

**BASIC DESIGN STUDY REPORT**  
**ON**  
**THE HIGH TENSION & SHORT-CIRCUIT**  
**TESTING LABORATORY CONSTRUCTION PROJECT**  
**IN**  
**THE ISLAMIC REPUBLIC OF PAKISTAN**

**SEPTEMBER 1986**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**GRS**

**86-86**



JICA LIBRARY



1031429[2]



**BASIC DESIGN STUDY REPORT**  
**ON**  
**THE HIGH TENSION & SHORT-CIRCUIT**  
**TESTING LABORATORY CONSTRUCTION PROJECT**  
**IN**  
**THE ISLAMIC REPUBLIC OF PAKISTAN**

**SEPTEMBER 1986**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

| 国際協力事業団   |          |             |
|-----------|----------|-------------|
| 受入<br>月日  | 86.11.07 | 117         |
| 登録<br>No. | 15647    | 64.1<br>GRS |

## PREFACE

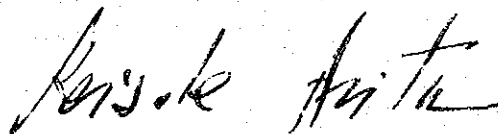
In response to the request of the Government of the Islamic Republic of Pakistan, the Government of Japan has decided to conduct a basic design study on the High Tension & Short-Circuit Testing Laboratory Construction Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Pakistan a study team headed by Mr. Kazuo Tanigawa, Head, 2nd Basic Design Study Division, Grant Aid Planning and Survey Department, JICA, from April 7th to 29th 1986.

The team had discussions on the Project with the officials concerned of the Government of Pakistan and conducted a field survey in Islamabad and Lahore. After the team returned to Japan, further studies were made, a draft report was prepared and, for the explanation and discussion of it, a mission headed by Mr. Toshio Nakamura, Deputy Head, 2nd Basic Design Study Division, Grant Aid Planning and Survey Department, JICA, was sent to Pakistan from July 25th to August 6th, 1986. As a result, the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Islamic Republic of Pakistan for their close cooperation extended to the team.

