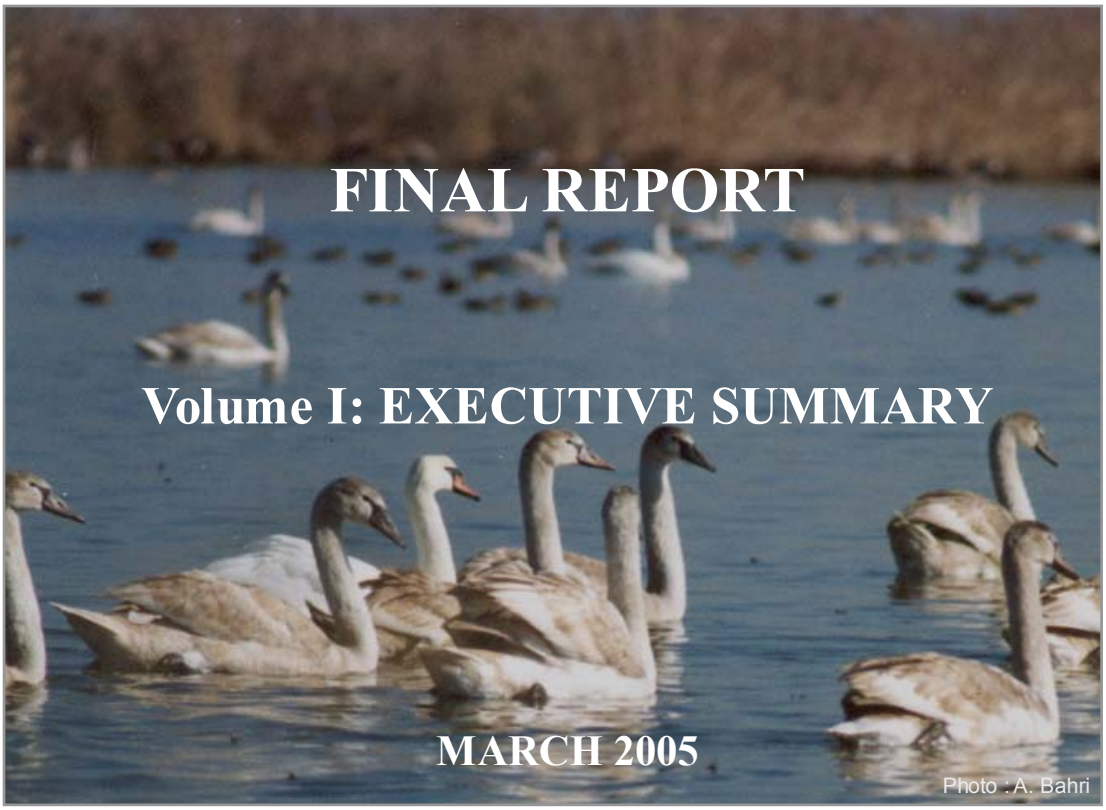
JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF THE ENVIRONMENT
MINISTRY OF JIHAD-E-AGRICULTURE
THE ISLAMIC REPUBLIC OF IRAN

THE STUDY ON INTEGRATED MANAGEMENT FOR ECOSYSTEM CONSERVATION OF THE ANZALI WETLAND IN THE ISLAMIC REPUBLIC OF IRAN



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LIST OF VOLUMES

Volume I	**:**	**Executive Summary**
Volume II	**:**	**Main Report**
Volume III	**:**	**Supporting Report**
Volume IV	**:**	**Data Book**

EXCHANGE RATE

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PREFACE

In response to a request from the Government of the Islamic Republic of Iran, the Government of Japan decided to conduct The Study on Integrated Management for Ecosystem Conservation of The Anzali Wetland in the Islamic Republic of Iran and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Hirofumi Sadamura of Nippon Koei Co., LTD. between May, 2003 and December, 2004.

The team held discussions with the officials of the Government of the Islamic Republic of Iran 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 a friendly relationship between our two countries.

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

March 2005

Etsuo Kitahara,
Vice-President
Japan International Cooperation Agency

Mr. Etsuo Kitahara
Vice-President,
Japan International Cooperation Agency
Tokyo, JAPAN

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the final report of "The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland".

The Anzali Wetland is internationally known as an important wetland for migratory birds on the southern coast of the Caspian Sea, and was registered as a Ramsar site in 1975. However, it was added to the Montreux Record of wetlands being degraded by human activities in 1993. The environment of the Wetland is deteriorating due to inflow of wastewater, solid waste, and sediment from its watershed.

This Study aimed at preparing an integrated management master plan for ecosystem conservation, implementing pilot activities, and conducting capacity development of the stakeholders in wetland conservation. The proposed master plan broadly incorporates a wetland ecological management plan, a watershed management plan, a wastewater management plan, a solid waste management plan, an environmental education plan, and an institutional plan for implementation. Eleven pilot activities, such as an environmental education program, eco-tourism, soil erosion control, etc. were selected and implemented in collaboration with the Iranian stakeholders. The master plan preparation and pilot activities contributed to the capacity development of the stakeholders.

We hope that this report and the results of our activities will be effectively utilized by the Department of Environment, Ministry of Jihad-e-Agriculture and relevant organizations of Iran, and that consequently the Anzali Wetland will be successfully conserved and sustainably used. It is also our sincere hope that this study and report will contribute to foster a long lasting partnership and friendship between the two nations of Japan and Iran.

Finally, we wish to express our sincere appreciation to the officials of JICA, JICA Advisory Committee, Ministry of Foreign Affairs, Ministry of Environment, Ministry of Land and Transportation, the Embassy of Japan for Iran, and JICA Experts for their continuous support throughout the Study. Also, we would like to express our great appreciation to the members of the National Steering Committee and Local Steering Committee of Iran and other Iranian personnel concerned for their cooperation during the Study.

Yours faithfully,

Hirofumi Sadamura
Leader for JICA Study Team

The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland in the Islamic Republic of Iran

JAPAN INTERNATIONAL COOPERATION AGENCY

Location Map of the Study Area

THE STUDY ON INTEGRATED MANAGEMENT FOR ECOSYSTEM CONSERVATION OF THE ANZALI WETLAND IN THE ISLAMIC REPUBLIC OF IRAN

OUTLINE OF THE STUDY

1. Objectives and Study Area

The objectives of the Study were:

1) Development of an integrated master plan for the conservation of the Anzali wetland through close collaboration between the JICA Study Team and the Iranian counterpart organizations;
2) Initiation of some of the measures that will be identified during the development of the integrated master plan, by the Iranian national and local organizations concerned during the Study; and
3) Assistance for capacity development of the organizations concerned and their staff, to eliminate the causes of the Anzali wetland degradation, to conduct scientific research work, and to build up coordination mechanisms for overall wetland management.

The study area covers the Anzali wetland itself and its watershed, as shown in the Location Map. The area of the watershed is 3,610 km^2.

2. Goal and Structure of the Master Plan

The goal of the master plan is:

"to implement integrated environmental management in order to maintain an ecological balance in the Anzali Wetland and its watershed"

The following six sub-plans were proposed under the general framework of the master plan in order to ensure integrated environmental management of the wetland and its watershed.

1) Wetland Ecological Management Plan
2) Watershed Management Plan
3) Wastewater Management Plan

4) Solid Waste Management Plan
5) Environmental Education Plan
6) Institutional Plan for Implementation

3. Target Year and Socio-economic Framework of the Master Plan

The target for completion of the implementation of the master plan is 2019. The current population in the study area is around 1.16 million in 2004. The population is estimated to increase at an average rate of 1.8%, and reaches 1.52 million in 2019. The urban population in 2019 would be about 1.13 million and the rural population would be 0.39 million. The GRDP of Guilan Province is expected to increase from 16.3 trillion Rials in 2000 to 41.3 billion Rials in 2019 assuming an annual economic growth rate of 5%.

4. Proposed Projects in the Master Plan

4.1 Wetland Ecological Management Plan

The projects/measures and executing organizations proposed in the Wetland Ecological Management Plan are summarized below.

Sub-component	Proposed Measures	Executing Organization
Environmental Zoning	(1) Establishment of environmental zones	DOE, HUDO, MOJA
	(2) Enforcement of zoning	DOE, HUDO, MOJA
Conservation of Wildlife	(1) Conservation of the threatened species	DOE, PSO
	(2) Control of the alien species	DOE
Conservation of Habitat	(1) Strengthen the regulations	
	1) Construction of guard stations	DOE
	2) Capacity development of rangers	DOE
	3) Regulation of motorboats	DOE, PSO
	(2) Rehabilitation and maintenance of habitat	
	1) Rehabilitation of habitat	DOE
	2) Measures for solid waste inflow	DOE, MOE
Promotion of Wise Use	(1) Development of ecotourism	
	1) Structuring of ecotourism network	DOE, CHTO, PSO
	2) Nature interpreter training	DOE, CHTO
	3) Preparation of infrastructure	DOE, CHTO
	4) Implementation of ecotourism	DOE, CHTO
	(2) Sustainable use of natural resources	
	1) Sustainable hunting and fishing	DOE, MOJA
	2) Beneficial use of *Azolla*	DOE, MOJA
Monitoring and Feedback	(1) Environmental monitoring for adaptive management	DOE, MOJA
	(2) Environmental research	DOE, MOJA

4.2 Watershed Management Plan

The projects/measures and executing organizations proposed in the Watershed Management Plan are summarized below.

Sub-components	Proposed Projects/Measures	Executing Organizations
Soil Erosion Control and Prevention of Land Slides	(1) Soil erosion control	
	1) Vegetative measures	MOJA (NRGO)
	2) Structural measures	MOJA
	(2) Prevention of landslides	MOJA
Forest and Rangeland Management	(1) Pilot activity of participatory resource management	NRGO
	(2) Reforestation of degraded forests (70 km^2)	NRGO
	(3) Reforestation in the margin areas (112 km^2)	NRGO
	(4) Forest management under forestry plan	NRGO
	(5) Conservation of protected forests	NRGO
	(6) Rangeland management by graziers	NRGO
	(7) Development of regulations necessary for participatory resource management	NRGO NRGO
	(8) Improvement of the livestock resettlement program	NRGO
Plain Area Management	(1) Source-level control of sediment runoff in plain area	MOJA
	(2) Measures to control inflow of sediment into the Wetland	MOJA
	(3) River management for extreme conditions	MOJA, MOE
Livelihood Development	(1) Capacity development of NRGO provincial and local offices	NRGO
	(2) Livelihood development of local people in forest and rangeland management	NRGO
Environmental Monitoring plan	(1) Monitoring of soil erosion controls	MOJA
	(2) Monitoring of land use/vegetation cover	MOJA
	(3) Monitoring of rangeland management	NRGO/MOJA
	(4) Monitoring of forest management	NRGO
	(5) Monitoring of livestock resettlement program	NRGO
Institutional Arrangement	(1) Coordination among relevant organizations	
	1) Coordination of NRGO and WMD	NRGO & MOJA
	2) Coordination of NRGO and DOE	NRGO & DOE
	3) Information sharing among NRGO, WMD and RWO	NRGO, WMD, RWO
	(2) Capacity development for sustainable watershed management	NRGO
	1) Capacity development for participatory resource management	NRGO & MOJA NRGO & MOJA
	2) Capacity development for long-term visions and plans	
	3) Capacity development for environmental monitoring	

4.3 Wastewater Management Plan

The projects/measures and executing organizations proposed in the Wastewater Management Plan are summarized below.

Sub-Components	Proposed Projects/Measures	Executing Organizations
Management of Domestic Wastewater in Urban Area	(1) Rasht sewerage system development project Phase 1 Service Population: 253,816 residents, Treatment Capacity: 80,000 m^3/d Phase 2 Service Population: 378,284 residents Treatment Capacity: 80,000 m^3/d	GWWC
	(2) Anzali sewerage system development project Phase 1 Service Population: 77,920 residents, Treatment Capacity: 34,000 m^3/d Phase 2 Service Population: 51,000 residents Treatment Capacity: 20,000 m^3/d	GWWC
	(3) Somehsara sewerage system development project Service Population: 56,980 residents Treatment Capacity: 12,700 m^3/d	GWWC
	(4) Promotion of individual wastewater treatment facilities outside of Sewerage Service Area Target Population: 113,000 residents Number of Septic Tank Installation: 22,600 units	DOE
	(5) Promotion of low phosphorous detergent use	DOE
Management of Domestic Wastewater in Rural Area	(1) Community wastewater treatment system development Service Population: 57,000 residents Sites: 21 villages	RWWC
Management of Industrial Effluent	(1) Centralization of industrial factories Sites: Six Industrial Cities (Anzali, Rasht, Somehsara,Fuman, Shaft and Masal)	DOE/MOIE
	(2) Construction of Centralized Wastewater Treatment System Sites: Six Industrial Cities (Anzali, Rasht, Somehsara, Fuman, Shaft and Masal) Total Treatment Capacity: 21,000 m^3/day	DOE/MOIE/ Private company
	(3) Strengthening of Monitoring Activities by DOE	DOE
Management of Livestock Waste	(1) Treatment of livestock waste from industrial animal husbandry Sites: 17 sites of existing industrial animal husbandries	DOE
	(2) Control of livestock waste in grazing lands in the plain area	DOE
Management of Pollution from Farmland	(1) Promotion of farming with less input 1) Promotion of use of compost such as livestock manure and/or *Azolla* 2) Expansion of Integrated Pest Management through Farmer Field School	MOJA
	(2) Proper use of agricultural chemicals and water management	MOJA

4.4 Solid Waste Management Plan

The projects/measures and executing organizations proposed in the Solid Waste Management Plan are summarized below.

