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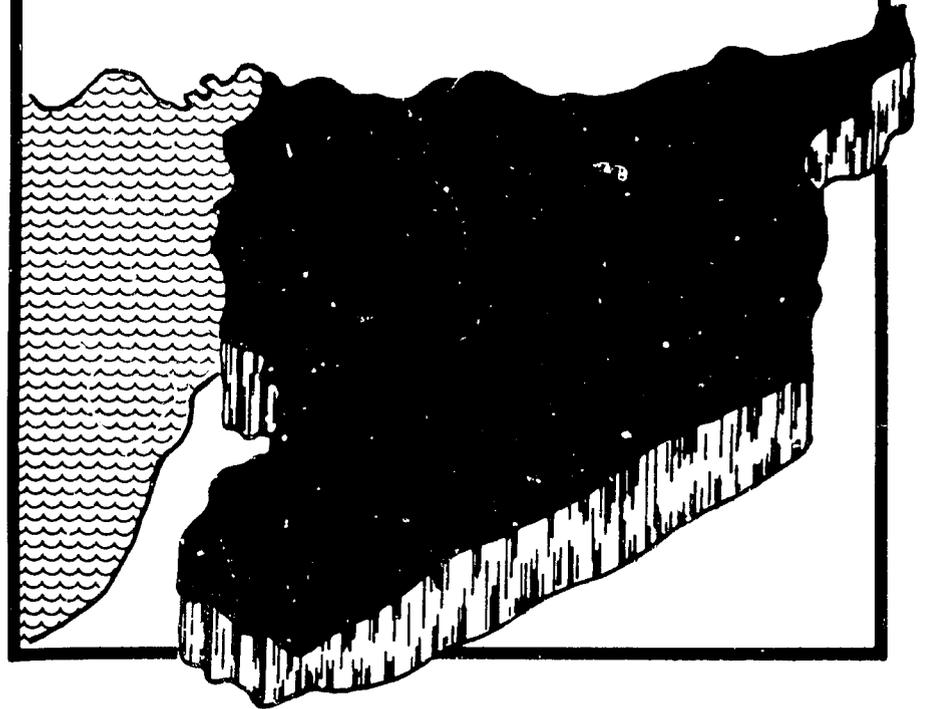
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MINISTRY OF TRANSPORT

SYRIAN ARAB REPUBLIC

**COMPREHENSIVE
TRANSPORT STUDY
FINAL REPORT
MARCH 1981**



VOLUME I

EXECUTIVE SUMMARY

LOUIS BERGER INTERNATIONAL, INC.

in association with

TIPPETTS-ABBETT-McCARTHY-STRATTON

This volume is one of seven produced as the Final Report for the Syrian Comprehensive Transport Study. The complete set of volumes is as follows:

- Volume I** – Executive Summary
- Volume II** – Transport Demand
- Volume III** – Railways
- Volume IV** – Roads and Road Transport
- Volume V** – Ports and Shipping
- Volume VI** – Other Modes and Related Industries
(Aviation, Pipelines, and Construction and Storage Industries)
- Volume VII** – Transport Sector Plans

Volume I

EXECUTIVE SUMMARY

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Volume I

EXECUTIVE SUMMARY

FOREWORD

The Agreement for the Syrian Comprehensive Transport Study, Contract Number SYR-MOT-276-001-3-80017, between the Ministry of Transport (MOT) of the Syrian Arab Republic and Louis Berger International, Inc. (the Consultants) was signed on 30 September 1978. The study was conducted in association with the firm of Tippetts-Abbott-McCarthy-Stratton. On 7 February 1979, the Consultants received the official notice to proceed. The study was initiated in Syria on 13 March 1979 with the arrival of the Project Manager in Damascus.

The Syrian Arab Republic's official representative, who provided day-to-day guidance for this study, is the Director of Studies of the MOT. In addition, an interministerial Coordinating Committee was designated to provide policy guidance and coordination for the study. Initially, the Coordinating Committee comprised nine members drawn from the Ministries of Transport and Communications, the State Planning Commission, the Directorate of Civil Aviation, the Central Bureau of Statistics, and the General Establishment for Major Projects. On 10 February 1980 the Coordinating Committee was expanded by the appointment of seven professors from Damascus University who are concerned with transport affairs. These new members participated with the MOT in supervising the implementation of the study and evaluating the reports, position papers, and computer programs prepared by the Consultants.

The Consultants were represented in Damascus by a full-time Project Manager who supervised the work of the Consultants' resident team of experts. Overall direction for the study was provided by a Vice President of Louis Berger International, Inc. who served as overall Project Coordinator.

The study covers all aspects of transport except intra-urban transport and includes an appraisal of Syria's construction and storage industries as they relate to transport.

The study was executed in two phases. Phase I consisted of more than 11 months of intensive field work. A Final Phase I Report presented an in-depth analysis of Syria's transport sector, identified problem areas, and submitted preliminary recommendations as to the means, procedures, and steps to be taken to eliminate them. In addition, the report contained a preliminary identification of transport investment priorities

for the 5th Five-Year Plan and of probable long-range transport investment requirements, by mode, to the year 2000.

The basic purpose of Phase II was to refine the Phase I projections of national economic activity and commodity flows and to refine or develop other analyses, including financial projections and training requirements. This Final Report summarizes the findings and conclusions of both phases of the study and presents the Consultants' final recommendations.

This Final Report, like the Final Phase I Report, is presented in seven volumes, covering:

- | | |
|------------|---|
| Volume I | Executive Summary |
| Volume II | Transport Demand |
| Volume III | Railways |
| Volume IV | Roads and Road Transport |
| Volume V | Ports and Shipping |
| Volume VI | Other Modes and Related Industries (Aviation, Pipelines, and the Construction and Storage Industries) |
| Volume VII | Transport Sector Plans |

CHAPTER 1

STUDY OVERVIEW

Chapter 1

STUDY OVERVIEW

1.1 OBJECTIVES

In summary form, the objectives of the Syrian Comprehensive Transport Study were:

- To assist the Government in defining policies for transport that will be economically optimal with respect to the overall development goals of the country, including policies for effective transport coordination.

- To determine the economically optimal plan for transport sector improvements required to meet national development goals.

- To prepare a detailed multimodal program of transport investments for the 5th Five-Year Plan (1981-1985) in order of priority based on cost estimates and preliminary feasibility analyses.

- To identify and quantify probable long-run transport investment requirements, by mode, to the year 2000.

- To identify needs for the improvement of Government organization, staffing, and administration of transport planning; to identify problem areas in the organization, management, and operation of each transport mode; to identify needs for technical improvements in design, construction, and maintenance; and to recommend what further advisory services and training might be required.

- To improve the professional capabilities of selected Syrian nationals serving as counterparts to members of the Consultants' team in transport planning, modal design, construction, and maintenance.

1.2 METHODOLOGY

The operation of a national transport system involves interactions among the goods and passengers to be transported, the vehicles that transport them, and the transport facilities that are required for the vehicles to do the job. Each of these three main elements has subordinate factors that determine its needs or requirements or affect its utilization. The normal interaction among these elements is directly affected by the extent and nature of Government action, primarily through

direct controls or indirect regulation such as fares, taxes, and subsidies. The relationship of all of these elements and factors is represented graphically in Figure 1.1.

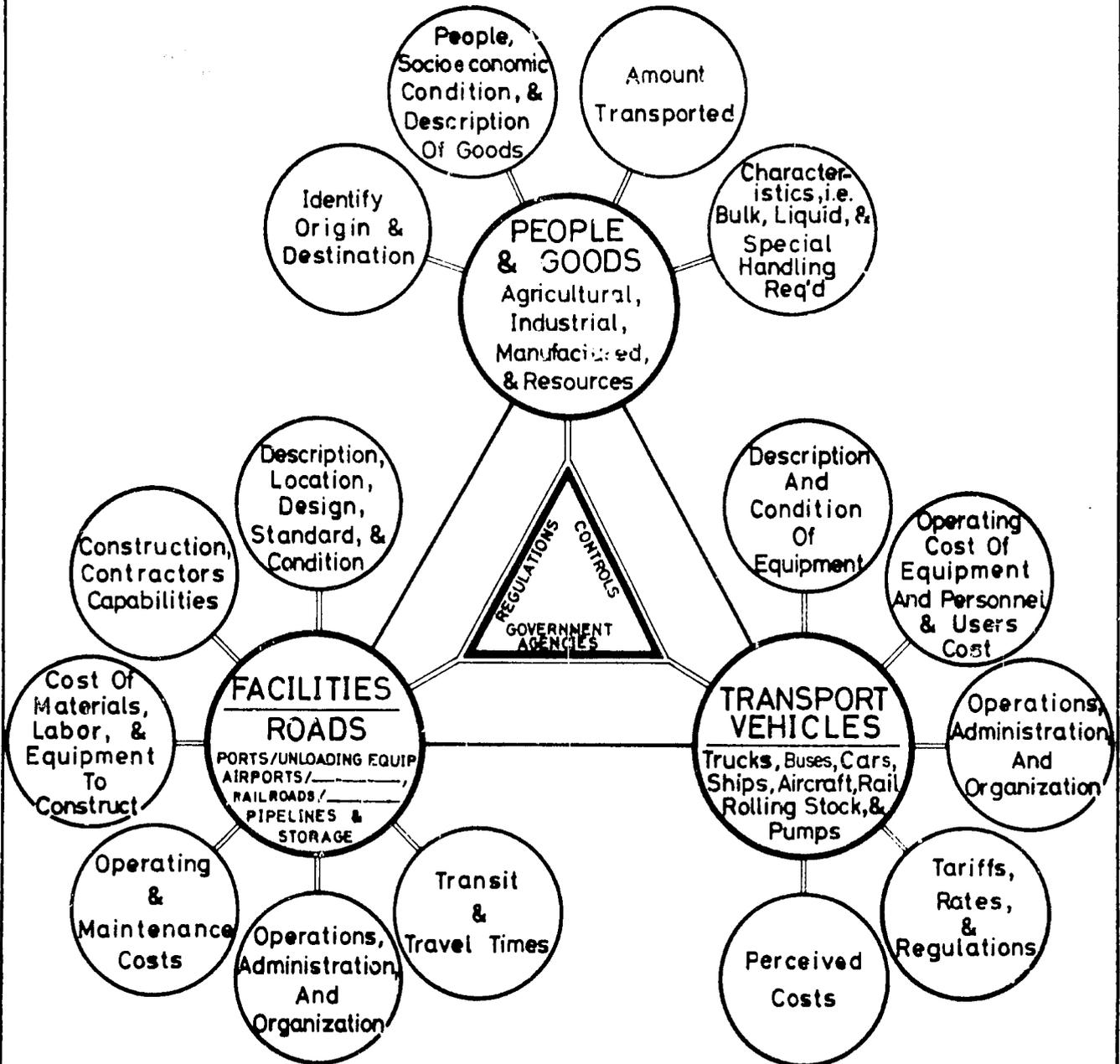
Major elements of the Consultants' efforts were directed toward the demand side of the transport system. They included:

- The identification of 80 traffic zones, representing the 58 Manatik (including Damascus City) and 21 exit/entry points. These zones have been used throughout the study as the basis for projecting transport demand in terms of commodity and passenger movements among the zones.
- The conduct of an origin and destination and axle load survey of road traffic during June and July 1979.¹ (A complete set of railway origin and destination data was provided by the Syrian Railway.)
- The design and conduct of a nationwide traffic counting program. This program was completed on 31 July 1980.
- The design and implementation of a truckers and shippers survey.
- A 5 percent sample of all truck trip tickets issued by the Cargo Transport Offices in 1979.
- An inventory of all bus routes and frequencies throughout the country.
- The collection of customs data for 1979 at all customs entry points.
- The preparation of projections of supply and demand for 33 agricultural and agro-industrial commodities and 18 industrial commodities by Mantika through the year 2000.
- A visual inspection and inventory of 7,600 kilometers of paved road, covering all of the paved primary and secondary road networks and over one-third of the paved tertiary network. A less comprehensive inventory of 1,500 kilometers of unpaved roads was also made.