September, 1986



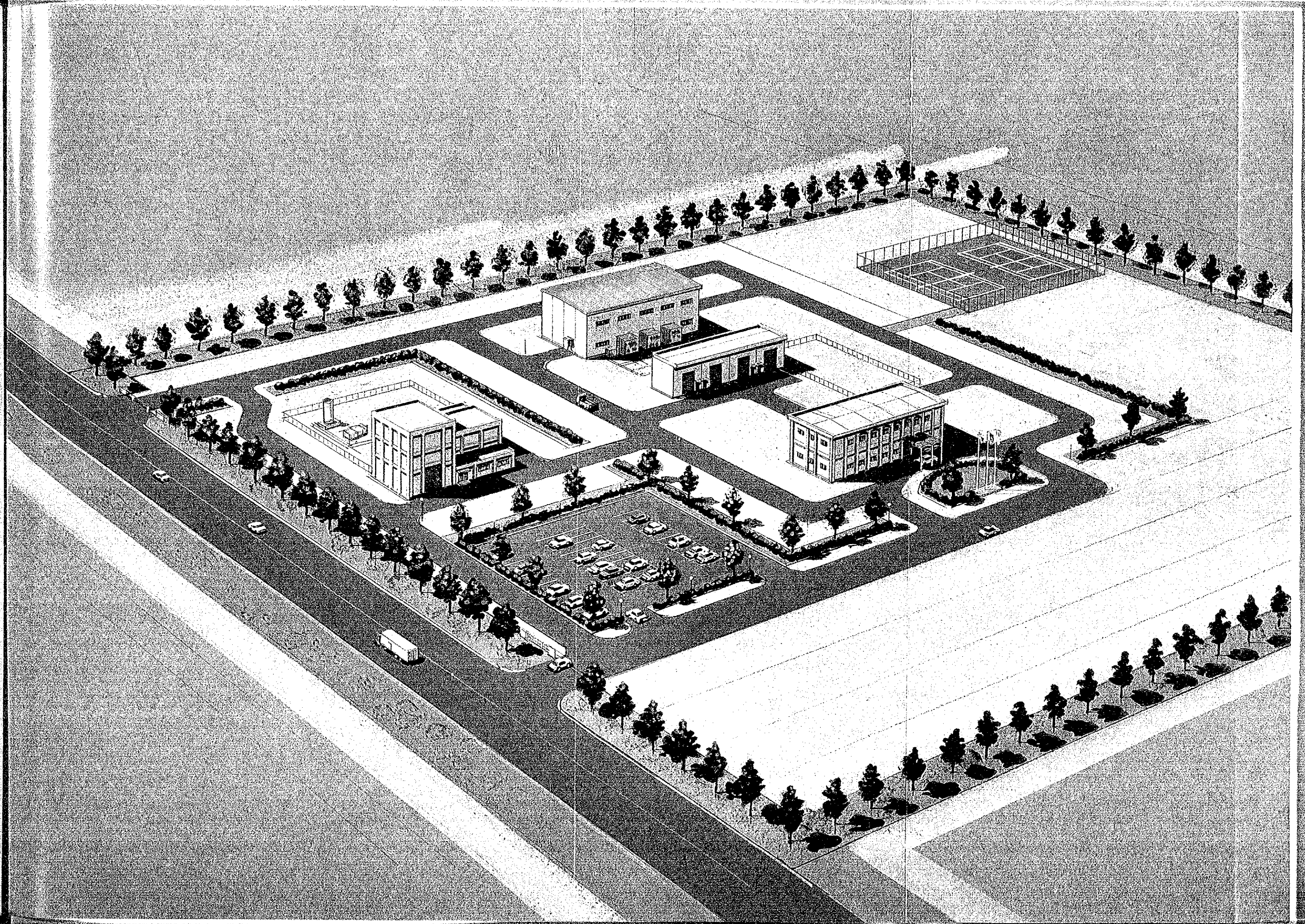
Keisuke Arita

President  
Japan International Cooperation Agency







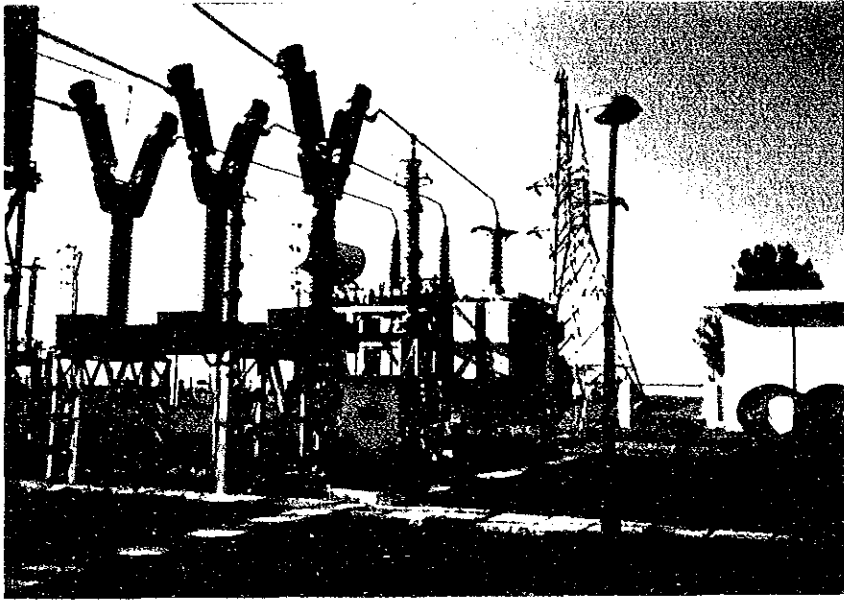






PROJECT SITE (River)





Riwat Substation (Rawalpindi)



Distribution Transformer (Karachi)



## SUMMARY

The Islamic Republic of Pakistan faces the Arabian Sea on the South, and is bordered by Afghanistan on the North, by Iran on the West, and by India on the East. Pakistan has a total land area of 796,095 km<sup>2</sup> (about 2.2 times larger than Japan), and a population of some 93 million, 80% of which reside in two provinces, the Punjab and Sind along the Indus. About 53% of the total population live on agriculture producing mainly cotton wool, rice and sugar cane. Textiles are the major industry, centered on the production of cotton yarn.

The electric power for general use in Pakistan is supplied by the Water and Power Development Authority (WAPDA) and the Karachi Electricity Supply Corporation (KESC). While KESC only covers the Karachi area, WAPDA covers the rest of the country. Pakistan's total generation capacity is 5,477 MW of which 2,897 MW (53%) is generated by hydropower. However, dam water levels lower in the dry season, drastically decreasing power supply capacity. Therefore, at the peak of the dry season, December through March, load shedding is undertaken in the country. Along with this, incomplete distribution networks coupled with breakdowns or damages in distribution equipment often causes power failures, thereby disturbing people's living and the development of industry.

To solve these problems, the Government of Pakistan has formulated, in its 6th Five-Year Economic Development Plan (1983-1988), a project to establish and expand its power generation facilities and distribution networks so as to meet demands for industrial development and rural electrification. Today, the electric utilities are engaged in large scale maintenance and expansion works on their transmission/distribution facilities, including construction of power stations with a total capacity of 3,000 MW, and nationwide extra-high voltage transmission lines (500 kV), all of which are scheduled to be completed by 1990. However, in order to accomplish this project and improve power supply conditions, many types of power equipment will be required. Presently, Pakistan's power equipment industry produces and supplies only those for 11 kV distribution. However, with international technological cooperation, Pakistan plans to produce up to 220 kV transmission and substation equipment domestically in the near future.



There is, however, no high voltage, short-circuit testing laboratory in Pakistan to inspect performance of such power equipment after production and therefore the quality control is totally inadequate. They are obliged to depend upon other countries for the quality tests on domestically manufactured transformers and breakers to be used in their distribution networks. The problems are not only the time and money that such tests cost, but also inefficient inspection of many other products.

Faced with these situations, the Government of Pakistan has formulated a plan to construct the High Tension and Short-Circuit Testing Laboratory in WAPDA for the promotion of its domestic industry, electrical technology improvement and savings of foreign currency, and has subsequently requested the Government of Japan for Grant Aid.

In response to the above-mentioned request, the Government of Japan sent a Preliminary Study Team to Pakistan in December 1985 through Japan International Cooperation Agency (JICA) in order to confirm details of the request and study the viability and effects of this project.

Also, in April, 1986 a Basic Design Study Team was sent to study the scale of the project and its concept.

The Basic Design Study Team held a series of discussions with concerned officials of the Government of Pakistan, at Islamabad, Lahore, and Karachi, based upon the basic agreement made by the Preliminary Study Team. The team also surveyed the project site and related facilities.

One of the findings of the survey is that the testing facilities owned by Pakistani electrical companies and manufacturers are of a very small in scale and quite inadequate for a nation to operate a 500 kV transmission system, which results in an insufficient quality of the products.

Transmission and distribution loss in Pakistan caused by defective equipment amount to 26.7% which is very high in comparison with Japan's 6%, and further aggravates electricity shortages. The Team has also understood that the Pakistani side strongly desires construction of such facilities and that the demand is high.

It is therefore most effective and meaningful to build a new laboratory with high tension and short-circuit testing facilities, to promote high

voltage technology improvement and also to improve reliable production technology in the domestic industry through practical quality testing.

The main purpose of this project is not to construct a large laboratory but to contribute to the quality improvement and development of electrical equipment already produced domestically or will be in the near future, to be used in diverse fields. Therefore, the scale of this testing facility will be limited within a minimum range where immediate effects can be expected. The minimum adequate capacities required are as follows:

- (a) Being capable of performance test of domestically manufactured distribution equipment.
- (b) Being capable of insulation characteristic and 500 kV insulator artificial pollution tests
- (c) The capacity of the short-circuit generator will be determined considering 132 kV and 220 kV breaker and transformer type tests, of which domestic production is expected in the near future.