Sub-components	Proposed Projects/Measures	Executing Organizations
Municipal Solid Waste Management	(1) Environmental awareness raising 1) Participatory recycling activity 2) Linkage to environmental education (2) Provision of efficient municipal waste collection service to the whole area 1) Provision of waste collection to villages 2) Change of collection frequency and collection points in urban areas (3) Proper disposal of municipal solid waste 1) Composting of municipal solid waste 2) Sanitary landfill construction (Rasht, Anzali) 3) Closure of present open dumping sites	Municipalities
Industrial and Medical Solid Waste Management	(1) Proper treatment of hazardous industrial solid waste 1) Construction of pretreatment facility for solid waste containing heavy metals 2) Establishment of separation and collection system for infectious waste (2) Non-hazardous industrial solid waste management 1) Promotion of reduction/recycling of industrial solid waste 2) Establishment of regulations to control industrial solid waste	 IMO MOH IMO DOE
Environmental Monitoring for Solid Waste Management	(1) Monitoring of municipal waste management in urban areas (2) Monitoring of municipal waste management in rural areas (3) Monitoring of recycling activities (4) Monitoring of leachate from landfills (5) Monitoring of industrial waste management (6) Monitoring of medical waste management	Municipalities Municipalities Municipalities DOE IMO MOH

4.5 Environmental Education Plan

The projects/measures and executing organizations proposed in the Environmental Education Plan are summarized as below.

Sub-component	Proposed Projects/Measures	Executing Organization
Environmental Education	(1) Environmental Education in Schools (2) Environmental Education in Higher Education	Ministry of Education, Ministry of Higher Education
Public Awareness Raising and Participation	(1) Decision Makers (2) Religious Leaders (3) Business and Industry (4) Farmers and Rural Communities (5) General Public and Tourists (6) NGO and Journalists	Ministry of Education, Ministry of Higher Education, religious leaders, business and industries, MOIM, MOJA, municipalities, DOE, NGO, media/journalists

4.6 Institutional Plan for Implementation

The projects/measures and executing organizations proposed in the Institutional Plan for Implementation are summarized below.

Sub-Components	Proposed Projects/Measures	Executing Organization
Establishment of Anzali Wetland Conservancy	(1) Establishment of Anzali Wetland Department (2) Formation of Anzali Sub-Group of WGLEP (3) Annual Anzali Forum	DOE, MOJA, NRGO, MOE, CHTO, MORT, WGLEP, Municipalities, and NGOs
Capacity Development	(1) In-country cross-sectoral training (2) DOE "apprenticeship" training (3) Overseas exchange visits	

4.7 Project Costs and Operation & Maintenance Costs

The projects costs and operation and maintenance costs of the proposed projects/measures in the master plan are as follows.

(Unit: billion Rials)

Sub-plans	Project Cost	Total O&M Cost*
(1) Wetland Ecological Management Plan	30.8	15.3
(2) Watershed Management Plan	726.8	43.3
(3) Wastewater Management Plan	2,449.9	439.8
(4) Solid Waste Management Plan	146.2	548.3
(5) Environmental Education Plan	1.2	38.5
(6) Institutional Plan	1.3	37.9
Total	3,356.2	1,123.1

Note: *- Total operation and maintenance (O&M) cost for 15 years of master plan period.

4.8 Implementation Program

The priorities of the proposed projects/measures were evaluated based on a set of criteria, such as effect, urgency, cost, capacity of executing organizations, etc., and the implementation schedules of the proposed projects/measures were designed accordingly. All projects/measures are to be implemented within 15 years (2005 – 2019). Twenty-two projects/measures that have to be implemented immediately were selected as priority projects. (see Chapter 11).

4.9 Evaluation of the Master Plan

The proposed master plan was evaluated with respect to i) economic and financial, ii) environmental and social, and iii) technical aspects (see Chapter 10). The results of the economic evaluation showed that the master plan is economically viable as the B/C = 1.1, and EIRR = 13.1%, though benefits of the proposed master plan were not easy to quantify because the proposed projects/measures involve various intangible benefits such as protecting threatened species or improving water quality. It was also found that more than 90% of the residents in the watershed have positive opinions about conservation of the Anzali wetland and its watershed. As many of the proposed projects/measures do not have any revenues, the financial feasibility of the master plan was evaluated by comparing the necessary cost of the master plan and the governmental budgets for relevant organizations. The proposed projects/measures are technically feasible as they can be implemented with technologies available in Iran. The master plan was designed to improve the environmental conditions of the wetland and its watershed, and negative environmental impacts of the proposed master plan are considered to be limited. However, the social aspects of the master plan, in particular relating to the on-going livestock resettlement program, need due attention. In conclusion, the master plan is worth implementing, and relevant organizations are urged to take necessary action to initiate the implementation of the master plan.

THE STUDY ON INTEGRATED MANAGEMENT FOR ECOSYSTEM CONSERVATION OF THE ANZALI WETLAND

FINAL REPORT
Volume I Executive Summary

TABLE OF CONTENTS

List of Tables

List of Figures

ABBREVIATIONS

B/C	Benefit-Cost Ratio
BEA	Business Environment Association
BOD	Biochemical Oxygen Demand
CEP	Caspian Environment Programme
CEPA	Communication, Education and Public Awareness
CHTO	Culture, Heritage, and Tourism Organization
COD	Chemical Oxygen Demand
COP	Conference of Parties
CPI	Consumer Price Index
DO	Dissolved Oxygen
DOE	Department of the Environment
DOE Guilan	DOE Guilan Provincial Office
EIA	Environmental Impact Assessment
El	Elevation
EIRR	Economic Internal Rate of Return
EMS	Environmental Management System
EPM	Erosion Potential Method
EU	European Union
FAO	Food and Agriculture Organization
FFS	Farmer Field Schools
F/S	Feasibility Study
FRO	Forestry and Range Organization
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information System
GOJ	Government of Japan
GOI	Government of Islamic Republic of Iran
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
GWWC	Guilan Water and Wastewater Company
HEEG	Higher Education Environment Group
HQ	Headquarter
HUDO	Housing and Urban Development Organization
IEE	Initial Environmental Examination
IEG	Islam and Environment Group
IMF	International Monetary Fund
IMO	Industrial Mining Organization
IPM	Integrated Pest Management
IRR	Iranian Rial
ISO	International Organization for Standardization
ISW	Industrial Solid Waste
ITTO	Iran Touring and Tourism Organization
IUCN	The World Conservation Union
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
MCM	Million Cubic Meter
MOE	Ministry of Energy
MOED	Ministry of Education
MOE Guilan	MOE Guilan Provincial Office
MOIM	Ministry of Industries and Mines
MOJA	Ministry of Jihad-e-Agriculture
MOJA Guilan	MOJA Guilan Provincial Directorates
MORT	Ministry of Roads and Transportation

M/P	Master Plan
MPO	Management and Planning Organization
NCSD	National Council for Sustainable Development
NGO	Non Governmental Organization
NPV	Net Present Value
NRGO	Natural Resources General Office
NWWEC	National Water and Wastewater Engineering Company
O&M	Operation and Maintenance
PEC	Provincial Environmental Committee
PPP	Polluter Pay Principle
PRA	Participatory Rural Appraisal
PSIAC	Pacific Southwest Inter-agency Committee
PSO	Ports and Shipping Organization
RAN	Rural Advisers Network
RAP	Resettlement Action Plan
REAN	Rural Environment Advisers Network
RET	Rural Environment Team
RWO	Regional Water Organization
RWWC	Rural Water and Wastewater Company
SCI	Statistical Center of Iran
SEG	Schools Environmental Group
SS	Suspended Solid
SWIM	Solid Waste Improvement Meeting
SWIM-H	Solid Waste Improvement Meeting for Hospital Waste
SWIM-I	Solid Waste Improvement Meeting for Industrial Waste
SWIM-M	Solid Waste Improvement Meeting for Municipal Waste
SWM	Solid Waste Management
The Study	The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland
TDS	Total Dissolved Solid
T-N	Total Nitrogen
TOR	Terms of Reference
T-P	Total Phosphorus
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USD	United States Dollar
US EPA	United States Environmental Protection Agency
VAT	Value Added Tax
WEMP	Wetland Ecological Management Plan
WGLEP	Working Group on Landuse, Environment and Population
WEAT	Wetland Environmental Action Team
WG	Working Group
WGLEP	Working Group on Landuse, Environment and Population
WL	Water Level
WMD	Watershed Management Department
WMP	Watershed Management Plan
WPDT	Wetland Professional Development Team
WTP	Willingness-To-Pay
WWTP	Wastewater Treatment Plant

ABBREVIATIONS (MEASUREMENT UNIT)

Length

mm	millimeter
cm	centimeter
m	meter
km	kilometer

Area

m^2	square meter
km^2	square kilometer
ha	hectare

Volume

m^3	cubic meter
l, L	liter
MCM	million cubic meter

Concentration

ppm	parts per million
mg/L	milligram per liter

Weight

mg	milligram
g	gram
kg	kilogram
ton	metric ton

Time

sec	second
min	minute
hr	hour
yr	year

Currency

IRR	Iranian Rial
JPY	Japanese Yen
USD	United States Dollar

Others

%	percent
°C	degree centigrade
10^3	thousand
10^6	million
10^9	billion

CHAPTER 1 INTRODUCTION

The Anzali Wetland covers an area of 193 km^2 in Guilan Province of Iran and is situated on the southern coast of the Caspian Sea. It is internationally known as an important wetland for migratory birds, and was registered as a Ramsar site in June 1975, and subsequently added to the Montreux Record of wetlands being degraded by human activities. The environment of the Wetland is deteriorating due to the inflow of wastewater, solid waste and sediment from its watershed.

Given this situation, the Government of Iran (GOI) asked the Government of Japan (GOJ) to extend technical cooperation for a comprehensive study on conservation of the Anzali Wetland. In November 2002, the Scope of Work for the Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland (the Study) was agreed between Japan International Cooperation Agency (JICA) and the Department of the Environment (DOE) and Ministry of Jihad-e-Agriculture (MOJA), Iran.

The objectives of the Study are as follows:

1) Development of an integrated master plan for the conservation of the Anzali Wetland through close collaboration between the JICA Study Team and the Iranian counterpart organizations;
2) Initiation of some of the measures that will be identified during the development of the integrated master plan, by the Iranian national and local organizations concerned during the Study; and
3) Assistance for capacity development of the organizations concerned and their staff, to eliminate the causes of the Anzali Wetland degradation, to conduct scientific research work, and to build up coordination mechanisms for overall wetland management.

The study area covers the Anzali Wetland itself and its watershed, as shown in the Location Map. The area of the watershed is 3,610 km^2. The total work period of the Study is 25 months from February 2003 to February 2005, and the entire study period is divided into two phases: Phase 1: Basic Study (February 2003 to February 2004) and Phase 2: Formulation of the Master plan (May 2004 to February 2005).

CHAPTER 2 PRESENT CONDITION OF THE STUDY AREA

2.1 Socio-Economy

2.1.1 National Socio-Economy

(1) National Economy

GDP of Iran was 741,068 billion Rials in 2000 at the price level in 2003. The average annual growth rate of the GDP was 23.1 % between 1997 and 2001. The major contributors to GDP are mining (15.5%), manufacturing (15.1%), wholesale and retail (14.5%), real estate (11.6%) and agriculture (10.9%). Iran has the second largest oil and gas reserves in the world. The national economy heavily depends on the oil-related sector, which was about 16 % of GDP in 2000.

The national economy of Iran is planned by the Five-year Development Plan. The Third Five-year Development Plan for 2000 - 2004 is under implementation. Overhaul of state enterprises, reduction of government subsidies, control of inflation, and job creation were among the priorities of the third five-year plan. Each province develops its provincial Five-year Development Plan based on the national plan.

(2) National Population

According to the 1996 Census, the total population of Iran in 1996 was about 60 million, while the total population in 2001 was estimated at about 66 million. According to the population structure by age, there is a remarkable feature that the age group under 30 years old is about 68% of the total population. Creation of job opportunities is one of the important issues in the national development plan.

2.1.2 Regional Socio-Economy

(1) Regional Economy

GRDP in Guilan province was estimated at 16,362 billion Rials for 2000. GRDP of Guilan province is ranked at 10th out of the 28 main provinces in Iran. Guilan province is a major agricultural area for rice, silkworms, and tea. The rice cultivation is the main agricultural activity in the province. Also, the province is one of the major domestic tourist destinations in the northern part of Iran for the summer season, especially along the coastal area of the Caspian Sea including the Anzali Wetland area. The employment rate in Guilan province has been gradually increasing since 1998, but it was still at a low level of 86.8% in 2001.

The average annual net incomes of households in urban and rural areas in Guilan province are 28.6 million and 19.3 million Rials/year/family, respectively, in 2002. While, the national average annual net income is 33.1 million Rials/year/family for the urban areas and 19.0 million Rials/year/family for the rural areas.

The annual budgets of Guilan province are given below. The provincial public revenue consists of taxes, profits from government monopoly and ownership, merchandise sales and services, insurance premiums and other revenues. The national public revenue is a budget allocated from the central governmental budget to the provinces. The current expenditure is used to maintain the level of government's socio-economic activities.