¹ The origin and destination survey, the traffic counting program, and the paved road inventory were carried out by the firm of Azmeh and Associates under a subcontract with the Consultants.

Figure 1.1

ELEMENTS OF A TRANSPORT SYSTEM



Considerable emphasis was also given to operational problems and their solutions and to management and organization. The stress on improving operational efficiency for each of the transport modes was deliberate, in order to point the way toward higher productivity without requiring large investments in new capacity or other infrastructure.

The Consultants believe that the next step in the development of transport planning within the Syrian Government should be to implement the type of demand-oriented planning that has been used to develop the project recommendations in this study. The main tools and approaches in the system are incorporated into SYRTRANS, an integrated computer transport planning model for Syria involving over 50 different computer programs specifically developed in Syria and adapted to Syrian conditions. To summarize very briefly, the system will:

- Forecast transport demand based on a macroeconomic forecast that takes into account subordinate socioeconomic forecasts of such factors as population, production and consumption of major commodities, foreign trade, and tourism.

- Determine trip requirements that allocate overall transport demand into forecasts of flows of commodities and passengers between specific points. (The 58 traffic zones and 22 exit/entry points are used in the model.)

- Apportion the trip requirements by transport mode, based on existing facilities and equipment, policies, and prices.

- Assign the modal demand to specific networks, determining the resulting rates of facility utilization and operating conditions for each link in the network and the network as a whole. (There are currently 1,426 individual road links in the model.)

- Determine total system operating costs and required system capacity and identify over- and underutilization of existing facilities and equipment for the system as a whole as well as link by link.

- Repeat the last three steps using alternative investments or policy and price changes to determine the economic costs and benefits of each and thus determine the mix of investments and price or policy changes that provides the largest net economic benefit and the preferred timing of the elements of each package.

The Consultants believe that the planning system that has been developed in the Comprehensive Transport Study will provide a sound basis for transport planning through 1985 and for forecasting requirements to the year 2000.

1.3 SYRIA'S TRANSPORT NETWORK

The Network

In Syria the leading mode for the movement of passengers and freight is road transport. Of an estimated 17,770 kilometers of roads, 11,570 kilometers are paved; 3,930 kilometers of the paved network are classified as primary, 200 kilometers as secondary, and 8,440 kilometers as tertiary.

The vehicle fleet in 1979 consisted of 75,800 cars and taxis, 81,300 light trucks, 31,000 heavy trucks and truck trailers, and 8,600 buses.

There are two railways, one a narrow gauge of 351 kilometers and the other 1,368 kilometers of standard gauge, which will increase to 1,900 when new lines under construction are completed. These represent a solid but underutilized transport resource. The narrow gauge road has 37 locomotives, 10 diesel rail cars, 83 passenger cars, and 486 freight cars. The standard gauge road operates 81 locomotives, 10 diesel rail cars, 24 generating cars, 110 coaches, and 1,813 freight cars. On order or being delivered are an additional 1,540 freight cars.

Two dry cargo ports handled 7,156,000 tons of exports and imports in 1979, and two oil ports exported and imported 20 million tons of crude oil and petroleum products, including transit crude oil from Iraq.

Two Government shipping companies, one owned jointly with Jordan, have five ships with a total displacement of 24,000 tons. In addition, the private sector owns 35 ships with a total displacement of 29,000 tons.

Five domestic airports and the major international airport at Damascus constitute the civil aviation system. Syrianair serves both the domestic and the international route network with a fleet of two B 747 SPs, three B 727s, and four Caravelles.

A total of 2,648 kilometers of pipelines transport crude oil, and 680 kilometers distribute refined products.

Plate 1.1 shows the Syrian transport network as of 1979.

1.4 TRAFFIC SUMMARY

General

The Consultants' traffic forecast is based on population and economic projections to the year 2000. The population projection is at the Mantika level and assumes that by 1990 Government policies to equalize economic opportunity by area, and thus reduce urban migration to the major cities, will be effective.

Forecasts of gross domestic product (GDP) were made with a computerized GDP forecasting model developed for this purpose. The overall forecasts were translated into sector forecasts, which then were split for transport demand purposes into projections of regional income distribution.

Passenger Traffic

Based on the population and economic projections, forecasts of passenger traffic were prepared, taking into account the elasticity of demand for travel as real per capita incomes increase.

The total domestic inter-zonal (i.e., inter-Mantika) passenger traffic is estimated to have been 137 million passengers and 12 billion passenger-kilometers in 1979. In terms of passenger-kilometers, the shares of the rail and the air modes were only 3.1 percent and 0.4 percent, respectively, reflecting the poor service availability of the railways and the limited service and high cost of air travel.

By 1985 the total number of passengers will grow by 54 percent over the 1979 level, but the total passenger-kilometers will grow by only 40 percent, because all major cities in Syria will be connected by high-quality highway and railway links, which shorten trip distances among major cities. The railway is expected to capture 12 percent of domestic passenger traffic in terms of passenger-kilometers.

The general level of passenger tariffs is very low and competition is distorted. The Consultants have assumed that, in any case, tariffs for passengers will be raised in the future. If the Government continues to subsidize the whole operating deficit of passenger transport within Syria, such subsidies would reach approximately 1.7 billion Syrian pounds (SP) per year by the year 2000, of which SP 900 million would be for the large buses alone. The regular subsidies to passenger transport would then amount to about 20 percent of the GDP of the transport and communications sector (or 1.5 percent of total GDP).

The Consultants analyzed two tariff increase cases. Both cases assume a recommended railway tariff that is sharply tapered to discourage rail travel for trips of less than 100 kilometers.

The base case assumes that all passenger tariffs increase at a 2 percent per year rate in real terms. The necessary subsidies would still be a significant \$P 800 million per year by 2000, but the proportion to GDP of the transport sector (9 percent) seems more acceptable.

The other (marginal cost) case assumed that by 2000 no direct or indirect operating subsidies would be paid to the passenger transport sector. The yearly growth rates of tariffs necessary to reach this goal (in percent) would be:

<u>Taxi</u>	<u>Microbus</u>	<u>Bus</u>	<u>Rail</u>
4.4	3.0	5.1	3.1

The amount of passenger traffic in year 2000 would depend on the pricing policy. If a policy of achieving the marginal cost pricing by year 2000 were adopted, the total number of passengers would be 3.4 times more than the 1979 level and the share of the railway would grow to 13 percent. If the more modest price increase policy of 2 percent per annum were adopted, the total number of passengers would be more than 3.8 times the 1979 level and the rail mode share would be 11 percent. The Consultants recommend the marginal cost pricing policy, and it is reflected in Table 1.1, which summarizes 1979 passenger traffic and the projections for 1985 and 2000.

Non-transit Commodity Traffic

Based on the economic and population forecasts, a total of 51 commodity categories were studied. Zonal surplus and deficits were computed for each. These were then grouped into 15 categories for purposes of determining commodity flows (origin/destination matrices). Surpluses and deficits were added separately since a particular zone may have a surplus in one item of a commodity group and a deficit in another. These groupings were based on similarity of product characteristics in terms of production and consumption.

For purposes of projecting commodity movements in 1985 and 2000, these 15 groups were further combined into 3 groups with similar per ton/kilometer transportation cost characteristics plus phosphate and crude oil. A modal split was constructed for these groups, and commodity traffic was then assigned on this basis. The total tonnages moved, excluding crude oil, for 1979, 1985, and 2000 are shown in Table 1.2. The commodity group of

Table 1.1

PRESENT AND PROJECTED PASSENGER TRAFFIC
(in million passengers and in billion passenger-kilometers)

	<u>Road</u>	<u>Rail</u>	<u>Air</u>	<u>Total</u>
<u>1979</u>				
Passengers	135.8	1.32	0.13	137.3
Passenger-Kilometers	11.55	0.37	0.05	11.97
Percent Share (Passenger-Kilometers)	96.5	3.1	0.4	100.0
<u>1985</u>				
Passengers	203.4	7.4	0.26	211.01
Passenger-Kilometers	14.70	1.95	0.12	16.77
Percent Share (Passenger-Kilometers)	87.7	11.60	0.7	100.0
<u>2000</u>				
Passengers	436.7	24.6	1.3	462.6
Passenger-Kilometers	32.3	5.0	0.4	37.7
Percent Share (Passenger-Kilometers)	85.6	13.2	1.2	100.0

Source: Consultants' estimates.

sand, gravel, and cement blocks is by far the largest group in 1979. 43 percent of the total. However, these commodities move only short distances, and production in 1979 and preceding years was unusually high. The separate total in Table 1.2 that excludes this group is a more accurate reflection of the growth rates of commodity transport in the future.

Given the substantial sunk costs resulting from the committed investments in expansion of the Chemin de Fer Syrian railway, the economic advantages of maximizing utilization of those railway facilities are clear. As a result, the Consultants' commodity modal split methodology is based on a determination of potential railway commodity traffic, with the residual assigned to roads. The only exception is refined petroleum products, where shipment by rail versus pipeline was subjected to specific economic analysis.

The resulting projected traffic by mode is shown in Table 1.3. By the year 2000 total ton-kilometers of non-transit commodity traffic, excluding pipelines, would grow to 3.5 times that of the 1979 level and the rail mode should capture 27 percent of the total.

Transit Commodity Traffic

Uncertainties concerning the transit traffic through Syria are indeed large. Nevertheless, the results of the Consultants' analysis are presented in Table 1.4. Excluding crude oil, growth rates of 9 percent per annum for the period 1979-1985 and 5 percent per annum for the period 1986-2000 are estimated by the Consultants in terms of total tonnage. During 1979, the amount of transit commodities transported by the railways was insignificant compared to that moved via road transport. As Table 1.4 indicates, this is expected to change as new rail lines and better international connections open up.

