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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

WEST PAKISTAN

APPRAISAL OF A SECOND HIGHWAY PROJECT

RETURN TO RECORDS CENTER ROOM GB-1 Box No. 269-23

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Projects Department

CURRENCY EQUIVALENTS

Unit of currency in use: Pakistan Rupee (Rs)

Official Exchange Rate

Rs	l(100 p ais a)	=	US\$ 0.21
Rs	4.76	=	US\$ 1.00
Rs	1 million	=	US\$ 210,000

Fiscal Year: July 1 to June 30

Units of Weights and Measures: British/US

British/US: Metric Equivalent

l mile	=	1.6. kilometers
1 foot	=	0.30 meters
l square mile	=	2.59 square kilometers
l ton	=	1.02 metric tons

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TABLE OF CONTENTS

			Page
	SUMMA	RY	i
1.	INTRO	DUCTION	l
2.	BACKG	ROUND	3
	A. B.	General The Transport Sector	3 3
3.	HIGHW	AY SECTOR	8
	A. B. C.	The Highway Network and Organization Vehicle Fleet and Traffic Volume Highway Financing	8 8 9
4.	THE P	ROJECT	11
	A. B. C. D. E. F. G. H.	Description Trunk Road Construction General Consultant Services Other Consultant Services Three-Year Maintenance Program Refunding of Credit S-1 PAK Execution Cost Estimate and Financing	11 12 13 13 15 16 17 18
5.	ECONO	MIC EVALUATION	21
	А. В. С.	Trunk Road Construction Consultant Studies Three-Year Maintenance Program	21 24 24
6.	CONCL	USIONS AND RECOMMENDATIONS	26

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Annexes

- I. Current Status of Highway Department
- II. Detailed Outline of General Consultant Services
- III. Population and Economic Activity in the Project Area

Tables

- 1. Commercial Vehicles "On Road"
- 2. Fuel Consumption by Road Vehicles in West Pakistan
- 3. Development of Paved Road Network
- 4. Provincial and Central Road Allocations
- 5. Vehicle Taxation
- 6. Revenues Collected Under Motor Vehicle Act and Fuel Taxes
- 7. Design Standards for Two-Lane Main Trunk Highways to be Constructed
- 8. Maintenance Equipment and Cost
- 9. Summary of Costs, Benefits and Rates of Return
- Chart Organization of the Highway Department

Map West Pakistan - Principal Roads and Railroads

APPRAISAL OF A SECOND HIGHWAY PROJECT

SUM1ARY

i. The Government of Pakistan has asked IDA to help finance a second highway project in West Pakistan. The highway project and studies being financed by Credit 54-PAK and the engineering studies by Credit S-1 PAK provide the basis for the proposed project. Performance under both credits is generally satisfactory.

ii. The second highway project consists of (a) construction of two trunk highways west from Lahore totalling about 170 miles: (b) consulting services (i) to provide continued assistance in reorganizing the Highway Department, (ii) to prepare a transport study for West Pakistan, and (iii) to study and partially design two trunk roads; and (c) a three-year maintenance program. The project is scheduled to commence in mid-1968 and to be completed by the end of 1971.

iii. IDA would finance the foreign exchange component estimated at US\$36.0 million equivalent out of a total project expenditure of about US\$76.0 million equivalent. These totals include US\$1.0 million for refunding Credit S-1 PAK. The local currency costs would be provided by the Government through its regular budgets.

iv. The estimated benefits of the two project roads to be constructed, primarily savings in vehicle operating costs, would yield an economic return of about 17 percent which is satisfactory. Benefits from other items of the project are important but are not readily quantifiable.

v. With the exception of the transport study which would be the responsibility of the Central Government, project responsibility would rest with the Highway Department of the Communications and Works Department assisted by consultants. After considerable delay in Government approval, a new functional organization for the Highway Department was adopted on October 1, 1967. Subsequent progress in its implementation has been satisfactory.

vi. The Government has indicated that it will sign a contract satisfactory to the Association for general consultant services prior to July 1, 1968. The signing of such a contract will be a condition of signing of the credit.

vii. A small amount of retroactive financing will be required as the credit will not be signed until after June 30, 1968.

viii. The project provides a suitable basis for an IDA credit of US\$36.0 million equivalent to the Government of Pakistan which would relend the proceeds to the Province of West Pakistan, with the exception of US\$0.50 million allocated to the transport study.

APPRAISAL OF A SECOND HIGHWAY PROJECT

1. INTRODUCTION

1.1 The Government of Pakistan has asked IDA to help finance a second highway project in West Pakistan. The project consists of: (1) construction of two trunk highways west from Lahore totalling about 170 miles; (2) consulting services (a) to continue assistance in reorganizing the Highway Department, (b) to prepare a transport study for West Pakistan, (c) to study and partially design two trunk roads; and (3) a three-year maintenance program.

1.2 The World Bank Group has been in contact with the problems and needs of roads and road transport in West Pakistan since 1961. Several years were required to prepare a project. Credit 54-PAK (Appraisal Report No. TO-406b) signed in June 1964, provided US\$17 million for the final engineering and construction of a new 89-mile highway between Karachi and Hyderabad; the review of design and supervision of construction for three major river bridges; the employment of general consultants for a threeyear period to advise and assist the Highway Department of matters of organization and operation; and consulting engineers to carry out feasibility studies of access to Karachi and Hyderabad. The quality of work performed under this credit is considered satisfactory and the total foreign exchange cost of the work is currently estimated at slightly under the US\$17 million credit.

1.3 Frederick R. Harris, Inc. (US) was selected in early 1965 for design and field supervision of construction on the Karachi-Hyderabad road. A construction contract was let to Cogefar-Astaldi (Italy) after international competitive bidding and work started in April 1967. Work is approximately 25 percent complete and the project is expected to be opened to traffic in November 1969, prior to the Credit closing date. The three new bridges are expected to be opened to traffic in June 1968, essentially on schedule.

1.4 Work of the general consultant, Howard, Needles, Tammen and Bergendoff (US) has been generally satisfactory (see Annex I) but accomplishments fell short of original expectations. The original schedule allowed one year for the general consultant to prepare a report on Highway Department reorganization and two years to assist in the implementation of recommendations. The report was issued on time but two years were required for Government consideration and approval. This delayed all other assignments of the general consultant particularly in establishing new sections and in training programs. Also the outbreak of hostilities between Pakistan and India in September 1965 seriously disrupted the general consultant's work.

1.5 Credit S-1 PAK (Appraisal Report No. TO-499a) signed in August 1966, provides US\$1 million for the detailed engineering of an 83-mile highway from Lahore through Sheikhupura to Lyallpur and a 109-mile highway from Sheikhupura to Khushab. The quality of work is satisfactory and the current estimate of the foreign exchange cost is within the credit amount. Sir William Halcrow and Partners (UK), in association with Incorporated Consulting Engineers (Pakistan), were selected as design consultants for the Lahore-Lyallpur road, and Pacific Consultants (Japan), in association with Zafar and Associates (Pakistan), for the Sheikhupura-Khushab road. Final design of the two roads has been completed. Plans for two major river bridges on the Sheikhupura-Khushab road, being prepared by the Bridge Directorate, are essentially complete, and Pacific Consultants have been asked to submit a priced proposal for plan review and construction supervision.

1.6 Credit 81-PAK (January 1966) provided US\$25 million for the import of heavy vehicle chassis components for assembly in Pakistan. Almost all assembly and delivery within Pakistan has been completed and the Credit has been fully disbursed.

1.7 In addition to the highway credits mentioned above, the Bank/IDA has provided eight other loans/credits for transportation facilities in West Pakistan. Two loans have been for ports and five loans and one credit have been for railroads.

1.8 This appraisal report is based on the findings of an IDA appraisal mission, consisting of Messrs. Young and Kaden (Engineers) and Mr. Roth (Economist), which visited West Pakistan in March, 1968.

2. BACKGROUND

A. General

2.1 The Province of West Pakistan covers a land area of about 310,000 square miles, one and a half times that of France. It consists mainly of a flat plain stretching from the foothills of the Himalayas in the northeast to the Arabian Sea in the southwest. Annual rainfall varies from 5 inches in the south to 30 inches in the north. The main inhabited area lies in the center and north of the Province. It is crossed by five great rivers, the Indus, Jhelum, Chenab, Ravi and Sutlej, which, after their confluence, flow as the Indus southwestwards to the sea. These rivers annually overflow their banks and the resulting floods cause serious interruptions to transport.

2.2 The Province has a population of about 54 million people, 75 percent of whom live in rural areas. Some 50 percent of the 13.5 million urban dwellers live in the five principal cities of Rawalpindi, Karachi, Hyderabad, Lahore and Lyallpur. The population is believed to be increasing at the rate of 2.6 to 3.0 percent per year, the growth in urban areas increasing at an above average rate because of migration from the countryside and the settlement of refugees.

2.3 West Pakistan's economy is primarily rural, with about half of the gross domestic product arising out of agriculture, fishing and forestry. Transport and communications account for 6.4 percent of gross domestic product. The main industries are centered in or around Karachi, Hyderabad, Multan, Lyallpur and Lahore and comprise cotton textiles, cement, sugar, chemical fertilizers and leather goods.

