

1. INTRODUCTION

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1.1 Background of the Study

The Ninth National Development Plan of Venezuela has been developed on the basis of realizing an internationally competitive economy and the development of the natural resources that lie mostly in the central and southern region of the country. For this purpose, it is utmost important to expand the economic activities in the undeveloped territories and the integration of those territories with the active economic centers as well as neighboring and distant markets. The Integrated Orinoco-Apure River Improvement is one of the key elements that forms the base for the development and integration of various regions in the Republic of Venezuela. Moreover, it enhances the international integration of Venezuela with the member countries of the CAN and Brazil, and the overall development of the Andean and Amazon region. Therefore, the Government of Venezuela has maintained its enthusiasm in the integration of inland waterways to the Atlantic Ocean.

The economy of Venezuela largely depends on the export of mineral resources. Although petroleum export has been a major source of income for a long time, export of other products from Lower Orinoco basin such as iron ore, iron pellet and aluminum is also substantial. Export of iron ore alone occupies a significant portion of the total exports of Venezuela. The waterway transportation system is economical and advantageous for the transportation of bulky quantities. Therefore, transportation of these products and other various kinds of industrial products along with primary and semi-processed commodities of agricultural and forestry products is heavily dependent on the waterway transportation system. As a result, reliable river navigation system is a pressing requirement for the further development of the Orinoco basin.

In order to compete in the international market place, the cost of transportation has to be minimized and use of large vessels that can transport bulk quantity is essentially required. Therefore, both strengthening the transportation capacity and providing an economical means of transportation are of extreme importance in the development program. Though Rio Grande waterway has been in use since 1950s, the high maintenance dredging cost of the channel due to the sediment deposition which has become a heavy burden to the Orinoco delta, eventually results in high overall transportation cost. The stabilization of the river course, maximizing the transportation capacity and minimizing the maintenance cost of the channel are the important issues at present. The government and its established institutions such as CVG, PROA, INC, etc. have been actively involved in maintaining the river navigation and development of the river basin. Despite their great efforts, the maintenance cost of the river navigation is still huge and improvements are required in order to increase transportation capacity and efficiency.

Under these circumstances, the Government of the Republic of Venezuela requested the Government of Japan to conduct the Study on the Integrated River Improvement of the Orinoco River in the Republic of Venezuela. In response, the Government of Japan has decided to carry out the study in accordance with the agreement on Technical Cooperation signed between the two Governments on April 6, 1988.

1.2 Objective of the Study

The objective of the study is to formulate a master plan for integrated river improvement of the Orinoco River for vessel navigation, to conduct the feasibility study on river improvement for the priority project identified in the Master Plan, and to transfer technology to the counterpart personnel in the course of the study.

1.3 Study Area

The study area is approximately 22,000 km² in Delta Amacuro State covering the Orinoco River Delta area, downstream of Ciudad Guayana, as shown in Fig. 1-1.

1.4 Execution of the Study

The Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, undertook the Study, in close cooperation with the counterpart agency, the General Direction of Orinoco-Apure Program (PROA) of Ministry of Environment and Natural Resources (MARN) and other related agencies in operation and maintenance, National Institute of Canalization (INC), National Hydraulics Laboratory (LNH) along with navigation channel users, enterprises of Venezuelan Corporation of Guyana (CVG) etc., in the Republic of Venezuela. The study is divided into two (2) Phases as the Master Plan Study (Phase I) and Feasibility Study (Phase II) as shown in Fig. 1-2.

The JICA dispatched the Study Team to Venezuela in each phase for field activities during October 1998 and December 1999. The team held series of discussions and interviews with the related agencies as well as conducted site surveys and data collections. After returning to Japan, the study team carried out analysis on the waterway transportation system, channel improvement measures etc. using all the available data and materials.

In the first phase, the major study items were river and coastal characteristics, cargo demand forecast, present and future waterway transportation system and port development, channel improvement, dredging improvement, facility planning, institutional and organizational study, environmental assessment, economic and financial evaluation, etc for overall study of river improvement. In the second phase, more specific study for the priority projects identified in the first phase was carried out

for using the supplementary data/information collected during the second field activities in Venezuela.

This Final Report presents the results of overall study and suggestions for the implementation of urgent improvement programs.