As a result of studies and discussions based on these concepts, appropriate scales of the facilities and equipment for this project have been determined as follows:

MAIN BUILDING AND EQUIPMENT RATINGS

| Apparatus                      | Rating  | Remarks  |
|--------------------------------|---|--|
| Building                       | Short-Circuit Generator Building (1)<br>Short-Circuit Testing Building (1)<br>Administration Building (1)<br>Fog Testing Building (1)   | (826 m <sup>2</sup> )<br>(320 m <sup>2</sup> )<br>(917 m <sup>2</sup> )<br>(595 m <sup>2</sup> ) |
| Short-Circuit Testing Facility | Short-Circuit Generator (1)<br>Horizontal, cylindrical rotor, rotating field, open air cooled type.<br>3 phases,<br>15 kV, 1,500 MVA<br>t=0 cycles, Connection Wye (Y)<br>Insulation Class F<br><br>Short-circuit transformer (3)<br>Single phase 15 kV/10-15 kV<br>50 MVA, %Z=2%<br>Short-circuit capacity 700 MVA<br><br>Synthetic Testing Facility<br>(1 set) for 36 kV - 145 kV GCB | The generator capacity is decided in consideration of 245 kV circuit breaker in future.          |
| High Voltage Testing Facility  | Testing Transformer (1)<br>Single phase, 50 Hz, 3.3 - 6.6 kV/500 kV<br>2 MVA (30 min. rating)<br>Short-circuit capacity 20 MVA<br><br>Impulse Generator (1)<br>Max charging voltage 1,800 kV<br>180 kJ  |  |
| Data Analyzing Facility        | Mini Computer Set (2)<br>16 bit   | Short-circuit Test (1)<br>High Voltage Test (1)  |

Japan's share in this project is the supply of required materials and machinery, machinery installation, construction of buildings in which the equipment is installed and other related design and construction works.

Pakistan's share is the procurement of the necessary lands, road construction both within and outside the project site, the supply of those electrical facilities required for this construction, and the maintenance and management costs of this laboratory.

The implementation period of this Project will be thirty-six (36) months in total on the assumption that five (5) months for detailed design, two (2) months for tendering work, fifteen (15) months for manufacture of equipment and supplies, two (2) months for transportation, eight (8) months for installation and erection of equipment and twelve (12) months for construction of buildings are to be required, respectively, counted from the signing date of the Exchange of Notes (E/N) between both Governments.

Maintenance and management after facility completion will be undertaken by WAPDA at an annual cost estimated at 8,648 thousand rupees (about ¥95,000 thousand). As this figure represents only 0.13% of WAPDA's annual operation costs (6,472,000 thousand rupees) there will be no problem for WAPDA to bear such maintenance cost.

Presently, since about 2,600 WAPDA engineers operate a total of about 4,300 MW power stations and related substations, it is considered that their management capabilities for a testing laboratory will be adequate. However, about 2-years of experience and high technology will be required for its operation, and therefore the procurement and training of an operating staff are definitely needed.

Technological participation for the followings is therefore required:

- (a) Technical training in Japan for Pakistan personnel
- (b) On-the-job training during construction period
- (c) Dispatch of Japanese experts to the project

The effects expected from this project are as follows:

- (a) Improvement on the quality of domestic products
- (b) Increased reliability of electric utilities

- (c) Development of equipment production technology
- (d) Cost savings in foreign currency to pay for tests
- (e) Improved technical abilities of electrical engineers
- (f) Training of electrical engineers
- (g) Development of new products

The type tests for distribution equipment produced in Pakistan have been done at the KEMA testing laboratory in Holland. These tests will be conducted domestically in Pakistan when this laboratory is completed, which will greatly reduce costs, including manpower.

It will also enable tests of equipment at various stages of manufacture, presently not accepted by KEMA. Therefore, the development of production technology and quality improvement will be highly promoted to contribute towards the progress of domestic industries.

In overall consideration of the above, it is believed that the establishment of this High Tension and Short-Circuit Testing Laboratory will be meaningful. In the event that this project is materialized under Japan's Grant Aid, it is expected that the afore-mentioned Laboratory will make great contributions to the improvement of power supply in Pakistan. (It is thus deemed that this Grant Aid Program is effective and appropriate.)

To pursue this project, it is advised that the related procedures in Pakistan be carried out as soon as possible, including land purchases, electrical facility preparations, and road construction, together with the procedures for importing materials and machinery, and budgetary procedures.

## CONTENTS

|   |    |
|---|----|
| PREFACE   |    |
| LOCATION MAP  |    |
| PHOTOGRAPHS   |    |
| SUMMARY   |    |
| CONTENTS  |    |
| CHAPTER 1 INTRODUCTION .....  | 1  |
| CHAPTER 2 BACKGROUND OF THE PROJECT .....   | 3  |
| 2-1 Outline of the Islamic Republic of Pakistan .....                                   | 3  |
| 2-1-1 Geographical Conditions .....   | 3  |
| 2-1-2 Climate .....   | 3  |
| 2-1-3 Population .....  | 4  |
| 2-1-4 Religion, Education and Language .....  | 4  |
| 2-1-5 Government .....  | 9  |
| 2-1-6 Economy .....   | 9  |
| 2-2 Electric Power Situation in Pakistan .....  | 11 |
| 2-2-1 History .....   | 11 |
| 2-2-2 Structure of Electricity Enterprises .....  | 12 |
| 2-2-3 Present State and Future Plans of<br>Power Facilities .....                       | 18 |
| 2-2-4 Present State and Future Plans of Electric<br>Power Equipment Manufacturers ..... | 29 |
| 2-2-5 Present State of Existing Testing Facilities .....                                | 29 |
| 2-2-6 Problems of Electricity Enterprises .....   | 32 |
| CHAPTER 3 CONTENTS OF THE PROJECT .....   | 35 |
| 3-1 Project Objective .....   | 35 |
| 3-2 Review of Scope of the Request .....  | 36 |