(Unit: million Rials)

Item	1998	1999	2000	2001	2002
1. Revenue	758,121	853,109	1,081,499	1,437,840	2,006,661
(1) Provincial public revenue	199,890	283,850	380,358	436,530	479,056
(2) National public revenue	558,231	569,259	701,141	1,001,310	1,527,605
2. Expenditure	758,121	853,109	1,081,499	1,437,840	2,006,661
(1) Current expenditure	616,137	695,870	897,776	1,118,579	1,498,614
(2) Development expenditure	141,984	157,239	183,723	319,261	508,047

Source: Guilan Statistical Yearbook 2003

(2) Regional Population

The total population of Guilan province and study area are estimated at around 2.5 million and 1.1 million in 2004 respectively based on the 1996 Census. 46% of the total provincial population lives in the study area.

Township	Total Population		
	Total	% to Total Study Area	% to Total Province
Anzali	132,297	11.4%	5.3%
Rasht	647,452	56.0%	25.8%
Shaft	75,512	6.5%	3.0%
Somehsara	138,665	12.0%	5.5%
Fuman	110,579	9.6%	4.4%
Masal	52,111	4.5%	2.1%
Total of Study Area	1,156,616	100.0%	46.1%
Province Total	2,508,605	-	100.0%

Source: Estimated by JICA Study Team based on MPO's estimation

The annual growth rate is assumed at 1.8%. According to the Third Five-year Development Plan of Guilan Province, the rate of population growth is dropping faster than in other parts of the country due to successful population program in the province.

2.2 Natural Conditions

2.2.1 Climate

The climate in the northern region of Iran comprising Guilan, Mazanadaran and Golestan provinces and where the Anzali Wetland lies is referred to as the Caspian or Hyrcanian climate. Its influence on this thin coastal strip of land along the Caspian Sea, coupled with the close proximity of the Alborz Mountain Range to the south, results in a climate that is unique from the arid climate that is typical in the rest of Iran. Rainfall is abundant in this region, varying greatly between 400-2,000 mm per year. The rainfall is the greatest in the west and gradually decreases towards the east. Evaporation increases from west to east with a regional average of 800 mm. The temperature is mild, ranging between -0.8°C - 37.3°C with an average of 17°C. Relative humidity varies depending on the location and season, having ranges between 24% - 100% and a regional average of 66%. The climate in the Anzali Wetland watershed is characterized by two distinct types. The lowland area to the north between El. -25 m to 500 m is characterized by warm temperatures, high moisture and abundant rainfall (Anzali station rainfall is the highest along Iran's Caspian coast) during the summer with a mild climate during the winter. The climate between El. 500 m to 3,000 m is noticeably different from the lowland, characterized by cooler temperatures, drier conditions and less rainfall.

2.2.2 Topography

The Anzali Wetland watershed is located between approximately N36º55' to 37º32' and E 48º45' to 49º42' and is situated in the northern part of the country and along the coast of the Caspian Sea. The watershed has a maximum elevation of about El. 3,105 m at the mountains, while the Caspian Sea coast has an elevation of about El. -25 m. The watershed of the Anzali Wetland is bordered by the fan of the Sefidroud River to the east, the Alborz Mountain chain to the south and west, and the Caspian Sea to the north.

The watershed is geomorphologically divided into 2 types of landforms, that is, a lower plain flat land in the north and a mountainous area in the south. The lower plain flat land, namely the Anzali Plain, is approximately 60 km wide and 20 to 40 km long, and the mountainous area is approximately 70 km wide and 25 km long. The plain, generally below El. 100 m, consists mainly of the Anzali Wetland and a wide paddy area. The natural gradient is less than 1 % in the plain inclined to the Anzali Wetland, and the gradient of the mountainous area increases to more than 25 % from the limit of the plain up to El. 2,500 to 3,000 m.

2.2.3 Hydrology

(1) Precipitation

The average annual precipitation of the Anzali Wetland watershed is about 1,200 mm. The precipitation in the coastal area is about 1,800 mm/year, the highest in the watershed, and decreases southward (1,300 - 1,600 mm/year). Monthly precipitation is the most abundant in October (230 mm), while it is the least abundant in June (65 mm). This seasonal change is less apparent towards the mountains.

(Unit: mm)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Anzali	182.8	133.1	111.2	50.7	50.9	43.0	46.0	130.2	197.1	338.8	299.7	244.6	1,828.1
Rasht	131.4	121.7	76.6	59.0	46.3	44.6	53.4	119.5	195.1	177.2	150.2	110.8	1,271.5
Ghalehro udkhan	105.9	117.5	95.5	106.1	105.4	108.8	119.5	238.7	220.0	170.5	143.7	101.5	1,618.9

Source: MOE

(2) Discharge

The Anzali Wetland watershed has a catchment area of 3,610 km^2. There are 10 major river systems entering the Wetlands. The sub-catchment areas range from 100 to 700 km^2. These rivers have perennial flow with origins in the Alborz Mountains to the south. The annual mean discharge into the Wetlands is estimated at about 76 m^3/s, or 2,400 MCM. The monthly mean discharge into the Wetland is given below.

(Unit:m^3/s)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
63.0	68.3	81.5	67.7	49.7	33.0	31.4	33.8	73.8	106.8	95.4	65.7	76.1

Source: MOE

(3) Water Levels of Caspian Sea and Anzali Wetland

The water level of the Caspian Sea is measured at Anzali Port. The maximum water level during the period from 1930 to 2000 was -25.27 m in 1929 and the minimum was -28.44 m in 1977. In 1977 the water level began to rise, reaching a recent maximum of -26.10 m in 1994. However, the water level has receded since then. The latest water level in September 2003 ranged from -26.20 m to -26.40 m.

Historical records of water level measurement of the Anzali Wetland are not available. The water level measurement for the Anzali Wetland was made at four locations in the Wetland over 40 days during the Study. There is a relatively good relationship between the Wetland water level fluctuation and the Caspian Sea water level fluctuation. It is known that the water level of the Wetland is about 40 cm higher than the Caspian Sea level.

2.2.4 Geology and Soil

(1) Geology

The geology of the Anzali Wetland watershed is classified into two geological zones, a Quaternary zone and a Pre-Tertiary zone. The plain area in the northern part of the watershed is generally covered by the Quaternary zone, Plistocene to recent sediments, while the mountainous area in the southern part is underlain by a Pre-Tertiary zone, Lower Paleozoic to Neogene Formations and some intrusive rocks. The oldest bedrock in the watershed is the Pre-Paleozoic formation. It is exposed mainly along the upstream reaches of the Shiamazgiroud River, the Gashutroudkhan River, the east bank of the Masulehroudkhan River and the Morghak River. Above the Pre-Paleozoic formation is a Paleozoic Formation. The Lower Paleozoic formation is of limited occurrence in the watershed. The Upper Paleozoic formation is widely developed along the upstream reaches of the Khalkaii River, the Shahmoalem River and the Teniyan River. Triassic-Jurassic, lower and upper Cretaceous formations are scattered on the eastern and western parts of the mountainous area, upstream of Masulehroudkhan River and the south part of the Rasht. Along the foot of mountainous area, recent deluvial and fluvial deposits have developed in the form of a narrow bank from east to northwest.

In the plain area of the watershed, the underlying zone is older in the southern part than the northern part and is subdivided into 1) the lower alluvial, flood-plain and deltaic deposits distributed only along some rivers, especially in the eastern part of the watershed; 2) pleistocene marine deposits distributed widely in the plain; 3) beach deposits overlying pleistocene marine deposits in the form of a narrow zone; 4) upper alluvium and flood plain deposits distributed along the rivers, recent deposits distributed along the Caspian Sea, and the most recent deposits of the Sefidroud River's fan, distributed south-east of Rasht.

(2) Soil

The soil types in the watershed are classified into two types, namely mountainous soils and plain soils. The mountainous soils are composed of lithic leptosols, dystric cambisoils, humic cambisoils, mollic leptosols, calcaric regosols, gleyic cambisols and calcaric cambisols, while eutric cambisols, eutric gleysols and gleyic luvisols are distributed widely in the plain area. These, especially eutric cambisols and gleyic luvisols, are usually acidic soils with a deep and heavy structure. Around the Wetland, mollic gleysols and calcaric regosols are dominant. Both soils have developed from gleyic coastal sand, but the former has a significant hydromorphic feature with fertile topsoil.

2.2.5 Vegetation

Approximately 42 % of the study area is covered by forests known as Hyrcanian Forest, which constitutes a narrow band of forests along the Caspian Sea. Depending on the elevation, the forests in the study area can be divided into three types, that is, lower elevation forests in the Querco-Buxetum association below El. 700 m, intermediate forests in the Querco-Carpinetum and Parrotio-Carpinetum associations between El. 700 m and El. 1,000 m and higher elevation forests in two associations of Rusco-Fagetum and Arctostaphylo-Fagetum between El. 1,000 m and El. 2,300 m. The area above the forests (El. more than 2,300 m) is covered with grasslands (rangelands) and bare land. The vegetation in the rangelands consists of several species. However, the density is low because of grazing pressure.

2.2.6 Land Use

The land use in the Anzali Wetland watershed has been classified as below according to the LANDSAT images in 1987, 1991 and 2002.

Category	1987		1991		2002	
	km^2	%	km^2	%	km^2	%
Lagoon/Ponds	57.5	1.6	57.7	1.6	45.5	1.3
Wetland	72.0	2.0	61.0	1.7	118.0	3.3
Orchards	460.2	12.8	467.7	13.0	311.2	8.6
Paddy Field/Farmland	1,073.6	29.8	1,062.6	29.5	962.5	26.7
Forest	1,331.6	36.9	1,401.3	38.9	1,513.5	42.0
Rangeland	73.6	2.0	211.2	5.9	107.7	3.0
Bare land	356.8	9.9	145.1	3.9	255.9	7.1
Urban area	181.4	5.0	200.2	5.6	292.4	8.0
Total	3,606.8	100.0	3,606.8	100.0	3,606.8	100.0

Source: JICA Study Team (2004)

As seen in the table, there have been some changes in land use for the last 15 years. Some are highlighted as follows.

1) The size of the urban area is increasing with development of the watershed.
2) Paddy/farmland reduced by about 100 km^2 from 1991 to 2002 due to expansion of tree plantation in the plan areas.
3) The areas of rangeland (mountain grasses) and bare land have fluctuated mainly because of climatic conditions of the respective shooting years.

2.3 Ecological Conditions of the Anzali Wetland

A Wetland generally consists of complex ecological interactions of (i) biological, (ii) physical and (iii) chemical components such as plants, animals, soils and water. It serves vital functions including wildlife habitats, water storage, flood mitigation, groundwater recharge and discharge, erosion control and water purification.

The Anzali Wetland is composed of diverse ecosystems including freshwater lagoons, extensive reed-beds, shallow impoundments and seasonally flooded meadows. Ecological components of the Wetland interact in a complex manner, which provide important habitats for many fishes and wintering waterfowls (Scott, D.A. ed, 1995). Ecological conditions of the Anzali Wetland are described in this chapter with literature review and the field survey that was conducted between 2003 and 2004 with the assistance of the JICA Study Team.

2.3.1 Biological Components

(1) Flora

The vegetative community of the Anzali Wetland is largely classified into the (i) Phragmites community, (ii) submerged plants community and (iii) *Azolla* community. The Phragmites community is largely distributed in the shallow area of the eastern wetland, and covers about a quarter of the wetlands excluding the lagoon. The submerged plants community covers almost the entire area of the lagoon. The *Azolla* community covers about a quarter of the Anzali Wetland except for the lagoon. Dominant plant species in the Wetland appear to be *Ceratophyllum demersum*, *Typha latifolia* and P*hragmites australis*. It was recorded that there were 31 species of macrophyte in the Wetland (Yecom consultant, 1989).

The field survey was conducted on the macrophyte by the Caspian Sea Bony Fishes Research Center from August 2003 to October 2003. A total of 24 species was identified, but, referring to the Red Data Book of Iran compiled by the Research Institute of Forest and Rangelands and the Red List of IUCN, no threatened species was found.

(2) Avifauna

A total of 140 migratory bird species are known in Iran, which includes 63 breeding species, 62 wintering species, 13 transit species and 7 rare species (Yecom consultant, 1989). The record also indicates that 77 species of migratory birds (53% of all) fly to the Anzali Wetland. The Wetland supports a large breeding colony of *Chlidonias hybridus*, small colonies of six species of Ardeidae, and a large resident population of *Porphyrio porphyrio*.

It also supports wintering concentrations of ducks, geese, swans and coots.

Bird population census has been carried out in the Wetland since 1970. The record indicates the highest number of migratory birds is 800,000 so far. The migratory bird population during 2002 and 2003 ranges between 150,000 and 400,000. Human pressure due to uncontrolled hunting may be the most serious factor affecting the population record.

In addition to the above census, a bird survey was conducted in the seven representative bird habitats of the Wetland from August 2003 to March 2004 by the DOE Guilan. The survey identified 89 species of migratory birds and 146,000 individual birds. The wintering waterfowl population is 27 species and 110,000 individuals. The population of *Anas crecca* (Common Teal) was 40% of all the birds recorded, which was the highest population of migratory birds followed by *Fulica atra* (Common Coot) with 30% and *Anas querquedula* (Garganey) with 18%. These three species account for 88% of all the wintering waterfowl.