Table 1.2

PRESENT AND PROJECTED COMMODITY TONNAGES MOVED
(excluding crude oil - in million tons)

	<u>1979</u>	<u>1985</u>		<u>2000</u>	
<u>Bulk Commodities</u>					
Sand, Gravel, and Cement Blocks	13.8	(-0.3)	13.5	(4.0)	24.3
Refined Petroleum	4.5	(4.2)	5.7	(5.0)	11.8
Cement and Wheat and Barley	3.2	(6.3)	4.6	(3.9)	8.1
<u>Intermediate Commodities</u>	6.2	(6.3)	8.9	(5.8)	20.8
<u>High Value Commodities</u>	3.1	(6.5)	4.5	(5.5)	10.1
Phosphate	<u>1.2</u>	<u>(4.6)</u>	<u>1.5</u>	<u>(4.6)</u>	<u>3.0</u>
Total	31.9	(3.4)	39.0	(4.7)	78.2
Total Excluding Sand, Gravel, and Cement Blocks	18.1	(5.9)	25.5	(5.1)	53.9

Source: Consultants' estimates.

Note: Figures in parentheses indicate percentage growth rates per annum for the period between the years.

Table 1.3

PRESENT AND PROJECTED NON-TRANSIT COMMODITY TRAFFIC
(in million tons and in billion ton-km)

	<u>Road</u>	<u>Rail</u>	<u>Pipeline</u>	<u>Total</u>
<u>1979</u>				
Tons	30.4	1.3*	12.3	44.1
Ton-Km	4.64	0.33	6.02	10.99
Percent Share (Ton-Km)	42.2	3.0	54.8	100.0
<u>1985</u>				
Tons	33.6	5.5	12.06	51.08
Ton-Km	6.6	1.7	5.7	14.08
Percent Share (Ton-Km)	47.1	12.1	40.7	100.0
<u>2000</u>				
Tons	64.3	13.9	18.56	96.76
Ton-Km	12.5	4.7	7.57	24.81
Percent Share (Ton-Km)	50.4	19.0	30.6	100.0

Source: Consultants' estimates.

*Excludes railway construction materials.

Table 1.4

PRESENT AND PROJECTED TRANSIT TRAFFIC
 (in million tons and in billion ton-km)

	<u>Road</u>	<u>Rail</u>	<u>Pipeline</u>	<u>Total</u>
<u>1979</u>				
Tons	2.93	0.16	7.40	10.49
Ton-Km	1.19	0.02	3.70	4.91
Percent Share (Ton-Km)	24.2	0.4	75.4	100.0
<u>1985</u>				
Tons	4.5	0.7	7.4	12.6
Ton-Km	1.8	0.4	3.7	5.8
Percent Share (Ton-Km)	30.2	6.0	63.8	100.0
<u>2000</u>				
Tons	8.2	2.6	7.4	18.2
Ton-Km	2.9	1.42	3.7	8.0
Percent Share (Ton-Km)	36.4	17.6	46.0	100.0

Source: Consultants' estimates.

CHAPTER 2

MAJOR FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Chapter 2

MAJOR FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter summarizes the major findings, conclusions, and recommendations contained in Volumes III through VII of this report, except for preliminary investment recommendations, which are summarized in Chapter 3 of this volume. It must be emphasized that these are brief summaries that cover only the major findings and recommendations. For ease of reading, cross reference to particular volumes and chapters or sections are not included in this volume. The reader who is interested in pursuing more detail on a particular recommendation or subject is referred to the table of contents of the appropriate volume.

The major overall finding with regard to transport in Syria is that the basic infrastructure required is either in place or under construction. There are very few new capital projects required in the 5th Five-Year Plan period that are not already committed. With completion of these projects by 1985, particularly in railways, ports, and roads, there will be limited need for new major infrastructure projects through the year 2000. What will be needed is a progressively improved utilization of this infrastructure and additional vehicles, rolling stock, and equipment to support growing transport demand.

2.1 POLICY MANAGEMENT AND ORGANIZATION

Organization and Responsibility for Transport

Although there are a large number of ministries and agencies involved in the transport sector, the Consultants have not identified resulting problems that would justify either a major reorganization of the sector, the creation of a single overall transport ministry, or the creation of a new coordinating council or other mechanism above the ministerial level.

Some changes are needed in assignment of responsibility and in procedural improvements. They fall principally into five areas:

- planning, including manpower planning,
- the national transport data bank,
- road construction and maintenance,
- tariffs, and
- vehicle operating costs.

The Supreme Planning Council and its supporting arm, the State Planning Commission, should remain the only point in Government where full intermodal transport planning occurs; and the next

step in the development of transport planning within the Syrian Government should be to implement the type of demand-oriented planning used to develop this report and described in Section 1.2 above.

Mechanisms should be established to ensure that the basic data, such as O & D surveys, traffic counts, and the road and other modal inventories collected by the Consultants in Phase I, are kept current on a continuing basis.

The Government should make an early decision on the future location of the national transport data bank and the SYRTRANS model. The SYRTRANS model is a planning system. It, and the national transport data bank, will require input data ranging from socioeconomic forecasts to traffic counts, which must be regularly obtained from a variety of organizations. The systems will also serve these organizations by providing analyses they require. For these reasons, the Consultants recommend placing this responsibility in the State Planning Commission.

The responsibilities for road planning, construction, and maintenance for all roads should be recentralized in the Ministry of Communications, with the Directorates of Communications in the Mohafazat reporting directly to the Ministry.

The Ministry of Transport's (MOT) authority with regard to tariffs should be clarified and its capability strengthened. Formal procedures should be established to ensure that tariffs are regularly updated with competing interests fully considered.

The MOT should be assigned responsibility for establishing vehicle operating costs to be used by all Government agencies, and a capability to do this should be created in the MOT.

The MOT should be reorganized to bring its organization structure and capabilities into conformance with its basic responsibilities to the subordinate transport agencies, and to lessen the burden now placed on the Minister and his Deputies.

The Management Problem

The Consultants find that one of the most pressing problems in the transportation sector in Syria is the need for improved management. Syria is incurring high losses through the low utilization and poor maintenance of existing capacity resulting from inadequate management.

While many of the recommendations for specific action are specific to a given mode, the Consultants have found that there are certain basic causes of inadequate management, some of

which are beyond the power of the transport agencies to solve. The common causes include:

- Salaries are low compared to some general companies and to the private sector. (The general salary increase in February 1980 was an important step toward resolving this problem.) Furthermore, incentives, including incentive wages, generally do not exist.

- Procedures are cumbersome and wasteful. A bulldozer worth SP 350,000 may sit idle for a month or more while a committee shops around for a spare part whose total cost is a fraction of the value of the machine time that is lost.

- Inadequate organization structures are not supported by clear job descriptions and statements of authority-responsibility relationships.

- Management information systems, including cost accounting and other information systems, either do not exist or the reporting is so far behind schedule that it cannot be used for management purposes.

- In-house and on-the-job training at the lower levels, where it is most needed, is generally neither required nor available.

- Responsible officials do not have the authority they need to do their jobs.

- Officials often do not communicate or cooperate with each other, even within a single organization.

The modal volumes contain a large number of specific recommendations for improved management and operations that are too specific to be summarized here. However, one recurring aspect is the need for external advisory services to improve operations and to help develop viable training programs. The major ones are described in the succeeding sections of this chapter and a complete listing is provided in Section 2.8 below and in Section 2.2.8 of Volume VII. In total they involve 805 man-months at an estimated cost of SP 15.7 million to SP 19.8 million.

2.2 ROADS AND ROAD TRANSPORT

Major Findings and Conclusions

The Syrian paved road network has expanded four-fold during the past 20 years, doubling in length during the last 10 years

alone to reach its current length of 12,570 kilometers. In addition, there are an estimated 5,200 kilometers of earth and gravel roads. The existing network, the investment plans, the proposed construction schedule, and the maintenance funding levels appear to be adequate in scope, but they are unlikely to provide for the fast, safe, and efficient transportation of people and goods through the year 2000.

The existing traffic is under 400 vehicles per day on 32 percent of the paved road network; the Consultants' recommended standards indicate that roads in this traffic range require only a gravel surface and one traffic lane. The Consultants estimate that approximately 10 percent of the existing paved road network will still be carrying under 400 vehicles per day in the year 2000.

Much of the remainder of the paved road network (all paved roads carrying over 400 vehicles per day) is deficient in pavement width and/or has a poor surface condition. For example, based on 1979 traffic, 26 percent of the primary and some 50 percent of the paved local roads are narrower than the standards normally applied to similar traffic volumes. Eighty-three percent of the entire road network has a fair or poor surface condition. Twenty-one percent of all roads need immediate reconditioning (resurfacing), while the remainder will require reconditioning during the early years of the next five-year plan.

The conclusions that can be drawn from these findings indicate that: the construction of new paved roads is surpassing the traffic demand for all but very high volume roads; traffic on 40 percent of the existing paved roads is exceeding the capacity of these roads to move people and goods safely, quickly, and efficiently; and deteriorated surface conditions on 83 percent of the roads are resulting in losses of benefits to the road users.

A number of construction practices contrary to Syrian specifications have been observed. Such practices have been allowed to take place unchecked by the normal process of construction inspection.

The preliminary findings regarding road maintenance indicate that the road network is badly deteriorated and continues to deteriorate at a faster than normal pace. The Consultants' conclusion is that the efficiency of the maintenance units must be improved significantly through advisory services and training; that they are not adequately equipped or staffed to maintain both local and primary roads; and that they need greater technical support from the Ministry of Communications and administrative support from all levels of Government.

Motor vehicle registrations have expanded four-fold during the past 15 years. During this period, the number of passenger cars has almost doubled, while commercial freight vehicles have expanded six-fold. In 1963, the vehicle ownership per 1,000 persons was 4.5 passenger cars versus 5.7 in 1978; for buses it was 0.37 versus 0.90; and for trucks, 2.1 versus 3.2.

Moving to marginal-cost-based tariffs for passenger transport over the next twenty years is recommended in Section 1.4 above. Freight rates should also be evaluated and adjusted in realistic terms. The Consultants estimate that the current official tariff for commercial freight vehicles is from 25 to 75 percent below costs; for passenger vehicles, it is from 15 to 16 percent depending on the vehicle type. Operators, after a certain amount of obligatory shipments, prefer to transact business with the private sector at higher freight rates. Perhaps this compensates them and covers losses sustained under the official tariff.

Overloading is encouraged with the existing freight and tariff regulations. Efforts to enforce the axle load limitation alone are not likely to solve the problem. There are two possible alternatives. The first is to revise the existing tariff system to enable truckers to cover operating costs and then to enforce the axle limits. The second is to gradually de-regulate the road transport industry to permit the truckers to set their own rates based on such factors as demand, supply, capability, and efficiency.

Statistical data on motor vehicles are not current or comprehensive enough to support proper transport planning.

Decentralization of responsibility for the road network has been underway since 1975 and has undergone many changes in the process. The three areas of planning, budgeting, and technical guidance continue to be problem areas that require further re-organization, as recommended above.