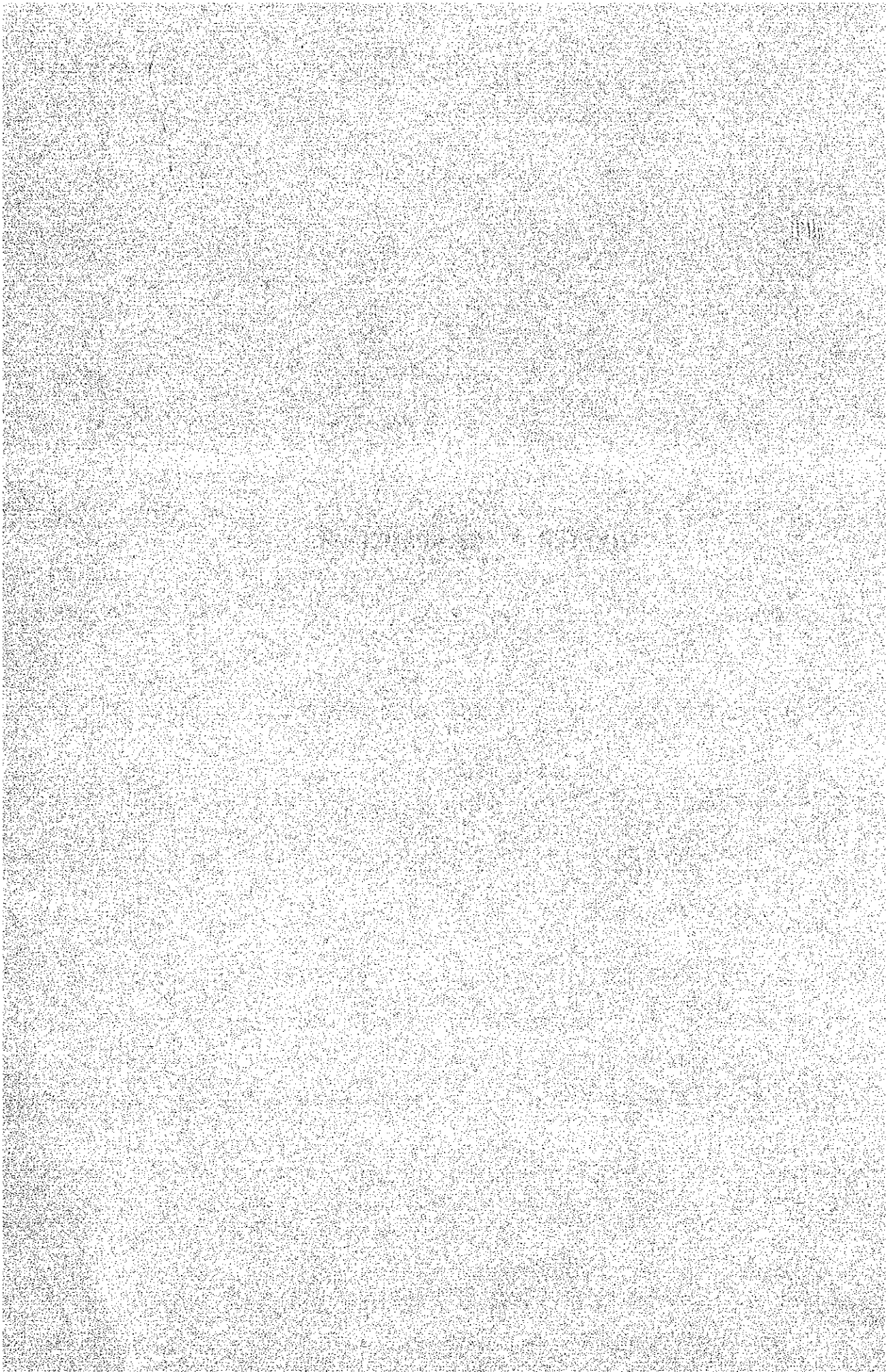
|           |  |     |
|-----------|--|-----|
| 3-3       | Project Outline .....  | 39  |
| 3-3-1     | Implementation Systems .....                                     | 39  |
| 3-3-2     | Basic Plan .....   | 40  |
| 3-3-3     | Proposed Project Site .....                                      | 43  |
| 3-3-4     | Plan Outline .....   | 44  |
| 3-3-5     | Management and Personnel .....                                   | 45  |
| 3-4       | Technical Cooperation .....                                      | 46  |
| CHAPTER 4 | BASIC DESIGN .....   | 49  |
| 4-1       | Design Principle .....   | 49  |
| 4-1-1     | Testing Facilities .....   | 49  |
| 4-1-2     | Buildings Accommodating Testing Facilities .....                 | 50  |
| 4-1-3     | Description of Facilities .....                                  | 50  |
| 4-2       | Design Conditions .....  | 62  |
| 4-2-1     | Equipment Design Conditions .....                                | 62  |
| 4-2-2     | Architectural Design Condition .....                             | 68  |
| 4-3       | Basic Plan .....   | 70  |
| 4-3-1     | Premise and Layout Plan .....                                    | 70  |
| 4-3-2     | Testing Facility Plan .....                                      | 70  |
| 4-4       | Architecture .....   | 84  |
| 4-4-1     | Plan and Elevation Designs .....                                 | 84  |
| 4-4-2     | Structural Design .....  | 86  |
| 4-4-3     | Facility Plans .....   | 87  |
| 4-4-4     | Building Material Plan .....                                     | 91  |
| 4-5       | Basic Design Drawing .....                                       | 94  |
| 4-6       | Construction Plan .....  | 115 |
| 4-6-1     | Construction Environment and Construction Work<br>Criteria ..... | 115 |
| 4-6-2     | Construction Work Category .....                                 | 115 |

