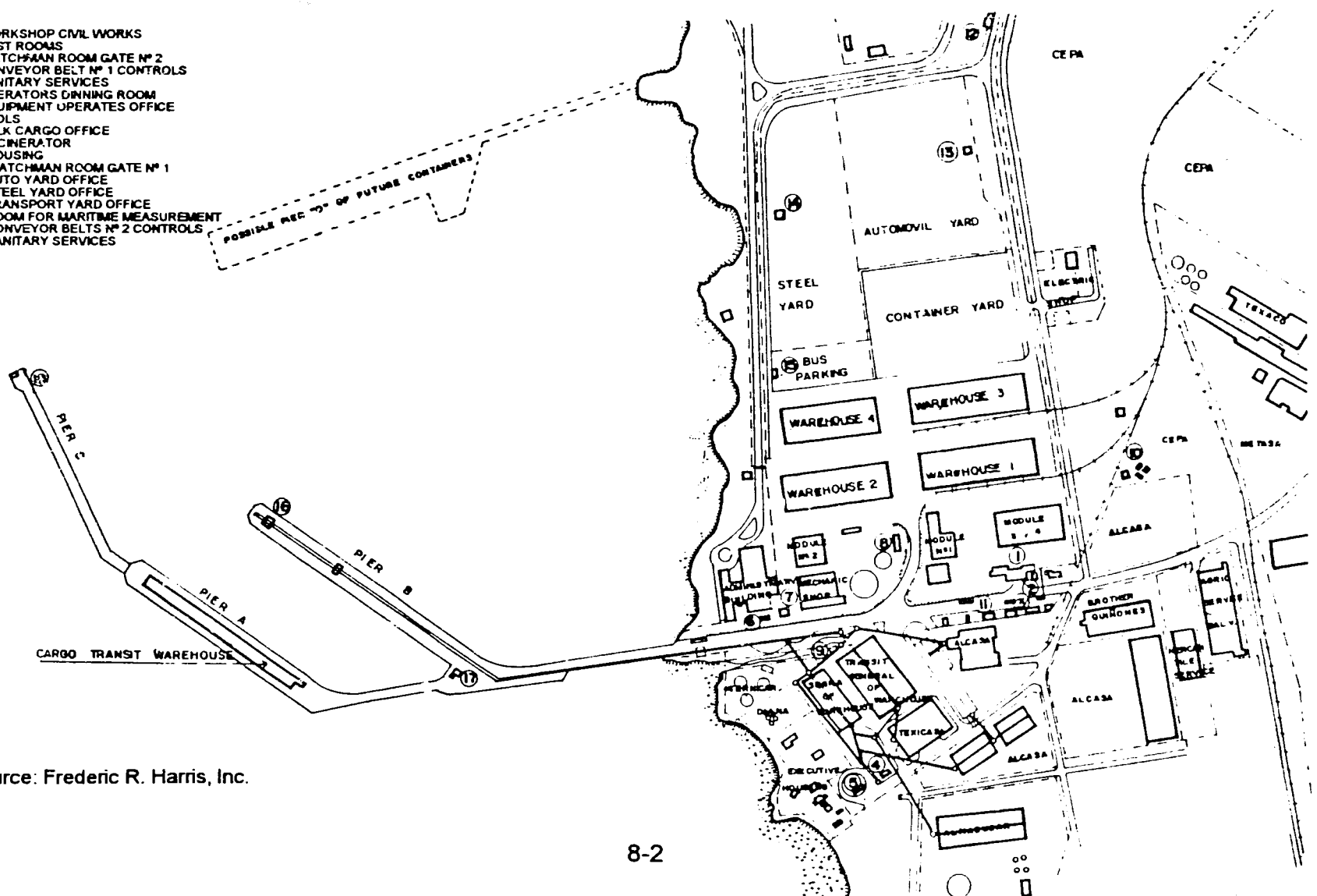
The location of the ports is open to the sea and during bad weather the port must close, on the average 2 to 3 weeks a year in the rainy season.

The configuration of the port is fairly efficient for handling bulk cargo, but difficult for moving break bulk and containerized loads. The port has three piers and eight berths.

The port has good road and railroad access. With a protecting breakwater advancing to a depth of 19 meters, the harbor also has easy and ample sea access through a natural channel that requires no dredging. See Figure 8.1.

FIGURE 8.1
Installations of the Port of Acajutla

1 WORKSHOP CIVIL WORKS
2 REST ROOMS
3 WATCHMAN ROOM GATE Nº 2
4 CONVEYOR BELT Nº 1 CONTROLS
5 SANITARY SERVICES
6 OPERATORS DINNING ROOM
7 EQUIPMENT OPERATES OFFICE
8 TOOLS
9 BULK CARGO OFFICE
10 INCINERATOR
11 HOUSING
12 WATCHMAN ROOM GATE Nº 1
13 AUTO YARD OFFICE
14 STEEL YARD OFFICE
15 TRANSPORT YARD OFFICE
16 ROOM FOR MARITIME MEASUREMENT
17 CONVEYOR BELTS Nº 2 CONTROLS
18 SANITARY SERVICES



Source: Frederic R. Harris, Inc.

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8.1.4 Acajutla Port Operations

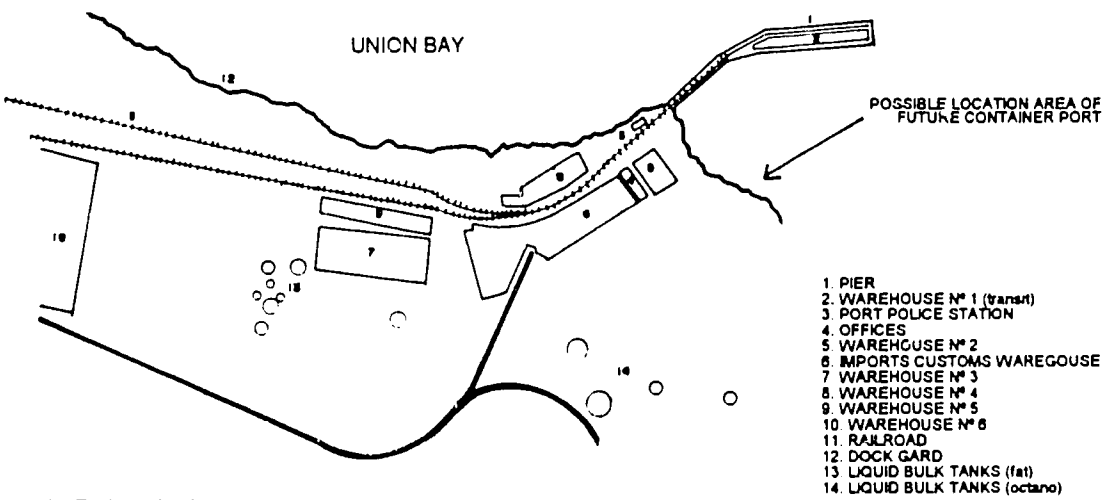
Acajutla handles dry and liquid bulks, break bulk and containerized cargo. Acajutla does not have a specialized container facility. The containers are transported in combined break bulk/container ships, loaded and unloaded with ship's gear directly to and from tractor-trailers.

