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No 57

FINAL REPORT

THE STUDY ON THE MAINTENANCE PROJECT OF THE PORT OF CALDERA IN THE REPUBLIC OF COSTA RICA

JULY 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

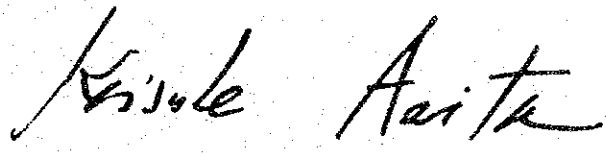
In response to the request of the Government of the Republic of Costa Rica, the Government of Japan decided to conduct a study on the Maintenance Project of the Port of Caldera and entrusted the study to Japan International Cooperation Agency (JICA). JICA sent to Costa Rica a study team headed by Mr. Takashi Hazama, the Overseas Coastal Area Development Institute of Japan from September to November, 1985.

The team had discussion on the project with the officials concerned of the Government of the Republic of Costa Rica and conducted a field survey. After the team returned to Japan, further studies were made and 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 authorities concerned of the Government of the Republic of Costa Rica for their close cooperation extended to the team.

July, 1986



Keisuke Arita

President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

July 1986

Mr. Keisuke Arita
President
Japan International Cooperation Agency

Dear Sir:

It is my great pleasure to submit herewith a report on the Maintenance Project of the Port of Caldera, the Republic of Costa Rica.

This report describes the result of studies on the project carried out by the joint study team of the Overseas Coastal Area Development Institute of Japan (OCDI) and Central Consultant Incorporated (CCI) at the appointment of the Japan International Cooperation Agency (JICA). The study team started the study on September 20, 1985 and conducted a field survey on the project in Costa Rica, including a field survey on natural conditions at the site, for two months ending on November 22, 1985. This report describes the Maintenance Project and the economic and financial feasibility of the project studied based on the findings of the survey as well as on the data and information collected and analysed in Japan. The study shows that the project is extremely important for the development of Costa Rica. Therefore, we earnestly hope that the project will be implemented as soon as possible.

On behalf of the Japanese Study Team, I would like to express my deepest appreciation to the Government of the Republic of Costa Rica including the Ministry of Public Works and Transportation (MOPT) and the Costa Rican Pacific Ports Authority (INCOP), and to the other related agencies of the government for the unlimited cooperation and assistance and the warm hospitality they extended to the team during our stay in Costa Rica.

I am also greatly indebted to the Japan International Cooperation Agency, the Ministry of Transport, the Ministry of Foreign Affairs and the Japanese Embassy in Costa Rica for giving us valuable advice and assistance during the field survey and the preparation of this report.

Sincerely yours,

T Hazama

Takashi Hazama
Head
Japanese Study Team for the Maintenance
Project of the Port of Caldera
(Senior Executive Director,
the Overseas Coastal Area Development
Institute of Japan)