Threatened species of birds found in the field survey are *Phalacrocorax pygmaeus*, *Aythya nyroca*, *Falco naumanni*, *Falco pelegrinoside*, *Falco peregrinus*, *Aquila clanga*, *Haliaeetus albicilla* and *Pelecanus crispus*. There was a significant decrease in the population of *Anthya nyroca* (Ferruginous Pochard) in the last two decades. Many species of raptors are threatened, of which there is only one breeding pair of *Haliaeetus albicilla* (White Tailed Eagle) known around the Anzali Wetland (DOE pers. com.).

(3) Ichthyofauna

The annual fish catch was between 5,400 and 5,700 tons until the 1940s. It had declined to about 75 tons between 1950s and 1980s due to a decrease in the water level of the Caspian Sea (Nezami, S. 1993). The water level of the Caspian Sea has rose, and the present fish harvest is estimated at about 400 tons per annum.

It is known that there currently are 49 fish species in the Anzali Wetland, of which 39 species are native and 8 species are non-native (Abbasi *et al*., 1999). A fish survey was conducted from September 2003 to January 2004 by Caspian Sea Bony Fishes Research Center in association with the JICA Study Team. There were 34 species and 12,488 individuals including both native and exotic species of fish identified in the survey. The survey indicates that fish abundance is relatively high in Siahkeshim and the eastern part compared with the western and the central parts of the Wetland. The high density of Phragmites in the shallow-water of Siahkeshim and the eastern part of the Wetland make the primary habitats of smaller fish. In contrast, the western and the central parts have large-sized open areas with 2 to 3 meter depth. These different features of the Wetland may be affecting the distribution of different species and sizes of fish.

There were 16 threatened species found in the survey mentioned above. Many of these species were found in the eastern part of the Wetland. Only one individual each of *Clupeonella cultriventris* (Black sea sprat), *Abramis brama orientalis* (Carp bream), *Rutilus rutilus caspicus*, *Perca fluviatillis* (European perch) and *Neogobius melanostomus* (Round goby) were found in the survey.

2.3.2 Physical Components

(1) Land Use around the Wetland

The Anzali Wetland is mostly surrounded with agricultural areas that are primarily paddy fields. There are also tree plantations with *Populas spp*. and alders and small areas of pasture land (less the 10 ha) around the Wetland. One of the pasture lands at the eastern side of the wetland is as large as about 100 ha. Large industrial areas do not exist around the Wetland. In the north of the Anzali Wetland, Anzali city is located around the outlet of the Wetland and along the shoreline of the Caspian Sea.

(2) Main Features of Wildlife Habitats

Key elements of the major wildlife habitats in the Anzali Wetland include reed beds, aquatic beds, a lagoon, rivers and others. There are eight habitat areas; the eastern part, Hosseinbekandeh, central, Selkeh, Sorkhankol, western part, Siahkeshim and rivers. The main issues on the major habitats are summarily shown below.

Location	Status of Protection	Main Issues
Eastern part	Not protected	Many threatened species require a low level of COD. If *Phragmites* continue overgrowth, the habitat for waterfowl will be lost.
Hosseinbekandeh	No-hunting area	Illegal hunting
Central	Not protected	Spawning ground should be protected from boat use and water pollution.
Selkeh	Wildlife refuge	The problem observed by the Study Team is overgrowth of *Azolla*.
Sorkhankol	Wildlife refuge	Illegal hunting and fishing.
Western	Not protected	
Siahkeshim	Protected area	This area is in danger of encroachment.
Rivers	Not protected	There is little water in those rivers for irrigation in summer.

(3) Sedimentation

It is said that the Anzali Wetland was much deeper in the past, but it seems to be becoming shallower due to sedimentation. The total amount of sediment inflow to the Wetland is

estimated at approximately 400,000 ton/year. Of which, 110,000 tons/year (30%) will be deposited in the Wetland and the remaining 290,000 tons/year (70%) will flow out to the Caspian Sea. The sedimentation rate was found higher in Anzali port, major junctions of channels and in the Siahkeshim area. In Siahkeshim, where water flow is slow and vegetation overgrows, sedimentation is considered to progress more quickly than in other areas.

(4) Fluctuation of Caspian Sea Water Level

Fluctuation of the Caspian Sea affects the wetland ecosystem as well as the land use pattern around the wetland. It changes water quality including salinity of the wetland, which affects distribution of fish (Holčil and Oláh, 1992). However, the mechanism of the water level fluctuation in the Caspian Sea is not well known at present.

2.3.3 Chemical Components

(1) Water Quality

The water quality of the Anzali Wetland was surveyed between September and December 2003. High values of COD, T-N and T-P were recorded throughout the Wetland, although the recorded values differ from point to point as shown below.

(Unit: mg/L)

Items	Area					Average
	Eastern	Central	Estuary	Siahkeshim	Lagoon	
COD	37	39	43	27	44	38
DO	7.8	7.1	7.3	7.6	8.3	7.6
T-P	0.28	0.20	0.32	0.17	0.09	0.21
T-N	2.3	1.8	2.7	1.8	2.3	2.2
Chl. *A*	3	9	28	16	31	17

Source: Result of Water Quality Survey made by DOE (2004).

According to the US EPA eutrophication criteria for COD, most of the Wetland water, except Siahkesim, is classified as highly polluted water (COD >30 mg/L). As for the T-P concentrations, the Wetland water is completely in a eutrophic condition according to three international eutrophication criteria (Vollenweider, US EPA and OECD).

(2) Sources of Pollution

The polluted wastewater from domestic, industrial and non-point sources is the main cause of the water pollution. The inflow of polluted water causes organic pollution. This problem is notable in the Pirbazar River downstream of Rasht and in a channel near the Anzali Port. In these water bodies, the level of COD is as high as 200 mg/L, which is close to the level of raw sewage, and the DO level is low due to decomposition of organic

material in water. Solid waste is another pollutant. A large amount of garbage reaches the Anzali Wetland. The amount of the solid waste dumped to the rivers is roughly estimated at 66 tons/day. Such garbage could contain hazardous chemicals and also is detrimental to the landscape of the Anzali Wetland. The toxic substances contained in solid waste may have direct negative impacts on the flora and fauna of the Wetland.

2.3.4 Value of the Anzali Wetland

Biological, physical and chemical components of the Anzali Wetland are linked and interact with each other in a complex manner. Ecological condition of the Wetland is maintained based on the delicate balance of those components. The Anzali Wetland represents unique and significant ecological as well as economical values. However, there are some factors threatening the future sustainability of this nationally significant Wetland.

(1) Ecological Value of the Anzali Wetland

In addition to the distributions of threatened species of wildlife described in Section 2.3.1, there is a unique ecological feature in the Anzali Wetland. The Wetland is located in the middle of two flyways, the Africa-Eurasian flyway and the Asia-Pacific flyway, where they cross each other. Other wetlands on the southern coast of the Caspian Sea located in the flyway represent similar ecological importance, but the Anzali Wetland receives a higher number of migratory birds flying to the Middle East. This remarkable feature of the wetland indicates nationally as well as internationally significant ecological value.

(2) Economic Value of the Anzali Wetland

Major economic values of the Anzali Wetland are associated with fishing, hunting and other recreational related activities. A significant number of the local people are involved, particularly in fishing and hunting, which is important to the local economy. The annual fish catch is about 400 tons and potential market value is about 10 billion Rials. Approximately 100,000 birds/season are hunted, and their potential market value is approximately 3 billion Rials.

In summer, the Wetland provides recreational activities for many visitors, including motor-boating and kayaking. The number of visitors to the Wetland is estimated at about 40,000 per year. Most of the visitors use boats, and they spend about 3 billion Rials per year. The Wetland also has a high potential for ecotourism activities that are in the form of environmentally sustainable use of natural resources.

2.4 Wetland Ecological Management

2.4.1 Relevant Laws and Organizations

(1) Relevant Laws

The Environmental Protection and Enhancement Act (1974, amended in 1992) and the Executive by-law on the Environmental Protection and Enhancement Act (1975, amended in 1995) are the main pieces of legislation governing environmental conservation in Iran. The Game and Fish law (1967, amended in 1996), the Executive by-law on the Game and Fish law (1967), and the Executive by-law on the Prevention of Water Pollution (1994) also contain important legislation for the protection of the environment.

(2) Organizations for Management

The ecological management of the Anzali Wetland is under the responsibility of DOE. The headquarters of DOE is mainly responsible for policy making, development of laws and regulations, management of national projects, budget allocation to provincial offices and technical support to the provincial offices. The provincial office of DOE (DOE Guilan) has direct responsibility for the Anzali Wetland management. The DOE Guilan has 11 local offices in Guilan Province. The activities related to the protection of the Anzali Wetland are under jurisdiction of Anzali and Somehsara local offices.

2.4.2 Present Management Activities

(1) Protected Areas

The Environmental Protection and Enhancement Act and the Executive by-law define the protected areas, such as national parks, national monuments, wildlife refuges, protected areas and no-hunting areas. In the Anzali Wetland three reserves have been established. The south western part of Siahkeshim (4,500 ha) was first established as a protected area in 1967 and upgraded to a wildlife refuge in 1971, then downgraded to a protected area in 1975. Selke (360 ha) has been protected as a wildlife refuge since 1970. Sorkhankol (477ha) was reserved as a no-hunting area in 1991 and upgraded to the wildlife refuge in 2002. DOE Guilan has recently submitted a series of proposals to the Supreme Council for the Environment to establish three no-hunting areas, one each at Chokam (347 ha), Hosseinbekandeh (367 ha) and Ghalm Godeh (119 ha) in 2002, 2002 and 2003 respectively.

(2) Strategies and Plans

Strategies and plans for the Anzali Wetland management are not properly documented by DOE Guilan. One of the main goals of the management is to control the illegal activities in accordance with the Executive by-law on the Environmental Protection and Enhancement Act. DOE Guilan also implements the following activities for the conservation of the Wetland:

1) Construction of a ditch around the Wetland to clarify the boundary of the Wetland,
2) Establishment of buffer zones,
3) Closure of the hunting season before the spring migration begins,
4) Limiting the list of game species for hunting,
5) Collection of data on hunting intensity and the number of animals harvested.

In 1995, Guilan University conducted a zoning study on the Anzali Wetland with the support of DOE. Although the outcome of this study has not been officially approved, it is used as a basis of planning by DOE Guilan at present.

(3) Control of Illegal Activities

Control of illegal activities is one of the major activities of DOE in the Anzali Wetland, particularly patrolling, which guards the wildlife refuges and protected areas. This is conducted by 21 rangers from three stations (Siahdarvishan, Ghalm godeh and Sorkhankol) of the Anzali office and 10 rangers from two stations (Selkeh, Esfand) of the Somehsara office. The staff patrol three times a day and 7 days a week (morning, afternoon and night). The staff of DOE can confiscate fishing and hunting gear when they find illegal activities, and also they are authorized to arrest the violators.

(4) Control of Encroachment

In the 1970s to 1980s when the Caspian Sea water level was low, emerging parts of the Anzali Wetland, including the western part of Siahkeshim were converted to agricultural land. DOE had to re-delineate the boundary of Siahkeshim Wildlife Refuge, and downgrade it to a protected area. As the water level started to increase in the late 1980s to 1990s, some of the illegal agricultural lands were flooded and abandoned. However, it is difficult to control the encroachment due to the ambiguous legal boundary of the Wetland. More than 100 ha of the Wetland have been converted into the paddy fields in the last five years.

(5) Control of Hunting and Fishing

The bird hunting and fishing are controlled by licenses issued by DOE. The number of bird hunting and fishing licenses issued in the last three years is as below.

Type of License	2001	2002	2003
Bird license (weapon)	986	1,042	988
Bird license (trap)	47	50	69
Bird license (abandan)	67	73	65
Fish license	3,186	2,902	2,577

Source: DOE (2003).

The permitted bird hunting days are 3 days in a week and the permitted bag limit is 6 game birds per day and 20 individuals per day. The permitted hunting bag limit with traps is 10 game species per day.

(6) Monitoring Activities

The Laboratory of DOE Guilan has conducted monthly water sampling and water quality analysis in the Wetland and three rivers, Goharroud (two sites), Zarjoub (two sites) and Pirbazar River (one site). Also, DOE Guilan has carried out annual bird census of migratory and resident species in January by the experts of Natural Environment and Biodiversity Section. The survey sites are the eastern area, western area, central area, Sorkhankol, Selkeh, Siahkeshim, Hosseinbekandeh and Chokam. The surveys of some species, such as the Pygmy Cormorant (*Phalacrocorax pygmaeus*), Whiskered Tern (*Chlidonia hybridus*) and Gray Heron (*Ardea cinerea*) are conducted during late June and July.

2.4.3 Major Issues

Reviewing the present situation of the wetland ecological management mentioned before, the following management issues are pointed out.