|           |   |      |
|-----------|---|------|
| 4-6-3     | Construction Work Management Plan .....   | 116  |
| 4-6-4     | Equipment and Material Procurement Plan .....   | 118  |
| 4-7       | Implementation Schedule .....   | 119  |
| 4-7-1     | Detailed Design .....   | 119  |
| 4-7-2     | Construction Work .....   | 119  |
| 4-8       | Maintenance/Management Costs .....  | 122  |
| 4-9       | Estimated Project Cost to be borne by the<br>Government of Pakistan .....               | 123  |
| CHAPTER 5 | PROJECT EVALUATION .....  | 125  |
| 5-1       | Quality Improvement in Domestic Product .....   | 125  |
| 5-2       | Improvement in Reliability Towards Electrical<br>Business Operation .....               | 125  |
| 5-3       | Savings in Foreign Currency .....   | 126  |
| 5-4       | Research and Development of New Products .....  | 126  |
| 5-5       | Economic Analysis .....   | 126  |
| CHAPTER 6 | CONCLUSION AND RECOMMENDATIONS .....  | 131  |
| 6-1       | Conclusion .....  | 131  |
| 6-2       | Recommendations .....   | 132  |
| APPENDIX  |   |      |
| 1.        | KEY PERSONNEL WITH WHOM THE STUDY TEAM MET .....  | A-1  |
| 2.        | MEMBER LIST .....   | A-3  |
| 3.        | ITINERARY .....   | A-5  |
| 4.        | MINUTES OF DISCUSSIONS (PHOTO COPY) .....   | A-9  |
| 5.        | LIST OF RECEIVED DATA AND INFORMATION<br>EXCEPT ITEMS FILLED IN THE QUESTIONNAIRE ..... | A-25 |
| 6.        | SELECTION OF FACILITY SCALE .....   | A-29 |
| 7.        | INSTALLATION OF ADDITIONAL TRANSFORMER<br>IN RIWAT SUBSTATION .....                     | A-53 |





## **CHAPTER 1 INTRODUCTION**



## CHAPTER 1 INTRODUCTION

The Islamic Republic of Pakistan (hereinafter abbreviated as Pakistan) is under practice of the 6th Five-Year Economic Development Plan (1983-1988).

One of the actual purposes of this Plan is energy development, especially urgent expansion is required in generating and transmission/distribution facilities responding to demands for industrial development and rural electrification. However, power supply cannot catch up with the rapid increase in demands, thus causing poor conditions. The load shedding is still undertaken regularly to restrict use.

On the other hand, the national project policy for electrical equipment production has been promoted strongly together with facility maintenance and expansion. Today, most electrical equipment below 11 kV are produced domestically. However, those manufacturers have to depend on foreign nations for performance tests for their products due to insufficient testing facilities. Therefore, they are facing various problems including time, cost, and disability for other tests. This is one of the main factors causing insufficient quality in domestic products.

Under these circumstances, the Pakistani Government has requested the Japanese Government for the Grant Aid, based upon a viewpoint that the construction of a testing facility for domestic equipment is a must for improvement in their electricity conditions.

The Japanese Government, in response to this request, determined to confirm its background and concept by the preliminary study. JICA conducted a preliminary survey during the period from December 2 through 14, 1985.

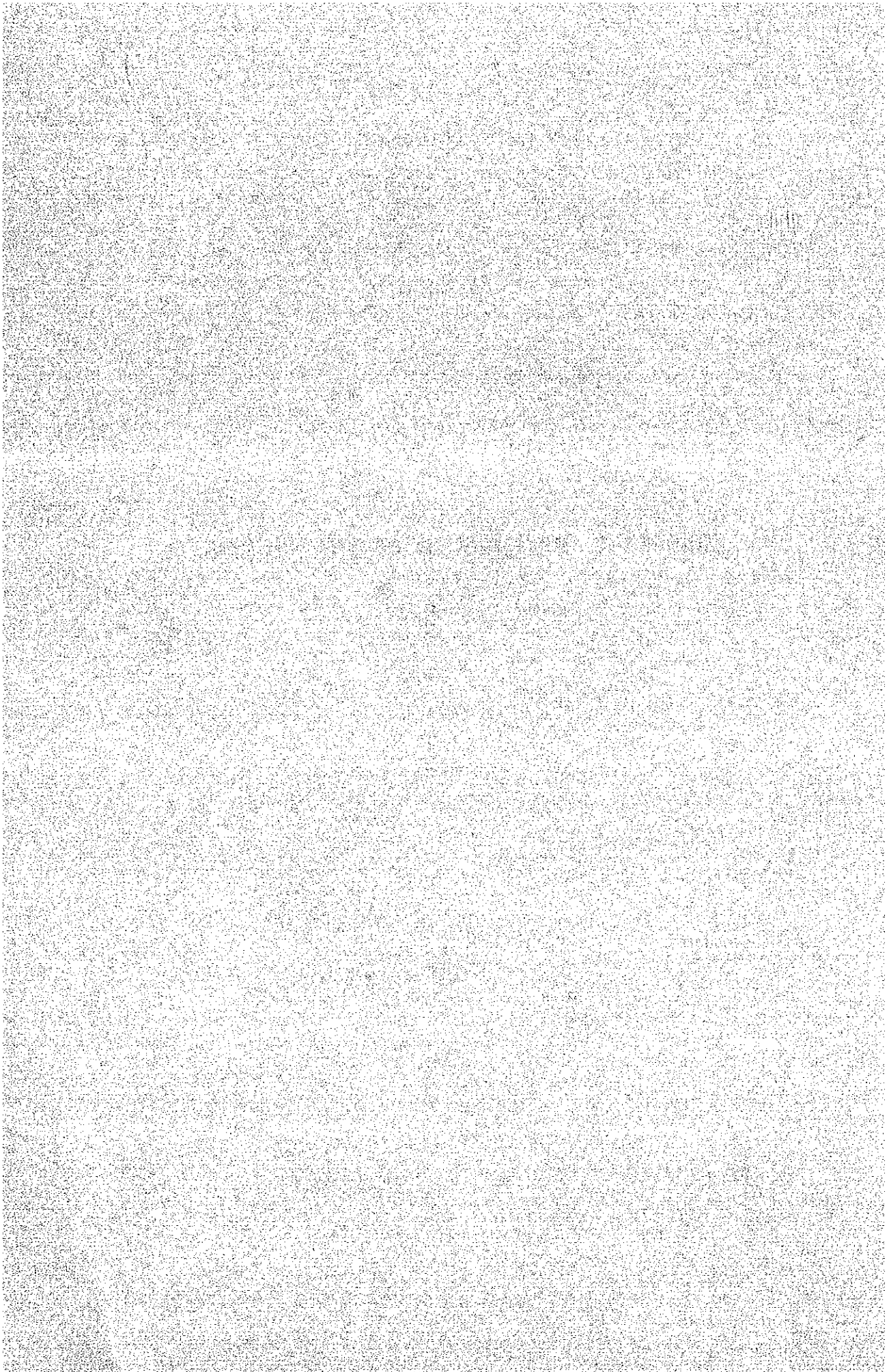
Following the above study, JICA also dispatched a Basic Design Study Team to Pakistan to study the adequacy of this project and determine its concept and scale. The Team, during their stay from April 7 through 29, 1986, studied the site, collected data, and discussed the matter with the officials of the Pakistan Government and WAPDA.