Labor contract requirements with the Acajutla port workers union impose excessive personnel and follow procedures that are inefficient and obsolete.

8.1.5 Port of Cutuco

The Port of Cutuco, consisting of only one finger pier, is located in the Gulf of Fonseca in the eastern region of the Country, 185 km by road and 252 km by rail from San Salvador. The pier needs repairs. See Figure 8.2.

FIGURE 8.2
Installations of the Port of Cutuco



Source: Frederic R. Harris, Inc.

FENADESAL is the owner of the port and the pier can be reached and operated only through the railroad. However, the six inland warehouses have road access. To reach Cutuco, ships follow a natural channel that does not require dredging but has a limiting depth of 23' at low side. Ships needing a deeper draft must wait for high tide to enter the port.

The participation of Cutuco in handling waterborne cargo has been greatly reduced, decreasing from 205,000 tons in 1979 to only 41,000 in 1993. Presently only fertilizer, some cement and liquid bulks are imported.

8.2 Port Analysis

In this section the needs for changes in operation and infrastructure are analyzed.

8.2.1 Utilization and Capacity of Acajutla

The low productivity of Acajutla was identified as a deficiency that increases port costs and limits the port's competitive position. Ships remain idle an average of over 40% of the ship's time at berth. A large portion of this time is due to union requirements and labor practices of work interruptions. For the six operating berths in Acajutla, the average rate of occupation is only about 15 to 36% of the annual available time. The Consultant has calculated that, on average, the port is utilized at 50% of its capacity.

8.2.2 Improved Operations

The Consultant considers that port capacity conditions can improve and most of the causes for delay in the operations would disappear as a result of the following:

- Negotiate with the Port Workers Union modernization of work practices and reduction of unnecessary personnel, considering the expected important port traffic increases that will result in more work and income, without discharging personnel.
- Set up modern installations and operations, lowering costs.
- Use the recently acquired cargo handling equipment and implement the pier and yard rehabilitation programs.

Based on these considerations, the Consultant has designed an improved operation with gangs tailored to each task and idle time reduced to a maximum of 20% of the ship's time at berth, eliminating delays for lack of coordination, equipment shortage and obsolete labor practices. The cost of each improved cargo handling operation has been estimated. In 1993 the port could have saved over 15 million colones using the improved operation, over four times the surplus made by the port in that period. Table 8.1 compares 1993 unit costs under present and with improved conditions.

TABLE 8.1
Operating Costs Comparison - Present and Improved Conditions - 1993
(in colones per moved ton)

Variable Operating Costs per Ton	Break Bulk	Solid Bulk	Liquid Bulk	Containers
Present Conditions	65	12	3	61
Improved Conditions	44	7	1	14

Source: Frederic R. Harris, Inc.

8.2.3 Utilization and Capacity of Cutuco

Considering the condition of the Cutuco Pier the Consultant recommends CEPA rehabilitation and provide road access. The two berths could handle some 540,000 tons a year using the mixture of loads forecasted for Cutuco in 2015. A 1978 study estimated rehabilitation would cost 9 million colones which in 1994 colones would be on the order of 44 million colones.

8.2.4 Demand Projections and Investments

Two scenarios were analyzed to project Salvadorean cargo demand and investment needs through 2015. Potential for generating Cutuco traffic from new free zones, Central America and a dry canal was not considered in this study. See traffic projections in Table 8.2.

TABLE 8.2
Salvadorean Cargo Forecast
Scenarios 1 and 2
(in tons)

Scenario and Type of Cargo	2000			2005			2010			2015		
	Acajutla (1)	Cutuco	Total	Acajutla	Cutuco	Total	Acajutla	Cutuco	Total	Acajutla	Cutuco	Total
Scenario 1 (without San Salvador bottleneck) (2)												
Break Bulk (3)	408,655	28,428	437,084	449,005	57,003	506,008	621,572	79,666	701,238	866,297	113,395	979,693
Containers	534,332	0	534,332	774,904	0	774,904	1,205,100	0	1,250,100	1,906,651	0	1,906,651
Dry Bulk	959,616	47,108	1,006,724	1,085,010	47,380	1,132,390	1,167,506	53,943	1,221,449	1,315,136	61,415	1,376,552
Liquid Bulk	1,698,179	11,200	1,709,379	2,051,638	16,160	2,067,798	2,369,626	19,318	2,388,944	2,737,752	23,093	2,760,845
Grand Total	3,600,782	86,736	3,687,519	4,360,558	120,542	4,481,100	5,363,804	152,926	5,516,731	6,825,837	197,904	7,023,741
Scenario 2 (with San Salvador bottleneck) (4)												
Break Bulk	415,666	45,238	460,904	442,451	62,941	505,392	566,725	146,459	713,184	693,706	313,251	1,006,958
Containers	572,144	0	572,144	700,000	0	700,000	700,000	344,128	1,044,128	700,000	761,744	1,461,745
Dry Bulk	922,290	47,108	969,398	1,034,268	50,742	1,085,010	1,072,942	148,536	1,221,478	1,221,488	165,064	1,376,552
Liquid Bulk	1,698,179	11,200	1,709,379	2,050,491	17,306	2,067,797	2,356,180	32,774	2,388,954	2,698,778	62,067	2,760,845
Grand Total	3,608,279	103,546	3,711,825	4,227,211	130,989	4,358,200	4,695,847	671,897	5,367,744	5,303,976	1,302,127	6,606,100

(1) Includes petroleum.
(2) Includes all road investments with committed funds and which are required to correct road capacity restrictions, plus all Acajutla investments; without terminal in Cutuco.
(3) The following maximum capacities for general bulk are estimated: 750 thousand t, Acajutla, 100 thousand t., Cutuco.
(4) Assumes the San Salvador Bypass Roads and the Acajutla container terminal are not built; and that the Cutuco terminal is.
Source: Frederic R. Harris, Inc.

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a. Scenario 1 (without San Salvador bottleneck)

This scenario assumes that the road system will expand according to traffic demand; therefore San Salvador will not become a bottleneck. In this scenario, the transportation model assigns most of the growth to Acajutla and forecasts a very moderate increase to Cutuco traffic.