The Mohafaza Directorates of Communications have been directed to organize separate units for the primary roads and local roads located within the Mohafazat. Furthermore, they are supposed to receive technical guidance from the Ministry of Communications. To date, there are no separate units and apparently very little technical direction. The division of responsibility seems both uneconomical and impractical, while technical guidance is absolutely essential.

Major Recommendations

- The rate of new construction should be reduced and the construction of committed projects be extended over a longer period of time than is currently planned.

- Preliminary new geometric road design standards and pavement design testing methods are recommended in Volume IV. The design standards proposed specifically for Syrian conditions were based on recommended international standards and are considered the minimum acceptable for the fast, safe, and efficient operation of motor vehicles. The pavement design methods currently being used in Syria are considered proper; however, it is recommended that the adequacy of the design be verified by soils material surveys, laboratory tests, and axle load studies. In addition, it is recommended that an immediate evaluation be undertaken of the bitumen base course designs currently in use, with a view towards the possibility of returning to a crushed granular aggregate base course where this is found to be practical.

- A road betterment and maintenance program should be initiated during the 5th Five-Year Plan period and should consist principally of pavement widening and resurfacing to eliminate the existing deficiencies and to accommodate projected traffic requirements.

Such a program, which has an economic rate of return of 60 percent, is estimated to cost SP 111 million for primary roads and SP 204 million for secondary roads over the 5th Plan period (in 1979 prices.) In addition, gravel rural access roads and upgrading existing earth roads to gravel standards at a total estimated cost of SP 302 million are proposed. Details by road link, by Mohafaza, including work to be done, timing, cost, and economic net value are contained in Volume VII.

In addition to 25 committed highway projects, the Consultants recommend construction of the Hama-Saraqeb second carriageway and the new Lattakia-Ariha road during the 5th Plan. After 1985 three new roads are economically justified: the Aleppo Bypass in 1991-1995, and the Hama-Al Salamieh-Al Raqqa and Tadmur-Albu Kamal roads between 1996 and 2000. From 1986 to 2000 an estimated 1,250 kilometers of gravel roads will need to be paved and 2,670 kilometers of new gravel rural access roads should be built.

- The diesel subsidy should be carefully re-evaluated by the Government with a view to setting the price for trucks equal to the actual cost of diesel fuel. This is a complicated economic and social issue that extends beyond the transport sector. However, the present subsidy is distorting freight allocations among modes, and a substantial part of the benefits accrue to foreign truckers.

- Vehicle fleet statistics for planning purposes should be improved by: noting on registration forms the date when a vehicle is withdrawn from circulation; requiring customs entry

points to record imported vehicles by type, category, and class; and requiring each Mohafaza to report vehicle registration changes every three months.

- Advisory services are required in the following areas:

to develop one Mohafaza Directorate of Communications as a model combination road maintenance, training, and production unit,

to evaluate existing design and construction procedures, and

to develop a program of road deflection measurements to establish the actual as-built design of existing roads, primarily for maintenance planning.

2.3 RAILWAYS

General

Syria is potentially an ideal country for railway operations. A large proportion of the population and development is concentrated on single north-south and single east-west axes. The distances between major cities are generally those for which rail is most competitive on inter-city passenger services. The country is well placed astride international freight transit routes, which are for the most part common to the main domestic demand axes. The two major ports are conveniently served by rail. Finally, major railway expansion underway in Iraq and planned in Jordan, Saudi Arabia, and Kuwait will produce an integrated network in the Middle East for which the railways of Syria provide the natural gateway to Europe.

A major railway construction program is in progress. This moment of massive change is not an ideal time to draw conclusions from current or past performance. The Consultants' approach is therefore to present an overview of the current situation, to determine the scope for increased traffic that is being created by the development program, and to point out areas for improvement, so that the railway will be able to exploit fully its future capacity.

Major Findings and Conclusions - Chemin de Fer Syrien (CFS)

The major findings and conclusions of the study on the CFS railway follow.

Line construction and reconstruction now in progress or planned will dramatically increase railway traffic potential. Passenger

traffic on the 1,900 route kilometer network, which represents the existing system plus the Mhine-Damascus and Deir Ez Zor-Albu Kamal lines, is expected to be 560 percent greater in 1985 than in 1979.

The projected traffic volume will not be achieved, nor will the postulated operating efficiencies, without a major change in the training of many railway employees and their general attitude toward their job. Highly disciplined operation will be required by 1985. It is unreasonable to expect CFS management to carry through the necessary staff recruitment and training programs and the introduction of new operating techniques without outside assistance.

It is the view of the Consultants that a comprehensive program of technical assistance must be provided as soon as possible. In addition, the management team must be strengthened to improve overall control, operating discipline, marketing, and maintenance of track and rolling stock for the future system. Coordination of operations and planning between the railway and the Ports of Lattakia and Tartous should be improved. In addition, deficiencies in present construction practices will create future maintenance problems for the railway.

The basic railway network is expected to be complete by 1985, with a consequent sharp reduction in investment in the 6th Five-Year Plan from the current peak levels. However, even with better utilization of present rolling stock, a considerable amount of equipment in addition to that on order will be required to carry the projected 1985 traffic. With full utilization of existing and ordered equipment, this could be limited to an additional 50 main-line locomotives, 300 coaches, 600 freight wagons, and 20 shunting locomotives. For 1986 to 2000 the additional equipment required to handle traffic growth and to replace worn-out equipment is estimated at 134 main-line locomotives, 543 coaches, 6,940 wagons, and 45 shunting locomotives.

Line capacity improvements, followed by double tracking, will be required between 1990 and 1995 on the Damascus-Mhine and Mhine-Homs lines. Improvements will be needed between 1995 and 2000 on the Jibrine-Al Raqqa, Wadihi-Lattakia, and Homs-Tartous lines.

Major Recommendations - CFS

- A major technical assistance program should be undertaken using a consulting subsidiary of one of the world's major railways operating to European UIC standards. The assistance should be wide ranging and last for a period of two years. As a

part of it, senior CFS personnel should be encouraged to spend time abroad assimilating the experience of other railways. Such a program, involving an estimated 30 man-years of foreign consultants' time in Syria at a total cost of SP 12 to 15 million, is equivalent to the capital cost of just four main-line locomotives. The return in terms of improved techniques and increased efficiency should pay for the expenditure in a short period.

- The CFS should be reorganized under a newly appointed Advisory Board of Directors consisting of the Director General and representatives of key ministries, the ports, and major customers. The reorganization should include creation of general-manager-level positions for finance and law, administration and personnel movements, planning and marketing, and engineering; director level positions for port liaison, reclamation, rules and safety, and marketing; and divisional manager positions for Aleppo, Deir Ez Zor, Al Kamishli, Lattakia, Homs, Tartous, and (at a later date) Damascus.

- Rolling stock acquisitions should be authorized only on the basis of outline future stock diagrams and working timetables. The order out to tender for eighty 3,000 hp locomotives should be phased, with delivery of 50 units in 1982-1983 and the remaining 30 in 1986-1987. Consideration should also be given to different types of locomotives for passenger and for freight service.

- Consideration should be given to changes in methods and design of new line construction in order to simplify future maintenance. This requires proper compaction during construction, an increase in roadbed width on fill sections, the provision of wing walls at bridge ends and longer culverts or adequate headwalls, and the re-distribution of the ballast on curves to the outside of the curves.

In addition to the above, Volume III contains a number of recommendations on specific aspects of proposed construction and actions needed to improve operations.

Major Findings and Conclusions - Chemin de Fer Hijaz (CFH)

The Hijaz network has been the victim of political events in the region. Once it was part of a flourishing railway system serving Palestine, Jordan, Lebanon, Syria, and for a short period, Saudi Arabia. In 1948 the important line to Haifa was cut at the Palestinian border and in 1976 the key route to Beirut was closed at the Lebanese border. With access to the Mediterranean cut off and connection with the standard gauge system at Rayak in Lebanon also broken, the major purpose of

the railway was lost. Since 1976 freight traffic has declined to virtually nothing. In 1979 a landslide cut the residual branch line to the Lebanese border in half, and a further temporary cut in this line was made in Damascus in 1980 in connection with roadworks.

The system is thus in a depressed state, and despite recent dieselization and re-equipment with modern rolling stock, the line as it now exists cannot hope to compete with road transport. Completion of the new CFS line to Damascus is unlikely to lead to significant traffic because of the break of gauge and freight transshipment required. The branch lines to Serqhaya, Bosra, and the border with Palestine do, however, have considerable tourist potential for scenic trips, and consideration should be given to their being kept in service on this basis. The narrow gauge mainline from Damascus to Dera'a has no economic basis to continue in operation, and eventual closure appears inevitable.

The traffic potential of the main-line system as part of an integrated standard gauge system is, however, more promising. There is considerable freight traffic on the Damascus-Dera'a-Amman corridor and a large passenger movement for which the railway could be expected to be competitive. In 2000 a standard gauge line is projected to be carrying 1.6 million tons of freight and 2.0 million passengers over the Damascus Dera'a section. Freight traffic could be far higher than this if through movements to Saudi Arabia are handled.

Major Recommendations - CFH

In light of the present feasibility study of a new standard gauge line to the south and the limited usefulness of the present railway, the Consultants have made a few operational recommendations covering the CFH. Perhaps the most important of these is that younger workers continue to be recruited at the Kadam workshop to benefit from the skills of the elite older technicians and artisans.

The following recommendation applies only if it is decided to develop a standard gauge line:

- The design standards for the line should be consistent with those adopted for the Homs-Damascus line, and a carriage and wagon repair shop should be constructed in Damascus to utilize the skilled CFH workforce.

2.4 PORTS

The major findings with regard to the Ports of Lattakia and Tartous is that, when the planned Tartous Port and the Phase I

expansion of Lattakia are completed, Syria will have sufficient port capacity to meet its needs through the year 2000. Estimates of port capacity and forecasts of traffic through the ports are contained in Table 2.1. The port capacities are based on average loading rates on a one shift per day basis. These rates should be achievable over time in Syria if recommended operational improvements are adopted. (Using two shifts, the Port of Tartous achieved 1.4 times the projected daily capacity per berth for general cargo in 1979.) An important factor in the Consultants' estimates is the apparent trend to increased containerization that is occurring in Syrian traffic as it is elsewhere around the world, and this is reflected in the Consultants' basic traffic estimates. However, Table 2.1 also shows the effect of the containerized traffic share of the total being 25 percent less (Alternative A) and 50 percent less (Alternative B) than estimated. Even under Alternative B, the ports have adequate capacity on a two shift per day basis. Container traffic trends in Syria's ports should be carefully monitored in the future.

The Syrian phosphate traffic forecast for the year 2000 assumes that a major part of Syria's phosphate will be used for domestic fertilizer production. As a result, even if potential phosphate exports of 4.7 million tons per year from Iraq after 1990 materialize, the Tartous phosphate pier will have adequate capacity. In addition, the sulfur pier proposed for Tartous should be studied further.

Although port facilities will be adequate, additional equipment is required now and will be in future years.