2.4 Average annual income per head in West Pakistan is estimated at about US\$120 in 1966/1967. Gross national product is increasing at a rate of 4.7 percent per year but in view of the population increase, the growth in GNP per head is between 1.5 to 2 percent per year. The economic situation in Pakistan has been reviewed extensively in recent Bank reports, the latest of which is Report No. AS-136, "Current Economic Position and Prospects of Pakistan," dated April 17, 1968.

B. The Transport Sector

a. General Survey

2.5 All transport modes, ranging from camel train to jet aircraft, are represented in West Pakistan. The main traffic flows converge on the thickly populated area in the northeast centered on Lahore. This area generates flows southwest to the port and industrial area of Karachi; west to the industrial and agricultural areas around Lyallpur, Sargodha, and Khushab; and northwest to the administrative centers in Rawalpindi and Islamabad, and to Peshawar and the Afghan border beyond. All these main routes are served by rail, road, and air transport. 2.6 The Pakistan Western Railways (PWR) are Government-owned and operated, and constitute one of the largest and most important organizations in the Province. For many years the railways provided the main means of mechanized transport; recently an increasing proportion of transport has been carried by road, and railway traffic has shown little overall growth.

2.7 Transport by road is provided by a wide variety of means. Animaldrawn traffic is widely used, particularly in agricultural areas. Motorized transport has doubled in the last ten years. Bus services are provided both by private and by Government-owned firms: the carriage of goods is almost entirely in private hands. Standards of both vehicles and roads are below those generally accepted in many developing countries.

2.8 Air transport is provided by the Government-owned Pakistan International Airlines (PIA) which operates services between twenty points in West Pakistan. The number of passengers carried within the Province rose from 198,000 in 1962/1963 to about 324,000 in 1966/1967, an average annual growth rate of 13.1 percent. Load factors and efficiency are high by any standard. PIA operates profitably.

b. The Railways

2.9 PWR have about 5,335 route miles of railway line, 87 percent of which are broad gauge. Since 1964/1965 the railways' passenger and freight traffic have remained virtually stable at about 5,000 million ton-miles and 6,000 million passenger-miles respectively. In 1967/1968 there is evidence of a decline in railway traffic. It is not clear to what extent this is due to a drop in demand or to a lack of carrying capacity, as rail users complain of having to wait up to six weeks for wagons.

2.10 Excessive emphasis is given by PWR to carrying passengers, at the expense of freight, at fares that make an inadequate contribution to revnues. As the average length of passenger journeys is under 50 miles, many journeys made by train might well be better suited to bus operation. It is therefore probable that the improvement of the roads in West Pakistan and the provision of more buses could do much to improve operations of the FWR by relieving it of some uneconomic passenger traffic.

2.11 PWR is making a major contribution to Pakistan's economic development. This contribution could be enhanced further if PWR concentrated on the transport of long distance bulk commodities, for which it has an advantage over road transport, and if it gave a lower priority to passenger services, where it operates at a disadvantage.

c. Road Transport

2.12 Reliable data are lacking on the road transport industry in West Pakistan. The latest available figures on the vehicle population (Table 1) together with figures of fuel consumption (Table 2) suggest that the use of mechanized transport is increasing at the rate of 10 to 15 percent each year. No adequate statistics are available on the commodities carried, the length of journey, or the size of transport firms. The transport of goods is entirely in private hands. Most of the haulage firms are very small units, typically operating three vehicles or less. It is likely that about 4,000 million ton-miles a year are trucked in West Pakistan, compared with the 5,000 million ton-miles carried by rail.

2.13 The trucking industry is still expanding, although not as quickly as in the period 1960-1967. The slowdown was associated with the requirement. that truck imports be paid for by means of "Bonus Vouchers," i.e., at a rate of exchange equivalent to about Rs. 13 to the dollar. The new import requirement followed the termination of commercial vehicle imports under IDA Credit 81-PAK, which enabled the road transport industry to purchase some 8,000 trucks and buses on favorable terms in 1966-1967. Under the new policy the price of a Bedford 7-ton truck rose from Rs. 32,000 payable under the IDA Credit to Rs. 50,000. At this price local assembly plants are working below capacity. The exchange rate used for commercial vehicle imports is an important element in transport coordination policy; but the subject has much broader implications. The Government has agreed that this matter will be included in the terms of reference of the proposed transport study of West Pakistan (para. 2.24).

2.14 Permits to use trucks for haulage are obtainable without difficulty and the licensing procedure does not interfere with the freedom of carriage; on the contrary, there is evidence that regulations limiting drivers' hours and axle weights are disregarded and that higher enforcement standards are required.

2.15 Bus services are provided both by the Government-owned Road Transport Corporation and by private firms. Total passenger mileage is about 6,400 million passenger-miles a year, which is almost equal to the output of the railways. In contrast to goods haulage, passenger transport is restricted by a licensing system that leaves much to be desired. Preference is given to Government-owned buses over privately owned ones. Furthermore, the scarcity of private bus permits is such that many are obtained for hiring to other bus operators. There is an urgent need to take a fresh look at the bus licensing system to determine the purpose (if any) of restriction and the best way of allocating permits. The Government has agreed to include the question of bus licensing in the terms of reference of the proposed transport study of West Pakistan (para. 2.24).

2.16 Bus fares are also determined by the Provincial licensing authorities and are currently fixed at a level of 3 paisa a mile. These rates appear to be acceptable to operators outside the urban areas though they probably contribute to the overcrowding and poor traveling conditions offered to bus passengers, and to the slow growth of the bus industry. In Karachi the official fare of 3 paisa is not high enough to cover the costs of the service and many buses have recently been withdrawn from the city.

2.17 There is evidence that the bus population is growing at about one third the rate of the truck population (para. 3.5), and that the fastest growing classes of traffic are the motorized cycles and rickshaws. As buses are heavily loaded, these figures suggest that the restrictions on bus operation encourage the growth of light motorized personal transport. One effect of this shift from public to private transport is an increase in the total number of vehicles, and, consequently, in the requirements for road space.

d. Transport Coordination

2.18 The authorities have not yet developed a consistent policy towards the problems of transport coordination. In general, government measures tend to favor the railways, which are allowed to import their requirements at preferential rates and which have access to cheap capital. Free competition is allowed between trucks, but not between buses.

2.19 Decisions about the allocation of investment funds to transport are made at two levels, first in the Planning Commission of the Central Government and secondly at the Provincial level. Control at the Center depends on the fact that all schemes costing more than Rs. 5 million, and all projects in the Five-Year Plan, must be approved by the National Economic Committee. However, the total number of projects approved is greater than can be financed by the present Plan, so that in practice the important question is which of the approved schemes are to receive priority. In the road and rail sectors, these decisions are made at Provincial level.

2.20 Allocations within the Provincial budget are determined by the Provincial Department of Planning and Development, which is therefore the organization primarily concerned with the coordination of transport investment. The importance of transport coordination is appreciated in the Department, but its effectiveness is limited by the extent of its authority and lack of information.

2.21 The authority of the Department extends only to "Provincial" subjects. Ports and civil aviation, as well as postal, telegraph and telephone services, are all "Central" subjects over which the Provincial Department has no authority. Furthermore, in road and rail transport its concern is mainly with public sector investments. It is not officially concerned with the licensing of commercial vehicles (which is the responsibility of the Provincial Transport Department) nor with the pricing policy or profitability of the railways. The railways are supervised by the (Provincial) Railways Ministry and there is no single Minister or Department responsible for looking at transport as a whole.

2.22 A Transport Planning Cell was set up in 1967 to supply the Planning and Development Department with the necessary expertise and data. The key people in the Cell are a transport planning expert of the Harvard Advisory Group and a Pakistani transport economist. An expatriate transport economist is to join the group under the auspices of the United Nations. The USAID has provided US\$100,000 for basic research. Investigations carried out by the Cell so far include a sample survey of commercial vehicles; a study of the economic base of the Province for the assessment of long term transport demand; a study of vehicle operating costs; and a study of the costs of the road system and of motor taxation revenues.

2.23 The Transport Planning Cell has started to do useful work that provides a foundation for sound transport planning. Its long term success, however, is dependent on its recruitment of permanent high-level Fakistani avail capable of persuading the various Departments to adopt proper policies for transport matters, since, as noted in paragraph 2.21 a number of important subjects are outside its direct authority.

2.24 The Government of Pakistan has proposed a major transport survey for both provinces to review and update previous studies, to collect further data as required and to make recommendations for the future development of transport. Such a study could provide the basis for effective transport coordination, especially if it were oriented to policy issues such as import policies for road and rail transport equipment (para. 2.13), the licensing of bus services (para. 2.15); and the financing of highways (para. 3.12). Since such a study would have considerable bearing on future Bank/IDA lending in the transportation sector in West Pakistan, it is included in the Project but will not be financed under this Credit if the cost can be met from another source. The Government has agreed to expedite the study.