Under this scenario, while the present Cutuco installations, when rehabilitated, would be sufficient to satisfy demand, Acajutla would require significantly expanded infrastructure as follows:

- ➔ An installation to handle containers with multi-purpose cranes on Pier C prior to year 2000 to handle about 500,000 tons/year.
- ➔ As pier C new capacity is fully utilized, a specialized terminal for containers to start operations in 2005. (Pier D).
- ➔ A grain terminal to start operating by 2010, when the capacity of the existing facilities become fully utilized.

b. Scenario 2 (with San Salvador bottleneck)

This scenario assumes that the land transportation system will not solve the future San Salvador bottleneck in time. In this case, Cutuco would attract a growing proportion of the port cargo generated east of San Salvador.

The analysis of this scenario further assumes that:

- ➔ The Cutuco container terminal is built.
- ➔ The container traffic to Acajutla is limited to the volume that can be handled by Pier C (around 500,000 tons per year).

Under this scenario, infrastructure improvements required are:

- ➔ Installation of multi-purpose cranes on Pier C to operate prior to year 2000.
- ➔ A grain terminal to start operating by 2010.
- ➔ Immediate rehabilitation of the Cutuco Pier.
- ➔ Construction of a specialized container terminal at Cutuco, to operate in year 2010.

c. Specialized Container Operations

The handling of containers in Acajutla is a slow operation performed with the ship's gear on a general cargo pier. This manner of handling containers may be used when the traffic is sporadic or does not exceed 200,000 tons a year. Otherwise it is necessary to have

specialized installations which require cranes on the pier and 10 or more hectares of yard per berth. The service offered by this type of operation is substantially different from the one existing today; it allows for regular sailings, reliable shipping and handling of high volumes of cargo.

8.2.5 Port Privatization

a. General Concepts

Privatization always seeks to allow the free play of market forces so that competition lowers costs and optimizes the assignment of port resources. To this end, entrepreneurs program new investments, try advanced work methods, develop intensive marketing and, as a result, the port becomes more efficient, reduces its costs and attracts a larger volume of cargo.

b. The Port Authority

The highest institutional level in the structure of port privatization is the Port Authority. This may be a public agency, often beginning as an enterprise where all stock is owned by the state which, in the short term, may transfer its interest to private hands. It receives the total state concession and in turn offers, in concession to private operators, the services of the port.

The responsibilities of the Port authority, in addition to administering state assets well, should include:

- Promotion of the port.
- Promotion of competition among concessionaires.
- Berth assignments.
- Enforcement of environmental regulations.
- Conservation and maintenance of port property.
- Furnishing common services.
- Preparation of the Master Port development Plan.
- Construction, maintenance and administration of port infrastructure not included in concessions.
- Formulation and enforcement of operating rules.
- Operation of general security services.
- Award of concessions by public tender and supervision of contract satisfaction.
- Fulfillment by concessionaires and operators.

The Port Authority should be autonomous financially and operationally and its policies should be those dictated by its own governing authorities. The income of the Port Authority comes from concession operator payments often including a participation on a per ton basis.

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c. The Concessions

For a service to be susceptible to privatization:

- ➔ It should be profitable: The tariff should be sufficient to pay its costs and leave a profit.
- ➔ It should be integrated: Only one operator assumes full responsibility for a complete process.

d. The Concessionaire

Prospective candidates should:

- ➔ Have successfully operated similar concessions and possess experience, connections and relationships in his field.
- ➔ Be an entrepreneur accustomed to evaluating and taking risks, and competing for market share.
- ➔ Be able to guarantee competent operations.

e. The Concession Process

The concession process must follow transparent and open procedures that guarantee that the award is made without favoritism or secret negotiations and that only the public interest prevails in the selection and contracting of the operator. Public tendering is preferred, prepared and controlled by the Port Authority.

The Study details the concession process and presents the principal aspects of the concession that should be dealt with in the tender as well as the key clauses that normally are part of concession contracts.

f. List of Possible Concessions

Following is a list of possible concession services. For each, the Study gives a description of the services to be provided, the conditions of the concession, the organization and resources available to the concessionaire and estimates income and expenditure projections:

- ➔ Break bulk services.
- ➔ Dry bulk services
- ➔ Containerized cargo.
- ➔ Pilot services.
- ➔ Tug and berthing services.

8.3 Recommendations

Port policies are recommended regarding Acajutla operations and privatization, and the transfer of Cutuco to CEPA. Investments and related pre-investments are proposed for

Acajutla multi-purpose cranes, container yard, grain terminal and specialized container terminal; as well as Cutuco pier rehabilitation and plans for a container terminal.

8.3.1 Port Policies

The key policy concerns and recommendations regarding the port sub-sector are:

The Port of Acajutla's operating inefficiencies can be remedied by:

- ➔ Implementing the proposed improved operations and setting gang incentives per ton handled.

After overcoming the several constraints to privatization, the Consultant recommends that:

- ➔ CEPA establish Acajutla as a landlord port Authority which would establish concessions, following proposed bidding procedures, for the integrated services listed above.

The Port of Cutuco, as a part of FENADESAL is managed, as a facility to exclusively service the railroad. This limits the port's flexibility, and potential for development. Therefore, the Consultant recommends that:

- ➔ GOES hand over Cutuco to CEPA for rehabilitation, including highway access.

Tables 8.3 and 8.4 summarize these and other constraints and proposals.

TABLE 8.3
Constraints and Policy Proposals - Port Subsector
CEPA - Acajutla

Constraint	Policies and Proposals
Acajutla has high operating costs and low productivity relative to potential performance; and lacks labor productivity incentives.	*Modernization: Re-engineering* Efficiencies can be achieved by: ➔ Improved operations by reduced gang sizes and inactive times. ➔ Gang incentives by ton moved.
Among the constraints to privatization: ➔ The law does not provide for concessions. ➔ The Union and some CEPA staff are not in favor of privatization.	*Modernization: Privatization* The Consultant recommends: ➔ Training in privatization. ➔ Approve revised legislation. ➔ Establish Acajutla as a landlord port Authority. ➔ Grant competitive port operations. ➔ Negotiate with the union in advance.
Current low tariffs for containers not applicable to specialized terminals.	*Tariff Policy*: Increase rates for multi-purpose cranes and specialized terminals to levels similar to those applied in other countries.

Source: Frederic R. Harris, Inc.

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TABLE 8.4
Constraints and Policy Proposals - Port Subsector
GOES / CEPA - Cutuco

Constraint	Policies and Proposals
The Port of Cutuco is not maintained. As a part of FENADESAL, it is managed to service the railroad.	*Modernization: Decentralization* GOES should hand over the port of Cutuco to CEPA for rehabilitation.
CEPA's management role of a new Cutuco terminal has not been determined. To be successful, it will need to actively compete for traffic with other ports.	The feasibility study should analyze management alternatives Once the decision is made to add facilities at Cutuco, consider it's establishment as a landlord port authority to more effectively promote its development.

Source: Frederic R. Harris, Inc.

8.3.2 Port Investments

Five programs are considered, three for Acajutla and two for Cutuco.