1.5 Participants of the Study

The participants in the Study are the following persons:

(1) The JICA Study Team

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|------|--|-------------------------------|
| (1) | Makoto TANAKA | Team Leader |
| (2) | Toshinori OSHITA | Co-Team Leader/River Engineer |
| (3) | Abdelaziz Abdalla RABIE | Coastal Engineer |
| (4) | Mitsuhiko HASEGAWA | Channel Dredging Planner |
| (5) | Kunio GONDA | Marine Transport Planner |
| (6) | Kazunori INOUE | Hydrology/Hydraulic Analyst |
| (7) | Tsuyoshi NOMURA | Port Planner |
| | (Takao KAKEI - Originally assigned) | |
| (8) | Isao MISONO | Facility Planner |
| (9) | Masakuni NAKAYAMA | Surveyor |
| (10) | Atsushi RIKIMARU | Satellite Image Analyst |
| (11) | Shigeru SAI | Environmental Expert |
| (12) | Charles Lazzari Gordils | Institutional Expert |
| | (Jesus SANCHEZ - Originally assigned) | |
| (13) | Naoki KUDO | Demand Forecast Analyst |
| (14) | Motoyoshi YAMADA | Economic/Financial Analyst |
| | (Yutaka NOZAKI - Originally assigned) | |
| (15) | Kyokazu YAMAKAWA | Interpreter |
| | (Yoshitaka ISHIKAWA - Originally assigned) | |
| (16) | Chikara SUZUKI | Coordinator |

(2) Japanese Advisory Committee Members

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|-----|------------------|----------|
| (1) | Kenichi NAKAMURA | Chairman |
| (2) | Kouichi FUJITA | Member |
| (3) | Motoyuki AYAKI | Member |
| (4) | Ryuichi KUWAJIMA | Member |

(3) Counterparts to the JICA Study Team

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|-----|----------------------|--|
| (1) | Juan Jose Garcia | Director General, PROA |
| (2) | Adalberto Nunez | Director of Plans and Management of Projects, PROA |
| (3) | Luis Andres Mejia M. | Director of Engineering, PROA |
| (4) | Oscar J. Mirabal C. | An official from Direction of Engineering, PROA |
| (5) | Rafael Espana | An official from Direction of Plans and Management of Projects, PROA |