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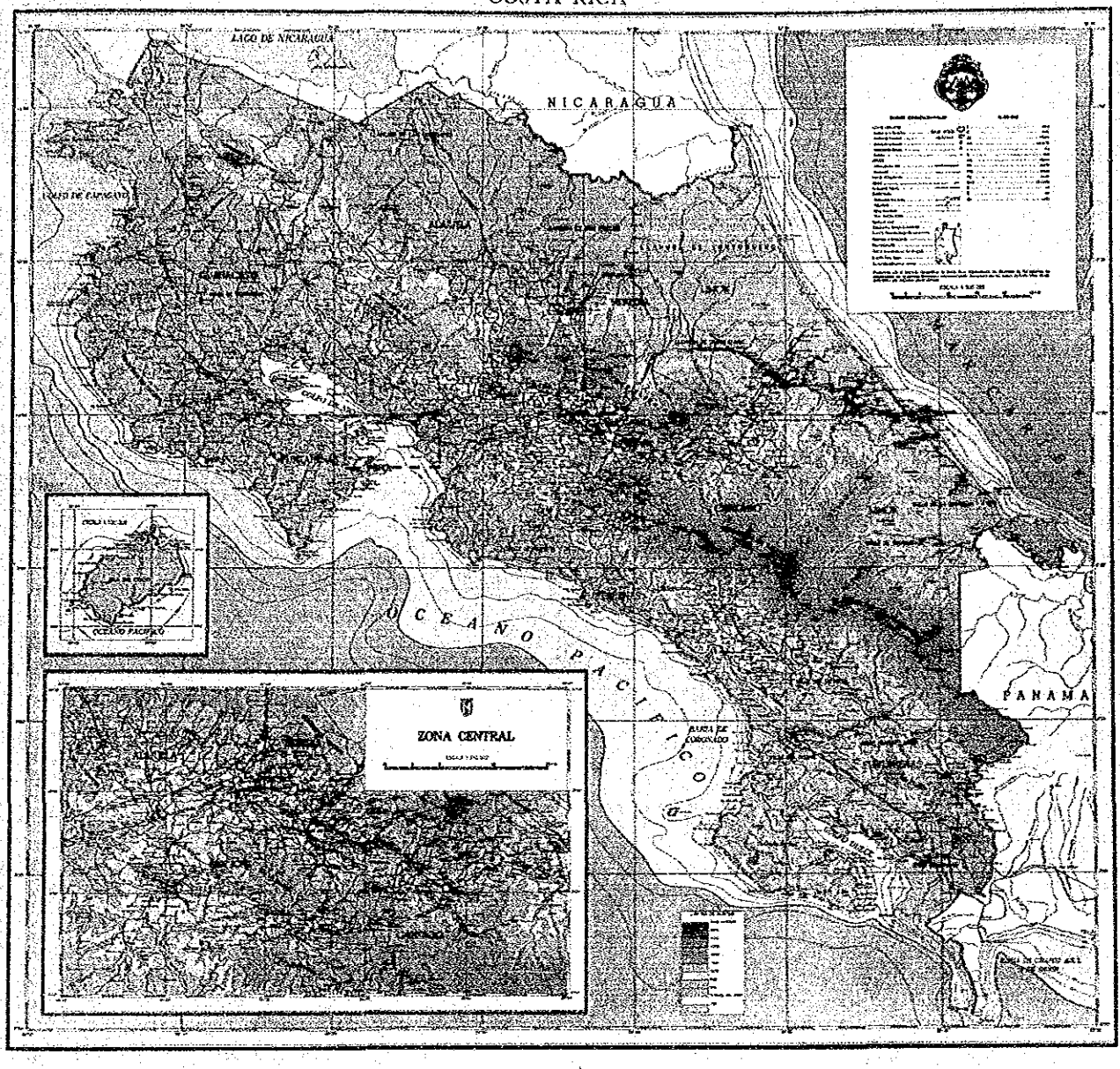