- ➔ Acajutla:
  - ✓ Multi-purpose Cranes and Container Yard.
  - ✓ Specialized Container Terminal.
  - ✓ Grain Terminal.
- ➔ Cutuco:
  - ✓ Pier Rehabilitation.
  - ✓ Specialized Container Terminal.

These recommended investments are summarized in Tables 8.5 and 8.6.

TABLE 8.5
Recommended Port Investments - *Acajutla*
(cost in million of 1994 colones)

Program	Cost	Year	Econ. IRR%	Econ. NPV	Financial NPV
Multi-purpose Cranes and Container Yard (Pier "C")	179	2000	22.02	128	624.73
Specialized Container Terminal (Pier "D")	700	2005 (1)	18.18	733	301.05
Grain Terminal (2)	132	2010	10.82	(42)	N.A.
Total	1,011			819	925.78

(1) Begin operations in 2010 in Scenario 2.
(2) Benefits from reduced pier traffic congestion not included. Traffic growth may warrant this investment earlier.
N.A. = Not Available.
Source: Frederic R. Harris, Inc.

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TABLE 8.6
Recommended Port Investments - *Cutuco*
(cost in million of 1994 colones)

Program	Cost	Year	Econ. IRR%	Econ. NPV	Financial NPV
Pier Rehabilitation	44	1996	16.85	21	74.45
Specialized Container Terminal (1)					
Scenario 2	437	2010	7.62	(366)	909.26
Scenario 1			2.79	(485)	N.A.
Total	481				983.71

(1) Investment recommended only for Scenario 2. Scenario 1, with San Salvador bottleneck; Scenario 2, without San Salvador bottleneck. Does not include benefits from port-related free zones, nor potential Central American and dry canal traffic.
N.A.= Not Available.
Source: Frederic R. Harris, Inc.

Regarding future port container services, the Consultant proposes GOES carry out the following decision sequence:

- ➔ Install the first multi-purpose crane on Acajutla's Pier C and expand container yard.
- ➔ Undertake Cutuco container terminal feasibility study, following recommendations made in this Study.
- ➔ Market Acajutla container services and monitor the operations. Re-estimate optimum investment year and likely capacity increase for Pier C's second crane.
- ➔ Prepare Acajutla Master Plan.
- ➔ Install second crane.
- ➔ Decide on future container terminal needs.

8.3.3 Port Pre-Investments

Once GOES makes the decision to proceed with the Acajutla port privatization process, resources should be committed to the following:

- ➔ Acajutla Master Plan: This should preferable be carried out by a relatively independent Acajutla Port Authority.
- ➔ Privatization Training: This should include:
  - ✓ Training of the port labor sector regarding the benefits of a more productive port.
  - ✓ Training of CEPA professional staff in preparation for their new roles.

Pre-investment work for Cutuco includes:

- ➔ Cutuco Pier Rehabilitation Design.
- ➔ The Cutuco Container Terminal Feasibility Study. This study should include:
  - ✓ The possible development of port-related industrial parks and free zones.
  - ✓ The port's development impact and its relation to country-wide container traffic.
  - ✓ Potential demand at this facility to service other Central American Countries and dry canal traffic.
  - ✓ The most effective management and marketing framework, preferably integrating the existing pier and the new facility within a relatively independent Cutuco port authority.

The Consultant considers that this should be analyzed as a dedicated container facility, keeping non-containerized cargo at the present pier. However, alternative facility scenarios could be considered.

- ➔ Container Services Program.

Once this feasibility study is completed and the plans for Acajutla's Pier C are implemented, the needs, investment years and locations of the specialized container terminals should be analyzed further to achieve:

- ✓ Optimum use of total capacity.
- ✓ Efficient use of the entire intermodal network.
- ✓ Commitments of interested shipping companies.

These pre-investments are summarized in Table 8.7.

TABLE 8.7
Port Pre-Investment Program

Program	Pre-investment Type	Year
Acajutla Master Plan	Master Plan / Concession Documents	1996-1997
CEPA Port Labor / Professional Staff Privatizatoin Training	Training	1996
Cutuco Container Terminal	Feasibility Study	1996
Container Services Program	Study / Action Plan	1997
Cutuco Pier Rehabilitation Design	Design / Action Plan	1996

Source: Frederic R. Harris, Inc.

CEPA

Chapter 9

AIR TRANSPORT STUDIES

HARRIS

9 AIR TRANSPORT STUDIES

This section presents an assessment and analysis of the air transport situation in El Salvador, focusing on air cargo.

The study covers institutional, traffic, operations, financial and regulatory aspects as well as the infrastructure and investments required to meet present and future cargo demands.

The key thrust of this task is to capitalize on El Salvador's potential comparative advantage in air cargo within Central America, specially by enhancing the private sector's role in cargo handling, and potentially in facility construction, management and operations.

9.1 Air Transport Assessment

9.1.1 Traffic

a. Passengers

Passenger traffic is concentrated at the International Airport of El Salvador (AIES). Passenger traffic at Ilopango is minimal, and has declined sharply in recent years; at other Salvadorean airports it is negligible. Table 9.1 shows recent passenger growth at AIES. Regional passenger traffic, although still a small share, is relatively more important than regional cargo traffic: 15% of all passengers are carried to/from bordering countries.

TABLE 9.1
Arriving/Departing Passengers
International Airport of El Salvador, 1988-1994

Year	Arrivals	Departures	Total
1988	220,897	211,875	432,772
1989	212,938	233,946	446,884
1990	264,193	240,600	504,793
1991	270,491	267,470	537,961
1992	368,478	356,858	725,336
1993	387,039	394,642	781,681
1994	427,835	403,451	831,286

Source: CEPA, Anuario Estadístico 1993, Cuadro N° 1

b. Cargo

Cargo traffic is concentrated at AIES. Growth over the past fourteen years has been significant, with total tons handled having increased almost 400% between 1981 and 1994, from 7,800 to 30,900.

Of Salvadorean air cargo, 58% is carried by airlines that transport both passengers and cargo in regular flights, and only 42% by enterprises operating cargo flights exclusively.

Air cargo exports consist largely of "maquila", and locally manufactured goods. Air cargo imports consist largely of manufactured goods, specially equipment, machinery and pharmaceuticals.

9.1.2 Operations

In the case of exports, cargo is brought to the airport and sorted by the airlines for shipment. CEPA or other authorities do not participate in the handling of exported cargo.

In the case of imports, twenty-nine steps are outlined, tracing the flow of cargo from its initial check by the delivering airline, to storage awaiting customs check, through customs, and ultimately to the consignee. In this process there are several space problems, because the cargo must be placed in an interim storage area awaiting customs processing, an average wait of 15 days according to CEPA studies on this matter.

Due to this disparity between exports and imports handling, export facilities occupy about one-fourth the space required for imported air cargo processing, although their annual volumes are virtually identical.