Although the problem of port congestion is widely recognized, the costs are hidden. In Phase I the Consultants conservatively estimated that the direct costs in the form of liner surcharges and demurrage were being incurred at a rate exceeding SP 10.5 million per month. In fact, the rate may have been three to five times that amount. However, increased productivity at both ports had eliminated the waiting queues by the late summer of 1980.

In the fall of 1979, a committee composed of the Deputy Ministers of Transport and Communications and the Directors of the Ports of Tartous and Lattakia proposed and submitted for approval a new tariff for the two ports. This proposed tariff, the first significant change since 1974, is a major improvement in terms of both structure and rates. It anticipates most of the changes the Consultants were planning to recommend and should be approved promptly, with minor modifications.

From a design viewpoint, the Port of Lattakia is beginning to suffer operational problems caused by the recent rapid changes

Table 2.1

PORT CAPACITY AND TRAFFIC, 2000

	GENERAL CARGO			Total
	Container Terminals	Roll on/Roll off	Break-Bulk	
<u>One-Shift Capacity</u>	6,000	1,500	5,430	12,930
<u>Traffic Alternatives</u>				
<u>Basic Estimates</u>				
Tons	4,600	2,000	7,600	14,200
% Utilization	0.77	1.33	1.40	1.10
<u>Alternative A</u>				
Tons	3,450	1,500	9,250	14,200
% Utilization	0.58	1.00	1.70	1.10
<u>Alternative B</u>				
Tons	2,300	1,000	10,900	14,200
% Utilization	0.38	0.67	2.01	1.10
<u>PHOSPHATE</u>				
Capacity - Tons				6,000
Utilization - Tons				5,300

Source: Consultants' projections.

Notes: Port capacities calculated at average loading rates on a one shift per day basis. Phosphate exports include 4.7 million tons from Iraq.

in ship cargo-handling requirements. These new requirements for open space container handling and storage, with adequate room for maneuvering large trucks and handling equipment, are rapidly making obsolete the need for permanent warehouses and transit shed buildings. During this transitional period, the port is faced with the difficulty of having to handle combination vessels with mixed traditional break-bulk and container cargo.

At Lattakia, cargo-handling equipment suffers from deficiencies in maintenance and repair. These deficiencies are largely caused by inadequate repair facilities, a shortage of competent mechanics and other craft tradesmen, a lack of systematic and procedural disposal and replacement of worn-out, unproductive machines, and difficulties in obtaining spare parts.

Although considerable construction work remains to be accomplished at Tartous, there are certain physical and operational advantages the port enjoys over Lattakia that preclude an effective comparison of productivity or efficiency of operations between the two ports.

These advantages of Tartous are, generally, listed below:

- The more recent design of the port leads to greater efficiency.

- Port management displays a high degree of interest in improving operating efficiency.

- The mix of cargo is more uniform, providing greater ease of handling and higher productivity.

- The frequent schedule of roll on/roll off vessels provides a substantial part of the total general cargo tonnage and generates little or no requirement for handling.

- With the exception of container cranes, cargo handling equipment is adequate for port requirements and is relatively new and in good condition.

The pervasive problem of phosphate dust at Tartous is hampering port operations and creating substantially increased maintenance costs. It also presents a serious health hazard for workers at the port, and to a lesser degree, to the people in the city.

Both ports are subject to myriad operational problems and improper practices and procedures that are already affecting operating efficiency and port throughput. One of the most

important overall factors is the lack of unitized cargo handling. There is an urgent need for pallets to be used for within-port cargo handling and for a significant increase in the amount of cargo that arrives in unitized--pre-palletized, pre-slung, or pre-bundled--form.

Another overriding problem has been the unavailability of sufficient and coordinated land transport to move cargo rapidly from the ports. In 1979, over 50 percent of all general cargo was discharged from vessels directly to rail wagons or trucks. While this method of cargo handling is efficient, it is predicated on the ready availability of rail wagons or trucks to handle the daily volume generated by modern cargo-handling methods and acceptable production rates. The serious shortage of available rail wagons serving the Port of Lattakia compounds the truck shortage. As a result, either ship turnaround at the berth has been delayed or double handling incurred in moving cargo through the transit sheds and warehouses.

Major Recommendations

- The proposed tariff for the Ports of Lattakia and Tartous should be approved promptly, with minor modifications set forth in Volume V of this report. The most important of the modifications is that the tariff should require that the Joint Committee annually review the rates and submit their analysis and any recommendations through the Board of Directors of the Lattakia Port Company and the Administrative Committee of the General Company for Tartous Port to the Minister of Transport.

- Minor construction and new equipment should be procured for the two ports, as specified in Volume V. Estimated costs are SP 46 million for equipment for the 5th Five-Year Plan period, and SP 109 million for the period 1986-2000, all in 1980 prices.

Volume V contains over 150 separate recommendations for improving operations at one, or both, of the ports. The most important of these recommendations follow:

- Unitization of cargoes should be encouraged as far as possible. Specifications for Government cargoes should provide for import cargoes to be unitized; private importers should be instructed to specify unitized packaging. This will be encouraged by the proposed tariff discount of 30 percent for unitized cargo. In order to reduce cement ship delays, bagged cement should be preslung in reuseable fiber net slings. The cement slings should be introduced at the manufacturer's plant and remain intact to the final destination.

- 45,000 wooden pallets should be acquired immediately for the ports. They are the first step in handling unitized loads and are the preferred method for handling most break-bulk cargo. On large cargo vessels, fork trucks and pallets should be used where practical in the hold of the ship.

- Steps should continue to be taken to improve the availability of trucks and rail wagons for direct delivery of cargo. The CFS should appoint full-time rail wagon coordinators to serve each port. In addition, the ports should have strict rules to the effect that when trucks are unavailable, cargo will be palletized and stacked by forklift trucks away from the operations area in either open or closed storage areas and the consignee will be charged accordingly.

- Given current container trends, the schedule for construction of the Phase I expansion of Lattakia should be revised to provide one container berth by 1985 and a second in the mid-1990s. The possibility of delaying the construction of some of the additional general cargo berths until traffic flows indicate they are justified should also be examined.

- Immediate improvements should be made to contain the dust from the phosphate conveyor and ship loading systems at Tartous. The labor and engineering required to accomplish the work can be performed by the port staff, and material and equipment, at 1979 prices, will cost a total of SP 68,000. Annual maintenance and repair to the phosphate mechanical system due to dust is estimated to have been SP 1.2 million in 1979.

- There should be annual or quarterly meetings between the two ports for personnel in similar positions for the purpose of exchanging information on procedures, equipment, cargo handling methods, statistical analysis, engineering, maintenance, repair methods, and housekeeping. It is further recommended that exchange visits to other world ports be arranged for the same purpose.

- A small team of expatriate port experts, including a training specialist, should be obtained through a technical assistance program to improve productivity in both ports and establish an in-house training program at each of them.

2.5 CIVIL AVIATION

Major Findings and Conclusions

Syria is well launched into the jet air age. With one major international airport at Damascus, an alternate international airport planned at Aleppo, four regional domestic airports, a

working air navigation system, and an airline serving many countries plus domestic services, the groundwork has been laid for further improvements in domestic and international services and facilities to keep pace with projected passenger and cargo traffic volumes. However, the 747 SP aircraft are being inefficiently utilized on routes that are too short for that type of aircraft, and plans must be made to replace the aging fleet of Caravelles. In addition, the Consultants' passenger projections indicate that there is a significant potential domestic air market that could be trapped if regular service were provided.

Thus, many changes and investments must be made to improve all six airports, modernize the air navigation system, and change aircraft types to fit both the domestic and the international route structure of Syrianair.

Both Syrianair and the Directorate General for Civil Aviation (DGCA) must intensify and reorient their training programs to upgrade para-professional and lower level positions to provide better services to international airlines and process more efficiently passengers and cargo handling. The quality of service at Damascus International Airport is below standard and is uniformly criticized by foreign air carriers serving Syria.

At present, Damascus Flight Information Region (FIR) consists of the airspace over the territories of the Syrian Arab Republic, including a 12 nautical mile wide strip along the coast. The Damascus FIR is surrounded by a number of relatively small FIRs, such as Nicosia FIR, Beirut FIR, Amman FIR, and Baghdad FIR. For modern jet aircraft, the size of these FIRs is too small to be operationally convenient and efficient; this is especially true for the pilot, but also pertains to the air traffic controller. Overflying Syria from Beirut to Amman or Baghdad, an aircraft stays for less than 20 minutes within Damascus FIR. The frequent transfer from one FIR to another is inefficient and increases the risks of misunderstanding and misinterpretation because of coordination problems.

The present airway system geometry is hampering air traffic efficiency, especially domestic traffic. Airway kilometers are sometimes considerably in excess of distances as the crow flies and are even longer than road distances. This causes additional operating costs to the airline operator and an increase in travel time.

Major Recommendations

- Master site plans should be prepared by qualified consultants for all five present domestic airports. This recommendation includes Aleppo, where an international airport is

planned to serve foreign airlines and provide an alternative to Damascus International Airport.

- The 1965 master plan for Damascus International Airport should be revised and updated by qualified consultants.

- A regional high-level traffic control center with advanced radar should be installed with the participation of Syria, Jordan, Iraq, and if possible, Lebanon. The multitude of small FIRs in the region should also be consolidated.

- Domestic airways should be straightened out whenever possible to provide for the most direct flight between city pairs.

- For international service, the present fleet of B 747 SP jumbos and Caravelles should be replaced by selling or trading them for more efficient aircraft, such as the B 727, that are better suited to the airline's route pattern and traffic volumes. Additional aircraft will also be needed over the next 20 years to handle growing traffic.

- For domestic service, the inefficient and obsolete Caravelle aircraft should be replaced with smaller, highly efficient turboprop aircraft such as the F-27. With good utilization, a fleet of three of this type of aircraft could serve projected traffic through 1990 with markedly increased levels of frequency and service. After 1990 conversion of some domestic routes to jets will be necessary.

- New air navigation equipment should be purchased in addition to that on order.

Even without an updated master plan, it can be determined that new investments at Damascus International Airport through 1985 will amount to some SP 36 million in current prices, mostly in navigation and landing aids. More precise requirements and cost estimates to increase peak hour capacity after 1985 will be possible only after the master plan is updated. However, the Consultants have preliminarily identified required improvements between 1985 and 2000 that will cost an estimated SP 257 million.

The remaining airports will require new investments totalling SP 143 million through 1985, and SP 108 million from 1986 to 2000.

Aircraft investments during the 5th Plan, assuming the sale of the B 747 SP aircraft, are estimated to total a net SP 124 million. An additional SP 1,076 million will be required through 2000 if international and domestic traffic grows as forecast.

2.6 PIPELINES

Major Findings and Conclusions

Syrian Company for Oil Transport (SCOT)

This pipeline has ample capacity under present circumstances for delivering crude oil from Iraq to the Syrian port of Banias.