3. HIGHWAY SECTOR

A. The Highway Network and Organization

3.1 The length of West Pakistan's road system is about 30,000 miles, excluding roads under municipal and tribal state authorities. The Highway Department, under the Communication and Works (C & W) Department, administers the more important roads - about 10,000 miles of paved roads (Table 3) and about 8,000 miles of shingled or brick surfaced roads (Map). The remaining 12,000 miles of mainly earth roads are under the jurisdiction of the Department of Basic Democracies. The density of the network is generally adequate, but its quality is poor.

3.2 The road system was largely developed in pre-Independence days by connecting population centers with a network of low standard, low cost roads many of which, despite surfacing and minor improvements, are inadequate for modern motor traffic. The magnitude and nature of the improvement and maintenance tasks facing West Pakistan would tax the capacity of any highway organization. As in many developing countries, road improvement and maintenance have been poor.

3.3 In recognition of these problems the Government adopted a new Highway Department organization on October 1, 1967. The principal problems to be overcome, progress made to date and a summary of further objectives for all sections of the new Department are presented in Annex I.

B. Vehicle Fleet and Traffic Volume

3.4 Published data about the number of motor vehicles in Pakistan are misleading, and may exaggerate the size of the vehicle population by as much as 50 percent. The corrected estimates of commercial vehicles on the road for the years 1960/61 to 1965/66 are shown in Table 1.

3.5 During this six-year period the bus and truck population grew at rates of 3 percent and 9 percent per year respectively. The growth of the bus population may have been inhibited by the restrictive licensing policy and by the control of bus fares. The growth rates in 1966 and 1967 were stimulated by vehicles provided under Credit ∂I -PAK (para. 1.6).

3.6 Estimates of the car population in 1965/66 vary from 47,000 to 99,000. The former figure is probably nearer the truth. It is not feasible to estimate directly the growth rate of the private car population. Other indications of growth rate may be obtained from the rate of increase in fuel consumption (Table 2). In the period 1962-1966 it was 11 percent per year for the whole Province. A major oil company expects Provincial fuel consumption to increase at about 12 percent per year between 1966 and 1970. The Pakistan Industrial Credit and Investment Corporation (PICIC) expects the growth of passenger traffic to average 10 percent per year between 1965 and 1970, and the growth of freight traffic to average 15 percent a year. Increases of this magnitude are not out of line with experience in other countries. In general it appears that motorized traffic is growing at a rate of about 10 percent p.a., in West Pakistan as a whole, but at a considerably higher rate in the project area (para. 5.7). The above figures take no account of animal drawn traffic. This appears to be declining, but it still takes up a considerable proportion of road capacity.

C. Highway Financing

3.7 Main highways in West Pakistan are financed from three sources: (a) funds voted from the Provincial budget and allocated to the Highway Department, (b) funds received from the Central Government, and (c) receipts from tolls.

3.8 The allocations from Provincial funds for the years 1963/64 to 1966/67 are shown in Table 4. Specific allocations are made for administration, maintenance and construction. The allocation for maintenance is based on road type and mileage and is distributed within the Province to the regional offices on a similar basis. The Director General allocates the funds for new construction, subject to the approval of the Department of Planning and Development of major schemes.

3.9 The allocations from Central funds for the years 1965/66 and 1966/67 are also shown in Table 4. The payments from the Center are made out of the Central Road Fund which was created in 1949. The Fund is financed out of a proportion of customs and excise duties on petrol (other than aviation) calculated at the rate of 31 paisa per gallon. 85 percent of the collections so made are distributed to the Provinces of which 75 percent goes to West Pakistan (which contributes about 85 percent of the revenues) and 25 percent to the East. The remaining 15 percent is kept to meet the costs of the Central Road Organization which administers the Fund and for surveys and research. Funds may also be allocated to the Provinces as special grants for selected works.

3.10 Tolls on bridges and ferries have a long history in the sub-continent. Most were abolished after the establishment of Pakistan but were reimposed in 1959 on new bridges, boat bridges and on "hill roads used by wellto-do people."

3.11 The Government enacted enabling laws in 1962 and decided in principle that all new limited access highways should be toll facilities. It is proposed to use private firms, to be selected by public tender, to collect the tolls. While there may be a case for collecting tolls at river crossings which offer exceptional benefits to users, and where opportunities for avoidance are few, the case for charging tolls on new highways is not clear. The imposition of tolls would tend to discourage the use of the new roads and would encourage motor traffic to remain on the old ones. The Government proposes to prohibit the use of alternative roads by regulation, but no scheme for this has yet been prepared and the enforcement problems appear to be considerable.

3.12 Toll revenues are intended to provide a direct source of funds to the Highway Department, and it is presumably for this reason that the Department favors toll financing. However, the same amounts could (if necessary) be raised by a surcharge on motor fuel. This would not discriminate against the users of new roads. In their original economic and engineering feasibility report on the Lahore-Lyallpur and Lahore-Sargodha-Khushab Roads, the consultants, Louis Berger Inc. (US), recommended that neither road should be subject to toll collection.

3.13 The Government has agreed to include the subject of road tolls for study in the terms of reference for the proposed transport study of West Pakistan (para. 2.24), and that the level of tolls, if any, will be determined after consultation with the Association in the light of the survey's recommendations.

3.14 The main charges payable by road users are shown in Table 5. Total revenues collected in West Pakistan under the Motor Vehicle Act and from fuel taxes are shown in Table 6. Revenues from these sources for 1966/67, net of contributions to the Central Road Fund, were Rs. 412.1 million, and allocations to the Highway Department for the same year were Rs. 201.7 million. It is apparent that payments by road users, even at present traffic levels, substantially exceed the expenditure on the road system in West Pakistan, and would exceed it even if all imported items (including fuel) were priced at a reasonable "shadow" exchange rate.

4. THE PROJECT

A. Description

- 4.1 The proposed project consists of the following (see Map):
 - a. Trunk Road Construction
 - A two-lane road from the new Ravi River bridge at Lahore to Lyallpur via Sheikhupura (about 80 miles) including a link road (about 8 miles) to the center of the city of Lyallpur and in additon, an access road (about 2 miles) to Shahkot.
 - (2) A two-lane road from the above new highway at Sheikhupura to the vicinity of Sargodha together with a connecting link to Sargodha (about 90 miles) and including a major bridge across the Chenab River.
 - b. General Consultant Services

To assist the Highway Department in continuing reorganization and training for a three-year period.

- c. Other Consultant Services
 - (1) To prepare a transport coordination study for West Pakistan.
 - (2) To update the feasibility studies for the main trunk road between Hyderabad and Multan (about 500 miles) and prepare detailed design for construction of high priority sections totaling about 250 miles.
 - (3) To prepare a feasibility study including preliminary engineering for the main trunk road between Lahore and Rawalpindi (about 200 miles).
- d. <u>A Three-year Maintenance Program</u>
 - (1) To establish proper maintenance for the new Karachi-Hyderabad Highway.
 - (2) To improve workshop facilities in three regions.
 - (3) To introduce in the Central Region a pilot maintenance scheme for the betterment and routine maintenance of roads to modern standards.
- e. The Refunding of the Highway Engineering Project under Credit S-1 PAK.

B. Trunk Road Construction

4.2 The existing roads from Lahore to Lyallpur and the road from Lahore to Sargodha were built to low standards. Pavement and shoulders are inadequate in width and strength and the low profile and infrequent drainage structures allow periodic flooding of some sections. Preliminary engineering and feasibility studies were prepared for both project roads in 1964. Under Credit S-1 PAK these studies have been updated and final designs have been completed (see para. 1.5). Some nominal changes in the bidding documents will be required due to changes in the project scope (paras. 4.6 and 4.8).

4.3 Standards used for design are listed in Table 7. For both roads the design provides two 12-ft lanes for motorized traffic (except motorized rickshaws) and a separate road for animal, cart and local motor traffic which is provided by the existing road along most of the length of the new highways. The Government plans to limit access and grade crossings will be permitted only at designated points with grade separations via bridges or culverts provided where warranted by cross traffic. The Government's view was that tolls would be collected on both roads (para. 3.11), and the designs include toll stations at suitable intervals. The added cost to the project for these toll facilities would be negligible.

4.4 Right-of-way plans for both roads are complete and the Government has started the acquisition program. They have given assurance that all right-of-way will be acquired before January, 1969, which is about 3 months in advance of the probable start of construction.

Lahore-Lyallpur Road (Map)

4.5 The project alignment traverses flat or very gently rolling agricultural land. Some water-logged areas and numerous irrigation canals are crossed and there is seasonal flooding in the area of Ravi River near Lahore. The design profile maintains the pavement above known flood levels and sufficient flood relief and other drainage structures are provided to prevent damage to the embankment. Departures from the existing road alignment are required to avoid built-up areas, to meet prescribed design standards and to avoid areas of expensive embankment and drainage construction.

4.6 An analysis of traffic growth and road capacity for the road section between Lahore and Sheikhupura shows that the capacity of two lanes would not be reached before 1976, four years after the project is opened to traffic. Therefore, initial construction of only two lanes is economically justified for this section. The project is planned for ultimate expansion to six lanes from Lahore to Sheikhupura and to four lanes from Sheikhupura to Lyallpur when justified by traffic increases, and sufficient right-of-way for such expansion will be included in initial acquisition.