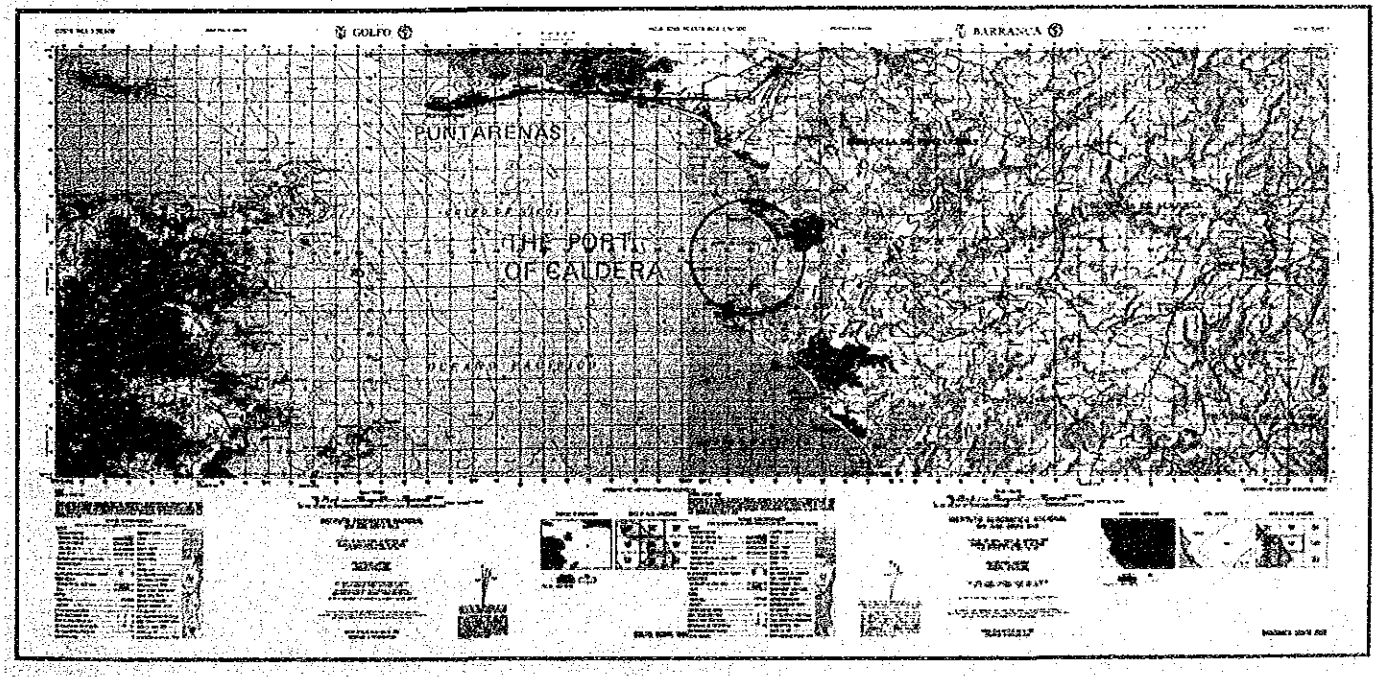
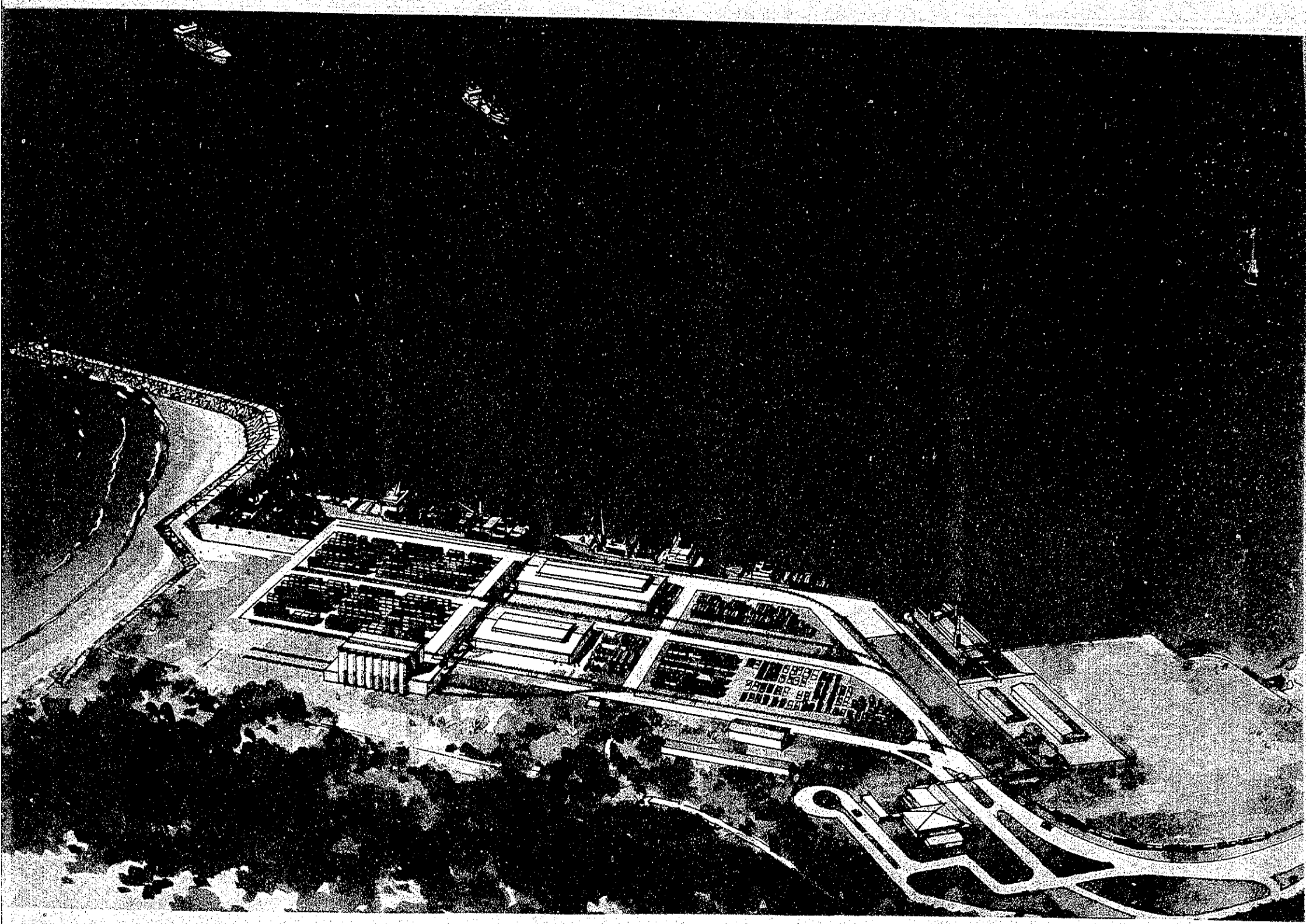
COSTA RICA