A basic agreements resulted from the discussion with the officials concerned of the Government of Pakistan were summarized in the form of the Minutes of Discussions, which was signed by both representatives on April 17, 1986.

The member list, itinerary key personnel with whom the Team met, list of received data and information as well as the copy of the Minutes of Discussions are attached as the Appendix at the end of the last chapter herein.

The justification of this project was studied further in Japan, based upon its survey results and the most appropriate plans to determine the details regarding this project, including materials and machinery selection, basic design of testing facilities and maintenance/management plans, were summarized in this report.

## **CHAPTER 2 BACKGROUND OF THE PROJECT**



## CHAPTER 2 BACKGROUND OF THE PROJECT

### 2-1 Outline of the Islamic Republic of Pakistan

#### 2-1-1 Geographic Conditions

The total area of Pakistan is 790,095 km<sup>2</sup>, 2.2 times that of Japan. On the northern border of Pakistan are Karakoram and the Hindu Kushi mountains of the Himalayas. In the center of the country runs from north to south the Indus, where from ancient times the rise and fall of the people have been staged.

Islamabad, the capital, is located 1,500 km north north-west of Karachi, an hour and forty minutes by air, at the foot of the northern mountain regions. It is located 10 km north of Rawalpindi which was the military capital under British rule. The population is 330,000 (as of 1981).

Urban development is presently under way in Islamabad and there are still a lot of green open spaces left in the city.

#### 2-1-2 Climate

The Tropic of Cancer runs a little south of the southern border of the country. It is in the subtropical zone, but the climate is dry with high temperatures and there is little rain. The extremely hot period continues from April to September and the temperature rises over 40°C during the day.

Pakistan's climate on the whole is very dry around the Indus basin from upper stream Punjab province to lower stream Sind province, and the annual rainfall is below 250 mm at the most. Other rivers swell during spring when the snow melts and the monsoon season in summer and often cause floods. This water is used for irrigation.

They have extremes of temperature during the year. In the summer it is one of the hottest places in the world with the low pressure system of monsoon, but in the winter they sometimes have frost and it is cold enough to snow in the mountain regions. It gets very cold at night in the plains also.



From past statistics, the temperature is at its highest in June and July, at above 52°C, and January has the lowest monthly temperature, -15°C was recorded in the western region.

The temperature in Islamabad from May to August is usually 40°C during the day, and sometimes rises to 46°C. The highest year average temperature is 28°C and the lowest is 14°C. The average humidity is 40 - 80%.

### 2-1-3 Population

The total population as of January 1984 is about 93 million and as a result of the 1981 census, between 1972 and 1981, in 8 years and 6 month, the population grew by 18.4 million, at the growth rate of 28.28%. Converted into a yearly average, it is 2.98%, a very high rate.

The population is centered in large cities like Karachi, Lahore and Islamabad, and 80% of the total population is centered in the Punjab Province, Sind Province and NWFP Province where these cities are located.

Table 2.1 shows the results of the 1981 census (population in age and sex) and in Table 2.2 the results of 1972 and 1981 censuses are compared.

### 2-1-4 Religion, Education and Language

#### (1) Religion

The national religion is Islam, and its followers make up about 95% of the population (1981 census).

