

 Japan International Cooperation Agency

Federal Flood Commission  
Ministry of Water and Power  
The Islamic Republic of Pakistan

**The Study on  
Comprehensive Flood Mitigation  
and Environmental Improvement Plan  
of Lai Nullah Basin  
in The Islamic Republic of Pakistan**

**Final Report  
Volume 2 Main Report**



September 2003

 CTI Engineering International Co., Ltd.  
 Pacific Consultants International

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### **PROJECT COST ESTIMATE**

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## PREFACE

In response to a request from the Government of Islamic Republic of Pakistan, the Government of Japan decided to conduct a development study on Comprehensive Flood Mitigation and Environmental Improvement Plan of the Lai Nullah Basin in the Islamic Republic of Pakistan, and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team, headed by Mr. MATSUMOTO Yoshiharu of CTI Engineering International Co., Ltd. to Pakistan three (3) times between August 2002 and August 2003. In addition, JICA set up an Advisory Committee chaired by Mr. MIYAGAWA Yuji of the Ministry of Land, Infrastructure and Transport between May 2002 and September 2003, which examined the Study from specialist and technical points of view.

The Team held a series of discussions with the officials concerned of the Government of Islamic Republic of Pakistan and conducted field surveys at 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 Islamic Republic of Pakistan for their close cooperation extended to the Study.

September 2003



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KAWAKAMI Takao

President

Japan International Cooperation Agency

September 2003

Mr. KAWAKAMI Takao  
President  
Japan International Cooperation Agency  
Tokyo, Japan

**LETTER OF TRANSMITTAL**

Sir:

We are pleased to submit herewith the final report of a Study on Comprehensive Flood Mitigation and Environmental Improvement Plan of the Lai Nullah Basin in the Islamic Republic of Pakistan.

Under a contract with the Japan International Cooperation Agency, the study was conducted by CTI Engineering International Co., Ltd. in association with Pacific Consultants International during the period from May 2002 to September 2003.

This final report presents a formulation of a master plan for comprehensive flood mitigation and environmental improvement of Lai Nullah. The principal component of the overall plan is placed in the structural flood mitigation plan, which aims at producing the immediate effect and ultimately making Lai Nullah free from overflow by the probable flood runoff discharge of 100-year return period. As the principal structures, a community pond, a flood diversion channel and supplementary works to the on-going river channel improvement are proposed. In addition to the above, non-structural flood mitigation plan such as flood forecasting and warning system, related environmental improvement plan and strengthening of institutional setup are proposed.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, and the Ministry of Land, Infrastructure and Transport. We would also like to extend our deep appreciation to the officials concerned of the Government of the Islamic Republic of Pakistan, Federal Flood Commission, the JICA Pakistan Office and the Embassy of Japan in Pakistan for their cooperation and assistance throughout our field survey.

Finally, we hope that this report will contribute to comprehensive flood mitigation and environmental improvement of Lai Nullah and sustainable development of the Islamic Republic of Pakistan.