EDICIÓN 1979







ABBREVIATIONS

In this report, the following abbreviations are used :

ABBREVIATION	FULL NAME (SPANISH)	FULL NAME (ENGLISH)
BCCR	Banco Central de Costa Rica	Central Bank of Costa Rica
CACM	Mercado Común Centroamericano (MCCA)	Central American Common Market
CCI		Central Consultant Incorporated
CELADE	Centro Latinoamericano de Demografía	Latin-American Center of Demography
CEMPA	Cementos del Pacífico, S.A.	Pacific Cement-manufacturing Corporation
CEMPRO	Centro de Promoción de Exportaciones e Inversiones	Export and Investment Promotion Center
CINDE	Coalición Costarricense de Iniciativa para el Desarrollo	Costa Rican Coalition of Initiative for Development
CNP	Consejo Nacional de Producción	National Council of Production
COCOSA	Constructora Costarricense S.A.	Costa Rican Construction Co., Ltd.
DGEC, MEIC	Dirección General de Estadística y Censos, Ministerio de Economía, Industria y Comercio	Bureau of Statistics and Census, Ministry of Economy, Industry and Commerce
DGOPF	Dirección General de Obras Portuarias y Fluviales, MOPT	Bureau of Port and River Works, MOPT
DGP	Dirección General de Planificación, MOPT	Bureau of Planning , MOPT
DGTM	Dirección General de Transporte Maritimo MOPT	Bureau of Maritime Transport, MOPT
FECOSA	Ferrocarriles de Costa Rica S.A. (el antepasado de INCOFE presente)	Costa Rican Railway Corporation (the predecessor of the present INCOFE)
FERTICA	Fertilizantes de Centroamerica (Costa Rica) S.A.	Fertilizers of Central America (Costa Rica) Corp.
IDB	Banco Interamericano de Desarrollo	Inter-American Development Bank
IECES	Instituto de Investigaciones de la Escuela de Ciencias Económicas y Sociales de la Universidad de Costa Rica	Investigation Institute of the Economic and Social Science College, University of Costa Rica