1) Unclear regulatory status of the wetland area
2) Conflict with development plans
3) Lack of management policy
4) Lack of wetland management plan
5) Weakness of institutional set-up for implementation of integrated management
6) Shortage of budget

2.5 Watershed Management

2.5.1 Present Conditions of the Watershed

(1) Situation of Soil Erosion

In the watershed, the management issue most relevant to the conservation of the Anzali Wetland is the control of sediment from the watershed, especially from the degraded forests and rangelands. All stages of soil erosion processes from sheet erosion to gully erosion are found in the upper watershed, especially in the rangelands. Overgrazing is the principal cause of rangeland degradation and a large part of grasslands are in devastated condition due to overgrazing. The sediment yields from the mountain areas were estimated using three empirical methods, namely the Erosion Potential Method (EPM), Pacific Southwest Inter-agency Committee Method (PSIAC) and Miyazaki-Oonishi method. The estimated sediment runoff is 326,000 ton/year. In addition to the mountain areas, sediment is released from the plain areas. The sediment origination from the plains is estimated at 74,000 ton/year. The total inflow of sediment to the Wetland is approximately 400,000 ton/year. A number of roads have been constructed in forestlands for timber transport and regional development. Unfortunately, these roads were constructed based on the standard cross-section designed for an area with stable geology and no slope protection was installed. For this reason, slope collapse and landslides are often found in geologically unstable areas. According to the GIS Center of MOJA Guilan, there are 20 landslides in the watershed.

(2) Situation of Rangeland and Forest Degradation

Rangelands are extensively used for grazing sheep/goats and cattle. According to the inventory survey by NRGO in 1984, about 3,900 families of graziers and about 431,000 units of livestock reside in the forests. Based on those figures, the total numbers of graziers and livestock are roughly estimated at 4,600 families and 507,000 units, respectively. The average stocking density is 11.5 units/ha. On the other hand, the stocking density permitted by NRGO is 3.7 units/ha. Clearly, this situation indicates overgrazing in the rangelands. The condition of the forests in the upper watershed is relatively good, although parts of the forests have been degraded since 1960s. The causes of forest degradation are commercial timber cutting, traditional exploitation for fuel use and domestic use, illegal cutting by outsiders, expansion of grazing area and disturbance by livestock.

According to the LANDSAT image analysis made in the Study, the degraded rangeland area is estimated at 77 km^2 and the degraded forest area is 70 km^2. In addition, areas currently consisting of 112 km^2 of grassland along boundaries between rangelands and forests above El. 1,500 m are also recognized as degraded forests since they were formerly forests in the 1960s. Consequently, the total degraded forest area amounts to approximately 182 km^2.

2.5.2 Relevant Laws and Organizations

The upper watershed areas are the main sources of sediment load to the wetland and proper management of the upper watershed, especially degraded forests and rangelands, is essential to control the sediment. There are many laws and regulations related to the management of rangelands and forests in Iran. The most relevant are the Law of Land Affairs (1962) and Law on Exploitation and Protection of Forest and Rangelands (1967, amended in 1997). Based on these laws, MOJA and NRGO have issued numerous internal regulations.

In the present administration, MOJA is responsible for watershed management. In the headquarters of MOJA, the Forest, Rangeland and Watershed Management Organization, and the NRGO's northern headquarters in Chalus are responsible for watershed management. In Guilan Province, the Deputy of Watershed Management of MOJA Guilan Provincial Office is responsible for soil erosion control and NRGO of Guilan Province is responsible for rangeland and forest management. River management is the responsibility of MOE.

2.5.3 Present Management Activities

(1) Erosion Control Works

The erosion control works are done by MOJA Guilan. The works carried out from 1998 to 2002 are summarized below. As seen in the table, the erosion control works are concentrated in the Masuleh watershed and the most typical measures are gabion check dams and wooden check dams.

Watershed	Type of Work	Quantity	Year
Masuleh Watershed	Gabion Check Dams	1,150 m^3	1999 - 2002
	Wooden Check Dams	850 m^3	2000
	Stone Masonry Walls	550 m^3	1995
	Vegetation (Grassing, Planting) and Protected Areas	400 ha	1996
Masal Watershed	Biological Works (Grassing, Planting)	220 ha	1998
Khorni Watershed	Gabion Check Dams	450 m^3	2000
	Wood Check Dams	700 m^3	2000 -2002
Palangver River (Tanian Watershed)	Protection Areas	120 ha	1999 – 2002
	Gabion Check Dams and Non-gabion	430 m^3	2000 -2002
	Wooden Check Dams	250 m^3	2001 -2002
Gohalu	Tree Planting	85 ha	1998 -2002
Choobar Area	Wooden Check Dams	250 m^3	1999
	Protected Areas	30 ha	2001 -2002

Source: MOJA Guilan

Although MOJA has made efforts to control soil erosion, most of the areas with gulley and rill erosion still remain untreated. If these areas are left without any countermeasures, the erosion process will progress and slope failures could cause serious problems such as debris flow and floods. In the upper watershed, cut slopes for the roads are not protected properly and therefore landslides and large-scale slope failures have often occurred.

(2) Forest Management

In the watershed, a total area of 215,000 ha, consisting of 161,300 ha of forest, 27,100 ha of rangelands and 26,900 ha of farmlands, is under the jurisdiction of NRGO Guilan. These areas are managed by six NRGO local offices, namely, Rezvanshahr, Shaft, Masal, Fuman, Rasht and Somehsara.

NRGO aims to restore the forests to the conditions in the 1960s. To this end, NRGO Guilan has carried out i) livestock resettlement; ii) reforestation; iii) conservation of protected forests and genetic flora; iv) forest management by entrusting private firms, and v) development of eco-tourism plans.

NRGO has implemented livestock resettlement activities to reduce the number of livestock and the associated negative impacts to the forest since 1990s. The progress and results of the activity in the past was not as good as expected since its compensation scheme was inflexible and there were few considerations of socio-economic aspects. In line with the presidential decree on the management of the northern forest (No.26239/16276) in August 2003, NRGO elaborated a livestock resettlement program with its implementation guideline. Through the resettlement program, about 3,900 families or 431,000 livestock

units[1] will be affected. Out of 3,900 families, 1,800 families will be relocated and 2,100 families will have to quit grazing. As a total of 337 families or 52,170 units of livestock have been relocated so far, and about 3,600 families will be affected and about 379,000 units of livestock will be relocated over the next six years. As a result, the numbers of graziers and livestock are expected to decrease to 693 families and 76,046 units, respectively.

There are 29 protected areas (3,250 ha in total), 25 biosphere reservation areas and one extensive protected forest (Shaft-Siahmezgi forest: 39,511 ha) in the watershed. To conserve these forest areas and encourage natural re-generation, NRGO restricts entrance of people and livestock in the protected areas and also implements tree planting in accordance with the Law on Protection and Exploitation of Forest and Rangeland. On the other hand, the forestry area is 107,275 ha in four sub-watersheds. Annual exploitation is 30,200 m^3/year. NRGO Guilan has carried out reforestation between 1981 and 2002 for the area of 31,500 ha. However, the reforestation for the last 5 years from 1999 to 2003 has not been extensive as the area reforested is 2,435 ha. While NRGO aims to restore the vegetation conditions of the watershed to the level in the 1960s, there is no long-term reforestation plan prepared in the office at present.

(3) Rangeland Management

Balancing the number of livestock is the main goal of rangeland management. In the past, grazing licenses were issued to control the number of livestock in the mountains, but there were many illegal graziers entering the rangeland to raise livestock and licensing alone was not able to stop overgrazing. For this reason, NRGO has stopped issuing licenses. Instead, NRGO has been trying to control the number of livestock through discussions with graziers.

The Rangeland Management Department of NRGO Guilan has prepared approximately 40 rangeland management plans dividing the rangeland into 156 areas. The rangeland management plan gives the existing livestock units, stocking potential of the area, recommended practices, etc., but has no scheme to reduce the number of livestock. So far, no rangeland management plan has been implemented, since NRGO recognized that the overgrazing problem could not be solved without reducing the number of livestock as well as graziers. The Rangeland Management Department has a plan to revise the rangeland management plans after implementation of the resettlement program.

[1] NRGO uses the unit to estimate the livestock intensity in the rangeland and forest, in which one head of goat/sheep is counted as one unit while one head of cattle is regarded as 5 units.

(4) Plain Area Management

The management of the plain area in the study area is mostly under the responsibility of MOJA Guilan. Due to the favorable combination of flat topography and the presence of paddy fields that dominate the study area, the amount of sediment run-off from the plain is about 74,000 ton/year, which is considered to be low compared to that from the mountains (about 326,000 ton/year). No management activities related to sediment control are implemented in the plain area.

2.5.4 Major Issues

Based on the present situation of the watershed management, the issues on the watershed management are itemized as follows:

1) Lack of active management to prevent progression of soil erosion
2) Poor construction method for roads in the mountains
3) Lack of long term vision of sustainable resources management
4) Lack of participation of local people in the forest and rangeland management
5) Lack of consideration of socio-economic aspects in resource management
6) Lack of coordination in forest and rangeland management
7) Insufficiency in the livestock resettlement program

2.6 Wastewater Management

2.6.1 Pollution Sources and Pollution Loads

(1) Pollution Sources

There are various kinds of water pollution sources in the Anzali Wetland watershed. They are largely divided into point sources and non-point sources. The point sources are urban population (762,000 persons), rural population (394,000 persons) and industrial factories (41 major factories). Non-point sources are livestock (860,000 head), farmland (99,000 ha) and forest/grassland (199,000 ha).

(2) Pollution Loads

The pollution loads discharged into the wetland are estimated by COD load and T-P load, and summarized below. The total COD load discharge is estimated at 65,300 ton/year and total T-P load discharge at 820 ton/year.

(Unit :ton/year)

Pollution Sources	Unit COD Load	COD Load Discharge	Unit T-P Load	T-P Load Discharge
Population (Urban)	130 g/p/day	35,247	1.8 g/p/day	488.0
Population (Rural)	40 g/p/day	5,757	0.5 g/p/day	77.7
Industrial Activities	50 mg/L	110	6.0 mg/L	13.1
Live Stock (Cow & Buffalo)	26g/p/day	3,083	0.5g/p/day	59.3
Live Stock (Sheep & Goats)	6.5g/p/day	1,275	0.125 g/p/day	24.5
Farm Land	107 kg/ha/year	10,562	0.98 kg/ha/year	96.7
Forest & Pasturage	47 kg/ha/year	9,306	0.3 kg/ha/year	59.4
Total		65,338		818.8

Source: JICA Study Team

2.6.2 Relevant Laws and Organizations

(1) Relevant Laws

The Regulation and Standard of Environment (1999) describes the effluent standards. According to the standard, all of domestic and industrial wastewater shall be treated properly before discharging to surface water or absorption wells. It will take a very long time for all polluters to follow the standard. GWWC and RWWC have plans to increase domestic wastewater treatment ratio, of which, some projects have been carried out. DOE conducts control of industrial effluent even to the extent of using legal force. The effluent standard stipulates allowable concentrations of 52 water quality parameters in effluent. The major water quality items are as shown below.

(Unit: mg/L)

Item	Discharge to Surface Water	Discharge to Absorption Well	Using for Agriculture and Irrigation
BOD	30	30	100
COD	60	60	200
Ammonia (NH4)	2.5	1	-
Nitrite (NO2)	10	10	-
Nitrate (NO3)	50	10	-
Total Phosphorous	6	6	-

Source: Regulation and Standard of Environment, 1999

(2) Organizations for Management

The organizations relevant to the wastewater management in the Anzali Wetland watershed are GWWC, RWWC, MOIM, DOE and MOJA. The task of each organization is as described as below.

Pollution Source	Task	Organization
Urban Domestic Wastewater	1) New sewerage system development 2) Management of sewerage systems	GWWC
Rural Domestic Wastewater	1) Development of rural wastewater treatment system	RWWC
Industrial Wastewater	1) Monitoring of Industrial Effluent 2) Permission for construction of industrial factories	DOE Guilan
	1) Development of industrial cities	MOIM
Livestock	1) Control of number of livestock in grazing land 2) Permission for execution of industrial animal husbandry.	MOJA DOE
Pollution from Farm Land	1) Control of agricultural chemical use 2) Control of fertilizer use.	MOJA

Source: JICA Study Team

2.6.3 Present Wastewater Management

(1) Urban Domestic Wastewater Management

About 762,000 people live in the urban areas of the basin, and most of them are connected to a combined sewer pipe system without any treatment. There are about 200 outlets from existing sewers along the rivers in Rasht, and about 100 outlets in Anzali. Some parts of the urban area are not connected to the sewer pipe system. The households in these areas discharge wastewater directly to rivers, absorption wells, or surface drains along the streets. GWWC has a long-term goal to provide sewerage systems to the whole of the urban areas. GWWC has a plan to develop sewerage systems in 10 cities in the Anzali Wetland basin. The construction of sewerage systems with secondary treatment (activated sludge) has already commenced in Rasht, Anzali and Somehsara. The sewerage system development projects planned by GWWC are as follows:

Basin	Projects	Service Population (persons)	Planned Capacity (m^3/day)	Stage
Eastern Part	Rasht (Phase 1)	253,816	80,000	Construction
	Rasht (Phase 2)	378,284	80,000	Basic Design
	Rasht (Phase 3)	93,600	30,000	Basic Design
	Anzali (Phase 1)	77,920	34,000	Construction
	Anzali (Phase 2)	51,000	20,000	Basic Design
	Anzali (Phase 3)	8,712	-	Basic Design
	Khomam	16,095	3,600	Basic Study
	Shaft	14,357	3,200	Basic Design
	Total	893,784	250,800	
Western Part	Somehsara	56,980	12,700	Construction
	Fuman	46,000	10,300	Basic Design
	Masal	24,762	5,600	Basic Study
	Total	127,742	28,600	

Source: JICA Study Team

(2) Urban Domestic Wastewater Management

About 394,000 people live in the rural areas. Most of the houses in rural areas have absorption wells constructed by the residents themselves, into which wastewater is discharged directly. RWWC has a target to provide septic tanks with an additional treatment process (secondary treatment level) for 40% of villages having more than 20 families by 2022. RWWC has prepared detailed designs for rural wastewater treatment systems for 16 villages, which include seven villages in the Anzali Wetland watershed, Atashgah, Kheshtnasjed, Gasht, Loleman, Norgeston, Sheikhneshin and Aliabad. The planned service population of the seven villages is 18,300 residents. These proposed projects have not commenced yet because of budget constraints.

