NO.

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVING THE QUALITY OF PRODUCTS AND INCREASING THE COMPETITIVENESS OF THE INDUSTRIAL SECTOR
IN
THE HASHEMITE KINGDOM OF JORDAN

JULY 2004

JAPAN INTERNATIONAL COOPERATION AGENCY

UNICO INTERNATIONAL CORPORATION

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PREFACE

In response to a request from the Government of the Hashemite Kingdom of Jordan, the Government of Japan decided to conduct a basic design study on the Project for Improving the Quality of Products and Increasing the Competitiveness of the Industrial Sector, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Jordan a study team from January 17 to February 19, 2004.

The team held discussions with the officials concerned of the Government of Jordan, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Jordan in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Hashemite Kingdom of Jordan for their close cooperation extended to the teams.

July, 2004

Yasuo Matsui
Vice President
Japan International Cooperation Agency

July, 2004

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improving the Quality of Products and Increasing the Competitiveness of the Industrial Sector in the Hashemite Kingdom of Jordan.

This study was conducted by UNICO International Corporation, under a contract to JICA, during the period from December, 2003 to July, 2004. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Jordan and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

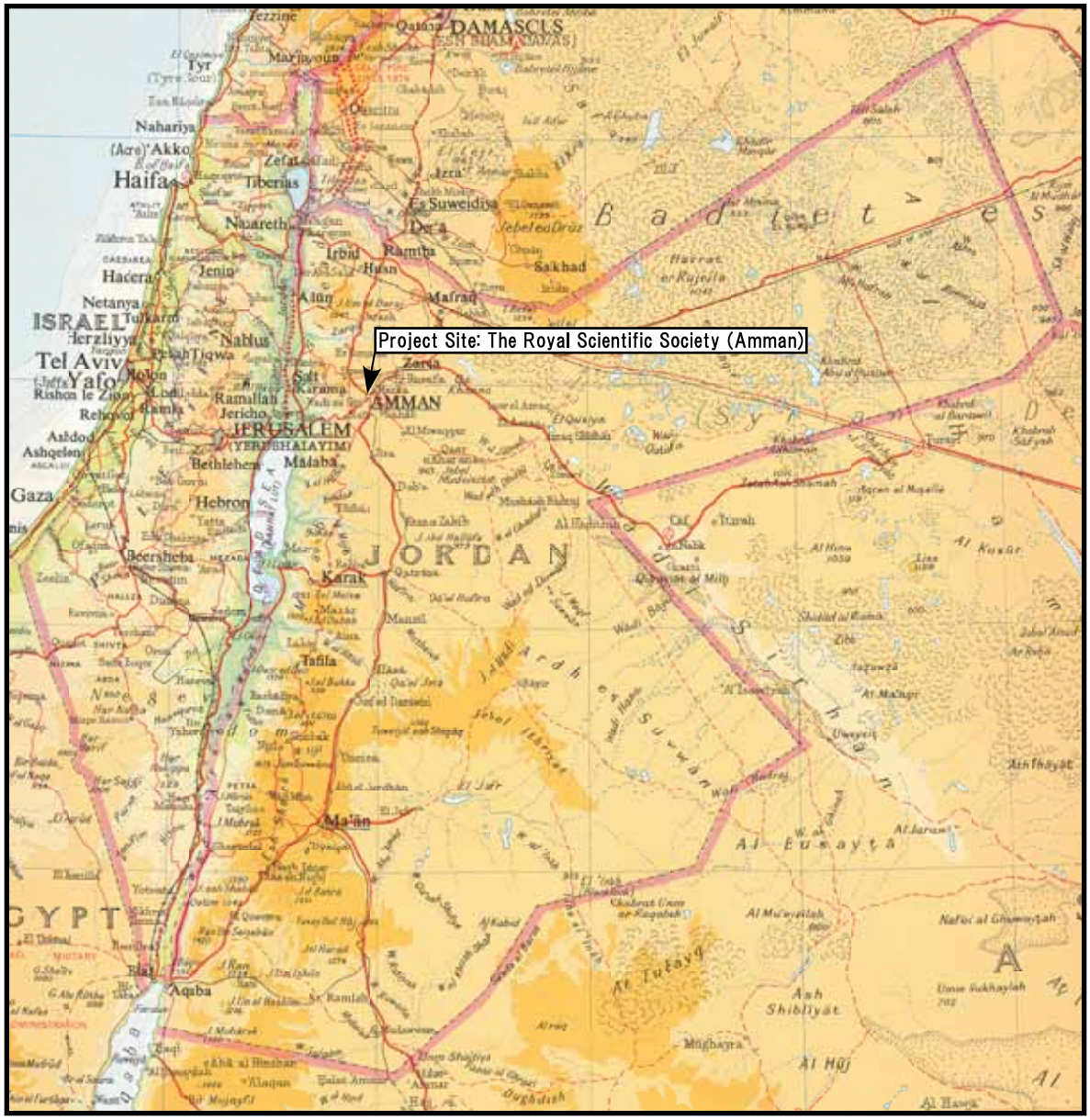
Very truly yours,

Katsuhiko Higuchi
Project manager,
Basic design study team on the Project for
Improving the Quality of Products and Increasing
the Competitiveness of the Industrial Sector
UNICO International Corporation

Location Map

Jordan and Surrounding Countries

Site Location



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Abbreviations

A/P	Authorization to Pay
ASTM	American Society for Testing and Material
B/A	Banking Arrangement
BRC	Building Research Center
E/N	Exchange of Notes
EN	European Standard
ERC	Environmental Research Center
ESDP	Economic & Social Development Plan
ESTC	Electronic Service and Training Center
EU	European Union
FOB	Free On Board
GFNP	General Framework of National Industrial Policy, The National Program for Jordan's Industrial Sector Qualification and Development
HCST	Higher Council for Science and Technology
ICC	Industrial Chemistry Center
IEC	International Electrotechnical Commission
IMF	International Monetary Fund
IOOC	International Olive Oil Council
ISO	International Organization for Standardization
ITC	Information Technology Center