ABBREVIATION	FULL NAME (SPANISH)	FULL NAME (ENGLISH)
IGN	Instituto Geográfico Nacional	National Geographic Institute
IMN	Instituto Meteorológico Nacional	National Meteorological Institute
INCOFE	Instituto Costarricense de Ferrocarriles	Costa Rican Railway Institute
INCOP	Instituto Costarricense de Puertos del Pacífico	Costa Rican Pacific Ports Authority
INVU	Instituto Nacional de Vivienda y Urbanismo	National Institute for Housing and City Planning
JAPDEVA	Junta de Administración Portuaria y de Desarrollo Económico de la Vertiente Atlántica	Authority for the Port Administration and Economic Development of the Atlantic Coast
JAPOQ	Junta Administrativa Portuaria de Quepos	Council for the Administration of the Port of Quepos
JICA	Agencia de Cooperación Internacional de Japón	Japan International Cooperation Agency
JST	Misión Japonesa de Investigación para el Estudio de Factibilidad del Proyecto de Mantenimiento del Puerto Caldera	Japanese Study Team for the Feasidility Study on the Maintenance Project of the Port of Caldera
LAICA	Liga Agricola Industrial de la Caña de Azúcar	Sugar-manufacturing Industry Corporation
MAG	Ministerio de Agricultura y Ganadería	Ministry of Agriculture and Stock Farming
MIDEPLAN	Ministerio de Planeación y Política Económica	Ministry of Economic Planning
MOPT	Ministerio de Obras Públicas y Transportes	Ministry of Public Works and Transports
OCDI	Instituto Japonés para el Desarrollo de Litorales en Ultramar	Overseas Coastal Area Development Institute of Japan
PHRI		Port and Harbour Research Institute, Ministry of Transport, Japanese Government
RECOPE	Refinadora Costarricense de Petroleo S.A.	Costa Rican Oil Refinery Corporation
SENARA	Servicio Nacional de Aguas Subterráneas, Riego y Avenamiento	National Agency for Underground Water, Irrigation and Drainage

ABBREVIATION	FULL NAME (SPANISH)	FULL NAME (ENGLISH)
SEPSA	Secretaria Ejecutiva de Planificación Sectorial, Agropecuaria y de Recursos Naturales Renovables	Executive Secretary's Office for Sectoral Planning, Agriculture and Renewable Natural Resources
SYSTAN		System International Inc.
ZONA FRANCA	Corporación Zona Franca de Exportaciones y Parques Industriales	Corporation of Free Zone for Exportation and Industrial Parks
CIF	coste, seguro y flete	cost, insurance and freight
EIRR	tipo interno economico de retorno	economic internal rate of return
FDD	dique flotante	floating dry dock
FIRR	tipo interno financiero de retorno	financial internal rate of return
FOB	franco a bordo	free on board
GDP	producto doméstico bruto	gross domestic product
Ro/Ro		roll on/roll off type sea transportation
N.H.H.W.L.	la pleamar más alta próximamente	nearly highest high water level
H.W.O.S.T.	pleamar media de marea viva	high water level of ordinary spring tide
M.H.H.W.	pleamar media más alta	mean higher high water
M.H.W.	pleamar media	mean high water
H.W.O.N.T.	pleamar media de marea muerta	high water level of ordinary neap tide
M.S.L.	nivel medio del mar	mean sea level
L.W.O.N.T.	bajamar media de marea muerta	low water level of ordinary neap tide
M.L.W.	bajamar media	mean low water
M.L.L.W.	bajamar media más baja	mean lower low water
L.W.O.S.T.	bajamar media de marea viva	low water level of ordinary spring tide
N.L.L.W.L.	la bajamar más baja próximamente	nearly lowest low water level
M_2		principal lunar constituent
S_2		principal solar constituent
K_2		lunisolar semidiurnal constituent
N_2		larger lunar elliptic constituent

ABBREVIATION	FULL NAME (SPANISH)	FULL NAME (ENGLISH)
K_1		lunisolar diurnal constituent
O_1		principal lunar diurnal constituent
P_1		principal solar diuranl constituent
Q_1		larger lunar elliptic constituent
M_4		lunar quarter diurnal constituent
MS_4		$M_2 + S_2$
A_0		mean sea level