Sheikhupura-Sargodha Road (Map)

4.7 The alignment for this road closely follows the existing road with some deviation to provide good alignment and to bypass built-up areas. The route passes through flat to gently rolling land devoted primarily to farming.

Areas adjacent to the main rivers are subject to seasonal flooding but only a few waterlogged areas are encountered. The design profile maintains adequate freeboard above known flood levels.

4.8 Final designs were prepared under Credit S-1 PAK for the route from Sheikhupura to Khushab which is economically and technically justified. However, the amount budgeted by the Association for this Credit is not sufficient to build the full length in addition to the other items proposed for the project. After consultation with the Government it was decided to build the road only to Sargodha at this time with a link road connecting it to the center of the city. As only 10 percent of the traffic assigned to the Sheikhupura-Sargodha section has an origin or destination beyond Sargodha, initial construction of only that section will provide a completely viable facility. The present road between Sargodha and Khushab can serve expected traffic for a few more years if some improvements are made to the road and to the rail/ highway bridge over the Jhelum River at Khushab. Reconstruction of this road is considered a much needed improvement, and it should be considered as of high priority in Pakistan's next highway program.

C. General Consultant Services

4.9 The Government is negotiating a new three-year contract with Howard, Needles, Tammen and Bergendoff (U.S.) to continue the services provided for the past three and a half years. The general consultant's contract includes a sub-contract with Booz, Allen& Hamilton Incorporated (U.S.) to provide management advice on the organization and operation of the Highway Department. A local firm of management consultants would also be retained under a subcontract to augment the staff of the management consultants.

4.10 The Government, working with the general consultant, has developed a program of goals to be accomplished in the next three years. These are for improvements in administration, planning, design, construction and maintenance of highways and form the basis for the scope of services for the new contract. They are considered realistic and necessary and take full advantage of past efforts. The emphasis will be on training; principally by work on actual projects, with the general consultant acting in an advisory capacity. The services to be provided are outlined in detail in Annex II and contain two items on which assurance from the Government has been obtained. These are (a) assurance that certain improvements in the organization of the Highway Department will be accomplished within the time limits agreed upon; and (b) assurance that facilities will be established and maintained to collect and record traffic and other data.

D. Other Consultant Services

Transport Coordination Study

4.11 As discussed in paras. 2.18 - 2.24, there is a need for improved transport coordination in West Pakistan and accordingly, a coordination study is included in the project. The purpose of this study is to provide the

Government with recommendations for the formulation of policies and programs to coordinate and develop the various modes of transport in West Pakistan in the most efficient manner.

4.12 The study will include a broad analysis of (a) present and anticipated demand for transport; (b) the economic and financial costs involved in the use of the different transport modes; (c) the appropriate technical and economic criteria for investment decisions; and (d) policies for the taxation. regulation and organization of the transport sector. The study will take into account existing studies, investment plans and policies and assess the effects of its recommendations on them. It will not involve the preparation of detailed investment programs for transport development but will indicate the broad investment (including foreign exchange) requirements through 1975 that follow from the recommendations.

Studies and Engineering for the Main Trunk Road, Hyderabad-Multan

4.13 The main trunk road Karachi-Hyderabad-Multan-Lahore-Rawalpindi-Peshawar-Torkham (Afghan border) forms the backbone of the West Pakistan road network (see Map). USAID assisted in financing the feasibility studies of the road section between Karachi and Lahore, and followed with detailed engineering and consideration of construction between Multan and Lahore. Th project of Credit 54-PAK (see para. 1.3) included detailed design and construction of the Karachi-Hyderabad section. The road sections between Hyderabad and Multan, about 510 miles in length, require immediate consideration for improvement. For example, on the 270 miles between Hyderabad and Reti, about 190 miles have only one lane (12 ft) paved, and not more than about 4 miles have an adequate two-lane width (22-24 ft) of pavement.

4.14 Traffic volumes obtained in 1967 at various counting stations showed ADT volumes ranging from 500 to 1200 vehicles, indicating an annual traffic growth of 12 to 20 percent since 1963.

4.15 The proposed alignment for a new highway between Hyderabad and Multan would be about 470 miles in length and would shorten the existing route by about 40 miles. Due to its length and cost, construction of a new highway should be undertaken in two stages. The proposed project therefore includes (a) updating earlier feasibility studies and the selection of priorities of sections for early detailed design; and (b) preparing detailed design for construction of high priority sections totaling about 250 miles. The general consultant will assist the Department in preparing outline plans for short term improvements for the remaining low priority sections.

4.16 Due to the shortage in trained personnel, the Highway Department will need to engage consultants to carry out the studies and the engineering work and such services are included in the proposed project.

Studies for the Main Trunk Road, Lahore-Rawalpindi

4.17 Needed improvements for the trunk road north from Lahore to Rawalpindi should be studied. Traffic counts in 1967 on various sections of the road showed ADT volumes of 2000 to 3000 vehicles with over 50 percent commercial vehicles. The Project includes preparation of a feasibility study including preliminary engineering for the section between Lahore and Rawalpindi (about 200 miles) where detailed design and subsequently construction should follow soon.

E. Three-year Maintenance Program

4.18 The project includes a three-year highway maintenance program (a) to establish proper maintenance for the Karachi-Hyderabad Highway; (b) to improve workshop facilities in the Central, Eastern and Southern Regions; and (c) to introduce in the Central Region a pilot scheme for the betterment and routine maintenance of roads to modern standards.

4.19 The three-year program would be the first stage of a more comprehensive and long-term maintenance program to cover all roads administered by the Highway Department. The general consultant will assist the Department to implement the maintenance program, in particular (a) to improve the organization and management including detailed records of all maintenance costs (see Annex II): (b) to train Department personnel; (c) to select types and numbers of various kinds of equipment, vehicles, spare parts and tools for procurement; (d) to prepare bidding documents for these procurements and to select the most favorable bids; (e) to install workshop equipment and to assign mobile equipment for suitable field operation; and (f) to demonstrate in the workshop and in the field a modern standard of performance. The program was discussed and agreed upon with the Government.

1. Maintenance of the new Karachi-Hyderabad Highway

4.20 The new highway between Karachi and Hyderabad financed under Credit 54-PAK, will be open for traffic at the end of 1969. There is a shortage of suitable maintenance equipment in West Pakistan and the project, therefore, includes the equipment required for the maintenance of this new highway.

4.21. Not all the equipment will be continuously engaged in the maintenance of the Karachi-Hyderabad Highway and part of the time it would be used for maintenance of other roads in the region. The equipment would arrive in late 1969 when the construction work is scheduled to be completed. The project cost includes only the acquisition of the equipment. It does not include the recurrent expenditures for maintaining the highway; these would be provided under the original assurance given by the Government to the Association that the highway would be properly maintained. The Government has given assurance that the Karachi-Hyderabad Highway will receive first priority on the use of this maintenance equipment.

2. Improvement of Workshops

4.22 Existing maintenance equipment is under-utilized because the workshop repair facilities and stocks of spare parts are inadequate. The project provides for procurement of workshop equipment and tools to properly equip three regional workshops and eight divisional shops located along the main traffic artery (Karachi-Hyderabad-Multan-Lahore-Rawalpindi) of West Pakistan, as well as in the area of the new highways included in the project for construction (see Map). It is estimated that US\$200,000 would be required to completely equip the three regional workshops and US\$80,000 to equip eight divisional shops.

4.23 Usable existing maintenance equipment has an at-cost value of about US\$3 million equivalent according to the general consultant's preliminary assessment. It is important that this existing equipment be kept in good operational condition and the project provides for the procurement of spare parts for repairing and maintaining the equipment assigned to the above three regional workshops. The project cost includes only the acquisition of the spare parts and not the recurrent expenditures for operating the workshops and installing the parts. The Government has given assurance that it will provide adequate workshop and warehouse space for the goods procured under the project.

3. <u>Pilot Maintenance Scheme for Betterment and Routine Maintenance</u> of Roads

4.24 The pilot maintenancescheme would demonstrate the performance of all principal operations in road maintenance as it is applicable to most of the existing paved roads in West Pakistan. The pilot scheme can be carried out most effectively in the Central Region (Lahore) where it can be closely supervised by the Highway Department and the general consultant. The first stage of the scheme would utilize existing equipment and the results will determine the subsequent scheduling of additional equipment to be purchased. This equipment will be imported on a staggered schedule, and IDA approval of the delivery of each order will be contingent on the ability of the maintenance organization to use it effectively.

4.25 The project includes several sets of equipment necessary to improve roads to acceptable standards and to provide routine maintenance. The various sets are listed in Table 8 with estimated project costs.

F. Refunding of Credit S-1 PAK

4.26 The engineering project financed by Credit S-1 PAK is virtually completed, and has provided the design and cost estimates on which the construction work of this project is based. It is proposed to refund Credit S-1 PAK of US\$ 1.0 million equivalent under the present project.