JAS	Jordan Accreditation System
JD	Jordan Dinar
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standard
JISM	Jordan Institution for Standards and Metrology
JQM	Jordan Quality Mark
JS	Jordanian Standard
MDTC	Mechanical Design and Technology Center
M/R	Mutual Recognition
NCL	National Calibration Laboratory
RSS	The Royal Science Society
SAP	Structural Adjustment Program
SETP	Social & Economic Transformation Program

Summary

Summary

The Hashemite Kingdom of Jordan is not a petroleum-producing country, not abundant in natural resources except for mineral phosphate, potassium etc., and productivity of agriculture is low due to climate conditions, and then, Jordan is dependent on import of many raw materials, energy, foods etc. Industry is prospering, then, many consumer goods and capital goods are imported too. On the other hand, means for acquisition of foreign currency are limited. In 1988, foreign accumulated debts amounted to 710 million dollar (GDP ratio 180%). Since 1989, Jordan has been under several times Structural Adjustment Program (SAP) of International Monetary Fund. As the result of the SAP, there have been certain achievements of macro economic index etc. However, unemployment and poverty were increased. Since the latter half of the decade of 1990, unemployment ratio has been about 15%, poverty class has been about 12%, which has been a problem to be solved for Jordan.

To reduce the foreign debts with expansion of exports, and to solve the problem of the poverty with employment creation, promotion of the industrial sector is one of the most important subjects. The Government of Jordan has been taking measures of affiliation with the World Trade Organization, conclusion of treaties of free trade with Arab, European and American countries, establishment of Aqaba Special Economic Zone, etc. for economic growth through attraction of direct foreign investment in the industrial sector and promotion of free trade. And, in the draft of the “Economic and Social Development Plan (2004-2006)”, and existing “General Framework of National Industrial Policy, The National Program for Jordan's Industrial Sector Qualification and Development” and “Social & Economic Transformation Program (2002-2005)”, various measures have been planned for expansion of the industrial sector and increasing competitiveness of Jordanian products, i.e. expansion of investment in the industrial sector, technical and financial supports to enterprises, encouragement of acquisition of ISO9001, policies for establishment of a certification system with testing institutions in conformity with international practices and levels.