There is also ample capacity to deliver crude oil in the opposite direction to Homs if this is required. Generally, equipment is adequately maintained and the operation procedures are adequate. Because there is excess capacity in the line, measures to increase throughput would be beneficial to Syria if tariffs at least cover the costs of operation or are above SP .015 per ton-kilometer in 1979 prices.

Syrian Crude Oil Transport Company (SCOTRACO)

The system to deliver Syrian crude oil to Homs and Banias has ample capacity for current and expected needs unless there are major new oil discoveries in Syria in the future. The maintenance and operation of the line are adequate, although they are made more difficult by the high sulfur content of Syrian crude oil.

Syrian Company for Storage and Distribution of Petroleum Products (SADCOP)

The Consultants have carried out a detailed intermodal analysis of the transport of petroleum products in the future. In summary, this analysis indicates that rail is more economic than pipelines if the distances are relatively equal and there is adequate rail capacity. When substantial rail investments, such as double tracking, are required, the balance shifts in favor of pipelines. In addition, substantial distance savings, such as a pipeline from Homs directly to Al Raqqa, cause pipelines to be more economic when adequate volumes are reached. However, the cost differences are too small to justify firm decisions on the level of pre-feasibility analysis done in this study. For these reasons the Consultants recommend the following:

A detailed engineering and economic feasibility study should be carried out for the northeast region encompassing the following alternatives:

1. Pipeline - Homs-Aleppo-Al Raqqa
2. Pipeline - Homs-Al Raqqa and Homs-Aleppo
3. Pipeline - Homs-Al Raqqa
4. Rail - Homs-Aleppo

A feasibility study should be undertaken for pipeline supply of petroleum products to Damascus International Airport, a new distribution center in southern Damascus, and a southern distribution point near Dera'a.

- Rail costs and capacities should be carefully monitored, because of their impact on pipeline planning.

Subject to the results of these analyses, the Consultants have forecast the following investments between 1985 and 2000.

- Homs-Adra, SP 109,000,000
- Homs-Al Raqqa direct, SP 105,387,000

2.7 CONSTRUCTION AND STORAGE

Storage

The Consultants completed an inventory of present storage facilities that covers, for each agency or organization, by Mohafaza, the following aspects of storage facilities:

- the type of storage,
- present storage capacity,
- commodities usually handled,
- percentage of utilization during peak and low periods,
- inventory turnover rates,
- addition to present capacity affected by carryover projects from the 4th Five-Year Plan,
- preliminary plans for further expansion of storage capacity in the 5th Five-Year Plan, and
- estimates of unit cost of construction.

A lack of systematically recorded data in recent years, and particularly the unavailability of records on turnover, makes it impracticable to attempt to estimate the dynamic storage capacity (i.e., capacity over time based on rates of stock turnover) versus static capacity (physical capacity at one point in time). This report, inevitably, deals with the latter.

The results of the inventory show that there is a very substantial potential capacity in the storage sector that can be realized through improvement in management and operational

practices. Specific recommendations for short-term improvements for selected agencies with major storage facilities are discussed and presented in the Final Phase I Report.

Our findings do not indicate the need for additional storage facilities beyond what is under construction, committed, or planned for expansion in the rest of the storage sector. In most of the public companies, the doubling of effective capacity can be achieved by improving operational efficiencies, which together with current and planned expansion of capacities, should provide adequate sectorwide storage capacity to meet forecast commodity volume up to the year 1990.

However, to achieve better sector-wide planning and utilization of storage facilities, all public companies with major storage facilities should be directed to set up or improve their record-keeping systems to ensure the availability of systematically collected data on throughput and turnover rates, which are vital for storage factor assessment, analysis of throughput productivity, and forecast of capacity requirements. This is very important to any attempt to make long-term forecasts of storage capacity requirements in relation to the forecast growth trends of the rest of the transport sector.

In the short run, Government efforts should be concentrated on enforcing the implementation of measures to ensure fuller and more efficient use of existing storage facilities.

Construction

The heavy civil works construction industry in Syria is dominated by state-owned firms. These firms generally specialize in a given construction sphere and are invited in turn to negotiate for major projects. Private companies also exist in Syria but tend to be smaller because they are excluded from participating in the large projects as prime contractors. Finally, foreign firms are also active in heavy construction and are eligible to bid on foreign-funded projects. Foreign firms and private domestic firms are also used for highly specialized projects where state-owned firms lack the experience necessary to complete the work.

State-owned companies appear to have unrestricted access to the equipment required for civil works construction projects, but they have difficulty keeping qualified personnel. There are adequate material and equipment resources available to complete the 5th Five-Year Plan program providing that existing equipment is properly maintained and worn-out equipment is replaced in a timely manner, as is currently the practice.

In terms of constant 1975 prices, the construction sector of the gross domestic product in Syria grew at an average annual rate of 9.6 percent from 1963 to 1979. The largest proportion of that growth took place between 1970 and 1979, when the sector as a whole more than doubled. The Consultants have forecast reduced growth rates for the future, with an expected annual growth rate of 7.6 percent from 1979 to 1985 and 6.4 percent from 1986 to 2000. Given the economy's ability (and by implication the construction industry's ability) to maintain high growth rates in the past, the projected lower growth rates in the future should be within the industry's capability, given reasonable expansion.

Data on available equipment and operating efficiencies were difficult to obtain. However, the Consultants have concluded that the construction industry, in general, will be sufficiently equipped to accomplish the 1981-1985 highway and ports programs as currently envisioned. Additionally, adequate equipment should be available for highway maintenance. Similarly, the General Company for Railway Construction has the capacity to complete the presently committed projects and to do additional work when they are completed. However, if additional projects, such as the Deir Ez Zor-Albu Kamal line are undertaken concurrently with current work, they should be contracted out, rather than increasing the Company's capacity in the face of a virtual cessation of new railway construction after 1985.

2.8 SUMMARY OF TRAINING REQUIREMENTS

In this volume and the modal volumes, the Consultants have recommended an interrelated sectoral manpower and training program to meet identified skill shortages and management needs. The program includes:

- a detailed manpower study for the sector,
- overall coordination of training by the Directorate of Transport, Communications, and Storage in the State Planning Commission,
- improved planning and direction of training by the Ministries of Transport and Communications,
- upgrading of functions and staff in the training offices of the various modal agencies,
- establishment of a Training Coordinating Committee in the Ministry of Transport, and
- the specific training and advisory services noted below (the information in parentheses refers to the volume and section containing a more detailed discussion of each):

1. Training advisor to assist the Ministry of Transport in developing an effective training department and training plans and programs within the Ministry and its subordinate agencies (VII, 2.2.4).

2. Workshops by the Management and Productivity Center of the Ministry of Industries on performance improvement programming and transport training and trainers (VII, 2.2.6).

3. A manpower planning expert to assist the SPC in a sector manpower study (VII, 2.1.5).

4. A Syrian computer expert to advise and assist in training Government staff to operate SYRTRANS and the data bank (VII, 1.4.2).

5. A wide ranging advisory assistance and training program in railway operations and management (III, A-1.5).

6. A training and advisory program to develop a road maintenance training and production unit in a selected Mohafaza (IV, 2.3).

7. A road and bridge design and construction expert to review design standards and train Ministry of Communications personnel (IV, 2.3).

8. Training of selected port officials through observation tours abroad (V, A-5.13).

9. An advisory training team to develop an on-the-job training program and improve operations at Tartous and Lattakia Ports (V, A-5.13).

10. An aviation training expert to assist the Directory of Training of Syrianair to improve the airline's training program (VI, B-6).

CHAPTER 3

PRELIMINARY INVESTMENT RECOMMENDATIONS

PRELIMINARY INVESTMENT RECOMMENDATIONS

3.1 GENERAL

The evaluation of future transport requirements for the Syrian transport sector was carried out by developing alternative scenarios and comparing their likely consequences.

Alternatives for 1985 began with the identification of committed projects in the existing plans. The definition of committed projects is provided in Section III.B.2.b of the Terms of Reference (TOR). All projects currently under construction or for which financing has been received or guaranteed are defined as committed projects.

These committed projects are quite extensive. All of them are planned to be completed by 1985. Considering the necessary lead time for initiating a new major transport facility construction project, it was decided that the transport network to be analyzed for the year 1985 would consist of all existing facilities and all committed projects, plus two feasible links integral to them.

For the year 2000 several additional transport links have been identified and alternative networks have been delineated. For the combined systems of rail and road transport, evaluations have been performed for each of the scenarios over the period from 1980 through 2020.

The economic effects of the alternative modal splits have been determined. Investment plans for the period 1981 through 1985 have been developed for each mode based on modal economic analyses within the framework of the preferred long-term alternative.

For the period 1986 through 2000, probable transport projects have been identified on the basis of projected traffic and the relative economic benefits determined in the preceding analyses.

It should be noted, however, that evaluation criteria applied in this chapter are strictly economic. They are not comprehensive since they exclude considerations of the political and social consequences of the development, some of which may be of greater significance in the long run.

Because diesel fuel is subsidized, unit costs derived from international market prices have been adopted to represent economic costs. Market values have been used for all other items. All costs have been estimated using 1980 price levels.

3.2 ALLOCATION OF DEMAND AMONG MODES AND SYSTEM ALTERNATIVES

Alternative system scenarios can have different impacts on each mode and on the transport sector as a whole. A scenario may be characterized by the lowest total cost for a mode but may have a higher total cost for the other modes, resulting in a higher total system cost.

No alternative infrastructure developments were examined for the period up to 1985. Because of the long preparation time for any major transport facility project, only fine tuning of the transport sector will be possible as the policy alternative. Moreover, alternative passenger pricing policies (the 2 percent annual increases in relative costs and marginal cost pricing by 2000) would not result in a significant difference by 1985.

For the period 1986 to 2000, for the combined system of road and rail modes, a number of alternative scenarios were developed for the purpose of system evaluation. The alternatives are concerned with:

- pricing schemes for passenger transport,
- modal split between road and rail for commodity transport,
- future railway additions,
- future highway additions, and
- a highway betterment and maintenance program

Table 3.1 summarizes the six system alternatives tested. Series A alternatives are with the base pricing policy and series B with the marginal cost pricing policy. For each alternative, road systems were tested with the recommended highway betterment and maintenance program and without the program.

In all, 12 combinations of rail and road systems were tested. In order to avoid the estimation of residual values at the end of the study period, cost streams were calculated up to year 2020 with the traffic level held constant after year 2000. All costs from 1981 through 2020 are at constant 1980 prices and discounted to the base year 1980. A 12 percent discount rate was used, and a 6 percent rate was also used as a sensitivity

Table 3.1

SUMMARY OF SYSTEM ALTERNATIVES

<u>Alternative Code</u>	<u>Description</u>
<u>Series A</u>	Passenger transport fares of rail, taxi, microbus, and bus fixed at present levels relative to each other but increased by 2 percent per annum relative to non-transport prices.
AO	Low rail share for commodity transport. Rail network addition to the 1985 network is the new Hijaz only. No new highway links added to the 1985 network.
A1	Low rail share for commodity transport. Rail network additions are the new Hijaz line and the Lattakia-Tartous line. No new highway links added to the 1985 network.
A2	Rail same as in A1. Highway link additions are Tadmur-Albu Kamal, Hama-Al Salamieh-Al Raqqa, and the Aleppo Bypass.
<u>Series B</u>	Passenger transport fares of rail, taxi, microbus, and bus will be set at economic marginal costs of each mode by the year 2000, resulting in a 4 percent per annum price increase as a whole relative to non-transport costs, and changes will occur in relative prices among the modes.
B1	Low rail share for commodities. Rail network additions are the new Hijaz line and the Lattakia-Tartous line. No new highway links added to the 1985 network.
B2	High rail share for commodities. Rail network and highway link additions are the same as in B1.
B3	High rail share for commodities. Rail network additions are the same as those in B1 plus the Tadmur-Albu Kamal line. Highway link additions are the same as in B1.