G. Execution

4.27 The Highway Department of the C & W Department, Government of West Pakistan, assisted by the general consultant will be responsible for the execution of the project except for the transport study which will be the responsibility of the Central Government. The services of the general consultant will be required for a three-year period commencing July 1, 1968. A priced contract, including subcontracts with management consultants, is being negotiated between the Highway Department and Howard, Needles, Tammen and Bergendoff (U.S.). The Government has indicated that it will complete these negotiations and intends to sign a contract for these consultant's services satisfactory to the Association prior to July 1, 1968. The signing of the contract with the above consulting firm (or another one acceptable to the Association) will be a condition of signing of the credit.

4.28 Construction will be by contractors under unit price contracts to be awarded on the basis of international competitive bidding in accordance with procedures satisfactory to the Association. The two highways have been divided in two sections each, in addition to the one river bridge, for the purpose of bidding. Prequalified contractors will be invited to submit bids for all five contracts simultaneously, and bidding would be permitted either for each individual contract or for any combination. The road construction work will be supervised by the consultants who prepared the designs and the bridge construction will be supervised by the consultant who reviewed the design prepared by the Highway Department. It is estimated that the contracts for construction will be awarded by about March 1969 and work completed in about 30 months, by late 1971.

4.29 Preliminary right-of-way plans for the roads and the major bridge to be constructed under the project have been submitted by the design consultants. The Government has given assurance that all right-of-way will be acquired by January, 1969.

^{4.30} The consulting services required for studies and design work will be arranged on terms and conditions satisfactory to the Association. The Government, assisted by the Highway Department, the general consultant and other advisors, will prepare the terms of reference and draft contracts in 1968, and it is estimated that by mid 1971 these consultants' assignments will be completed.

4.31 With the two exceptions noted below, all equipment and vehicles will be procured on the basis of international competitive bidding. The two exceptions are: the US\$150,000 in spare parts for existing equipment provided under the three-year maintenance program for which no other external financing is available; and the US\$50,000 in office and engineering equipment provided in the general consultant's contract which is of a specialized nature or supplementary to present equipment and must be ordered from specific or limited sources. Delivery of goods should start in early 1969 and continue until about late 1970. 4.32 The Government has confirmed the proposed procurement procedure and time schedule mentioned above for the project items.

H. Cost Estimate and Financing

4.33 Cost estimates for construction works included in the project are based on unit prices of similar contracts under execution or recently completed, and on detailed engineering being completed by consultants. The costs of consultants' services are based on priced offers or estimates prepared by consultants. All cost estimates were confirmed by the Government and reviewed by the Association.

4.34 The foreign currency component of the highway construction cost is estimated by IDA at 53 percent on the basis of analyses made by consultants. The foreign exchange component for construction of the major bridge is 33 percent. The foreign exchange cost of consulting services is estimated at percentages ranging from 45 to 75 percent; the wide range results from the variety of services to be provided and the higher values are for work on which more expatriates will be required.

4.35 A 10 percent contingency allowance has been provided for possible increase in estimated physical quantities during construction and for unforeseen requirements of engineering work. A price escalation contingency of 5 percent is deemed adequate over the expected 30 months of the construction work and a 10 percent escalation contingency is allowed for the equipment.

4.36 The estimated project cost and the foreign currency component are as follows:

	(US\$	Million Equivale	ent)
	Local	Foreign	Total
Trunk Road Construction			
Lahore-Lyallpur Road Sheikhupura-Sargodha Road Chenab River Bridge Construction Supervision Contingencies	$ \begin{array}{r} 13.12 \underline{1} \\ 11.27 \underline{1} \\ 3.94 \\ 1.39 \\ \underline{4.32} \end{array} $	11.32 10.75 1.94 0.75 <u>3.93</u>	24.44 22.02 5.88 2.14 8.25
Sub-Total	34.04	28.69	62.73
General Consultant Services			
Services and Equipment Contingencies	1.60 0.16	1.34 <u>2</u> / 0.14	2.94 0.30
Sub-Total	1.76	1.48	3.24
Other Consultant Services			
Transport Study Studies for Hyderaba d- Multan R Studies for Lahore-Rawalpindi Contingencies	0.27 od. 1.40 Rd. 0.20 0.19	0.45 1.40 0.20 0.21	0.72 2.80 0.40 0.40
Sub-Total	2.06	2.26	4.32
Three-Year Maintenance Program			
Maintenance Equipment for Karachi-Hyderabad Road Improvement of Workshops Pilot Maintenance Scheme Contingencies	0.04 0.08 2.00 0.21	0.22 0.43 1.68 0.24	0.26 0.51 3.68 0.45
Sub-Total	2.33	2.57	4.90
Refund of Credit S-1 PAK	_0	1.00	1.00
Project Total	40.19	36.00	76.19

1/ Includes right-of-way cost of US\$3.09 million equivalent for Lahore-Lyallpur; and US\$1.72 million equivalent for Sheikhupura-Sargodha.

2/ Includes US\$0.05 million for office and engineering equipment.

4.37 The Government has confirmed the above cost estimate and given assurance that adequate funds will be available to carry out the project. The Government has furnished adequate funds on previous loans/credits.

4.38 As the proposed credit will be signed after June 30, 1968, the Government has agreed to provide interim financing of some nominal costs incurred after that date and until the credit becomes effective. IDA retroactive participation in such costs would be about US\$500,000 for the last half of 1968 for consultants' services and some spare parts for maintenance equipment.

4.39 Disbursements from the proposed credit for construction contracts will be based on percentages related to the presently estimated foreign exchange component. If such costs are higher than estimated, the Association may, at its option, establish such lower percentage as will permit disbursements to be spread throughout the project period. Disbursements for consulting services and procurement of equipment will be made against the actual foreign exchange costs. Any balance of the credit remaining undisbursed after completion of the project will be cancelled. Estimated disbursements of the proposed credit including the full US\$1.0 million refunding of Credit S-1 PAK as soon as this credit is made effective, are as follows (in US\$ million equivalent):

Calendar Year	1968	<u>1969</u>	1970	<u>1971</u>	1972	<u>Total</u>
Disbursement	1.5	9.5	17.0	5.8	2.2	36.0

5. ECONOMIC EVALUATION

A. Trunk Road Construction

a. General

5.1 Road traffic is increasing rapidly in West Pakistan while the quality of the roads remains low. Many rural through roads in West Pakistan have a paved strip designed to carry one lane of traffic only. When vehicles pass or overtake, one or both have to leave the paved strip and travel on the shoulder with consequent damage to both roads and vehicles. By paying substantially more in taxation than is currently being spent on constructing and maintaining the road system, road users indicate an economic demand for substantial road improvements including two full traffic lanes on many routes of the network. This project is designed to provide 170 miles of such roads.

5.2 A second major weakness of the road system arises from its use by mixed traffic. Existing rural roads are generally all-purpose, shared by motor vehicles, bullock carts, motorized rickshaws, camel trains, etc. Animal drawn traffic drastically reduces the capacity of a road to carry motorized traffic, particularly if the road has only one paved lane. Since animal drawn traffic is expected to continue to have an important function for many years in West Pakistan, the most promising way of dealing with this problem is by segregating it from the motor vehicle flow. This requires the provision of separate roads for motorized traffic, and conversely (particularly in market areas) the reservation of some roads primarily for animal drawn and pedestrian traffic.

5.3 The problem of separating motorized from animal traffic and providing an adequate track for each can be approached in two ways: either by providing new roads for motor vehicles only and retaining the existing roads for animal, slow moving, and local motorized traffic; or else by retaining the existing roads for motorized traffic and providing new roads (of a lower standard) for animals and slow traffic.

5.4 In the case of West Pakistan the second course is considered to be impracticable for two reasons: firstly, because the existing roads (as mentioned in para 3.2) cannot be made suitable for modern motorized traffic without extensive rebuilding; and secondly, because there are practical difficulties in closing to animal traffic roads that have been used by it for many years. For these reasons it is proposed to construct two-lane roads with few access points for the sole use of motorized traffic (excluding motorized rickshaws) from Lahore to Lyallpur, and from Sheikhupura to Sargodha.

b. Project Area

5.5 The proposed highway improvements will directly benefit areas covered by the administrative divisions of Sargodha and Lahore. These two adjacent divisions (total area: 26,000 square miles or slightly more than that of Belgium and the Netherlands combined) are geographically unified and economically complementary. Details of the population and economic activity in the area of the project roads are given in Annex III.

c. Traffic

5.6 Observations made in the project area indicate that on one of the busiest roads one third of the traffic is non-motorized. Of the motorized traffic, 29 percent consists of passenger cars, 23 percent of buses, 33 percent of trucks and 15 percent of rickshaws and motorcycles. On the less busy roads there is a larger proportion of animal drawn traffic and a smaller proportion of passenger cars. Flows of motorized traffic on main rural roads in 1967 varied from 1,500 to 3,500 passenger car units (pcu) per day.

5.7 In 1963 Louis Berger Inc. predicted a continuing traffic growth rate of 15 percent per year in the project area. Counts carried out by both the consultants who updated his analysis in 1967 generally supported this prediction, except for the Lahore-Sheikhupura section where annual growth rates of 30 percent for trucks and cars, 13 percent for buses, and 49 percent for motorcycles and motorized rickshaws were observed.