In consequence of those actions, competition among industrial products has intensified in both export and domestic markets; the need for quality control of industrial products as a means of increasing their competitiveness has grown. In such circumstances, the Royal Scientific Society which is a central institute for testing and research in Jordan has been required to provide calibration and testing services to medium and small-sized enterprises which have no testing equipment and to large or foreign capital enterprises which require the third party test and inspection. However, almost all items of the existing equipment of the Royal Scientific Society are too old, as those were procured 15 to 20 years ago, and their functions and quantities are not sufficient, and preparation of equipment for calibration and testing has been

necessary. In case that the Royal Scientific Society procures such equipment for calibration and testing with its own expenses, the costs are charged to the enterprises together with charges of the calibration and testing services, and it cause avoidance of testing or price increase of products, and competitiveness is decreased. In this context, in July 2000, the Government of Jordan requested grant aid assistance to the Government of Japan for the preparation of equipment for calibration and testing for the Royal Scientific Society.

In reply to the request, the Government of Japan decided to execute preparatory study, and Japan International Cooperation Agency (JICA) conducted the preparatory study from June to July 2003. During the preparatory study, whole picture of the request was clarified, necessity and propriety of execution of this project were confirmed, and matters that require attention for execution of basic design study were considered. Based on the results of the preparatory study, the Government of Japan decided to execute basic design study, and JICA conducted the basic design study. Field survey was made from January 17 to February 19, 2004, and the study team made discussion and confirmation with Jordanian side based on the results of the preparatory study, and collected information and materials concerned. After analysis in Japan, such as consideration of equipment plan and overall scale, cost estimation, etc., explanation of draft report was conducted from May 22 to June 2, 2004 in Jordan, and the details of the project was confirmed.

For selection of the equipment, calibration equipment was limited to ① calibration equipment for laboratory equipment of the Royal Scientific Society, or ② calibration equipment for measuring or testing equipment of firms etc., and testing equipment was limited to testing equipment for Jordanian industrial products. Upon these criteria, medical equipment calibration system, equipment for the personal dosimetry laboratory system, soil testing equipment, and air quality measurement equipment in requested equipment were omitted from equipment plan.

In addition, demands from industrial sector for calibration and testing services were researched and confirmed with statistics, questionnaire to the Royal Scientific Society and enterprises, visiting to enterprises etc. Based on the results, equipment was selected provided that sufficient number of request for the service was expected. Furthermore, items that propriety was not sufficient were omitted from equipment plan, i.e. ① Items which require large-scale modification/construction of buildings for installation, ② Items necessary for calibration or testing which is conducted more efficiently by other institutions, ③ Simple equipment, tools, standards etc. which can be easily procured by the Royal Scientific Society, ④ Items which can be substituted by existing equipment etc., and ⑤ Items which have difficulty to procure spare parts or consumables locally.

For setting up quantities of the equipment, necessary quantities were calculated based on frequency of use,

and necessary time of use and calibration. Common use of equipment was considered among sections of the Royal Scientific Society as much as possible. In addition, number of existing equipment was deducted.

Major planned equipment and quantities are as follows:

Equipment for Calibration (National Calibration Laboratory in Electronic Services Training Center)