ABBREVIATIONS (UNIT)

UNIT MARK	FULL NAME (ENGLISH)	QUANTITY
°C	degrees Celsius	temperature
cm/s	centimeters per second	velocity
d	days	time
DWT	dead weight tonnage	dead weight of vessels
Gal	gals	acceleration
GRT	gross registered tonnage	volume of vessels
h	hours	time
ha	hectare	area
kgf/cm^2	kilogram weight per square centimeter	stress, pressure
kgf/cm^3	kilogram weight per cubic centimeter	unit weight , coefficient of subgrade reaction
km	kilometers	distance
km/h	kilometers per hour	wind speed
kVA	kilovolt amperes	power
l	liters	volume
m	meters	depth, distance
m^2	square meters	area
m^3	cubic meters	volume
min	minutes	time
mm	millimeters	precipitation, distance
mon	months	time
m/s	meters per second	velocity
PS	horsepower	power
s	seconds	time, wave period
tf	ton weight	weight, dead weight of vessels
tf/m^2	ton weight per square meter	stress, load, surcharge, pressure
tf/m^3	ton weight per cubic meter	unit weight
TEU	twenty-foot equivalent units	containers
y	years	time
°	degrees	angle, latitude, longitude
'	minutes	angle, latitude, longitude
"	seconds	angle, latitude, longitude
"	inches	diameter, length
%	percent	percentage
¢	colon	monetary unit of Costa Rica

UNIT MARK	FULL NAME (ENGLISH)	QUANTITY
$	dollar	monetary unit of the United States of America
¥	yen	monetary unit of Japan

CONTENTS

CONTENTS OF THE APPENDIX

LIST OF FIGURES

CHAPTER IV

CHAPTER VI

CHAPTER VII

CHAPTER VIII

CHAPTER IX

CHAPTER X

APPENDIX 1

APPENDIX 6

APPENDEX 8

APPENDIX 11

LIST OF TABLES

CHAPTER VIII

CHAPTER IX

CHAPTER X

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS AND RECOMMENDATIONS

[CONCLUSIONS]

1. Significance and Urgency of the Maintenance Project

The Port of Caldera is the major gateway for the international trade of Costa Rica on the Pacific coast, as well as the nearest port to the national capital, San José. The port leads the national economy and industry and supports the livelihood of the Costa Rican people through commodity supply. However, one of the three berths of the port, which is the deepest and most important, has not been fully available because of shoaling due to the sand sedimentation in the harbour. Furthermore, the pier at the Port of Puntarenas which handles all the grain imports for the nation has already become superannuated. Thus, the Port of Caldera is obliged to take over the function of handling grain imports in place of Puntarenas pier in the immediate future.

Accordingly, the Maintenance Project of the Port of Caldera is both serious and urgent.

2. The Maintenance Project

The target year of the Maintenance Project of the Port of Caldera should be 1992 considering the required construction period and the projected increase in port cargo volume. The project consists of the following three main programs :

(1) Countermeasures against sand sedimentation
1) Breakwater extenstion : 200 m long
2) Primary dredging in the harbour : Volume of 72,000 m^3
3) Periodic maintenance dredging : Approximately 60,000 m^3/five years

(2) Enlargement of mooring facility capacity in response to the necessity of handling grain imports and the progress of containerization in sea transportation
1) Shift of a section of the existing breakwater 50 m to the west : length 162 m
2) Restoration of the −3.0 m small craft basin : 50 m×90 m
3) Construction of the −3.0 m quaywall : 110 m long
4) Construction of the small pier (gangway) : 45 m long
5) Construction of the mooring dolphin : 1 dolphin (5 m×5 m)

(3) Reinforcement to cargo handling capacity in response to the necessity of handling grain imports and the multipurpose use of the terminal
1) Reinforcement of the cargo handling equipment
2) Pavement of the open yards : Area of 42,000 m^2

3. Construction Method

Construction works at the Port of Caldera consist of both primary works and maintenance works. To execute the planned construction works economically and rationally, the construction method should be as follows :

First, MOPT should obtain a new dredger fleet and construction machinery for the future maintenance dredging and other works after the primary construction works are completed.