(3) Industrial Wastewater Management

The amount of industrial effluent from major factories in 2002 is estimated by DOE Guilan as below.

Items	Number of Factories (nos.)	Wastewater from Process (m^3/day)
Textiles	11	3,407
Foods	15	1,476
Electrical Products	3	728
Ceramics	6	383
Metals and Machines	5	404
Chemical	1	217
Total	41	6,615

Source: DOE

The total industrial effluent is estimated at about 6,600 m^3/day, which corresponds to about 3% of the total wastewater discharge by volume. The pollution load from industrial activities does not seem to be serious at present. However, industries may be developed much more in the future and will become major sources of heavy metals and other toxic materials. There are five existing industrial cities and one planned in the watershed listed below.

Industrial City	Area	Operating Factories	Management
Rasht	420 ha	125	Managed by Semi Private Company
Shaft	38 ha	2	Managed by MOIM, New construction
Somehsara	100 ha	15	Managed by MOIM
Fuman	14 ha	--	Managed by MOJA
Masal	-------	-------	(Planning stage) To be managed by MOIM
Anzali	50 ha	34	Managed by MOIM, To be expanded up to 85 ha

Source: MOIM Guilan

The Ministry of Industries and Mining is trying to move the existing large-scale industrial factories and new industrial factories to the above industrial cities to effectively control the industrial effluent in the watershed. There is no wastewater treatment facility in any of the industrial cities so far. A small-scale wastewater treatment facility is under construction in Anzali industrial city.

(4) Livestock Waste Management

According to the statistic data of Guilan Province, about 862,000 livestock live in the Anzali Wetland watershed, which consists of 309,000 cows, 417,000 sheep, 120,000 goats, 17,000 water buffalo and 47,000 horses/donkeys. They are divided into four groups, those fed by individual farmers, those in the mountain rangeland, those in the plain area rangeland and those in the industrial animal husbandries.

About 200,000 head of cows and buffalo are fed by individual farmers in the plain area. These farmers have been using manure on their farmland. Most of about 537,000 head of sheep and goats in the basin stay in the rangelands and forests in the mountain area. Waste from the sheep and goats is spreading over a wide area, because they are moved from place to place. Large parts of the pollution load are decomposed in the soil, and only a small amount of pollution load is discharged to the rivers. Livestock waste in the rangelands and forests in the mountain area is not a serious problem to the wetland because the rangelands are far from the wetland. About 20,000 head of cows and buffalo are fed in rangeland near the wetland. Wastes from these livestock are spread in the rangeland, and may be discharged to the wetland in the rainy season. It may be a serious pollution source, because it is easy for the waste to reach the wetland. There are about 17 industrial animal husbandries in the watershed. Each animal husbandry keeps more than 20 head of cows. Dung from the cows is used as fertilizer for farmland or feed in fishponds. Liquid waste is discharged to absorption tanks or ponds, and is not treated properly. DOE asked the industrial animal husbandries to have suitable waste treatment facilities to meet the effluent standard.

(5) Management of Pollution Load from Farmland

The area of farmland in the Anzali Wetland watershed is 98,700 ha, which consists of 80,900 ha of paddy fields and 17,900 ha of other farmlands. A part of the fertilizers, pesticides and manure spread on the farmland is discharged into the wetland as pollution load. MOJA has an important role in controlling the pollution load from the farmland. For the control of consumption of fertilizers, pesticides and herbicides, MOJA gives advice to farmers through the Agricultural Service Centers and Township Cooperative Offices.

1) Chemical Fertilizers

On average, 75 kg of nitrogen, 4 kg of phosphorous and 26 kg of potassium were applied to one hectare of paddy fields in 2002 based on the data given by MOJA. At present, fertilizers are subsidized by the Government and provided to farmers through cooperatives. The optimal dosage of fertilizers based on the soil analysis of MOJA is given to farmers to reduce the quantities. Through these activities, MOJA has successfully reduced average phosphorous consumption from 36 kg/ha/year in 1992 to 4 kg/ha/year in 2002.

2) Agricultural Chemical

On average, 4.5 kg/ha of pesticide, 0.1 lit./ha of fungicide and 2.5 kg/ha of herbicide are used per cropping. The agricultural minister, in 1994, set a goal to reduce the quantity of agricultural chemical use. Accordingly, MOJA has implemented the Integrated Pest Management (IPM) program to enable farmers to minimize their chemical use. In fact, at the national level the consumption of chemicals has decreased to one third of the former amount over the last decade.

2.6.4 Major Issues

Reviewing the present situation of wastewater management mentioned before, the following management issues are pointed out.

1) Lack of wastewater treatment systems in urban areas
2) Unsuitable wastewater treatment in rural areas
3) Insufficient monitoring systems for industrial effluent
4) No treatment of waste from industrial animal husbandries

2.7 Solid Waste Management

2.7.1 Impact of Improper Solid Waste Disposal on the Wetland

Improper management of solid waste could affect the wetland ecosystem in two ways, (i) direct impact to birds and other animals through ingestion of waste or entanglement, and (ii) through water pollution.

Out of about 670 tons/days of waste generated in the urban areas, the municipalities collect the large part. However, due to low environmental consciousness of residents, a significant amount of waste is illegally dumped into rivers, and ends up in the wetland. It is difficult to estimate the amount of waste dumped into rivers, but according to a questionnaire survey conducted in the course of the Study, it is estimated as much as 66 tons/day is dumped to rivers from both urban and rural areas. The waste generated in

rural areas, which is about 121 tons/day, is not collected at all. A large part of this is presumably self-disposed in backyards, but a large amount is dumped into rivers. There is no doubt that improper disposal of waste is not only a serious environmental threat to the wetland, but also a major public health concern.

Furthermore, none of the dumping sites in the study area has proper leachate control, and pollution of the surrounding environment is a concern. This includes the dumping site in Bandar Anzali that is located right next to the wetland. Though the amount of hazardous industrial waste seems limited, the detrimental impact of heavy metals and other toxic substances on the wetland ecosystem should be taken into account.

2.7.2 Relevant Laws and Organizations

(1) Relevant Laws

The Waste Management Law was enacted in June of year 2004. This comprehensive law covers all wastes, including municipal waste, industrial wastes, hazardous and infectious wastes. In addition, DOE has a jurisdiction and power to recommend environmental standards and criteria to any companies/institutions under the "Environmental Protection and Enhancement Act" (1974). In 2001, DOE defined pollution in the Executive Bylaw for Paragraph (C) of Article 104 of the Law of Third Plan of Economic, Social and Cultural Development. This bylaw also provided the classification of waste material based on the contents of toxic substances in the waste, and the method to estimate environmental fines for the improper disposal of solid waste.

(2) Organizations

According to the new solid waste management law, municipal solid waste should be managed by urban municipalities (Shahrs) and villages (Dehestans), as regulated by the Municipal Law. Waste in ten municipalities in the study area has been managed by municipalities. However, the responsibility of counties was added only recently in 2004 under the new law, and there has not been any solid waste management in villages in the past. The management of industrial and medical wastes is the responsibilities of the factories and hospitals/clinics.

2.7.3 Present Management Activities

(1) Municipal Solid Waste

In the municipalities, 670 tons are generated by 744 thousand persons at an average rate of about 900 g/person/day. The overall collection service coverage rate in the study area is about 65% on a population basis and about 86% on a waste amount basis. There is no

organized recycling in either urban areas or villages.

A waste collection service is provided 6-7 days a week to every house in the urban areas. However, even in such areas, illegal dumping of solid waste is common due to the low environmental consciousness of local residents. As much as 34 tons/day of waste is dumped into rivers in urban areas. Almost all waste collected from the municipalities is taken to the Sarawan dump site, which is a large dump site located in Rasht township. This has been used without any liner or leachate treatment for many years. A composting facility was constructed in 2002 in Rasht township with support from central government. At the present time, about 200 tons of waste per day are treated in this facility, though the high operational cost is a major constraint to the effective operation of this facility. In addition to the Sarawan dumping site, there are a number of smaller dumping sites in the area, including the Anzali dumping site adjacent to the wetland. None of these has proper leachate control. The 121 tons generated in the villages, the "Dehestans", are not collected, and they are disposed of informally around the communities. Roughly 32 tons/day of waste is dumped into rivers.

(2) Solid Waste Management Fees

The municipal budget, including SWM costs, is allocated by the central government. The municipalities additionally collect municipal tax, also used for SWM. The municipal tax varies from 20,000 Rials to 100,000 Rials per year per household. There is no direct charge system for only SWM service.

(3) Industrial Waste

There is no written law/regulation on management of industrial waste, but DOE controls factories so they treat their non-hazardous and hazardous waste properly.

Non-hazardous industrial solid waste (ISW) is managed by the factories by transporting their waste to municipal landfill sites themselves or by using private contractors.

Hazardous ISW is only generated by five factories in the Study area, according to a research questionnaire conducted by "Jahad Daneshgahi Guilan". The total amount of hazardous ISW is only 50 ton/year and almost all of this is sludge from plating processes containing chromium. There is no official disposal site for hazardous ISW, so factories retain the hazardous ISW inside their factories. This is clearly not a sustainable situation.

Infectious waste from hospitals, clinics, laboratories, etc, is another important hazardous waste. Four public hospitals incinerate their infectious waste in on-site incinerators. In these hospitals, separation at source is practiced. Waste products are divided into infectious and non-infectious waste. Infectious waste is discharged into yellow bags,

which are burned. Rasht municipality is constructing a new incinerator for infectious wastes. This plant will cover all hospitals and private clinics.

2.7.4 Major Issues

Reviewing the present situation of solid waste management mentioned before, the following management issues are pointed out.

1) Low level of environmental awareness
2) Low rate of collection coverage in rural areas
3) Inefficient waste collection in urban areas
4) Limited recycling by residents
5) Unsanitary disposal of municipal solid waste
6) Insufficient capacity of composting plant
7) Anticipated increase in non-hazardous industrial solid waste
8) Weak management of hazardous industrial solid waste and infectious solid waste

2.8 Environmental Education

2.8.1 Introduction

For many people in Iran, "environmental education" is the same as "nature education", "awareness raising" means telling people they must love and protect nature, and "participation" means taking part in activities. However, conservation of the Anzali Wetland and its watershed require broader perspectives, such as sustainable development, as recognized in the Rio Declaration in 1992, Johannesburg Declaration in 2002, and UNESCO's decade of "education for sustainable development" to start in 2005. The lack of such broader perspectives is the main weakness of current activities in environmental education, awareness raising and public participation in the study area, and it is important to build highly structured and coordinated approaches encompassing broader perspectives into the daily activities of the stakeholders.

2.8.2 Relevant Laws and Organizations

(1) Relevant Laws and Regulations

The requirements for Environmental Education and Public Participation are included in major legislative documents such as the Constitution, Environmental Protection and Enhancement Act (1999), and the Third Socio Economic and Cultural Development Plan of the Islamic Republic of Iran. Other major international and national strategic

documents related to the environment include The Ramsar Convention (1971), National Report for the Caspian Environment Programme (1998), Strategic Action Plan for the Caspian Sea (2004), The National Caspian Sea Action Plan (2003) and The National Reports for the Convention on Biological Diversity (2000, 2001).

(2) Organizations

Many organizations are involved in environmental education and public participation. The Ministry of Education and DOE are the main organizations for environmental education in schools and environmental education for the general public and environmental professionals. MOJA has active environmental education programs for farmers and graziers. Environmental education of industries is carried out by MOIM and DOE. In addition, there are about 40 environmental NGOs in the area, and some of them have active programs for environmental education, awareness building, and others.

2.8.3 Environmental Education for Children and Young People

(1) Environmental Education in the Formal Education Sector

There is no formal system as such for environmental education in Iran. Although DOE has a remit for environmental education, it does not have a policy statement or strategy for the development of environmental education. Neither does the Ministry of Education. There are a number of positive signs. These include the work of the Joint Committee of the Ministry of Education and DOE that meets to strengthen environmental education. And yet another encouraging sign was the first ever National Conference on Environmental Education held in December 2003, hosted by the Ministry of Education.

(2) Non-formal education

In terms of non-formal education and after schools activities, relatively little environmental education takes place in a systematic way. For example, schools generally do not have Eco Clubs or any environmentally related extra curricular activities.

DOE through it's Public Relations Department, occasionally provides lecturers in schools to make presentations about the environment and is also involved in encouraging some practical children's actions such as demonstrating against litter and taking practical action against litter and waste. Some schools take part in NGO projects related to waste and other environmental issues.