Table 2.1 Population by Sex, Age and Urban/Rural Areas-1981 Census

| Age              | Total      |            |            |            |            |            | Urban      |            |            | Rural      |      |        |
|------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------|--------|
|                  | Both Sexes | Male       | Female     | Both Sexes | Male       | Female     | Both Sexes | Male       | Female     | Both Sexes | Male | Female |
|                  | All Ages   | 81,607,075 | 42,823,596 | 38,783,479 | 23,681,572 | 12,661,787 | 11,019,785 | 57,925,503 | 30,161,809 | 27,763,694 |      |        |
| 0-4 Years        | 13,093,870 | 6,469,467  | 6,624,403  | 3,639,619  | 1,836,225  | 1,803,394  | 9,454,251  | 4,633,242  | 4,821,009  |            |      |        |
| 5-9 Years        | 13,199,864 | 6,865,998  | 6,333,866  | 3,517,992  | 1,811,055  | 1,706,937  | 9,681,872  | 5,054,943  | 4,626,929  |            |      |        |
| 10-14 Years      | 10,555,894 | 5,742,527  | 4,813,367  | 3,124,544  | 1,666,018  | 1,458,526  | 7,431,350  | 4,076,509  | 3,354,841  |            |      |        |
| 15-19 Years      | 7,711,126  | 4,139,099  | 3,572,027  | 2,539,232  | 1,363,804  | 1,175,428  | 5,171,894  | 2,775,295  | 2,396,599  |            |      |        |
| 20-24 Years      | 6,339,042  | 3,300,031  | 3,039,011  | 2,150,859  | 1,176,455  | 974,404    | 4,188,183  | 2,123,576  | 2,064,607  |            |      |        |
| 25-29 Years      | 5,531,833  | 2,854,401  | 2,677,432  | 1,733,402  | 933,882    | 799,520    | 3,798,431  | 1,920,519  | 1,877,912  |            |      |        |
| 30-34 Years      | 4,572,764  | 2,335,413  | 2,237,351  | 1,378,307  | 740,863    | 637,444    | 3,194,457  | 1,594,550  | 1,599,907  |            |      |        |
| 35-39 Years      | 4,047,655  | 2,080,305  | 1,967,350  | 1,233,809  | 655,865    | 567,944    | 2,823,846  | 1,424,440  | 1,399,406  |            |      |        |
| 40-44 Years      | 3,623,117  | 1,891,560  | 1,731,557  | 1,062,493  | 588,243    | 474,250    | 2,560,624  | 1,303,317  | 1,257,307  |            |      |        |
| 45-49 Years      | 3,019,991  | 1,597,534  | 1,422,457  | 860,341    | 482,412    | 377,929    | 2,159,650  | 1,115,122  | 1,044,528  |            |      |        |
| 50-54 Years      | 2,845,426  | 1,575,230  | 1,270,196  | 766,646    | 440,182    | 326,464    | 2,078,780  | 1,135,048  | 943,732    |            |      |        |
| 55-59 Years      | 1,593,557  | 846,442    | 747,115    | 418,900    | 237,379    | 181,521    | 1,174,657  | 609,063    | 565,594    |            |      |        |
| 60-64 Years      | 2,091,342  | 1,214,283  | 877,059    | 516,812    | 303,204    | 213,608    | 1,574,530  | 911,079    | 663,451    |            |      |        |
| 65-69 Years      | 967,596    | 538,970    | 428,626    | 226,442    | 131,565    | 94,877     | 741,154    | 407,405    | 333,749    |            |      |        |
| 70-74 Years      | 1,104,214  | 634,587    | 469,627    | 253,009    | 141,424    | 108,585    | 851,205    | 490,163    | 361,042    |            |      |        |
| 75 Years & above | 1,309,784  | 737,749    | 572,035    | 269,165    | 150,211    | 118,954    | 1,040,619  | 587,538    | 453,081    |            |      |        |

Note: This excludes the population of FATA

Source: Population Census Organisation

Table 2.2 Comparative Position of 1972 and 1981 Censuses

(In thousands)

|                 | 1972   |        |        | Density<br>persons<br>per sq.<br>km | 1981   |        |        | Density<br>persons<br>per sq.<br>km |
|-----------------|--------|--------|--------|-------------------------------------|--------|--------|--------|-------------------------------------|
|                 | Total  | Male   | Female |                                     | Total  | Male   | Female |                                     |
| Pakistan        | 65,309 | 34,833 | 30,476 | 82                                  | 83,782 | 43,960 | 39,822 | 105                                 |
| Urban           | 16,593 | 9,027  | 7,566  | ...                                 | 23,729 | 12,450 | 11,270 | ...                                 |
| Rural           | 48,716 | 25,806 | 22,910 | ...                                 | 60,053 | 31,501 | 28,552 | ...                                 |
| NWFP            | 8,389  | 4,363  | 4,026  | 113                                 | 10,885 | 5,652  | 5,233  | 146                                 |
| Urban           | 1,196  | 647    | 549    | ...                                 | 1,658  | 851    | 797    | ...                                 |
| Rural           | 7,193  | 3,716  | 3,477  | ...                                 | 9,227  | 4,791  | 4,436  | ...                                 |
| Punjab          | 37,845 | 20,341 | 17,505 | 183                                 | 47,116 | 24,783 | 22,328 | 229                                 |
| Urban           | 9,259  | 5,023  | 4,236  | ...                                 | 12,971 | 6,824  | 6,147  | ...                                 |
| Rural           | 28,586 | 15,318 | 13,268 | ...                                 | 34,145 | 17,964 | 16,181 | ...                                 |
| Sind            | 14,156 | 7,574  | 6,582  | 100                                 | 18,966 | 9,935  | 9,031  | 134                                 |
| Urban           | 5,726  | 3,131  | 2,595  | ...                                 | 8,226  | 4,309  | 3,917  | ...                                 |
| Rural           | 8,430  | 4,443  | 3,987  | ...                                 | 10,740 | 5,626  | 5,114  | ...                                 |
| Baluchistan     | 2,428  | 1,289  | 1,139  | 7                                   | 4,205  | 2,274  | 2,031  | 12                                  |
| Urban           | 399    | 218    | 181    | ...                                 | 672    | 355    | 317    | ...                                 |
| Rural           | 2,029  | 1,071  | 958    | ...                                 | 3,633  | 1,919  | 1,714  | ...                                 |
| FATA            | 2,491  | 1,266  | 1,225  | 92                                  | 2,175  | 1,129  | 1,046  | 80                                  |
| Urban           | 13     | 8      | 5      | ...                                 | ...    | ...    | ...    | ...                                 |
| Rural           | 2,478  | 1,258  | 1,220  | ...                                 | 2,175  | 1,129  | 1,046  | ...                                 |
| Islamabad (FCA) | 235    | 130    | 105    | 259                                 | 335    | 182    | 153    | 369                                 |
| Urban           | 77     | 46     | 31     | ...                                 | 202    | 110    | 92     | ...                                 |
| Rural           | 158    | 84     | 74     | ...                                 | 133    | 72     | 61     | ...                                 |

FATA: Federally Administered Tribal Areas      Source: Pakistan Census Organisation  
 FCA : Federal Capital Area

(2) Education

The total average literacy rate as shown in the attached Table 2.3 (1981 census) is 26.2%. However, Pakistan is aiming to bring this value up to 40% within the 6th Five-Year Economic Development Plan.