A. Electrical Calibration System
Direct Voltage Reference Standard 1 unit, Resistance Standards 1 set, Direct Voltage Standard 1 unit, Oscilloscope Calibrator 1 unit, Digital Multimeter 1 unit, 1000A DC Current Source 1 unit, Microwave Frequency Counter 1 unit, Standard Capacitances (1pF - 1000pF, 4 kinds) 1 set, Decade Capacitor 1 unit, Standard Inductance 1 set, Global Positioning System with Time Interval Counter 1 unit, Calibration Asset Track/Management Software 1 set, Multifunction Calibrator 1 unit
B. Temperature Calibration System
Water Bath 1 unit, Fluid Bath (low temp.)1 unit, Fluid Bath (high temp.) 1 unit, Salt Bath 1 unit, Triple Point of Water Cell 1 pc, Freezing Point of Indium Cell 1 pc, Freezing Point of Aluminum Cell 1 pc, Freezing Point of Tin Cell 1 pc, Freezing Point of Copper Cell 1 pc, Bath for Maintaining Triple Point of Water and Gallium Cells 1 unit, Bath for Maintaining Indium, Tin , Zinc and Aluminum Cells 1 unit, Bath for Maintaining Silver and Copper Cells 1 unit, Dry Block Calibrator 2 kinds 1 set, Spherical Furnace 1 unit, Humidity/Temperature Recorder 1 unit, Humidity/Temperature Chamber 1 unit, Reference Standard Thermocouples and Resistance Thermometers 4 kinds 1 set, Digital Precision Thermometers 4 kinds 1 set, Liquid In Glass Thermometers 10 kinds 1 set, Cold Junction Comparison 1 unit
C. Length Calibration System
Gauge Block Set 4 kinds 1 set, Angle Block Set (0-360°) 2 units, Dial Gauge Tester 1 unit, Automatic Gauge Block Comparator 1 unit, Machine for calibration of length standards, steel rulers, etc. 1 unit, Special Gauge Block Set for vernier caliper with control ring for inner diameter and height calibration 1 set
D. Mass Calibration System
Weight Sets E1 Class 2 sets, Weight Sets E2 Class 2 sets, Weight Sets F1 Class 1 set, Electronic Digital Balance 3 kinds each 1 unit, Digital Balance Comparator 4 kinds each 1 unit, Apparatus for Measuring Density of Weights 1 unit, Apparatus for Measuring Magnetic Susceptibility of Weight 1 unit
E. Pressure Calibration System
Dead Weight Tester 1 set
F. Force Calibration System
Digital Force Read Out 2 units, Reference Standard Machine for Calibration of Load Cells 1 unit, Load Cell 6 kinds each 2 units
G. Volume & Density Calibration System
Standard Hydrometer 1 unit
H. Flow Calibration System
Reference Standard and Working Flow Meters (Fluid) 3 kinds 2 units each
J. Light Calibration System
Reference Standard and Working Luxmeters 2 units, Reference Standard and working UV-meter 2 units

Equipment for Testing

Electronic Services Training Center

1. Equipment for testing safety of Home Use Electronic Appliance
Proof tracking test apparatus 1 unit, IP Rating Test equipment 1 unit, Door endurance tester for microwave ovens 1 unit, Hot winding ohmmeter 1 unit, Torque tester for lamps 1 unit, Life cycling tester for lamps 1 unit, Test corner 1 unit
2. Equipment for testing of Electric Irons
Steam pressure measuring apparatus 1 unit
3. Equipment for testing of Switches, Plugs and Sockets
Tumbling barrel 1 unit, Apparatus for cord retention testing 1 unit, Apparatus for socket-outlets breaking capacity and normal operation test 1 unit, Apparatus for flexing test 1 unit, Test apparatus for making and breaking capacity for switches 1 unit, Conductor damage test set 1 set, AC current source 1 unit, Inductive Loads 1 unit
4. Equipment for testing of Refrigerators, Freezers, and Bottle Coolers
50/60 Hz Frequency Converter 1 unit, Temperature and Humidity Chamber 1 unit
5. Equipment for testing of Lead Acid Starter Batteries
Temperature Chamber 1 unit, Vibration Tester 1 unit, High Rate Discharge Tester 1 unit, Universal Battery Tester 1 unit, Water Bath 1 unit
6. Equipment for testing of Television Receivers
Oscilloscope 1 unit, Softening temperature-testing equipment 1 unit, Surge test generator 1 unit, Full draught oven 1 unit, Video test signal generator 1 unit, Audio test signal generator 1 unit, Spectrum analyzer with digital frequency counting function 1 unit, Video noise meter 1 unit, Television test modulator 1 unit
7. Equipment for testing of Circuit Breakers
Short circuit current test set with all standard accessories 1 unit, Glow wire test apparatus 1 unit