9.1.3 Finances

AIES makes a substantial surplus sufficient to provide for the costs of periodic rehabilitation and/or expansion. Thus, in 1993 the surplus was on the order of ¢63,350,000. Between 1991 and 1993, overall AIES expenses rose 22.7%, while income increased by 80%.

Ilopango, administered by the DGTA, has low revenues given the extremely low levels of commercial activity; its operation is vastly subsidized. Tariffs have not been adjusted since 1975.

9.1.4 Tariffs

The present tariffs charged by CEPA for air cargo imports are shown in Table 9.2. Exports and transit cargo are free of CEPA charges. The basic tariff allows the cargo to stay at the airport for a period of ten (10) days. That certainly defeats the purpose of air transport which is speed.

TABLE 9.2
CEPA's Tariffs on Imported Air Cargo
(in ¢/kg)

Period	BG (1)	BR	BC	BS
Initial Period: 10 days	0.36	0.60	0.72	2.40
Additional Periods for General Merchandise (2)				
First 7 days	0.08	0.22	0.34	0.42
From the 8th to the 15th day	0.17	0.42	0.67	0.84
From the 16th to the 30th day	0.23	0.58	0.91	1.14
More than 31 days	0.30	0.76	1.20	1.50
Additional Periods for Special Regime Cargo(3)				
First 7 days	0.07	0.18	0.28	0.35
From the 8th to the 15th day	0.14	0.35	0.56	0.70
From the 16th to the 30th day	0.19	0.48	0.76	0.95
More than 31 days	0.25	0.63	1.00	1.25

(1) **BG** General Warehouse
BR Frozen Warehouse
BC Container Warehouse
BS Security Vault

(2) After the basic storage period of 10 days, general merchandise pays an extra charge per kilogram for every additional day or fraction.

(3) Charge per warehousing service for imported cargo protected by the Free-Zones and Treasury Precincts Law; also for the import of medicines and their raw materials.

Source: AIES, CEPA, Tariff Regulation 1993.

9.1.5 Regulations

The primary applicable laws are those of December 1992, creating the General Directorate of Air Transport and June 1974, assigning to CEPA the direction, administration, maintenance and expansion of all facilities at AIES. Also of significance is Executive Decree 422 of 1987, limiting operations at Ilopango to private aircraft of less than 15,000 pounds weight and 12 passenger capacity.

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9.1.6 Facilities and Capacity Constrains

The facilities at AIES, the most complete and important in the country, include:

- A large central passenger terminal, six arrival/departure lounges, with corresponding jetways, arrival hall for immigration processing and a baggage claim/customs check area. This facility is at present under a major expansion. Three jetways have been added and the passengers area is being enlarged.
- A separate cargo terminal with adjacent parking and truck docks, including air cargo agent offices and air cargo handling equipment.

Present facilities are limited as follows:

- Export Cargo Area: This area is limited as excess cargo must be stored outside.
- Import Cargo Area: This area is limited in terms of lack of alternate space to break down pallets or containers and by congestion in the CEPA in-bound storage area where goods await customs processing.

Ilopango is no longer used for large commercial passenger and cargo purposes.

9.2 Air Transport Analysis

This section addresses future cargo growth; and institutional, operational, financial, regulatory and facility constraints to this growth.

9.2.1 Future Cargo Planning Scenarios

The following scenarios have been analyzed:

Scenario 1 Assumes existing air cargo volume.

Scenario 2 Assumes growth only of existing Salvadorean air cargo products without diversification.

Scenario 3 Assumes both growth and diversification of only Salvadorean air cargo.

Scenario 4 Assumes growth and diversification in both Salvadorean and regional air cargo, assuming the concept of El Salvador as a regional cargo hub for Central America.

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Air cargo summary forecasts are shown in Table 9.3.

TABLE 9.3
Air Cargo Projections by Type and Scenario
(in 1,000 tons)

Scenario	Year	Imports	Exports	Transit	Total
Scenario 1					
	1994	15	15	4	34
Scenario 2					
	2000	23	30	2	55
	2005	35	54	3	92
	2010	51	99	5	155
	2015	74	177	8	259
Scenario 3					
	2000	26	33	2	61
	2005	46	63	3	112
	2010	70	131	6	207
	2015	114	256	11	381
Scenario 4					
	2000	26	33	17	76
	2005	46	63	30	139
	2010	70	131	56	257
	2015	114	256	104	474

Source: Frederic R. Harris, Inc.

To analyze the planning scenarios, export and import air cargo terminal capacities are first calculated based on the tonnage stored per square meter of warehouse and different average cargo stay cycles. For a two-day cycle, the existing terminal capacities have been determined to be 108,000 tons for imports, 30,000 tons for exports and 5,000 tons for transit cargo.

Tariffs are also analyzed in the study, since they affect interest on the part of the consignees to remove their cargo promptly.

9.2.2 Analysis of Scenario 1

The forecast for this scenario assumes that the 1994 annual air cargo volume of 34,000 (imports, exports and transit) will remain constant over the forecast period. Under this scenario, no further facility improvements are required, since capacity is greater than demand in all periods. However, internal procedure enhancements to sharply reduce overall processing time and virtually eliminate long-term on-airport cargo storage will be useful, if only to clients served by the facility.

9.2.3 Analysis of Scenario 2

In this scenario, as shown in Table 9.4 import cargos can be handled without need of additional facilities. Export cargo requires additional facilities prior to the year 2010 (only about 400 sq. m.) and up to 2,200 sq. m. prior to year 2015, to handle the 99,000 tons of excess capacity.

TABLE 9.4
Air Cargo Planning at AIES Under Scenario 2

Year	Imports (tons)	Exports (tons)	Transit (tons)
Existing Terminal Capacity			
	108,000	81,000	5,000
Required Terminal Capacity			
2000	23,000	30,000	2,000
2005	35,000	54,000	3,000
2010	51,000	99,000	5,000
2015	74,000	177,000	8,000
Excess/Shortfall of Capacity (in tons handled)			
2000	85,000	51,000	3,000
2005	73,000	27,000	2,000
2010	57,000	(18,000)	-
2015	34,000	(96,000)	(3,000)

( ) Shortfall
Source: Frederic R. Harris, Inc.

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9.2.4 Analysis of Scenario 3

In this scenario, as shown in Table 9.5, the imports will not require additional facilities; the small excess of 6,000 tons per year can be accommodated by internal reallocation and improved handling. Export plus transit cargo will require facility expansions on the order of 1,100 sq. m. prior to year 2010 to handle the 51,000 tons of excess cargo and on the order of 4,000 sq. m. prior to year 2015 to handle the 181,000 tons excess cargo.