5.8 It is difficult to assess the significance of this sudden growth without further information. In 1967 the consultants assumed annual growth rates of 15 percent from 1967 through 1974, and 10 percent from 1975 through 1985. For the purpose of this appraisal a 15 percent growth rate is assumed only to 1971. Thereafter a growth rate of 10 percent is assumed until either 1985 or until traffic flow exceeds 15,000 peu per day, whichever is the earlier.

d. Assessment of Benefits

5.9 Benefits have been calculated on a "with and without" basis, by comparing conditions on the proposed new road with the conditions that would obtain if the existing road were to carry the increased traffic without major improvement. The following benefits can be quantified:

- (a) Savings in vehicle operating costs.
- (b) Benefits to generated traffic.

Savings in Vehicle Operating Costs

5.10 The Road Research Laboratory in Lahore considers that the riding quality of the existing roads in the project area is between that of a gravel and an earth road. On the basis of a recent Bank study 1/ it is possible to estimate the likely savings resulting from providing good paved roads. These savings were compared with those used by the consultants in their calculation. Time of drivers and car passengers, but not of bus passengers, was allowed for.

^{1/} Jan de Weille. "Quantification of Road User Savings" World Bank Staff Occasional Papers No. 2.

5.11 The comparison suggested that the consultants' figures of savings were high for private cars and low for commercial vehicles. In view of the predominance of commercial vehicles (which are responsible for over 80 percent of the benefits) it was assumed that, overall, the consultants' figures are conservative and acceptable.

5.12 As the project would involve a considerable route shortening, (27 miles), there would be savings in total vehicle operating costs, additional to savings from reduced costs on improved roads. Overall, the figures used by the consultants were conservative and acceptable.

Benefits to Generated Traffic

5.13 As there are already two direct routes connecting Lyallpur with Lahore, there appears to be no basis for assuming that the road improvement will generate substantial traffic which would not have appeared but for the improvement. But the road from Lahore to Sargodha, and the new bridge over the Chenab River, will result in a sharp drop in transport costs between Lahore and the agricultural area to the west of the river and some development traffic may be expected. The consultant assumed that this might total 30 percent of existing traffic and would develop in equal increments over a period of five years. This assumption is used in the analysis, such traffic being credited with half the unit benefits accruing to the existing traffic.

e. Road Maintenance Costs

5.14 According to figures obtained from the Highway Department, the amounts spent on special repairs to existing roads averaged Rs. 5,110 per mile per year, exclusive of equipment depreciation. These amounts were additional to the expenditure on routine maintenance which average about Rs. 2,400 per mile per year. As maintenance costs on the new roads are expected to be about Rs. 5,000 (US\$1,050) per mile per year, it may be assumed that the project will not increase maintenance expenditures.

f. The Effect of Tolls

5.15 The Government has given no indication of the level of the tolls it wishes to impose, nor of the mechanics of collection. To cover the costs of the highways it would be necessary to charge about $US\phi$ 1 per pcu per mile, i.e. $US\phi$ 1 for a private car and $US\phi$ $2\frac{1}{2}$ for an average commercial vehicle. Such a toll could equal a third or half the benefits to road users or 10-15 percent of their costs. Even a toll of that magnitude would leave most road users the bulk of their savings and would be unlikely to deter those whose use of the new roads would entail no additional journey costs. The tolls could, however, deter certain types of users: firstly, those whose routes do not coincide with the new roads, and who would have to make detours to get on them. The combination of detours and tolls could make the new roads uneconomical for certain journeys. Secondly, experience from other countries suggests that some truck drivers may prefer to pocket the toll fees provided by the employers and to use the free routes. 5.16 Factors such as these would inevitably have some effect on the rate of traffic growth on the project roads. But so long as tolls do not exceed $US\phi$ 1 per pcu per mile they would be unlikely to affect the rates of return.

g. Rates of Return

5.17 On the basis of the foregoing assumptions, and of the costs listed in para. 4.36 the first year benefits and internal rates of return for the period 1971 to 1995 are tabulated in Table 9. The rates of return for the Lahore-Lyallpur and Sheikhupura-Sargodha roads are 19 percent and 16 percent respectively. In view of the conservative assumptions, and the exclusion of "intangible" savings, these rates probably underestimate the benefits from the project roads and amply justify the proposal to construct them.

B. Consultant Studies

5.18 There is an urgent need to review and resolve a number of major transport coordination problems in West Pakistan, some of which were touched upon in Sections 2 and 3. The transport coordination survey, which was originally proposed by the Central Government, should give the necessary guidance and early implementation is recommended. At US\$800,000, its cost is 0.16 percent of West Pakistan's allocation for road and railway development expenditure in the current five year plan.

5.19 As schemes selected for feasibility study are the most likely to go forward to completion, it is important to identify and pick out the best at an early stage. No doubt the improvement of the 1,100 mile main route Karachi-Multan-Lahore-Rawalpindi-Peshawar-Torkham to modern standards would receive high priority under any reasonable transport plan for West Pakistan. The priority of this main route was emphasized in the extensive transport survey undertaken with USAID assistance by Transportation Consultants Inc. (US) in 1961/62. Some preliminary investigation of particular sections was undertaken by a number of US consultants, financed by PL-480 counterpart funds. It is proposed as part of the project to investigate these and other sections in more detail and on the basis of more up-to-date information. The studies are considered essential for the development of Vest Pakistan's road network. In view of the limited funds available it is necessary to carry out the work by stages and to strengthen the weakest links as soon as possible. The project is designed to provide a scheme of priorities for the improvement of the route, with estimates of comparative rates of return.

C. Three-Year Maintenance Program

5.20 Expenditure on road maintenance results in benefits to road users in the form of reduced travel costs. It can also bring about a reduction in the total cost of road provision. Although total maintenance allocations are known, there is hardly any information about the actual costs of maintaining different kinds of roads, and no information at all about the likely benefits. The maintenance project is designed to obtain such information by means of pilot projects. In view of the considerable amounts allocated to maintenance (Table 4), the gathering of such information on costs and benefits must be considered an important and urgent task. 5.21 The Association has a special interest in the preservation of roads it helped to finance. Not only should it assist in the provision of meintenance facilities; it should require that they be efficiently applied to the Karachi-Hyderabad Road, and to any other road projects built with its assistance. The provision of maintenance equipment and workshops should result in substantial savings, and is considered indispensable to the program.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 The proposed road construction would substantially improve road transportation in the Lahore area of West Pakistan. It is well planned, technically feasible and would yield a satisfactory economic return on the investment from lower transport costs alone. The general consultant's advisory services would assist the Government in reorganizing the Highway Department and training its personnel. The transport survey would provide the basis for more effective transport coordination and the studies and engineering are a necessary base for future construction projects. The maintenance program is a first practical step to improve road maintenance to modern standards in West Pakistan.

6.2 The cost estimates are soundly based and adequate allowances for contingencies have been provided. The Association is proposing to finance the foreign exchange cost of the project, which amounts to about 47 percent of the total cost. The Government would provide the remaining amount from local resources.

6.3 During negotiations, agreement was reached with the Government on the following principal points: (i) the transport coordination study in West Pakistan would be expedited (paras. 2.24 and 3.13); (ii) the organization of the Highway Department would be further improved (para. 4.10); (iii) the services of the general consultant would be continued (para. 4.27); and (iv) procurement of special equipment and spare parts totaling \$200,000 would be exempt from international competitive bidding (para. 4.31).

6.4 A condition of signing of the credit would be the signing of a contract between the Government and the general consultant, or another consulting firm acceptable to the Association (para. 4.27).

6.5 A small amount of retroactive financing will be required as the credit will be signed after June 30, 1968 (para. 4.38).

6.6 The proposed project constitutes a suitable basis for an IDA credit of US\$36.0 million to the Government of Pakistan.

June 12, 1968

APPRAISAL OF A SECOND HIGHWAY PROJECT

Current Status of Highway Department

a. Administration and Planning

1. Prior to 1967 the Buildings and Roads (B & R) Department of the C & W Department was responsible for the planning, design, construction and maintenance of most roads in the Province. It had similar responsibilities for public buildings and as a result most B & R personnel were involved in both activities simultaneously. With the exception of bridge design, soils and materials testing and the administration of foreign-aided highway works, which were handled at B & R headquarters at Lahore, all other functions related to roads were delegated to five regional organizations which, in turn, were further subdivided on a geographic basis. The entire B & R organization was outdated, unwieldy and could not operate in an efficient, functional manner. The lack of planning has been one of the major weaknesses of the organization. There were no workable programs for collection of basic data such as traffic volumes, road inventories, etc., which are fundamental to proper highway planning.