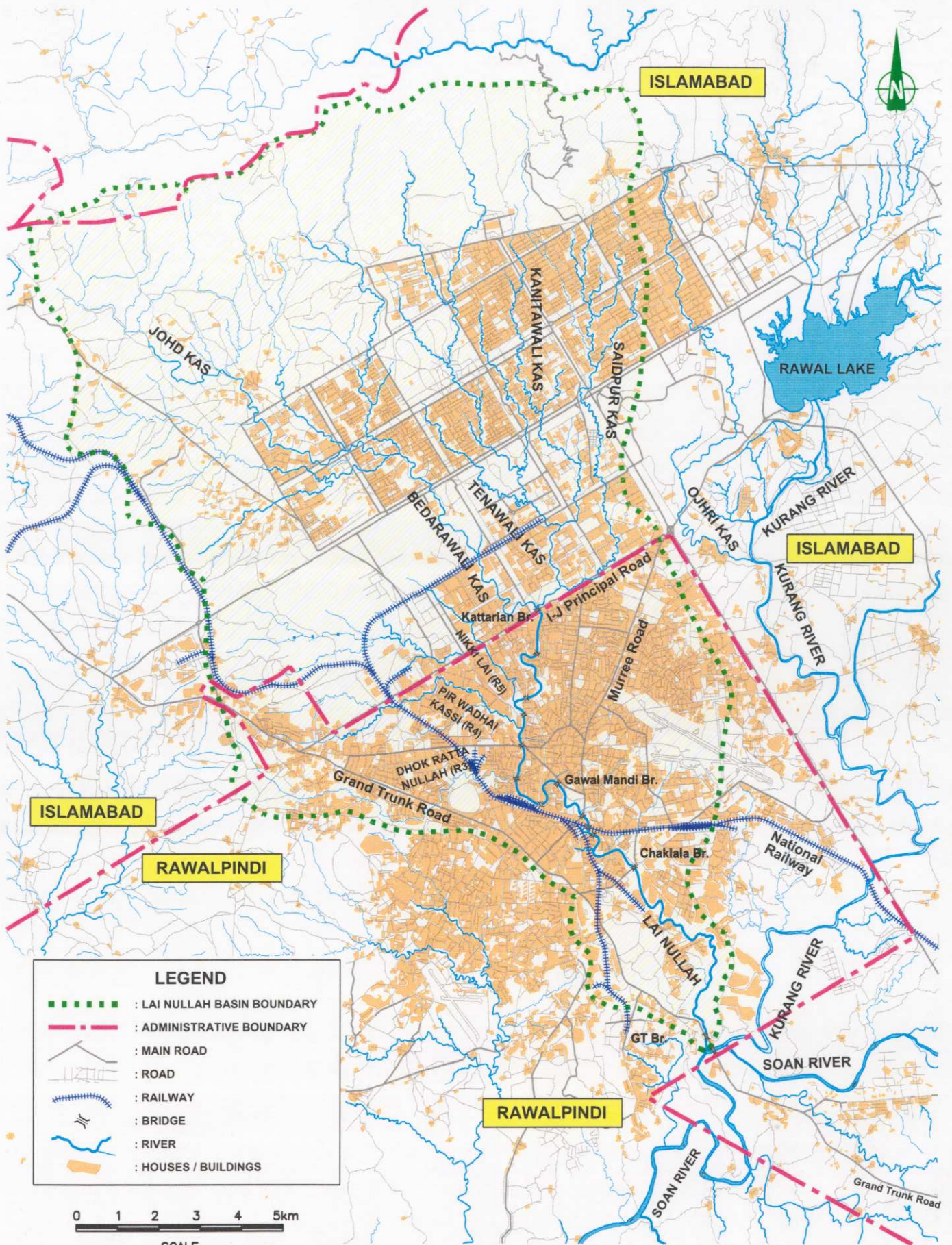
Very truly yours,



MATSUMOTO Yoshiharu

Team Leader

The Study on Comprehensive Flood Mitigation  
and Environmental Improvement of Lai Nullah Basin  
in The Islamic Republic of Pakistan



# VOLUME 2: MAIN REPORT

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## ABBREVIATION

### Organization

ADB	:	Asian Development Bank
AMC	:	Rawalpindi Agromet Center
CDA	:	Capital Development Authority
CIW	:	Commissioner for Indus Waters
DHI	:	Danish Hydraulic Institute
ECNEC	:	Executive Center of National Economic Council
FFC	:	Federal Flood Commission
FFD	:	Flood Forecasting Division
JBIC	:	Japan Bank for International Cooperation
JOCV	:	Japan Overseas Cooperation Volunteer
MES	:	Military Engineering Services
MMP	:	Mott MacDonald Pakistan
MWP	:	Ministry of Water and Power
NFFD	:	National Flood Forecasting Division
OECF	:	Overseas Economic Cooperation Fund
PCIW	:	Pakistan Commissioner for Indus Waters
PID	:	Punjab Irrigation and Power Development
PMD	:	Pakistan Metrological Department
RCB	:	Rawalpindi Cantonment Board
RDA	:	Rawalpindi Development Authority
RMC	:	Rawalpindi Municipal Corporation
SDO	:	Small Dams Organization, Irrigation and Power Development, Punjab
TMA	:	Tehsil Municipal Administration Rawalpindi
WAPDA	:	Water and Power Development Authority
WASA	:	Rawalpindi Water and Sanitation Authority

### Unit

°C	:	Degree Centigrade
cusec	:	Cubic feet per second (1 cusec = 0.0283 m <sup>3</sup> /s, or 1 m <sup>3</sup> /s = 35.3 cusec)
dia.	:	Diameter
g	:	Gram
Ghz	:	Gigahertz
ha	:	Hectare
Kg, kg	:	Kilogram
Km, km	:	Kilometer
L. l. lit.	:	Liter
m	:	Meter
m <sup>3</sup>	:	Cubic meter
m <sup>3</sup> /s	:	Cubic meter per second
mil.	:	Million
Mhz	:	Megahertz
MLD	:	Million Liter per Day
MGD	:	Million Gallon per Day (1 MGD = 4.546 MLD)
Rs.	:	Pakistan Rupee
sec	:	second
t, ton	:	Tonnage
US\$	:	American Dollar
W	:	Watt

## **Others**

CEA	:	Chief Engineering Advisor
CFFC	:	Chairman, Federal Flood Commission
CN	:	Curve Number
ERC	:	Emergency Cell
EIRR	:	Economic Internal Rate of Return
FFWS	:	Flood Forecasting and Warning System
IEA	:	Initial Environmental Analysis
LAA	:	Land Acquisition Act
PST	:	Pakistan Standard Time
SCS	:	Soil Conservation of Services
SME	:	Small and Medium Enterprise
SWM	:	Solid West Management
Sweep	:	Solid Waste Management & Environmental Enhancement Project
UNDP	:	United Nation's Development Programme
UWSSP-R	:	Urban Water Supply and Sanitation Project for Rawalpindi City
WTP	:	Wastewater Treatment Plant