TABLE 9.5
Air Cargo Planning at AIES Under Scenario 3

Year	Imports (tons)	Exports (tons)	Transit (tons)
Existing Terminal Capacity			
	108,000	81,000	5,000
Required Terminal Capacity			
2000	26,000	33,000	2,000
2005	46,000	63,000	3,000
2010	70,000	131,000	6,000
2015	114,000	256,000	11,000
Excess/Shortfall of Capacity (in tons handled)			
2000	82,000	48,000	3,000
2005	62,000	18,000	2,000
2010	38,000	(50,000)	(1,000)
2015	(6,000)	(175,000)	(6,000)

( ) Shortfall
Source: Frederic R. Harris, Inc.

9.2.5 Analysis of Scenario 4

Under this broad scenario, assuming AIES as a cargo hub for Central America, export plus transit cargo demands grow substantially, as shown in Table 9.6. Again, import cargo does not require facility expansion. The small excess of 6,000 tons per year can be accommodated by internal reallocation and improved handling. Export plus transit cargo will require facility expansions on the order of 2,200 sq. m. prior to year 2010 to handle the 101,000 tons of excess cargo and on the order of 6,000 sq. m. prior to year 2015 to handle the 274,000 tons of excess cargo.

TABLE 9.6
Air Cargo Planning at AIES Under Scenario 4

Year	Imports (tons)	Exports (tons)	Transit (tons)
Existing Terminal Capacity			
	108,000	81,000	5,000
Required Terminal Capacity			
2000	26,000	33,000	17,000
2005	46,000	63,000	30,000
2010	70,000	131,000	56,000
2015	114,000	256,000	104,000
Excess/Shortfall of Capacity (in tons handled)			
2000	82,000	48,000	(12,000)
2005	62,000	18,000	(25,000)
2010	38,000	(50,000)	(51,000)
2015	(6,000)	(175,000)	(99,000)

( ) Shortfall
Source: Frederic R. Harris, Inc.

9.3 Review of the Cuscatlán Master Plan

The Cuscatlán Master Plan, prepared between 1979 and 1982, was conceived to meet the development pressures generated around the new El Salvador International Airport, to contribute planned development of its area of influence and to the country's regional planning.

Its purpose was to utilize to maximum potential the airport itself and its influence area to promote national economic and social objectives.

The area covered was approximately within a 15-kilometer radius around AIES as well as large towns beyond that radius such as Zacatecoluca and Olocuilta.

Elements taken into consideration were: natural and environmental characteristics, economic and social aspects, actual and potential land use, transport, public and community facilities, the airport itself, legal, administrative and institutional aspects.

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After evaluating three development alternatives, AIES was selected as the development pole having the highest regional and national benefits. The detailed design of the Master Plan followed, taking into consideration the following elements: land use planning, urban development, financing, organizational model, regulations and implementation plan.

The Cuscatlán Master Plan did not cover and has never been used as a guide for the development of AIES infrastructure nor has it been utilized as a planning tool for the development of the airport's influence area.

9.4 Recommendations

Recommendations for the air transport sector are made here regarding needed policy measures, investments in air cargo facilities according to four demand scenarios, privatization and required pre-investments.

9.4.1 Policies

Air transport issues and proposed policy measures are summarized in Table 9.7. Of those indicated, the key concerns and proposals are:

- ➔ There is little effort to promote the International Airport's services abroad. The role of CEPA as the principal government entity concerned with development of air cargo is critical. It must assume a strong institutional marketing-oriented approach to promote the services and facilities of AIES to a larger number of airlines and cargo services.

- ➔ Delays in Customs and Court of Accounts processing of imported cargo and handling charges which do not lead consignees to quickly retrieve cargo, reduce the warehouse's dynamic capacity. Cargo handling and customs procedures should be streamlined by developing and implementing the required operational and information systems. Graduated rates should be applied to improve cargo flow and minimize on-airport storage time. These improvements will defer facility investments to future years.

- ➔ While AIES is financially self-sufficient, air cargo tariffs do not cover all costs. There is a need for an overall review and update of air cargo tariffs.

- ➔ The DGTA, a regulatory agency, directly manages Ilopango Airport, an activity which is naturally a function of a private or government-owned Company. This responsibility should be passed on to CEPA. This airport's fees are unjustifiably subsidized by the national treasury and should be updated.

TABLE 9.7
Air Transport Subsector Policy Constraints and Proposals

Institution and Constraint	Policy and Proposal
GOES/CEPA	
Lack of effort to market AIES services.	*Modernization: Strengthening of Role* CEPA should institutionally market AIES services.
Delays in customs and Court of Accounts processing of imported cargo can increase storage requirements. Cargo handling charges do not reflect excessive time cargo occupies prime apron-front space.	*Modernization and Tariff Policy: Re-engineering* Reduce average stay of cargo in storage by: ➔ Integrated computerization and communications systems. ➔ Customs control by sampling. ➔ Extended customs work hours. ➔ Revised and updated cargo handling charges with graduated scale of fees to encourage consignees to pick up their cargo quickly.
Limited airline access to AIES space for private cargo facilities.	*Modernization: Privatization* Consider opening competition for concessions to build freight facilities.
AIES rental fee per sq. m. of cargo space for export and transit cargo appears too low to cover costs.	*Tariff policy:* Review and update cargo space rental fee to cover the costs of facility construction, maintenance, and operation.
AIES does not currently charge a fee per kg of export and transit cargo, nor are records kept of transit cargo.	Consider levying a per-kilo charge on export and transit cargo commensurate with handling costs, infrastructure use and impact. Keep records.
VMT - DGTA	
DGTA functions are not in accord with its needs given changes in traffic.	*Modernization: Adequate Resources* DGTA responsibilities and staffing requirements should be reviewed.
DGTA, a government department, manages Ilopango airport directly. Also operations have been restricted to private aircraft by 1987 Decree 422.	*Modernization: Decentralization and Deregulation* Transfer responsibility for Ilopango operations to CEPA. While restricted to regional passenger operations, passengers per aircraft restriction could be adjusted.
Freight rate and passenger fares to/from US set by market based on treaty but not to other countries.	*Modernization: Deregulation* Study impact of freeing rates to other markets.
Ilopango airport fees are unjustifiably subsidized by the national treasury. DGTA airport and aircraft charges have not been changed since 1975.	*Tariff Policy:* Review and update Ilopango airport fees to allow its limited traffic to make a reasonable contribution to the upkeep of its facilities.

Source: Frederic R. Harris, Inc.

9.4.2 Investments

The only infrastructure program considered in this study is the future expansion of the cargo terminal. Table 9.8 summarizes the resulting financial indicators for the four scenarios described above. Revenues are projected for import, export and transit cargo for each scenario. Costs include investments (the proposed information system and warehouse expansion) and operating costs.