2.8.4 Environmental Education in Higher Education

(1) Environmental Education in Higher Education

In Guilan there is the government funded University of Guilan and the essentially private Islamic Azad University. Both of the Universities have Faculties of Science and teach environmentally related subjects such as Biology and Ecology. A number of Universities in Tehran also have Environmental Faculties. These focus mainly on ecology and environmental science and the Islamic Azad University also has a Masters course on environmental management. However the range of subjects that take a broad approach to the environment and that integrate key topics such as sustainable development is limited. The development of new courses is to a large extent limited by the availability of qualified and experienced lecturers.

(2) Higher Education in DOE

Nationally, DOE has established a College of the Environment and The Institute for Scientific and Applied Environmental Research to train the DOE Staff.

At a regional level, professional development for those working in wetlands has recently taken a step forward with the establishment of the Ramsar Education and Training Centre, in Ramsar. This has been established by the Ministry of Foreign Affairs and funded by DOE, as a result of the commitment made by Iran at the Barcelona Ramsar COP meeting in 2002. The Centre will start its work in 2005 after an initial start up period.

2.8.5 Environmental Education for Adults

(1) General Adult Education

Adult Education is the responsibility of a number of different Ministries and Departments including the Adult Education Department of the Ministry of Education, PR Section of DOE and Education and Extension Departments of both MOJA and NRGO. The Ministry of Education has a number of responsibilities including literacy education, life skills and vocational education. One mechanism for delivering this education is through a growing network of Community Learning Centers (CLCs), which have their priorities focused on rural communities and women. A number of the CLC courses have content that includes environmental topics such as energy, waste, caring for the environment in the home and so on.

(2) Education for Farmers

Education and awareness raising for farmers are the responsibility of appropriate departments of MOJA through their Extension Department. MOJA consciously uses a variety of training methodologies including class based, excursions and field visits, workshops, exhibitions, seminars, face to face discussions in the field, and group training. The Department has six Agricultural Education Centers in the study area and each Center runs a program of training for farmers.

(3) Education for Those Living in the Rangelands and Forests.

NRGO is responsible for education and awareness raising for those living in the rangelands and forests. An Education and Extension Department in Rasht with a staff of around 20 people, is supporting 16 offices in townships in Guilan Province. Each township office has someone responsible for education and extension. The Department undertakes an impressive range of activities and produces a large number of materials each year. Many of the activities are undertaken by the regional offices by local staff after they have been trained by the Head Office. The NRGO Education and Extension Office cooperates with a wide range of stakeholders including around 17 active NGOs.

2.8.6 Awareness Raising for the General Public

(1) Work of DOE in Raising Public Awareness

DOE Headquarters in Tehran and each of the provincial offices engage in a wide variety of activities designed to raise environmental awareness amongst different groups, such as celebration of environmental days, various environmental competitions, media coverage of environmental issues, etc.

At a provincial level the Public Relations Section in the DOE Guilan engages in the activities of organizing specific events and producing specific information materials such as posters and leaflets for the special environmental days that are celebrated. The Section also manages a small but well stocked library, runs an information Hot Line (8824626/7 and 8829561), liaises with NGOs and includes them in different activities. DOE Guilan also regularly contributes to local television and radio programs.

(2) Role of NGOs

A number of NGOs in the region has grown over the last few years. There is an active network of around 40 NGOs in Guilan Province. Many of them are members of the Green Network. In Rash, there are a number of active NGOs including Sabz (Persian for Green) Guilan Association and the Women Against Environmental Pollution NGO (part of

a national NGO). Their activities often attract large numbers of people, and they work closely with DOE on specific projects.

(3) Environmental Awareness Raising for Tourists

The Guilan office of the newly established Culture, Heritage and Tourism Organization (CHTO), which replaces Iran Tourism and Travel Office (ITTO), provides glossy high quality information leaflets about the Province and also runs an excellent and informative web site. There is however, little information about the need for environmental protection or the problems that the Anzali Wetland is facing and little encouragement for visitors to behave in a particular way. The Guilan CHTO works closely with the municipalities and produces other simpler materials stressing the importance of caring for the Wetland, not dropping litter and so on. The Guilan CHTO is also especially open to new ideas about the promotion of eco tourism activities.

(4) Role of Other Organizations

Other organizations that could have an impact on environmental education and awareness building of the general public are the Islamic Councils in the Cities and Villages. Currently, they undertake very little environmental awareness raising, but they have great potential for being a focus on public participation.

2.8.7 Public Participation

(1) Public Participation in the Planning Process

Each Province has a plan for the economic, social and cultural development of the region, though no public consultation on the plan took place, and only a minimum of information is given to the public about the plan.

(2) Public Participation and Environmental Impact Assessment

An Environmental Impact Assessment (EIA) is required for specified large scale projects. The precise mechanisms for public consultation within the EIA process are not clear, but it appears that consultation is only required to take place with major resettlement projects. Nevertheless, there are some signs of public participation and to some extent protest exists.

(3) Public Participation in Rural Development

Public participation is not yet common in rural development projects in Iran, but the techniques, such as Participatory Rural Appraisal (PRA), are becoming more accepted as a methodology for rural development. A recent study undertaken by Tehran University on participatory planning and management of the Anzali Wetlands (March 2003) highlights

the gaps between communities and other stakeholders and stresses the need for greater participation in rural planning. Although this might be the current situation in the Anzali Wetland, the public participation is slowly becoming more main stream to the work of the MOJA and DOE.

(4) Promotion of Public Participation

DOE is encouraging the spread of public participation methodologies. The Bureau of Public Participation was established in 1998. The Bureau has prepared an educational kit to encourage women's participation and a kit about participatory appraisal, and is preparing a booklet about participation for NGOs.

MOJA has a Department of Extension and Participation and has a well structured approach to public participation. MOJA works at a national level to encourage a great level of participation from other Ministries in natural resource management. MOJA also works with communities to establish cooperative companies.

A number of NGOs are well known in the area of PRA, including CENESTA and Igra in Tehran, and both are frequently contracted by government agencies to advise and take part in participatory programs. There are few local NGOs with this expertise.

2.8.8 Major Issues

In summary the main issues of environmental education, awareness raising and public participation are as follows:

1) Lack of understanding of some of the key concepts of environmental education, awareness and participation;
2) Lack of systems to ensure that education, awareness and participation are delivered in a strategic and consistent way;
3) Lack of capacity to deliver education, awareness and participation;
4) Lack of tools, including publications and other resources, to do work effectively;
5) Lack of partnership between national and provincial government Ministries and Department themselves and between decision makers and other stakeholders, including businesses and NGOs;
6) Lack of motivation and interest on the part of decision makers and other stakeholders;
7) Lack of evaluation taking place to assess whether what is being done is working; and
8) Lack of finance allocated to education, awareness and participation.

2.9 Institutional and Organizational Aspects of Environmental Management

2.9.1 Introduction

The Study has investigated and defined a number of different types of environmental problems in the Anzali Wetland and its watershed, all of which are contributing to a gradual degradation of the wetland environment, and the consequent loss of its value, both as a wildlife habitat and an economic resource. That degradation is largely due to numerous unwise human activities, and is partly due to human neglect of the Wetland. The solution to this is better management of the wetland and its watershed, i.e. proper management of human activities, and integrated conservation of the fabric of the Anzali Wetland environment. Better management and improved integration are institutional challenges.

2.9.2 Institutional Structure of Government

(1) National

The Islamic Republic of Iran has a centralized form of government, administered by the 19 Ministries (plus the Office of the President and the Judiciary Power) headquartered in Tehran. Each ministry and department has a staff structure in each of the provinces (Ostans).

Three national level inter-sectoral oversight bodies are also of relevance. The Supreme Council for the Environment is chaired by the President. This council would need to approve any change in legislation affecting the environment. Moreover, it has the power to make new environmental legislation without reference to or approval from the Majlis. The Water High Council is also chaired by the President. This council co-ordinates decision making with respect to the provision, distribution and use of water. The national Commission on Agriculture and Natural Resources (one of 22 parliamentary commissions) may also be of relevance.

(2) Provincial

The provincial administrations, led by a centrally-appointed governor, are staffed by the provincial staff of the ministries, who are therefore, answerable to both their HQ and their Provincial Governor. The provinces (Ostans) are divided into townships (Shahrestans), which are usually centered on a large town or city. Guilan Province has 16 townships, six of which cover the study area, and two cover the Anzali Wetland, Bandar-e-Anzali and Somehsara. The municipal authorities in the townships are responsible for public services, development control, and development planning. Water supply and sewage treatment are

provided by nominally independent water companies at township level, with separate companies for the urban and rural areas (GWWC and RWWC, respectively).

2.9.3 Anzali Stakeholder Organizations

Numerous organizations have some responsibility for, or interest in, environmental management of the Anzali Wetland and its watershed. The following organizations will be stakeholder organizations.

1) Department of the Environment (DOE), Headquarters in Tehran
2) Department of the Environment, Provincial Directorate in Guilan
3) Ministry of Jihad-e-Agriculture (MOJA), Headquarters in Tehran
4) Ministry of Jihad-e-Agriculture, Provincial Directorate in Guilan
5) Ministry of Industries and Mines (MOIM), Provincial Organization in Guilan
6) Management and Planning Organization (MPO), Provincial Directorate in Guilan
7) Ministry of Energy (MOE), Guilan Regional Water Company
8) Guilan Water and Wastewater Company (GWWC) – urban systems.
9) Rural Water and Wastewater Company of Guilan (RWWC)
10) Ministry of Roads and Transportation (MORT), Provincial Directorate in Guilan
11) Ports and Shipping Organization (PSO), Bandar e Anzali
12) Government of Guilan Province
13) Rasht Municipalities (Rasht, Anzali, Somesara)
14) Iranian Travel and Tourism Organization (ITTO)[1], Guilan Provincial Office
15) Guilan University, Rasht
16) Guilan Green NGOs Network

The NGOs are mostly very small low-profile groups of people. DOE continues to encourage the development of such "sabz" (green) NGOs. However, it seems that there are not any associations or clubs to represent the usual amenity interest groups such as hunters, anglers, bird-watchers, water-skiers, etc.

2.9.4 Existing Coordinating Body

Poor co-ordination has been identified as the principal constraint to good environmental management of the Anzali Wetland and its watershed. It would be preferable to improve co-ordination by means of existing channels and institutions. There is already a Thematic Working Group on Land Use and Environment and Population (WGLEP), for which MPO provides the secretariat. It is one of 16 Thematic Working Groups under the Provincial

Council for Planning and Development (chaired by the Governor), each of which also has technical Working Groups. However, the Working Group has the following shortcomings as a forum for integration.

1) WGLEP is not specific to Anzali or its catchment,
2) It is a forum for discussion and decision-making, rather than a body responsible for continuous management, and
3) It does not meet very often (only once during the two years of the study).

It, therefore, does not currently provide an adequate co-ordination mechanism to address the principal institutional problems identified above.

2.9.5 Institutional Problems of Environmental Management

Issues of environmental and resource management are very broad, and the present administrative system is not able to address them in an integrated fashion. The environmental problems of management of the Anzali Wetland and its watershed are therefore largely organizational and institutional in origin, and can be summarized as follows:

1) Poor Inter-organization co-ordination
2) Poor Intra-organization co-ordination
3) Unclear responsibilities
4) Inadequate budget
5) Need for ecosystem approach
6) Inadequate planning
7) Lack of pro-active management in the Wetland
8) Lack of implementation

CHAPTER 3 FRAMEWORK OF MASTER PLAN

3.1 Introduction

Upon the registration of the Anzali Wetland as one of the Ramsar sites in 1975, it was internationally realized that the environmental conditions of the wetland satisfied the Convention's standards as a wetland of international importance especially as a habitat for migrating birds. However, in the 1980s, the environmental conditions of the wetland started to deteriorate due to inflow of wastewater, sediment and garbage from the watershed, encroachment of the wetland boarders, excessive hunting and fishing, spreading of invasive species, and other reasons. Ecological data that were collected during the course of this study affirm that there is a tendency of degradation in the wetland ecosystem at present.

With the degradation of the environmental conditions, people started to realize the important functions and values of the wetland. The wetland is the habitats for many threatened species and wintering birds. It provides natural resources, such as fish, which is important for local economy, and is a prime destination for many tourists from all over Iran. Over 90% or the people in the area are now in favor of conservation of this beautiful wetland – the conservation of the Anzali Wetland is a societal choice.

In order to conserve the wetland, various measures have been taken in the wetland and its watershed. However, the effectiveness of these measures has been limited. It was realized that the following factors are particularly pertinent to effective conservation of the wetland :

- The ecosystem of the wetland is supported by a dynamic and delicate ecological balance, and in order to conserve the wetland, all major human activities and natural phenomena that affect the ecological balance have to be taken into account.
- The wetland is located at the bottom of the watershed, and is inherently sensitive to environmental pressures. Even relatively diffuse problems at their sources could get concentrated in the wetland.
- The environmental problems in the wetland and its watershed are deeply related to the local socio-economic issues. Unless these issues are addressed in the conservation of the wetland and its watershed, it would be difficult to get stakeholders' support.
- The conservation of the wetland and its watershed involve various cross-sectoral issues, and concerted efforts of stakeholders are essential.