Only the elementary school education is compulsory. The number of elementary schools in 1981 - 1982 was 62,580. The number of pupils and students in 1982 - 1983 was 6,023,000 in elementary schools, 1,652,000 in junior high schools, 996,000 in high schools, 388,000 in the literary and science departments on junior colleges, 84,330 in vocational schools (including junior colleges of education) and 78,660 in universities. The number of teachers in the above schools is in the above order, 200,800 - 56,600 - 85,287 - 14,063 - 5,050 (from FEA 1984 - 1985 yearbook).

They are promoting Islamic education with a ten-year plan. Between 1983 - 1984, 695 elementary schools, 74 junior high schools, 77 high schools, 14 junior colleges and 3 vocational schools were newly built. The total number of students rose 341,000.

(3) Language

The language of Pakistan is Urdu. Urdu is the national language of Pakistan under the constitution.

Table 2.3 Literacy Ratio by Sex, Age and Urban/Rural Areas - 1981 Census

(Percentage)

| Age Group        | Total      |      |        | Urban      |      |        | Rural      |      |        |
|------------------|------------|------|--------|------------|------|--------|------------|------|--------|
|                  | Both Sexes | Male | Female | Both Sexes | Male | Female | Both Sexes | Male | Female |
| 10 Years & above | 23.3       | 31.8 | 13.7   | 43.4       | 51.5 | 33.7   | 14.8       | 23.1 | 5.5    |
| 10 - 14 Years    | 22.2       | 26.8 | 16.7   | 40.1       | 41.9 | 38.0   | 14.6       | 20.6 | 5.5    |
| 15 - 19 Years    | 34.1       | 42.5 | 34.4   | 56.2       | 60.5 | 51.3   | 23.3       | 33.6 | 1.3    |
| 20 - 24 Years    | 32.1       | 43.0 | 20.2   | 54.4       | 62.4 | 44.6   | 20.6       | 32.3 | 8.7    |
| 25 - 29 Years    | 27.5       | 38.9 | 15.4   | 49.6       | 60.1 | 37.4   | 17.4       | 28.6 | 6.0    |
| 30 - 34 Years    | 24.0       | 35.7 | 11.8   | 45.2       | 57.8 | 30.7   | 14.9       | 25.4 | 4.3    |
| 35 - 39 Years    | 22.4       | 34.0 | 10.2   | 42.2       | 55.5 | 26.9   | 13.8       | 24.0 | 3.4    |
| 40 - 44 Years    | 19.2       | 29.8 | 7.7    | 37.4       | 50.2 | 21.5   | 11.7       | 20.6 | 2.5    |
| 45 - 49 Years    | 17.6       | 27.5 | 6.6    | 35.4       | 47.9 | 19.3   | 10.6       | 18.6 | 2.0    |
| 50 - 54 Years    | 13.8       | 21.0 | 4.9    | 29.0       | 39.6 | 14.8   | 8.2        | 13.8 | 1.5    |
| 55 - 59 Years    | 14.6       | 23.8 | 4.1    | 31.5       | 45.1 | 13.6   | 1.8        | 15.5 | 1.1    |
| 60 Years & above | 9.5        | 14.8 | 2.3    | 20.8       | 30.7 | 7.4    | 6.0        | 10.0 | 0.7    |

Source: Population Census Organisation

English still plays an important role as an official language even after Pakistan's independence. It is widely used in government agencies, academic circles and business practices, but the government is promoting a policy, slowly, to use Urdu as an official language instead of English.

#### 2-1-5 Government

The government body under the 1973 constitution is a federal republic with democracy, liberty, equality, tolerance and socialism as set by Islam.

#### 2-1-6 Economy

35% of the total population are engaged in agriculture. Four major crops, cotton, rice, sugar cane and wheat make up about 30% of the GNP which is dependent on agriculture. Industry makes up about 15% of the GNP and the majority is textile producers of cotton fabrics and thread.

#### <The 6th Five-Year Economic Development Plan>

The planning of the Sixth Five Year Plan is presently under way. According to the announcement by MAHBUB-UL-HAQ, chairman of the planning committee, the total investment is Rs.525,000 million (about \$42,000 million). The target amount within the term is 6 to 7% of the GDP's actual yearly growth, 5% agriculture, 10% industry and growth of manufactured exports 15%.

It is announced that if this growth rate can be achieved, even with the growth of the population by the final year of the plan, every household will have an annual income growth of Rs.800.

Pakistan plans to realize within the five-year, electrification of 45,000 villages, widespreading waterworks, (from the present 20% to 50%), bring up enrollment in elementary schools in the rural areas (from the present 50% to 75%) and also important is increasing exports of surplus attained by increasing production of food. Especially with agricultural products, not only rice and wheat but exports in large volumes of vegetables, fruit and dairy products to the Middle and Near East are planned. Education and research on scientific technology is also one of the important tasks.

<The General Situation (gross national product including national income)>

According to the '83 - '84 yearly report of the national bank, the real economic growth rate of '83 - '84 fiscal year (July 1, 1983 to June 30, 1984) was only 4.5% due to slow growth rate of the net income because of bad weather and a slump in agriculture, however, the growing trend was maintained. '83 - '84 GDP was Rs. 375,690,000,000 (growth rate +4.5%), GNP Rs. 416,200,000,000 (+4.6%).

Growth rate for each sector is, commodity production +1.6%, service industry +8%, agriculture -4.6% and manufacturing industry +7.7%. The national average annual income is Rs.4,530. The inflation rate is 9.4%. The balance of payments is \$267,000,000 in the red. National savings ratio against GNP was 12.3% and domestic savings ratio against GDP was 5.2%.