TABLE 9.8
Technical and Financial Indicators of Scenarios, 1995-2015
(values in million 1994 colones)

Technical and Financial Indicator	Existing Cargo Volume	Growth Without Diversification	Growth and Diversification of Salvadorean Cargo	Growth in Both Salvadorean and Regional Demand
Projected 2015 Traffic (t)	34,000	259,000	381,000	474,000
Additional sq. m. Required	0	2,200	4,000	6,000
Investment Cost	0	14.25	20.01	28.50
First Investment Required Before	-	2010	2010	2010
Present Value of Revenues	121.90	226.79	282.29	282.63
Present Value of Costs	105.31	136.87	151.72	154.23
Net Present Value	16.59	89.92	130.57	128.40
Revenue/Cost Ratio	1.16	1.66	1.86	1.83

Source: Frederic R. Harris, Inc.

The results presented lead to the following conclusions:

- All the scenarios show positive net cash flows at a 12% annual discount rate. Therefore, even if no increase in air cargo traffic is attained, with the proposed tariffs, the air cargo services would provide financial benefits to AIES. With increased air cargo movement, financial benefits increase substantially.
- Based on the proposed tariffs, revenues and costs estimates, air cargo services generate enough funds in all scenarios to cover operating and investments fund needs.
- Cargo facilities should be expanded by about 2005, according to a master plan, improved systems and procedures and demand growth.

9.4.3 Privatization

The private sector could be interested in getting concessions for future facilities and cargo handling.

Possible concessions could be awarded to:

- ➔ Individual airlines or associated airlines
- ➔ Specialized air cargo handling enterprises

Operation of the present cargo facilities and their freight processing could also be considered for privatization. This probably would result in expediting cargo movement, but customs delays would remain to be solved.

It is the Consultant's opinion that, at least until the year 2005, CEPA should continue handling the cargo, but follow the recommendations given in this study to expedite the handling of the import cargo affected by unjustified delays.

The Study provides detailed general privatization concepts and the process to be followed in the awarding of concessions.

9.4.4 Pre-Investments

Given the lack of a master plan to guide future construction at the International Airport and current cargo terminal constraints, the Consultant recommends carrying out a Master Plan for the El Salvador International Airport which should:

- ➔ Inventory existing airport facilities and ongoing expansion projects.
- ➔ Design airport infrastructure development based on identified operational and demand parameters, including schedule and priorities for expansion, financial and economic evaluation.
- ➔ Review legal, administrative and institutional aspects to achieve maximum AIES efficiency, including development of AIES institutional marketing role.
- ➔ Prepare concession plans and documents required for letting one or more cargo terminal concessions, including systems to manage cargo flow and terminal use.

Also the Cuscatlán Master Plan should be updated to establish long-term strategies for the development of the airport's influence area, including a regulatory plan for orderly growth, legal and institutional aspects, related investment programs and their evaluation.

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MOP

Chapter 10

ENVIRONMENTAL REVIEW

HARRIS

10. ENVIRONMENTAL REVIEW

10.1 Introduction

This review was undertaken to pre-evaluate a list of projects, identify main conflicts and foreseeable environmental problems and not as an environmental impact study.

The criteria used for environmental assessment are based on those recommended by international lending agencies, specifically by World Bank Technical Papers No. 139 and 140 (1992), also applied by the IDB. They are compatible with SEMA's criteria given in their Environmental Agenda and the draft Law for Environmental Protection. Once Article 33 of this Law is regulated, the studies for specific projects should follow these directives.

Projects were classified in four categories as shown in Table 10.1.

TABLE 10.1
Levels of Environmental Impact

Level	Description
Projects with Low Environmental Impact	Do not require environmental impact studies -EIS; sufficient to adopt limited environmental protection regulations
Projects with Limited (or moderate) Environmental Impact	Require limited EIS focussing on specific negative aspects and needed mitigating measures.
Projects with Serious (or high) Environmental Impact	Require detailed EIS clearly determining their environmental feasibility. An environmental management plan must be carried out including mitigation costs to be added to the budget.
Projects Totally Conflictive with the Environment	Must be rejected because of environmental considerations.

Source: World Bank

10.2 Institutional and Legal Aspects

The institutional and legal basis for environmental management are little developed. However, the Executive Secretariat for the Environment - SEMA was established by Decree 19 of July, 1994 as part of the Ministry of Planning, to coordinate environmental and natural resource management and develop a national environmental strategy. It existed previously as the Secretariat of the National Environmental Council - CONAMA, created by Executive Decree 73 of December 18, 1990, which began operations in 1992.

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Several Sector Environment Units -UAS- have been set up at specific agencies. The IDB is providing institutional strengthening support to SEMA, the UAS of the Ministry of Public Works and of several other agencies.

Environmental legislation is disperse and lacks regulations. The Municipal Code assigns the protection of renewable and non-renewable resources to the municipalities. The Health Code defines industrial health risks and import controls. An Integrated Water Resource Management Law directs MIPLAN to prepare regulations on waste disposal and other water contamination sources. Executive Decree 50 of October, 1988 regulates water pollution. SEMA considers the Forestry Law, Decree 268 of February, 1973, obsolete. CENDEPESCA applies the Fishing Resource Protection Law to protect certain sea species. The only environmental reference in the Law of Highways and Rural Roads, Decree 463 of 1969, prohibits leaving solid wastes. A Special Law of Cultural Heritage Protection, Decree 513 of April, 1993, regulates and controls cultural sites under the Ministry of Education. Also, according to SEMA, GOES has signed 13 relevant treaties.

The Consultant reviewed the draft Environment Protection Law currently being discussed in the Assembly and finds it generally well conceived. Two modifications are recommended at the end of this chapter.

10.3 Environmental Framework

The Study reviews the key environmental problems of El Salvador: deforestation, erosion and soil loss, genetic erosion and environmental pollution.

Maps were prepared of areas proposed for protection, as well as archaeological, environmentally critical and sensitive areas.

Steps are being taken to establish a system of protected areas - SISAP - to, among other objectives, preserve and restore natural resources, biodiversity and historical sites. Many of the proposed zones are very small; therefore, they will hardly meet these objectives.

According to the Directorate of Cultural Patrimony, there are 334 registered cultural and archaeological sites although there may be more than 5,000.

Four levels of environmentally critical areas were identified according to seismic risk. Environmentally sensitive areas were located including SISAP protected areas, coral reefs, fishery zones, endemic species areas, wetlands (including sea and fresh water lakes), estuaries and indigenous settlements.

10.4 Environmental Assessment

The environmental assessment of the projects evaluated in the Study are summarized in Tables 10.2, 10.3 and 10.4.

