

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

**MINISTRY OF TECHNIQUE AND INTERNATIONAL COOPERATION (SETCO)
NATIONAL SERVICE AUTHORITY FOR WATER SUPPLY AND SEWERAGE (SANAA)**

THE STUDY

**ON WATER SUPPLY SYSTEM
FOR TEGUCIGALPA URBAN AREA
IN THE REPUBLIC OF HONDURAS**

FINAL REPORT

MAIN REPORT

JANUARY 2001

PACIFIC CONSULTANTS INTERNATIONAL

Foreign Currency Exchange Rates Applied in the Study

Currency	Exchange Rate/USD
Honduran Lempiras (Lps)	14.87
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PREFACE

In response to a request from the Government of the Republic of Honduras, the Government of Japan decided to conduct the Study on Water Supply System for Tegucigalpa Urban Area in the Republic of Honduras and entrusted the study to the Japan International Cooperation Agency (JICA).

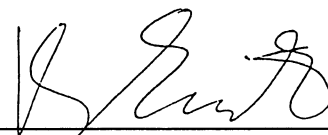
JICA selected and dispatched a study team headed by Mr. Akira Takechi of Pacific Consultants International (PCI) and composed of staff members of PCI to Honduras, two times between February 2000 and November 2000. In addition, JICA set up an advisory committee headed by Mr. Yoshiki Omura, Senior Advisor, Institute for International Cooperation, JICA, which examined the Study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of the Republic of Honduras, and conducted field surveys in the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Honduras for their close cooperation extended to the team.

January, 2001



Kunihiko Saito
President
Japan International Cooperation Agency

**THE STUDY ON WATER SUPPLY SYSTEM FOR TEGUCIGALPA URBAN
AREA IN THE REPUBLIC OF HONDURAS**

January, 2001

Mr. Kunihiko Saito
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

Dear Sir,

We are pleased to submit to you the final report entitled "The Study on Water Supply System for Tegucigalpa Urban Area in the Republic of Honduras". This report has been prepared by the Study Team in accordance with the contract signed on 18 January 2000 and amended on 10 August 2000 between the Japan International Cooperation Agency and Pacific Consultants International.

The report examines the existing conditions of the water supply system in the study area, proposes a master plan for the development of the water supply system and presents results of a feasibility study on the construction of a water source dam, which was identified as a priority project in the master plan.

The report consists of the Summary, Main Report, Supporting Report and Data Book. The Summary summarizes the results of all studies. The Main Report contains the existing conditions, the proposed master plan, the results of the feasibility study, and conclusions and recommendations. The Supporting Report includes technical details of contents of the Main Report. Data Book contains basic data used in the study.

All members of the Study Team wish to express grateful acknowledgement to the personnel of your Agency, Advisory Committee, Ministry of Foreign Affairs, Ministry of Health and Welfare, and Embassy of Japan in the Republic of Honduras, and also to Honduran officials and individuals for their assistance extended to the Study Team. The Study Team sincerely hopes that the results of the study will contribute to the improvement of the water supply conditions of Tegucigalpa, and that friendly relations of both countries will be promoted further by this occasion.

Yours faithfully,



Akira Takechi
Team Leader

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ABBREVIATIONS

CNSSP	: National Supervising Commission for the Public Services
COHDEFOR	: Honduran Forestry Development Corporation
CPI	: Consumer Price Index
DCI	: Ductile Cast Iron
DGEC	: General Directorate of Statistics and Census
EIA	: Environmental Impact Assessment
EIRR	: Economic Internal Rate of Return
EL	: Elevation
EPHPM	: Permanent Multiple Questionnaire Survey of Families
FIRR	: Financial Internal Rate of Return
FNUAP	: United Nations Population Fund
F/S	: Feasibility Study
GDP	: Gross Domestic Product
HH	: Household
HWL	: High Water Level
IDB	: Inter-American Development Bank
IMF	: International Monetary Fund
JICA	: Japan International Cooperation Agency
LWL	: Low Water Level
M/P	: Master Plan
NPV	: Net Present Value
OCC	: Opportunity Cost of Capital
P/L	: Profit and Loss Statement
PVC	: Polyvinyl Chloride
SANAA	: National Service Authority for Water Supply and Sewerage
SECPLAN	: Ministry of Planning, Coordination and Budget (current SETCO: Ministry of Technique and International Cooperation)
SERNA	: Ministry of Natural Resources and Environment
SOPTRAVI	: Ministry of Public Works, Transportation and Housing
USAID	: United States Agency for International Development
WTP	: Water Treatment Plant
JPY	: Japanese Yen
kW/h	: kilowatt per hour
Lps	: Lempiras
l/c/d	: liter per capita per day
l/s	: liter per second
mg/l	: milligram per liter
m ³ /d	: cubic meter per day
N/100 mL	: number per 100 milliliter
NTU	: nephelometric turbidity unit
Pt-Co unit	: Platinum-Cobalt unit
USD	: United States Dollar

GLOSSARY

- 99 % reliable yield capacity : A yield capacity of a water source during the driest month in 10 years. It means available yield in 119 months during 120 months, which is equivalent to 99.17 % (= 119/120) reliable in terms of duration.
- Accounted-for water : Distributed water which generates revenue.
- Unaccounted-for water : Distributed water which does not generate revenue. Unaccounted-for water may include physical loss, water use for fire fighting, and non-measured water due to malfunction and insensibility of micrometers.
- Willingness to pay : An amount which a respondent of the questionnaire survey accepts to pay for the project(s) or service(s) specified in the questionnaires.
- Opportunity cost of capital : Lost profitability of alternative investments which should be given up because of investments to the proposed projects. Theoretically the opportunity cost of capital equals to the marginal productivity of capital in a country, however, practically it is difficult to calculate it. If the economic internal rate of return of the proposed projects becomes lower than the opportunity cost of capital, the proposed projects are not feasible from the economic viewpoint.
- Net present value : Difference between present value of benefits and present value of costs. Present value of benefits (or costs) is given as follows.
- $$PV = \sum_{t=1}^n \frac{Bt \text{ (or } Ct)}{(1 + r / 100)^t}$$
- where, *PV*: present value,
 n: evaluation period of the project
 Bt: benefits in the year t,
 Ct: costs in the year t
 r : discount rate (%)
- Economic internal rate of return : A discount rate with which the net present value of economic benefits and economic costs of the project becomes zero.
- Financial internal rate of return : A discount rate with which the net present value of financial revenue and financial costs of the project becomes zero.
- Standard conversion factor : A factor to convert domestic market price of non-tradable goods to international market price. The standard conversion factor is approximated based on trade statistics such as amount of import and export goods and import and export taxes.