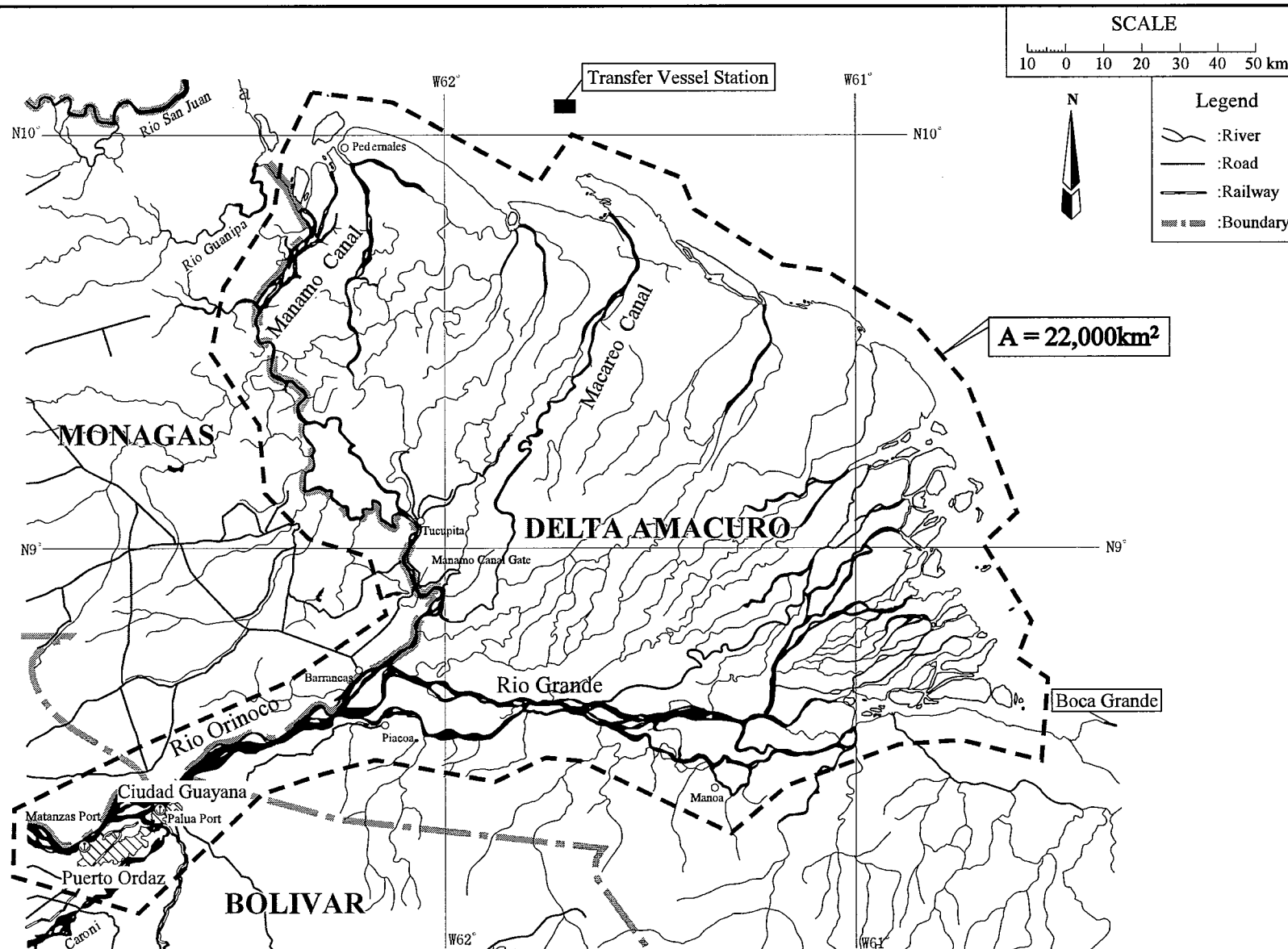


Fig. 1-1

STUDY AREA

THE STUDY ON INTEGRATED RIVER IMPROVEMENT OF THE ORINOCO RIVER IN THE REPUBLIC OF VENEZUELA

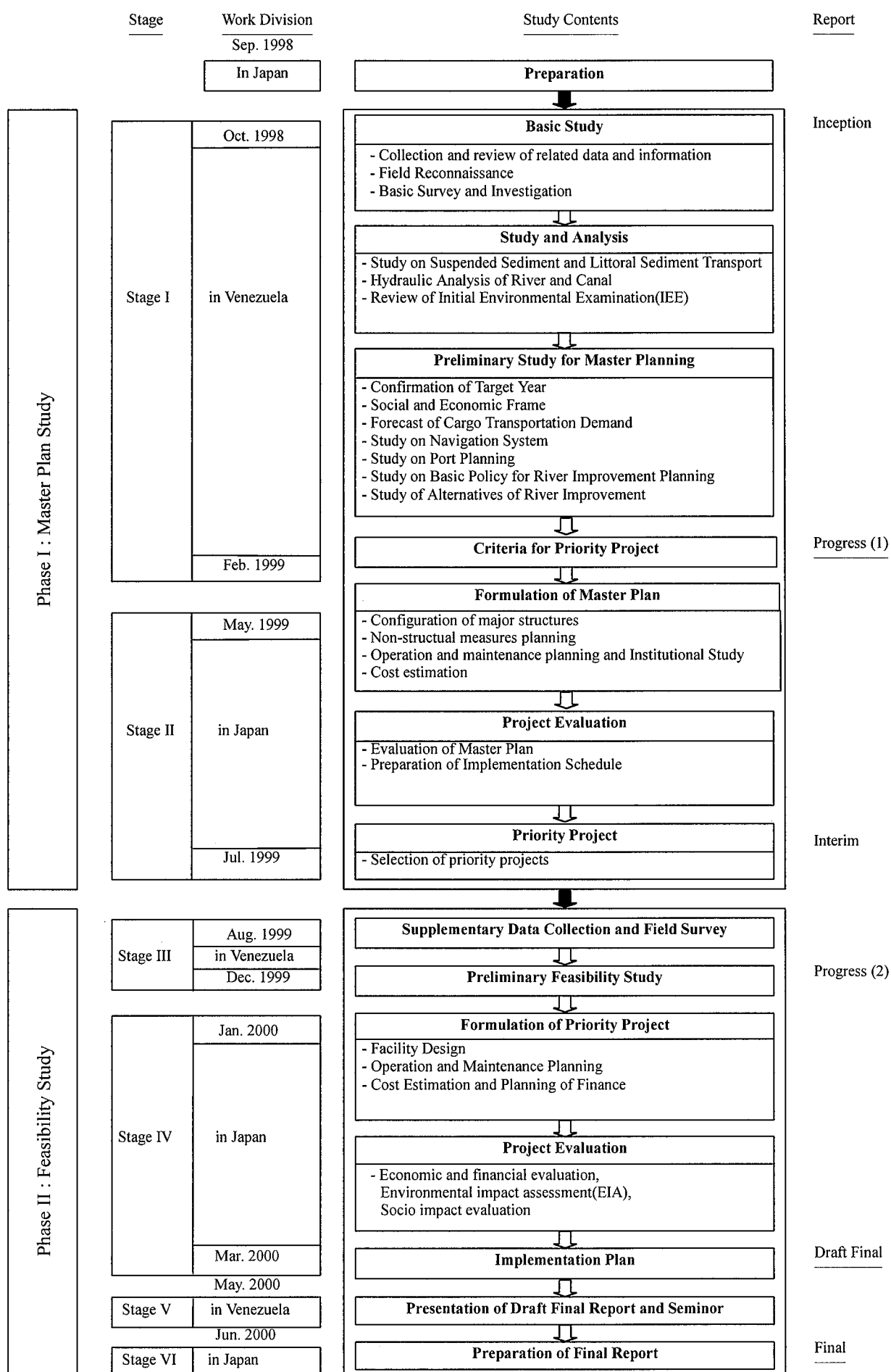


Fig.1-2 FLOW CHART OF THE STUDY