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TABLE 10.2
Environmental Effects of Road Projects

Project	Type of Action	Level of Impact	Impacts
Maintenance of Existing Highway Network			
Paved Network	Routine and Periodic Maintenance	Low	1 to 6
Non-Paved Network			
Northern Bypass (Alternative 1)			
Junction CA-8 - Sitio del Niño	Construction	High	1 to 7
Sitio del Niño - Apopa	Expansion	Moderate	1 to 6 & 8
Apopa - San Martín	Construction	High	1 to 4, 6 & 9
Ilopango Connector	Construction	Moderate	1 to 4, 6 & 10
Ilopango - San Martín (New CA-1)	Expansion	Moderate	1 to 6
Southern Bypass (Alternative 3)			
La Cuchilla - Santa Tecla	Expansion	Moderate	1 to 6
Santa Tecla - La Libertad Junction	Construction	Moderate/High	1 to 4, 6, 9 & 10
La Libertad Junction - San Marcos	Construction	High	1 to 4, 6, 9 &10
Santo Tomás - Ilopango	Construction	High	1 to 4, 6, 9 &10
Northern East-West Highway			
Metapán - Nueva Concepción	Construction	High	1 to 6, 11 & 12
Nueva Concepción - Inters. CA-4	Construction	High	1 to 6 & 11
Inters. CA-4 - Chalatenango	Reconstruction	High	1 to 6, 11 & 13
Osicala - Inters. CA-8 (km 18)	Reconstruction	Moderate	1 to 6 & 14
Chalatenango - Sensuntepeque	Reconstruction	High	1 to 6 & 15
Sensuntepeque - Osicala	Construction	High	1 to 6 & 16
Sensuntepeque - San Vicente Junction	Construction	High	1 to 6 & 10

Source: Frederic R. Harris, Inc.

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TABLE 10.3
Environmental Effects of Railroad Projects

Project	Type of Action	Level of Impact	Impacts
Acajutla - Apopa - San Salvador	Reconstruction	Low/High (1)	1 to 6 & 17
Sitio del Niño - Santa Ana	Reconstruction	Low	1 to 6 & 17
Metapán - Apopa	Reconstruction	Low	1 to 6
Apopa Connection	Construction	High	1 to 6 & 19
Santa Ana Connection	Construction	High	1 to 6 & 19
Santa Ana - Texis Junction	Reconstruction	Low	1 to 6
Nejapa Extension to the Thermoelectric Plant	Construction	High	1 to 6 & 18
Bridge over Río Negro near Sonsonate	Construction	N.A.	1 to 6 (2)

N.A. = Not Available
(1) High impact in urban areas due to squatter settlements.
(2) The impact on river hydraulics should be analyzed.
Source: Frederic R. Harris, Inc.

TABLE 10.4
Environmental Effects of Port Projects

Project	Type of Action	Level of Impact	Impacts
Port of Acajutla			
Container Terminal (Pier C)	Expansion	Low	1, 2 & 6
Special Container Terminal (Pier D)	Construction	High	2, 20 & 21
Inland Complements	Construction	Low	1, 2 & 6
Grain Terminal	Construction	Low	1, 2 & 6
Port of Cutuco			
Rehabilitation of the Pier	Reconstruction	Low	1, 2 & 6
Container Terminal	Construction	High	2, 22

Source: Frederic R. Harris, Inc.

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LIST OF IMPACTS

1- Adds sediment to water bodies.
2- Pollutes the air due to machinery operation and/or asphalt plants, produces noise and suspends solids in the atmosphere.
3- Destabilizes sidehills in borrow areas.
4- Alters drainage patterns.
5- Generates erosion sources.
6- Inadequately disposes waste on embankment slopes.
7- Will pass through an irrigation district, which risks adding sediment to ditches, possibly obstructing ditch inlets and interfering with the railroad.
8- Passes through the sensitive Chanmico Area.
9- May lead to problems with sidehill slope stability in steep topography with high seismic and volcanic hazards.
10- Environmental impacts may arise associated with existing human settlements and may induce human settlements alongside the new road corridors, and demands for new roads and public infrastructure. In other words, the city will grow towards the belt roads, which sooner or later will cease to function as such.
11- Major earth works along the Lempa River Basin would worsen sedimentation problems affecting the Cerrón Grande and 5 de Noviembre Dams.
12- The road corridor, as defined, passes very close to the San Diego and La Barra Protected Areas in Metapán.
13- The road corridor passes very close to the Santa Barbara Protected Area and borders the Cerrón Grande Dam, which could increase the already serious sediment problems.
14- The road corridor passes very close to the San Carlos and Cerro Cacahuatique Protected Areas.
15- The road corridor borders the Cerrón Grande and 5 de Noviembre Dams which could produce instability phenomena and increase sedimentation.
16- The road corridor passes very close to the San Carlos Protected Area.
17- Informal urban areas will be seriously affected.
18- Crop zones will be affected.
19- Changes land use.
20- Adds significant sea sediment, causing fish to leave.
21- Affects coral reefs, biotic productivity, physical, chemical and biotic water quality.
22- Affects the estuary, fish and shrimp reproduction areas in the Gulf of Fonseca.

10.5 General Recommendations

According to the level of environmental impact, the Consultant recommends specific guides found in the final report be adopted and fully applied under MOP/UAS supervision:

- For low impact projects which do not require EIS, an Environmental Manual for Road Design and Construction, included in the main report, should be adopted, specifying general mitigation measures during design and construction. They are low cost and easy to apply in most cases.
- Environmental impact studies are recommended for each of the projects with moderate or high impact. Procedures are proposed for preparing EIS terms of reference. The studies center on the main aspects of each project, avoiding generic terms of reference and sensibly reducing their cost. Limited studies of moderate impact projects will cost from US$15,000 to 25,000, depending on project size. Detailed studies are needed for all projects with serious (high) environmental impact. An EIS for a new section of road or railroad could be around US$20,000 to 30,000.
- For the Northern East-West Highway, the EIS cost could be around US$80,000 to $100,000. CEL should be specially involved in this highway as the alignment should avoid passing too close to dams and other environmentally sensitive areas.
- For railroad rehabilitation projects in urban areas, which imply settlement relocation, special programs are required with community participation. Studies would have an approximate value of US$80,000 to $100,000.
- Port projects imply dredging, requiring an EIS to determine their feasibility, the design of specific mitigation measures and environmental management, as well as the preparation of contingency plans. The study should include analyses of ocean currents to determine dispersion of solids, depending on the season when dredging is done. Radioactive tracer studies would be useful. Detailed studies on biological and fishing aspects are required. Socio-economic aspects of fishing are basic and extensive community consultation and participation is required. These studies would cost around US$300,000 to $500,000.
- Given the great dispersion of cultural and archeological sites, for all projects on new lands, archaeological prospections should be carried out or the opinion of the General Directorate of Cultural Patrimony should be requested.

The Consultant recommends the approval of the Environmental Protection Law with the following modifications:

- Environmental permits be issued only by SEMA following EIS reviews by the UAS. Each UAS should have no more than 4 to 5 staff.
- SEMA should coordinate directly, rather than through multi-sector committees, which would not be operationally effective.