Mechanical Design Technology Center

1. Equipment for the Plastics & Rubber Unit
Universal testing machine 1 unit, Melt flow indexer 1 unit, Computerized tensile film tester 1 unit, Sample preparation machine 1 unit
2. Equipment for the Strength of Materials Unit
Automated Universal tensile/compression testing machine 1 unit, Impact testing machine 1 unit
3. Equipment for the Measurement & Calibration Unit
Digital balance 3kinds, 1 each)
4. Equipment for the Metallography & Heat Treatment Unit
Scanning Electron Microscope with X-ray Analyzer 1 unit, CS Analyzer 1 unit, Cutting Machine 1 unit, Grinding and polishing machines 1 set, Digital Universal Hardness Tester 1 unit, Mini-load hardness (Micro-hardness) tester 1 unit, Electric Furnace 1 unit, Salt Spray Cabinet 1 unit, Automatic Mounting Press Machine for Sample preparation 1 unit
6. Equipment for the Non-Destructive Testing Unit
Directional X-Ray Machine for industrial radiography 1 unit, Digital Ultrasonic Flow Detectors with probes 2 units
7. Equipment for the Radiation Measurement and Calibration Laboratory
Portable Gamma Spectroscopy System 1 unit, Gamma–Ray Spectroscopy Analysis Software 1 set, Gross Alpha / Beta Counter 1 unit
9. Equipment for the Casting Technology Unit
Induction Furnace 1 set, Mobile Sand Testing Laboratory for foundry industry 1 unit

Industrial Chemistry Center

1. Equipment for the Textile & Paper Unit
Nu-Martindale Tester 1 unit, Washing Machine 1 unit, Steaming Cylinder with Steam Generator 1 unit, Air Permeability Tester of Paper 1 unit, Motor driven Water Penetration Tester 1 unit, Reflectometer 1 unit, Tensile Machine 1 unit
2. Equipment for the Cigarettes Unit
Smoking Machine 1 unit, Gas Chromatograph 1 unit
3. Equipment for the Organic & Food Unit
Gas Chromatography/Mass Spectrometer (GC/MS) 1 unit, Gas Chromatography/Flame Ionization Detector (GC/FID) 1 unit, High Performance Liquid Chromatography (HPLC) (Semi-Preparative) 1 unit, Automatic Kjeldahl Nitrogen Analyzer 1 unit, Milk Analyzer 1 unit, Meat Analyzer 1 unit, Amino Acid Analyzer 1 unit, Automatic Melting Point Apparatus 1 unit
4. Equipment for the Petrol & Lubricants Laboratory
Lubricant Test Machine 1 unit, Dielectric Breakdown Voltage of Insulating Liquids 1 unit, Evaporating Loss of Lubricating Oils (Noack Test) 1 unit, Determination of Vapor Pressure 1 unit, Determination of Air Release Value 1 unit, Demulsibility Characteristics 1 unit, Automatic Oxygen Bomb Calorimeter 1 unit, Bench top XRF 1 unit
5. Equipment for the Paints, Lacquers & Solvents Laboratory
Constant Climate Chamber 1 unit, Superchroma Spectro-colorimeter 1 unit
6. Equipment for the Inorganic Material Division
Atomic Absorption Spectrophotometer 1 unit, X-Ray Diffractometer 1 unit, Sequential Plasma Emission Spectrometer (ICP) 1 unit, XRF- Sequential Spectrometer 1 unit

Building Research Center

1. Equipment for the Cement and Concrete Unit
Auto Test Compression/Flexural Machine 1 unit, Water Permeability of Concrete 1 unit
2. Equipment for the Ceramic Unit
Equipment and Accessories to Test Sanitary Ware 1 set
3. Equipment for the Building Components & Insulation Materials Unit
Guarded Hot Plate Apparatus 1 unit

Environmental Research Center

1. Equipment for the Chemical Testing Unit	2. Equipment for the Chemical Testing Unit
Gas Chromatograph (with Purge & Trap Concentrator, and ECD) 1 unit	Environmental Cabinet Assembly 1 unit

The implementation period of the project when it is carried out under the grant aid cooperation program of Japan is 4.5 months for implementation design, 6.5 months for procurement of the equipment, total 11.0 months, and total costs of the project is estimated at approximately 914 million yen (Japanese side approximately 905 million yen, Jordanian side approximately 8.7 million yen).

Expected effects of the project are as follows:

(1) Direct Effect

- Sort of the calibration and testing services of the Royal Scientific Society will increase from 147 to 199, and number of the services will increase.
- High quality technical consultation will be available at the Royal Scientific Society, which will contribute to improvement of technology of enterprises in Jordan, improvement of quality of products, reducing production costs, etc.