Note: Each alternative shown above was further divided into two alternatives, with a second digit added. The second digit 1 indicates cases without the recommended highway betterment and maintenance program and the second digit 2 indicates cases with the recommended program.

test. Major conclusions were not affected by the lower rate. Resulting present values of total system economic costs (at 12 percent) are summarized in Table 3.2.

Among the system alternatives tested, alternative B22 is the least cost solution. In other words, a combination of the following policies would result in achieving the least total system economic costs for the combined rail and road transport system in Syria.

- Implementing the recommended highway betterment program.

- Gradually changing passenger transport fares to achieve marginal cost pricing by the year 2000.

- Upgrading the rail network so that the rail mode would capture higher shares than otherwise. This includes construction of the Lattakia-Tartous line and some double tracking.

The largest cost savings come from the proposed highway betterment and maintenance program. Regardless of the other alternative system components, the proposed betterment program would produce a difference of SP 3 billion in terms of present value, or roughly 5 percent of the total combined costs of the rail and the road modes. In particular, the preventive resurfacing is the most effective, since the road vehicle operating costs are very sensitive to the highway surface conditions and the cost of resurfacing is relatively inexpensive.

Based on the size of the Government owned vehicle fleet, it is estimated that the Government bore 13 percent of the total road vehicle operating costs in 1978. If this Government share remains stable, cost savings to the Government alone by the highway betterment and maintenance program would be SP 390 million in present value, enough to cover the cost of the projects.

The policy of gradual passenger tariff changes to achieve marginal cost pricing for all surface passenger transport modes by the year 2000 would lead to a substantial total system cost reduction of more than SP 2 billion in present value after compensating for the suppressed passenger trips.

The sensitivity of the ranking of the alternatives to changes in relative costs was also tested. It indicates that in order for alternative B1 to become the least cost solution, rail costs must be more than 36 percent higher than the original estimates, or road costs must be more than 36 percent less. It is unlikely that road costs will decrease in such magnitude since road cost increases during 1979-1980 were almost this much.

Table 3.2

COMBINED RAIL AND ROAD SYSTEM COSTS

(in million SP)

<u>System Alternatives</u>	<u>Present Value of Total System Costs¹</u>	<u>Economic Comparison Costs²</u>
Without Betterment and Maintenance Program		
A01	65,128	65,128
A11	65,208	65,208
A21	65,111	65,111
B11	62,898	63,008
B21	62,813	62,923
B31	62,886	62,996
With Betterment and Maintenance Program		
A02	62,145	62,145
A12	62,225	62,225
A22	62,140	62,140
B12	59,900	60,010
B22	59,822	59,932
B32	59,890	60,000

Source: Consultants' estimates.

¹ Sums of cost streams for the period 1981-2000 discounted to 1980 at 12 percent per annum discount rate.

² For the B series alternatives economic costs of lost or suppressed passenger trips due to higher tariffs are added to the actual system costs.

Rail costs depend very much on operating efficiency. A much-improved level of efficiency over the present level was assumed for all alternatives, although the assumed level is still lower than those of European railways. If the railway is operated at 62 percent of the efficiency assumed, the rail mode would no longer be a favorable mode when earlier double tracking is involved.

In summary, the following conclusions can be drawn from the above analysis.

- The proposed highway betterment program is expected to yield high economic benefits regardless of rail operations.

- The proposed marginal cost pricing for passenger transport would result in substantial total system costs savings, not only because it would suppress excessive passenger trips but also because it would lead to a more desirable split among modes. Its effect of relieving the Government from excessive subsidies to passenger transport is also substantial.

- The rail mode is more cost efficient than the road mode under normal circumstances even when the double tracking of the Damascus-Aleppo line is involved. Efforts should be made in all areas to ensure high rail mode shares of passengers and freight through the level of service, pricing, marketing, and Governmental guidance. The cost advantage of the rail mode, however, depends on operating efficiency, which could vary widely. Efforts also must be made to achieve an operating efficiency of at least 65 percent of the level assumed in this study.

- The Tartous-Lattakia railway line should be constructed after 1985. The Tadmur-Albu Kamal railway line should not be constructed before 2000. The Aleppo Bypass opening in 1995, the Hama-Al Raqqa Highway, and the Tadmur-Albu Kamal Highway, opening before 2000, are all economically feasible.

3.3 TRANSPORT SECTOR DEVELOPMENT PLANS

The 5th Plan

Based on the systems analysis and the recommendations developed in the modal sections of the report, the Consultants have prepared a transport sector development plan, 1981-1985, and a forecast of probable investments for the period 1986-2000. The 5th Plan is summarized in Table 3.3; details by project are shown in Table 3.4. Committed projects are divided largely between roads, rail, and ports, in that order. Rail accounts for 37 percent of total investments and 50 percent of the uncommitted projects. Comparable percentages for roads are 41 and 31, respectively.

Table 3.3

SUMMARY RECOMMENDED TRANSPORT SECTOR PLAN, 1981-1985

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>
1. <u>Projects Carried Forward</u>						
Rail	410.0	390.0	380.0	300.0	220.0	1,700.0
Road	485.2	571.0	538.0	403.3	369.0	2,366.5
Civil Aviation	123.1	2.5				125.6
Ports	289.0	228.5	275.5	233.5	109.0	1,135.5
Pipeline	<u>5.2</u>					<u>5.2</u>
Total Projects Carried Forward	1,312.5	1,192.0	1,193.5	936.8	698.3	5,332.8
2. <u>New Projects</u>						
Rail	80.0	170.0	250.0	250.0	240.0	990.0
Road	142.0	129.4	113.8	127.5	103.3	616.0
Civil Aviation	157.7	-200.3	322.5	15.5	7.4	302.8
Ports	<u>11.6</u>	<u>11.5</u>	<u>7.7</u>	<u>7.7</u>	<u>52.7</u>	<u>91.2</u>
Total New Projects	391.3	110.6	694.0	400.7	403.4	2,000.0
GRAND TOTAL	1,703.8	1,302.6	1,887.5	1,337.5	1,101.7	7,332.8
Funds Available						
Budget	1,498.0	1,512.0	1,527.0	1,543.0	1,558.0	7,638.0
Expenditures	1,017.0	1,027.0	1,037.0	1,048.0	1,058.0	5,187.0
Transport Sector Surplus or Deficit						
Alternative A	-534.0	-462.0	-302.0	15.0	294.0	-991.0
Alternative B	-869.0	-790.0	-644.0	-344.0	-83.0	-2,730.0
Alternative C	-1,023.0	-1,007.0	-818.0	-528.0	-275.0	-3,651.0

Source: Consultants' calculations.

Note: Alternative A - Unrestricted automobile imports.
 Alternative B - Automobile imports restricted to 50 percent of demand.
 Alternative C - Automobile imports restricted to 25 percent of demand.

Table 3.4

RECOMMENDED TRANSPORT SECTOR DEVELOPMENT PLAN,
1981-1985, BY PROJECT
 (1980 SP millions)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>
<u>1. Rail</u>						
General Establishment of the Syrian Railways (CFS)						
<u>A. Projects Carried Forward</u>						
. Lattakia-Aleppo- Al Mamishli line	80.0	50.0	30.0	10.0		170.0
. Mhine-Phosphate Mines line	40.0	20.0	10.0			70.0
. Akkari-Homs-Damascus line	120.0	120.0	100.0	80.0	50.0	470.0
. Aleppo-Homs line	120.0	150.0	100.0	60.0	20.0	450.0
. Deir Ez Zor- Albu Kamal line	-	10.0	100.0	150.0	150.0	410.0
. Signalling and Telecommunications	<u>50.0</u>	<u>40.0</u>	<u>40.0</u>			<u>130.0</u>
Subtotal	410.0	390.0	380.0	300.0	220.0	1,700.0
<u>B. New Projects</u>						
. Rolling Stock	<u>80.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>90.0</u>	<u>470.0</u>
Subtotal	80.0	100.0	100.0	100.0	90.0	470.0
Total General Establishment of the Syrian Railways (CFS)	490.0	490.0	480.0	400.0	310.0	2,170.0
General Establishment of the Hijaz Railway (CFH)	<u> </u>	<u>70.0</u>	<u>150.0</u>	<u>150.0</u>	<u>150.0</u>	<u>520.0</u>
Total Rail	490.0	560.0	630.0	550.0	460.0	2,690.0

Table 3.4 (Continued)

RECOMMENDED TRANSPORT SECTOR DEVELOPMENT PLAN,1981-1985, BY PROJECT

(1980 SP millions)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>
<u>2. Road</u>						
<u>Primary Network</u>						
<u>A. Projects Carried Forward</u>						
<u>1. Damascus-Aleppo Autostrad</u>						
Ma'loula-Homs 2nd Road	24.0					24.0
Aleppo-Saraqeb	13.0					13.0
Homs-Hama	12.0					12.0
Damascus-Ma'loula Jct.	11.0					11.0
Hama-Saraqeb, 2nd Road	37.0	37.0	37.0	37.0		148.0
Homs Bypass	9.0					9.0
Hama Bypass	2.2					2.2
Ma'loula-Homs Resurface	<u>17.0</u>	<u>13.0</u>	—	—		<u>30.0</u>
Subtotal	125.2	50.0	37.0	37.0		249.2
<u>2. Second Group Autostrad</u>						
Damascus-Jordan Border	34.0	78.0	78.0	101.0	45.0	336.0
Damascus-Lebanon Border	25.0					25.0
Tal-Kalakh Diversion	22.0	22.0	10.0			54.0
Akkari-Tartous	28.0	22.0	22.0	22.0	20.0	114.0
Tartous-Lattakia	11.0	39.0	67.0	67.0	92.0	276.0
Lattakia-Ariha	<u>28.0</u>	<u>61.0</u>	<u>90.0</u>	<u>100.0</u>	<u>142.0</u>	<u>421.0</u>
Subtotal	148.0	222.0	267.0	290.0	299.0	1,226.0
<u>3. Aleppo-Tal Kojak</u>						
Aleppo-Kara Kojak	15.0	22.0	28.0	34.0	17.0	118.0
Kara Kojak-Ain Issa	11.0	16.0				27.0
Kantari-Tal Tamer	17.0	22.0	10.0			49.0
Tal Tamer-Tal Alo	17.0	34.0	34.0	39.0	53.0	177.0
Tal Alo-Tal Kojak	<u>10.0</u>	—	—	—	—	<u>10.0</u>
Subtotal	72.0	94.0	72.0	73.0	70.0	381.0