2. The general consultant, retained under Credit 54-PAK (see para 1.2), recommended splitting the B & R Department and creating a new highway department organized along functional lines which would remain under the administrative control of the C & W Department. The attached chart shows the new organizational structure for headquarters and a typical region which was adopted in principal by the Government on October 1, 1967. The division of physical assets between the Highway Department and the residual Building Department has been completed. The general consultant has issued interim reports on the master plan for roads which set up road classifications, establish basic performance criteria for the various classes and present a tentative plan for a primary and secondary road system. A Province-wide traffic counting program has been established and periodic traffic maps have been issued. A program of road and bridge inventory has been started and limited origin and destination surveys have been undertaken.

3. Further work by the general consultant is required to assist in implementing the new organization, establishing needed administrative and budgetary controls, and training the administrative staff of the new department. The general consultant will also be needed to aid in organizing the planning sections, training local staff in proper planning procedures and establishing continuing programs for data collection and analysis.

b. Engineering and Construction

4. In the past all highway design work was done in the regions, Recently bridge design has successfully been concentrated at Department headquarters and has reached a fair level of competence. However, little progress in improving road design practices and procedures has been attained and most

road design is still done in the field at levels well below the regional headquarters. With few exceptions roads are constructed almost entirely with hand labor, equipment being limited to few essential units such as rollers and trucks. This often produces results below acceptable standards. The Karachi-Hyderabad highway and the three major river bridges included in Credit 54-PAK are being built by international contractors employing modern construction methods and equipment. Only a few qualified and experienced local contractors exist and in most cases control and direction of construction are left to Department staff who are often not qualified for this work.

5. The general consultants have completed a code of practice for bridge design, and drafts of design and plan preparation manuals for bridges and roads are well advanced. Standard designs and drawings, design aids and typical plans have been essentially completed as have drafts of standards specifications and contract documents and a manual of field supervision of construction. Two reports have been issued covering an appraisal of the present Road Research Laboratory and detailed recommendations for additional equipment and personnel training. The Government has obtained some construction equipment from various sources and have assigned Department staff to assist in construction supervision on the Karachi Hyderabad road and on the three major river bridges.

6. The Government needs further assistance from the general consultant to set up modern design sections and implement training in actual design and plan preparation. Field training of laboratory personnel needs to be accelerated so that regional design support laboratories can be placed in operation. The new construction sections at headquarters and in the regions must be organized and field training started.

c. Maintenance

7. Road maintenance has been and will continue to be carried cut by the regions. Road maintenance has been badly managed and performed and with few exceptions has failed to maintain roads in their original condition much less make needed improvements. Improper design and construction practices in the past and substantial increases in traffic volumes during recent years have presented maintenance forces with an almost impossible job.

8. For the most part maintenance is done by hand labor and what equipment is utilized is generally antiquated and improperly used. Assigning maintenance labor on a "men per mile" basis with little consideration of road type and condition has produced badly unbalanced results. Maintenance funds are allocated on the basis of reported mileage of roads and to provide equal distribution by geographic areas. Total maintenance allocations over the past several years (Table 4) have generally proven inadequate both for urgently needed betterment and for routine maintenance.

9. Regional and field shops have not been developed effectively. Spare parts are in short supply and parts inventories have been inadequate.

ANGEX J Page 3

10. The impact of the new Highway Department organization could not yet be felt to any major degree in maintenance operations. The general consultant, working with Department forces, has completed inventories for maintenance equipment and machinery and for spare parts throughout the Province. Two reports covering an analysis of past maintenance operations and detailed recommendations for reorganization of maintenance operations have been issued. A basic manual covering maintenance practices has also been issued.

ANNEX II

WEST PAKISTAN

APPRAISAL OF A SECOND HIGHWAY PROJECT

Detailed Outline of General Consultant Services

1. Administration: The Highway Department will be assisted in a continuing program of implementation and evaluation of the new organization and preparation of a management control system with assistance in the installation and expansion of this system. The Government has agreed with the following principal improvements:

- a. Provide joint accommodations based on functional assignments for the Highway Department and the general consultant staffs. Existing accommodations should be utilized as quickly as possible in this merging of functions and efforts will be continued to provide a suitable building for the Department headquarters by June 30, 1970.
- b. The sections of the Department headquarters (see Chart) should be established and staffed by January 1, 1969.
- c. By April 1, 1969, establish appropriate measures to recruit and to retain qualified staff at Department headquarters.
- d. Completely separate by June 30, 1970, the cadre of the previous Buildings and Roads Department between Highways and Buildings.
- e. Provide the head of the Highway Department with adequate authority to deal expeditiously with the implementation of technical and budgetary matters of approved projects and programs.

2. <u>Planning</u>: A separate planning section will be established at Department headquarters and proper planning and traffic analysis techniques will be initiated on all new projects. Work will be continued on the development of a master plan for highways in close cooperation with the Planning and Development Department and other planning agencies. Training will be expanded through demonstration projects and planning sections will be established in the regions as soon as trained staff becomes available. The Government has agreed that facilities will be established and maintained to collect and record data required to assess the technical, economic and financial aspects of the West Pakistan highway system. 3. <u>Design</u>: Initial work will be directed towards strengthening the review and advisory capacity of the central bridge design section and the establishment of a central highway design section. Emphasis will be on training through demonstration projects and modern standards and design techniques will be introduced. Regional design sections will be strengthened and appropriate projects will be undertaken by them as soon as practical.

4. <u>Construction</u>: A construction section will be established immediately at Department headquarters and trained in modern testing, construction control, and record keeping. Much of this training will be on actual work in the field. As trained staff becomes available, regional construction sections will be formed and divorced from maintenance operations as quickly as possible. Standard specifications, contract forms and contractor prequalification requirements will be introduced concurrently with the formation and training of all construction sections.

5. <u>Maintenance</u>: In this category the consultant's staff will assist in the organization and conduct of the three-year maintenance program which is described in more detail in paras. 4.18 - 4.25.

6. <u>Laboratory Facilities</u>: A full time expatriate advisor provided under the Colombo Plan is presently assigned to the Central Laboratory in Lahore. It is expected that this advisor will be available for about three additional years and will assist in the modernization and equipping of the Central Laboratory and the training of staff via work in support of actual design and construction projects. Field laboratories will be planned for each region and put into operation when justified by work load and as trained staff and equipment become available. The general consultant will coordinate this work with the development of other headquarters and regional sections and will provide additional expatriate staff if required.

APPRAISAL OF A SECOND HIGHWAY PROJECT

Population and Economic Activity In the Project Area

1. About 13.5 million people (or about that of the Netherlands) live in the project area. It is one of West Pakistan's most congested population centers. According to the 1961 census, there were 724 persons per square mile in the Lahore Division and 350 in the Sargodha Division, compared with 138 persons per square mile for West Pakistan as a whole. The ratio of urban to rural population in the area is nearly twice the average for West Pakistan. The average income is estimated to be 20 percent higher than the average in the Province. To a large extent, this is due to the relatively high degree of industrialization, but the high agricultural productivity has also had an effect.

2. The Sargodha Division, composed of the Districts of Lyallpur, Jhang, Sargodha and Mianwali, lies in the north central part of West Pakistan. It includes many different regions varying from the recently settled lands in the east, to the desert and mountains west of the Chenab River. Mianwali District includes most of the Thal Desert with its sparse population.

3. The Division is based on an agricultural economy, except for the heavily industrialized areas immediately around Lyallpur and Mianwali-Daudkhel. Much of the farming is on land irrigated and settled during the present century. The main crops are cotton, wheat and sugarcane. Daudkhel, a city in the northwest corner of the Mianwali District, has four heavy industries including a cement plant, a fertilizer plant, a chemical and dye plant and a penicillin factory. Nearby are some coal and salt mines, including the Makerwal Collieries.

4. The major industrial area is around Lyallpur (population approximately 500,000). Situated near both the center of the northern part of the country and in the heart of a rich farming area, Lyallpur has become heavily industrialized and has experienced a very rapid growth rate in agricultural processing industries such as textiles, ginning, vegetable oils, flour and sugar mills. From 1941 to 1961 its population increased five-fold and it is now the third largest city in the Province.

5. The Lahore Division, composed of the Districts of Gujranwala, Lahore, Sheikhupura and Sailkot, is the northeastern sector of West Pakistan. Some of the best agricultural lands and some of the heaviest industrialized areas in West Pakistan are in Lahore Division. Rice, sugarcane, wheat and cotton are the main crops. 6. Along with the farming area there is large concentration of industry in and around Lahore and north along the Grand Trunk Road through Gujranwala. The larger industrial concerns include metal processing plants, steel re-rolling mills, chemical industries, film industries and flour and cotton mills. Because of Lahore's favorable location in the center of an important market and as a focal point for transport, industrial activity is expected to expand rapidly.

7. <u>Lahore</u> (population approximately 1.5 million) is the capital and second largest city in West Pakistan. It ranks second only to Karachi as a commercial, business and industrial center. With its 29 colleges and universities, it is the Province's undisputed leader in education and cultural activities. Most of the area around Lahore is socially and economically integrated with the city itself.