(2) Indirect Effect

- The enterprises of Industrial sector in Jordan, approx. 18,000 (in the year of 2002), will be able to plan improvement of quality of products and saving production costs, and then competitiveness of the enterprises in Jordan will increase. And it will contribute to promotion of industrial sector and economic growth in Jordan.
- The Royal Scientific Society will be able to provide wider and more accurate calibration and testing services than ever to those firms of the middle east surrounding countries too. And then, it will contribute to development of industrial sector in the whole area.
- Jordan Institute for Standards and Metrology (JISM) is planning to conclude mutual recognition (M/R) with Syria, Lebanon, Palestine, Iraq, Egypt, Kuwait, Qatar, Saudi Arabia, Oman, Yemen, Tunisia, so that Jordan Quality Mark (JQM) and Jordan Accreditation System (JAS) can be accepted in the area. For the plan, improvement of functions of calibration and testing of the Royal Scientific Society is one of necessary conditions, and then the Project will contribute to realization of the plan.
- JISM is planning to conclude M/R with not only the Arab countries but also with the other advanced countries, so that JQM and JAS can be accepted internationally. After realization of the plan, export of Jordanian products will become easier, and the Project will contribute to realization of the plan.

Estimated cost borne by Jordanian side, approximately JD55,000 (8.7 million yen), for installation of the equipment is 5.1% of construction budget, and 0.6% of total budget of 2004, and there will be no problem in increasing the budget to cover the cost.

Total number of staff of the Royal Scientific Society is 673 (in the year of 2002), and more than half numbers of staff members have high educational backgrounds (Ph.D.: 51, M.A. or M.Sc.:89, B.Sc or B.A.: 237). The Royal Scientific Society has many experiences of calibration and testing services since establishment, and it has high technology in the fields. In addition, the Royal Scientific Society has confirmed to secure new staff allocation necessary for execution of the project. Therefore, there will be no

problem in execution of the project.

The annual additional costs for operation and maintenance of the planned equipment are approximately JD370,167 for personnel expenses, approximately JD41,641 for consumables and parts, and approximately JD16,500 for calibrations by outside institutions etc., totaling JD428,308 ($603,914). In the category of expenditure of the Royal Scientific Society, those are corresponding to the items of expenditure of personnel, consumables & parts, and equipment respectively. Comparing with the average of past three years, those are 7.3%、9.2%、7.7% increase respectively, which can be borne without difficulties. New staff is allocated to sections in which calibration and testing services are expanded and income is increased, and, costs for consumables, parts, and calibration are generally charged to the applicants together with the charge for testing services, therefore, there will be no problem in increasing the budget to cover the costs.

For more effective and efficient execution of the project, it will be valuable to make cooperation with technical assistance, and advertisement of new sorts, ranges, accuracies of calibration and testing services of the Royal Scientific Society to enterprises.

The Royal Scientific Society is expected to make financial arrangements to secure necessary fund for the replacement or upgrading of the equipment in future.

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Chapter 1　Background of the Project

Chapter 1. Background of the Project

The Hashemite Kingdom of Jordan has been planning economic growth through attraction of direct foreign investment, and promotion of free trade through accession to the World Trade Organization, conclusion of treaties of free trade with Arab, European and American countries, and establishment of Aqaba Special economic zone, as the major initiatives. In consequence, competition among industrial products has intensified in both export and domestic markets; the need for quality control of industrial products as a means of increasing their competitiveness has grown. In such circumstances, the Royal Scientific Society which is a central institute for testing and research in Jordan has been required to provide calibration and testing services to medium and small-sized enterprises which have no testing equipment and to large or foreign capital enterprises which require the third party test and inspection. However, almost all items of the existing equipment of the Royal Scientific Society are too old, as those were procured 15 to 20 years ago, and those grades and quantities are not sufficient, and preparation of equipment for calibration and testing has been necessary. In case that the Royal Scientific Society procures such equipment for calibration and testing with its own expenses, the costs are charged to the enterprises together with charges of the calibration and testing services, and it cause avoidance of testing or price increase of products, and competitiveness is decreased. Therefore, in July 2000, the Government of Jordan requested grant aid assistance to the Government of Japan for the preparation of equipment for calibration and testing for the Royal Scientific Society.

Prior to the basic design study, a preparatory study was executed, and 1. necessity of expansion of the functions of the Royal Scientific Society for calibration and testing services, and 2. capacities of staff of the Royal Scientific Society for operation and maintenance etc. were confirmed.