Table 3.4 (Continued)

RECOMMENDED TRANSPORT SECTOR DEVELOPMENT PLAN,
1981-1985, BY PROJECT
 (1980 SP millions)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>
4. Other						
Jableh-Ain Sharkieh	11.0	22.0	17.0			50.0
Nasrieh-Qariatain-Phosphate	9.0	11.0	11.0	3.3		34.3
Damascus-Baghdad	7.0					7.0
Tadmur-Deir Ez Zor	17.0	17.0	11.0			45.0
Furqlos-Phosphate	6.0	9.0				15.0
Damascus Bypass	<u>90.0</u>	<u>146.0</u>	<u>123.0</u>			<u>359.0</u>
Total	140.0	205.0	162.0	3.3		510.3
Total Projects Carried Forward	485.2	571.0	538.0	403.3	369.0	2,366.5
<u>B. New Projects</u>						
5. Primary roads-betterment program	34.3	43.7	6.9	13.7	12.0	110.6
6. Secondary and tertiary roads-betterment program	32.7	23.6	45.8	52.7	49.0	203.8
7. Rural Roads	<u>75.0</u>	<u>62.1</u>	<u>61.1</u>	<u>61.1</u>	<u>42.3</u>	<u>301.6</u>
Total New Projects	142.0	129.4	113.8	127.5	103.3	616.0
Total Road	627.2	700.4	651.8	530.8	472.3	2,982.5

Table 3.4 (Continued)

RECOMMENDED TRANSPORT SECTOR DEVELOPMENT PLAN,
1981-1985, BY PROJECT
 (1980 SP millions)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>
<u>3. Civil Aviation</u>						
<u>Airports and Facilities</u>						
<u>A. Projects Carried Forward</u>						
. Complete Damascus Terminal	33.1					33.1
. Convert Terminal to Freight		1.0				1.0
. High level radar	<u>90.0</u>	<u>1.5</u>				<u>91.5</u>
Subtotal	123.1	2.5				129.6
<u>B. New Projects</u>						
. Damascus						
Update Master plan	0.8					0.8
Apron extension	6.0					6.0
3 bar VASIS	1.1					1.1
Terminal modification	5.0					5.0
ILS Category I	2.5					2.5
Approach/AFL lighting	2.7					2.7
Other		13.4				13.4
Contingencies	2.8	2.0				4.8
. Aleppo						
Master plan	0.8					0.8
Pavements	12.3					12.3
Terminal/tower	23.0					23.0
Fire and rescue	6.6					6.6
VASIS/Air Navigation		3.2				3.2
AFL		3.4				3.4
Other	2.3	2.3				4.6
Contingencies	6.8	1.3				8.1

Table 3.4 (Continued)

RECOMMENDED TRANSPORT SECTOR DEVELOPMENT PLAN,
1981-1985, BY PROJECTS
 (1980 SP millions)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>
<u>3. Civil Aviation (Cont'd)</u>						
<u>Airports and Facilities</u>						
<u>B. New Projects (Cont'd)</u>						
. Other Airports						
Master plan	0.6					0.6
Pavement	5.3					5.3
Terminal	9.5	9.5				19.0
VASIS/NAVIAD		5.4				5.4
Airfield lighting			7.1	7.1		14.2
Other		6.4	6.4	6.4	6.4	25.6
Contingencies	2.3	3.2	2.0	2.0	1.0	10.5
Total New Projects	<u>90.4</u>	<u>50.1</u>	<u>15.5</u>	<u>15.5</u>	<u>7.4</u>	<u>178.9</u>
Total Airport and Facilities	213.5	52.6	15.5	15.5	7.4	304.5
<u>Syrian Arab Airlines</u>						
New Projects						
. Domestic Aircraft	67.3					67.3
. International Aircraft		<u>-250.4</u>	<u>307.0</u>			<u>56.6</u>
Total Syrian Arab Airlines	<u>67.3</u>	<u>-250.4</u>	<u>307.0</u>			<u>123.9</u>
Total Civil Aviation	280.8	-197.8	322.5	15.5	7.4	428.4

Table 3.4 (Continued)

RECOMMENDED TRANSPORT SECTOR DEVELOPMENT PLAN,
1981-1985, BY PROJECT
 (1980 SP millions)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>
<u>4. Ports and Maritime Sector</u>						
<u>A. Projects Carried Forward</u>						
. Complete Tartous Port	123.0	107.0	99.0	101.0		430.0
. Enlarge Lattakia Port	143.0	99.0	154.0	110.0	109.0	615.0
. Complete Nucleus Fleet	22.5	22.5	22.5	22.5		90.0
. Sea wireless station	<u>0.5</u>					<u>0.5</u>
Total	289.0	228.5	275.5	233.5	109.0	1,135.5
<u>B. New Projects</u>						
. Tartous Port						
. Minor construction and equipment	4.2	4.2	3.8	3.8	3.8	19.8
. Lattakia Port						
Minor construction and equipment	7.4	7.3	3.9	3.9	3.9	26.4
Additional ships Syrian Navigation Company					22.5	22.5
Additional ships Syrian-Jordanian Navigation Company					<u>22.5</u>	<u>22.5</u>
Subtotal	<u>11.6</u>	<u>11.5</u>	<u>7.7</u>	<u>7.7</u>	<u>52.7</u>	<u>91.2</u>
Total Ports and Maritime Sector	300.6	240.0	283.2	241.2	161.7	1,226.7
<u>5. Pipelines</u>						
Projects carried forward						
. Homs-Adra line	<u>5.2</u>					<u>5.2</u>
Total Pipelines	5.2					5.2

Source: Consultants' calculations.

Table 3.3 also shows forecasts of budget availabilities for transport sector investments. (These forecasts are very tentative because basic budget data have not been made available to the Consultants.)

In summary, transport investment requirements total SP 7,333 million over the 5th Plan period, compared to an estimated total budget availability of SP 7,638 million and a total expenditure availability of SP 5,187 million. This would indicate that additional investment funds will have to be found or that some projects may have to be delayed. There is a problem with fund availabilities in the early years. This is due primarily to three factors: the peaking in the early years of carryover projects from the 4th Plan, the inclusion of most of the investment costs for an improved domestic air service in 1981, and the costs in 1981 for road betterment to correct existing deficiencies. Further study may indicate that the latter two items will need to be spread out over several years due to physical constraints on accomplishing the work in a single year.

The picture is similar with regard to the transport sector's ability to finance operations and maintenance, and investments over the 5th Plan period. Depending on the Government's policy with regard to automobile imports, the sector as a whole will require budget support varying from SP 1 billion to SP 3.8 billion over the period. At the same time, the sector would pay SP 1.4 billion in income taxes. Under a policy of unrestricted automobile imports, the sector would produce a slight surplus that could be used for other purposes.

The investment plan shown in Table 3.3 is for public sector investments. It does not include investments in the motor vehicle fleet required over the 5th Plan period, since these are largely private sector investments. The Consultants' estimates of motor vehicle fleet requirements total SP 8 billion in foreign exchange for the 1981-1985 period. Of this amount, SP 2.2 billion is for passenger cars alone.

5th Plan Priorities

For the 5th Plan period, the Consultants recommend the following order of priorities, for the reasons given:

1. Committed projects. (They comprise 72 percent of the total.)
2. Rail and port equipment needed to utilize existing and committed transport facilities.

3. Air navigation equipment required to bring the system up to agreed-upon international standards.

4. Two new primary road links that show a high economic rate of return. The links and rates are:

- Lattakia-Ariha	19.2
- Hama-Saraqeb	60.0

5. Road betterment program. Over a 40 year period, the road betterment program produces net present benefits that exceed net present costs by SP 3 billion.

6. New and improved rural access roads.

7. Domestic air service. If necessary infrastructure improvements at domestic airports are included, the net present value of costs for a domestic air service substantially exceeds benefits. The system as a whole can be justified on socio-political grounds only.

Probable Transport Investments 1986-2000

The Consultants' forecast of probable investment requirements for the transport sector for the period 1986-2000, by plan period, is summarized in Table 3.5.

Table 3.5

PROBABLE LONG-RUN TRANSPORT SECTOR INVESTMENTS, 1986-2000

(1979 SP millions)

	<u>1986-1990</u>	<u>1991-1995</u>	<u>1996-2000</u>	<u>Total</u>
<u>1. Rail</u>				
<u>A. Line Capacity</u>				
Improvements				
CFH	310			310
Damascus-Mhine		290		290
Mhine-Homs	130	128		141
Jibrine-Al Raqqa			38	38
Homs-Vodehi			20	20
Wadini-Lattakia			35	35
<u>B. Rolling Stock</u>	500	632	577	1,709
C. Other	<u>225</u>	<u>240</u>	<u>250</u>	<u>715</u>
Total Rail	1,048	1,290	920	3,258
<u>2. Road</u>				
A. Primary Network				
New Roads				
Hama-Al Salamieh-Al Raqqa			233	233
Aleppo Bypass		87		87
Tadmur-Albu Kamal			340	340
Betterment	153	274	383	810
<u>B. Secondary and Tertiary Network</u>				
New Paved Roads	38	38	38	114
Betterment	335	428	546	1,309
Rural Roads	<u>88</u>	<u>88</u>	<u>88</u>	<u>264</u>
Total Road	614	915	1,628	3,157

Table 3.5 (Continued)

PROBABLE LONG-RUN TRANSPORT SECTOR INVESTMENTS, 1986-2000

(1979 SP millions)

	<u>1986-1990</u>	<u>1991-1995</u>	<u>1996-2000</u>	<u>Total</u>
<u>3. Civil Aviation</u>				
<u>A. Airports</u>				
Damascus	111	79	79	257
Aleppo	33	33		66
Lattakia		8		8
Deir Ez Zor		<u>34</u>		<u>34</u>
Total Airports	144	142	79	365
<u>B. Syrian Arab Airlines</u>				
International Aircraft	314	314	314	942
Domestic Aircraft	<u>67</u>		<u>67</u>	<u>134</u>
Total Syrian Arab Airlines	<u>381</u>	<u>314</u>	<u>381</u>	<u>1,076</u>
Total Civil Aviation	525	456	460	1,441
<u>4. Ports and Maritime</u>				
Tartous	22	20	20	62
Lattakia	17	15	15	47
Additional ships	<u>226</u>	<u>226</u>	<u>226</u>	<u>678</u>
Total Ports and Maritime	265	261	261	787
<u>5. Pipeline</u>				
Homs-Adra Line		109		109
Homs-Al Raqqa Line		<u>105</u>		<u>105</u>
Total Pipelines		<u>214</u>		<u>214</u>
Grand Total	2,452	3,136	3,269	8,857

Source: Consultants' estimates.