8. <u>Sheikhupura</u>, 22 miles west of Lahore, lies at the junction of the Lahore-Khushab and Lahore-Lyallpur Roads. Because of its location, the market in Sheikhupura serves an area traversed by both highways to be constructed in the project. The main crops produced in the vicinity include rice, wheat and cotton. Other crops brought to the market are sugarcane, gram, maize, barley and fodder. This is also a major market for firewood, which is supplied to all cities and towns in the area. Except for rice, which is procured by the Government and shipped by rail, all other crops are generally trucked. The Government is encouraging industrial development in Sheikhupura and two fertilizer plants (in which the World Bank Group is interested) are to be located there.

9. <u>Sargodha</u> (population approximately 150,000) is located some 105 miles west of Lahore on the Lahore-Khushab Road. Cotton and wheat are the two most important products marketed there. In addition, smaller quantities of maize, rice, sugarcane and potatoes were also marketed. The area north of Sargodha is known for the large orange groves which supply the bulk of organges consumed in West Pakistan. Beside being an agricultural market, Sargodha is increasing in significance as an industrial center. A textile mill employing 4,000 workers is located there as are some 12 cotton plants. Sargodha is also the largest soap manufacturing center in West Pakistan accounting for over one-half of the Province's soap output.

APPRAISAL OF A SECOND HIGHWAY PROJECT

Commercial Vehicles "On Road" 1/

<u>Year</u>	Buses	Trucks
1960/61	7,050	12,791
1961/62	7,932	14,444
1962/63	6,894	14,823
1963/64	7,394	17,086
1964/65	7,933	16,906
1965/66	(8,000)2/	20,326
1966/67	(8,500) ^{2/}	(22,000) <u>2</u> /

- 1/ "On Road" includes those vehicles which pay taxes and those which are exempt (e.g. Government vehicles); the latter, however, is only a rough estimate. The Bureau of Statistics table does not give the bus fleet for 1965/66; some sources give the 1965/66 bus fleet at about 7,500 but this seems unlikely in view of the level of new registrations in 1965/66.
- 2/ IDA estimate

Source: Pakistan Bureau of Statistics.

APPRAISAL OF A SECOND HIGHWAY PROJECT

Fuel Consum	ption b	by Re	oad	Vehicl	es in	West	Pakistan
(Millior	15 0	f In	perial	Gall	ons)	

Fiscal <u>Year</u>	Motor Spirit (Gasoline)	High Speed Diesel Oil
1963/64	68.0	87.6
1964/65	68.3	131.0
1965/66	86.5	115.6
1966/67	80.7	130.3

Source: Transport Planning Ceil, Labore

APPRAISAL OF A SECOND HIGHWAY PROJECT

Development of Paved Road Network

Year	Approximate Length in Miles
1947	5,050
1950	5,620
1955	7,980
1960	8,770
1961	8,830
1962	9,000
1963	9,330
1964	9,450
1965	10,010
1966	10,130
196 7	10,280

APPRAISAL OF A SECOND HIGHWAY PROJECT

Provincial and Central Road Allocations (Millions of Rupees)

(a) Expenditure from Provincial Funds

Fiscal Year	Construction	Maintenance	Administration	Total
1963/64	56.9	38.9	8.7	104.5
1964/65	80.14	48.6	9.6	138.6
1965/66	65.2	35.5	9•7	110.4
1966/67	142.4	50.0	9.3	201.7

(b) Expenditure from Central Road Fund

Fiscal Year	Construction	Total
1963/64	7.0	7.0
1964/65	14.3	14.3
1965/66	6.1	6.1
1966/67	58.2	58.2

Source:	(a)	Transport	Plar	nning	Cell	, Lał	lore			
	(ь)	Government	t of	Pakis	tan,	"The	Budget	in	Brief	1967-68"

APPRAISAL OF A SECOND HIGHWAY PROJECT

Vehicle Taxation

(Excluding Contribution to Central Road Fund)

- Fuel Taxes Rs 2.49 (US \$0.52) 1/per Imp. Gal. for Gasoline Rs 1.35 (US \$0.28) per Imp. Gal. for Diesel Oil
- Lubricant Tax Rs 1.20 (US \$0.25) per Imp. Gal.
- Tire Tax 42.3% ad valorum
- License Fees Range from Rs 150 (US \$32 to Rs 1,500 (US \$316) per year depending on vehicle size
- Import Duty 56% ad valorum for trucks and buses Range of 35% to 266% and valorum for private cars

1/	Excise Duty	Rs 2.00
	Sales Tax	0.30
	Defense Surcharge	0.50
		2.80
	Less Contribution	
	to Central Road Fund	0.31
	Net Total	Rs 2.49

Source: Transport Planning Cell, Lahore

APPRAISAL OF A SECOND HIGHVAY PROJECT

Revenues Collected Under Motor Vehicles Act_and Fuel Taxes2/ (Millions of Rupees)

Fiscal Year	Motor Vehicle <u>Act</u>	Tax on Gasoline	Tax on High Speed Diesel Oil	Total
1963/64	39.3	113.6	79.8	232.7
1964/65	48.6	111.8	128.7	289.1
1965/66	63.5	175.3	144.1	382.9
1966/67	64.6	213.1	161.0	438.7

- 1/ Mainly quarterly license fees.
- $\frac{2}{2}$ Excise Duty, Sales Tax and Defense Surcharge
- Sources: Government of West Pakistan: White Paper 1967/68 Transport Planning Cell, Lahore

APPRAISAL OF A SECOND HIGHWAY PROJECT

Design Standards for Two-lane Main Trunk Highways to be Constructed

1.	Minimum right-of-way width (including future expansion to μ-lane divided highway)	275 ft.
2.	Design speed	70 mph
3.	Maximum gradient	4%
4.	Desirable minimum horizontal curve	2,500 ft.
5.	Pavement width of (a) the road (b) each shoulder	24 ft. 8 ft.
6.	Shoulder width	10 ft.
7.	Road pavement in following courses:	
Q	 (a) cement stabilized sub-base over compacted embankment (b) bitumen bound base (c) asphalt concrete surface 	9 ins. 4 ins. 2 ins.
0.	 (a) drainage layer of crushed overburnt bricks on compacted fill (b) cement stabilized base (c) two coats bituminous surface treatment 	4 ins. 6 ins.
9.	Pavement cross slope	2% - 3%
10.	Maximum superelevation	8%
11.	Normal median width edge to edge of pavement for future second two-lane carriageway	40 ft.
12.	Fill slope (a) up to 9 ft. height (b) over 9 ft. height	4:1 2:1
13.	Minimum free board above high flood level	
	(a) for pavement (b) for bridges	2 ft. 3 ft.
14.	Maximum axle load	18,000 lbs.
15.	Bridge design loading	West Pakistan Code of Practice 1967
16.	Headroom overbridging	
	 (a) major roads (b) minor roads (c) village roads (d) cattle and pedestrian crossing (e) railway sections to be electrified (f) other railway sections 	16 ft. 6 ins. 14 ft. 6 ins. 12 ft. 0 ins. 10 ft. 0 ins. 19 ft. 3 ins. 17 ft. 9 ins.

APPRAISAL OF A SECOND HIGHWAY PROJECT

Maintenance Equipment and Cost 1/ (US\$ Thousand Equivalent)

Paragraphs of Report		Category of Main- tenance Program	Types	Equip No.	ment Spread Unit Cost	Assembling and Local Transport	Assembling, Local Transport, and Operating Cost	Total <u>Cost 3</u> /	Proposed IDA Participation
4.20, 4.21	1.	K ara chi -Hyder abad Road	Routine Maintenance	1	220	40		260	220
4.22, 4.23	2.	Workshop improve-	(a) Regional Workshops	3	67	40	-	240	200
		ment	(b) Divisional Shops	8	10	10	-	90	80
			(c) Spare parts for existing Equipment	<u></u>		302/	-	180	150
			SUB-TOTAL			80		510	430
4.24, 4.25	3.	Pilot maintenance scheme	(a) Betterment work						
			(i) Basic spread	3	21 ¢0	-	(1,050	(1,890	720
			(ii) Special spread	1	1 2 0	-	{	(120
			(b) Resurfacing work	3	1 30	-	870	1,260	390
			(c) Routine maintenance	2	225	80	•	530	450
			SUB-TOTAL			80	1,920	3,680	1,680
			TOTAL	<u></u>		200	1,920	4,450	2.330

 $\frac{1}{2}$ Including spare parts in an amount of 15% of the equipment value

2/ Local transport cost only

 $\frac{3}{2}$ Excluding import duty and taxes.

APPRAISAL OF A SECOND HIGHWAY PROJECT

Summary of Costs, Benefits, and Rates of Return (Millions of US\$)

	Lahore-Lyallpur Road			Sheikhupura-Sargodha Road (Inc. Chenab Bridge)	Both Roads
	Lahore- Sheikhupura	Sheikhupura- Lyallpur	Total		
Total Cost	9.82	19.63	29.45	33.28	62.73
lst Year Average Daily Traffic	6,100 pcu	5,200 pcu		2,800 pcu	
lst Year Benefit	0.889	2,630	3.519	2.777	6.153
Assumed Life	25 Years	25 Years		25 Years	
Traffic Growth Period	9 Years	ll Years	19%	15 Years	
Internal Rate of Return	14,3	21%		16%	17%