Second, the dredger fleet and construction machinery purchased by MOPT should be lent to a foreign contractor to execute the primary works. MOPT personnel should also take part in the primary construction works which will be executed by the foreign contractor as a type of on the job training.

Finally, after the primary works are completed and the dredger fleet and machinery have been returned to MOPT, MOPT should execute periodic maintenance works including maintenance dredging itself, using its own dredger fleet and machinery.

4. Grain Import Function

It is crucial to transfer the function of handling imported grain from the superannuated Puntarenas pier to the Port of Caldera as smoothly and as promptly as possible. As the grain will be handled at a multipurpose terminal at the Port of Caldera, a new mechanized and rationalized cargo handling system for grain will have to be implemented to increase the cargo handling efficiency so as to minimize the effects of the handling of grain on the handling of other cargoes.

5. Required Amount of Investment and Construction Period

The total investment for the Maintenance Project including the purchase cost of the dredger fleet, construction machinery and cargo handling equipment is estimated as approximately 1,268 million colones at December 1985 prices. About 80.4% of the investment will be made using foreign currency. The total construction period for the Maintenance Project will be four years including the preliminary contract procedures and the purchase of a dredger fleet, construction machinery and cargo handling equipment.

6. Economic and Financial Analyses of the Maintenance Project

(1) Economic Analysis

The Maintenance Project is evaluated using the Economic Internal Rate of Return (EIRR) which is calculated based on a cost-benefit analysis from the viewpoint of the national economy. The main tangible benefit considered is the reduction in ships' staying cost at the port, while main costs are the construction, purchase, maintenance and administrative costs. The EIRR is calculated to be 23.7% using 30 years as the period of economic calculation. This shows that the Maintenance Project is advantageous from the viewpoint

of the national economy.

(2) Financial Analysis

The analysis covers the costs of the newly improved facilities and procured equipment which will produce additional revenue, and the amount of the additional port revenue which will be generated by the improvements and procurements. The profitability of the project itself is analyzed based on the Financial Internal Rate of Return (FIRR) using the Discount Cash Flow Method. Domestic funds are assumed to come from government funds, and foreign funds from soft loans (annual interest rate : 4.75%, term of repayment : 25 years, grace period : 7 years). Revenues are assumed as port dues, wharfages and stevedoring charges according to the current Costa Rican tariffs. The analysis shows that the project is profitable with an FIRR of 8.26%. This exceeds the weighted average interest rate of the procured funds (3.62%).

Judging from the above, it can be concluded that the Maintenance Project with the target year of 1992 is feasible both economically and financially.

[RECOMMENDATIONS]

1. Necessity of Investment by the National Goverment

Such basic port facilities as the breakwater, the quaywall, the small craft basin and the turing basin should be constructed at the expense of the Costa Rican national government considering that all these items require a large amount of investment at one time and that other than the quaywall none of them will directly produce additional port income.

These basic facilities are all essential for the actual functioning of the port, and the entire port itself is a basic socioeconomic infrastructure which contributes both directly and indirectly to economy of Costa Rica and the livelihood of the Costa Rican people.

2. Future Reviews

The Maintenance Project with the target year of 1992 is formulated based on the projected socioeconomic frame. However, the economy is subject to constant flux, and the demand at the port may be greatly influenced by changes in the domestic and world economy. Thus, it is important to review the project along with any major future changes in the socioeconomic frame as needed.

3. Construction of Grain Silos with a Sufficient Storage Capacity

As grains will begin to be imported through the Port of Caldera, grain silos with a sufficient capacity of 20,000 tons should be constructed at the Port of Caldera by the agencies concerned by the target year of the Maintenance Project.

4. Conducting Regular Field Surveys

To accurately estimate the future sand sedimentation volume and to implement an economical and effective maintenance dredging program as a countermeasure against sand sedimentation, it will be necessary to periodically conduct field surveys related to sand sedimentation such as depth soundings, topographic surveys along the shoreline and wave observations as in the past.