3.2 Goal and Approaches

3.2.1 Goal

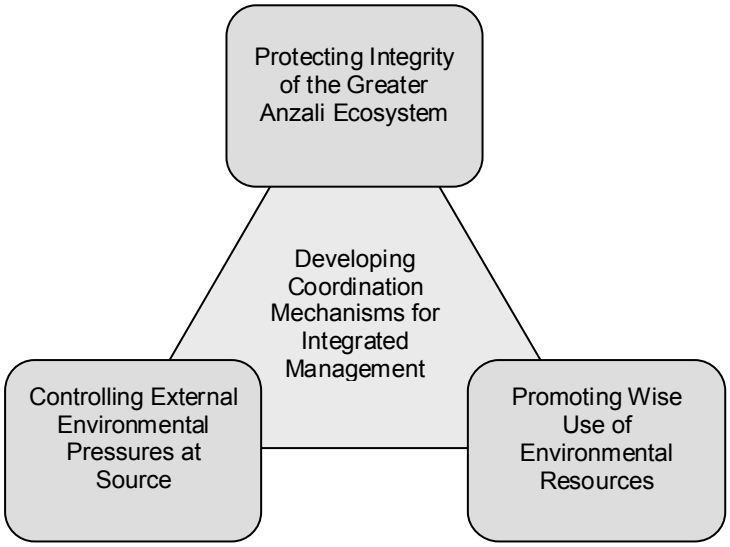
Under these circumstances, this study proposes a master plan with the following goal:

"to implement integrated environmental management in order to maintain an ecological balance in the Anzali Wetland and its watershed"

3.2.2 General Approaches of the Master Plan

(1) Introduction

In order to achieve this goal, the master plan will take the following general approaches, taking the Ramsar guidelines, Ecosystem Approach by Convention of Biodiversity, the JICA Guidelines for Environmental and Social Considerations (JICA, 2004), and various suggestions from local stakeholders and international experts into consideration.



(2) Protecting the Integrity of the Greater Anzali Ecosystem

The watershed of the Anzali Wetland is particularly relevant to the ecosystem of the wetland, because the wetland is supported and maintained by flows of water, nutrients and energy from the watershed. It is the continuum of the forests, rangelands, paddy, rivers, the wetland, other areas in the watershed and the Caspian Sea, that give uniquely diverse habitats for birds, fishes and other wildlife in the region. If the environmental problems are neglected upstream of the wetland, it is the wetland that suffers from it. In order to protect the structure and functioning of the ecosystem of the wetland, the master plan

considers the ecological integrity of the entire ecosystems in the wetland and its watershed, which is called "the Greater Anzali Ecosystem" in this master plan.

(3) Controlling External Environmental Pressures at the Source

The Anzali Wetland exhibits various ecological problems, such as excessive growth of *Azolla*, depletion of oxygen in the water, and diminishing number of fish species. These internal environmental problems are the results of complex, dynamic ecological processes, caused by external environmental pressures, such as inflow of polluted water, garbage, sediment, fishing, hunting, encroachment, etc. Unless these external environmental pressures are removed, it is difficult to save the wetland. Therefore, the main focus of the master plan is placed on controlling the external environmental pressures at the source.

(4) Promoting Wise Use of Environmental Resources

Many environmental measures introduced in the wetland and its watershed belong to a class of measures known as "regulatory" measures. However, regulatory measures do not give positive incentives for environmental management, and are not particularly effective in controlling problems related to management of environmental resources. As an alternative approach, the master plan promotes "wise use" of environmental resources. This approach allows local stakeholders to use environmental resources in the wetland and its watershed in a sustainable manner. This gives the local stakeholders incentives to become ardent supporters of the environmental conservation in order to protect their long-term benefits from the effects of degradation of the environment.

(5) Developing Coordination Mechanisms for Integrated Management

DOE, MOJA and many other organizations already have various plans and activities to protect the Anzali Wetland, control wastewater and solid waste, and promote sustainable use of natural resources, such as forests and rangelands. However, these measures are implemented to control existing problems within the jurisdiction of each organization, and have inherent limitations in dealing with complex, cross-sectoral issues. In order to protect the wetland and its basin effectively, institutional mechanisms that coordinate activities of these organizations are built into the master plan.

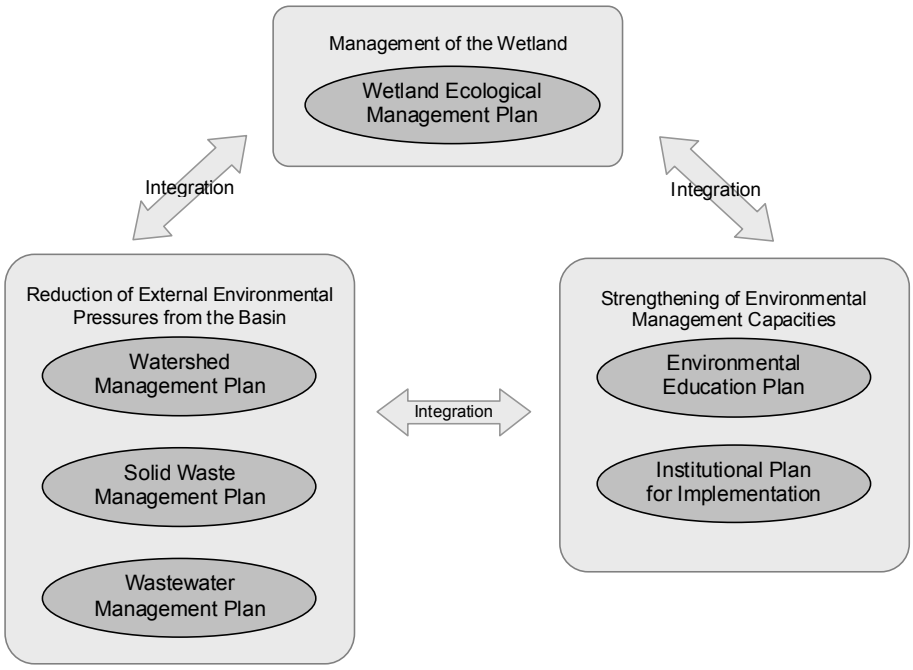
3.3 Target Year

The target for completion of the implementation of the Master Plan is 2019 (Iranian Year 1398). The implementation period will be divided into three periods, i.e., Period I (2005-2009) corresponding to the Fourth Five-year Development Plan (Iranian Year 1384-1388), Period II (2010-2014) corresponding to the Fifth Five-year Development Plan

(Iranian Year 1389-1393), and Period III (2015-2019) corresponding to the Sixth Five-year Development Plan (Iranian Year 1394-1398). At the ends of Period I and Period II, interim evaluations will be carried out in order to evaluate the achievements, and make necessary adjustments for the future.

3.4 Components of the Master plan

In order to conserve the wetland in an integrated manner, it is essential to unite management of various environmental management components, including the management of the wetland, control of sewage and solid waste in urban and rural areas, control of agricultural chemicals in the agricultural fields, forest and rangeland management in the mountains, and land use control. To achieve the integration of these environmental components, six sub-plans are proposed under the general framework of the master plan as shown below.



3.5 Socio-Economic Framework

The socio-economic framework is of interest to the study, because it has many significant impacts on the environmental conditions of the wetland and its basin, and it is the basis of the master plan development. For example, population is the main determinant of domestic wastewater and solid waste generated. To develop plans to manage wastewater and solid waste, information on future population is essential. Similarly, growth of regional economy, such as agriculture and industry, and major development projects in the

basin, are important factors affecting the environmental impact on the wetland.

(1) Population

The population of the study area in 2004/05 is estimated at 1.16 million, and nearly 50% of them live in Rasht City. The future population in 2019/20 is forecast to be 1.52 million with an average annual growth rate of 1.8%. Of these, 1.13 million live in the urban areas and the remaining 0.39 million in the rural areas. The urban population will increase by 44% over the next 15 years, while the rural population will slightly decrease by 0.3%. The population by township is shown below.

(Unit: thousand persons)

Year	Anzali	Rasht	Shaft	Somehsara	Fuman	Masal	Total	Urban *	Rural **
2004/05	132.3	647.5	75.5	138.7	110.6	52.1	1,157	763	394
2019/20	155.9	927.7	85.9	159.4	126.5	64.2	1,520	1,127	393

Note: * - Total population of urban areas covers cities ("Shahr" in Farsi).
** - Total population of rural areas covers rural districts ("Dehestan" in Farsi).
Source: The above figures are estimated based on preliminary estimates by the Statistics Unit of MPO Guilan only taking account of the past 20-year trend of the census data from 1976/77 to 1996/97 and without consideration of other factors such as birthrate, mortality and social increase/decrease.

(2) Gross Regional Domestic Product

As no official forecast of the Gross Regional Domestic Product (GRDP) of Guilan Province is available, GRDP in 2019/20 for the master plan is forecast based on the total revenue growth rate of Guilan provincial government for the past five years assuming that the total revenue growth reflects the economic growth. The annual growth rate of the total revenue from 1998/99 to 2002/03 is estimated at 5.8% at the price level of 2002/03. Therefore, the annual growth rate of GRDP is assumed to be 5%. As the GRDP of Guilan Province in 2000/01 was 16,362 billion Rials, the GRDP in 2019/20 is estimated at 41,345 billion Rials at the price level of 2004 as below.

Year	GRDP (billion Rials)
2000/01	16,362[1)]
2005/06	20,882[2)]
2019/20	41,345[2)]

Note: Estimated at constant price of 2000/02
Source: [1)] GRDP in 2000/01 was obtained from MPO Guilan
[2)] GRDPs between 2005 and 2019 were estimated by the JICA Study Team

3.6 Basic Conditions for Cost Estimates

The costs of the proposed projects/measures are to be estimated based on the following conditions.

(1) Price Level and Exchange Rate

The cost is estimated based on June 2004 constant prices in the Iranian Rials (IRR). The exchange rates to be applied are

USD 1 = IRR 8,652 and JPY 100 = IRR 7,955 (as of June 30, 2004)

The value added tax (VAT) for all cost components and import tariffs for imported equipment are to be included in each unit cost.

(2) Cost Components

The cost estimate is made for the project cost (investment cost) and operation and maintenance (O&M) cost. The cost components of each cost are to be as follows:

1) Project cost
    1. Construction cost
    2. Land Acquisition cost
    3. Compensation cost
    4. Administration cost (5% of 1.)
    5. Engineering cost (10% of 1.)
    6. Physical contingency (20% of 1. to 3.)
    7. Project cost (Total of 1. to 6.)
2) Operation and maintenance cost
    1. Personnel cost
    2. Expenses

3.7 Prioritization and Evaluation of the Proposed Measures

(1) Prioritization of Proposed Measures

The master plan proposes many environmental measures essential for conservation of the wetland and its watershed. However, it is difficult to implement them all at once. Thus, the proposed measures are prioritized based on the following criteria.

Name	Prioritization Criteria
Effect	How effective is the proposed measure to control environmental problems in the wetland
Efficiency	Timeframe that the proposed measure starts to make an impact on the environmental problems
Urgency	Urgency to implement the measure
Cost	Whether the cost required to implement the measure is reasonable.
Capacity of Executing Organization	Whether the capacities of the executing organization are sufficient to implement the measures and if there is a need for trainings
Conformity with Existing Policy	Whether the proposed measure is in conformity with the existing policy framework
Environmental Impact	Whether the proposed measures have unwanted environmental impact, or environmental improvement effect other than the improvement of environmental conditions of the wetland
Social Impact	Whether the proposed measure have unwanted social impact, or positive social impact, such as improvement of the regional economy or sanitary conditions
Other Criteria	Other criteria

The implementation schedule of the proposed measures is designed based on these criteria, and a set of environmental measures that have to be implemented immediately are proposed as "Priority Projects".

(2) Evaluation of Proposed Measures

In order to make sure that the proposed measures are sustainable and viable, they are evaluated with respect to the following three aspects.

Name	Evaluation Criteria
Environmental and Social Aspects	Whether the proposed measures bring undesirable environmental and social impacts
Economic and Financial Aspects	Whether the economic benefits of the proposed component plans are more than the economic costs, and thus, are they worth implementing. Also, whether the proposed component plans are viable within the financial constraints of the implementing organizations and local residents, and how to finance the proposed measures.
Technical Aspects	Whether the proposed measures can be implemented within the technical capacities of the implementing organizations.

CHAPTER 4 WETLAND ECOLOGICAL MANAGEMENT PLAN

4.1 Introduction

The Anzali Wetland still holds ecological character of international importance as habitats for various endangered species and 150,000-400,000 migratory birds that visit the wetland every year. The wetland also supports livelihood of many local residents who depend on natural resources in the wetland, such as fish. However, the present status of the wetland indicates considerable environmental deterioration of these natural properties. Among the various causes of the environmental deterioration, the most direct impacts are caused by human activities within and around the wetland, such as over hunting and over fishing, illegal access to ecological sensitive areas, encroachment of the wetland boarder, uncontrolled speedboats, introduction of exotic species (e.g., Azolla), etc. In order to maintain the ecological character of the wetland, and to benefit from the natural resources and other values of the wetland, the Wetland Ecological Management Plan presented below proposes ways to control these activities and use the wetland sustainably.

4.2 Objective and Strategies

4.2.1 Objective

The Anzali Wetland has ecological functions and significant ecological and economic values, which are supported by a delicate ecological balance between the biological, physical and chemical components. The livelihood of many people depends largely on natural resources of the wetland such as fish and other resources. Natural properties including the wetland functions and values are public assets, which should be maintained to secure the well-being of the people. For this purpose, the objective of the wetland ecological management plan is:

- to secure the ecological balance to maintain the natural properties of the Anzali Wetland as for future generations.

4.2.2 Strategies

To achieve the objective mentioned above, the following strategies are employed:

(1) Environmental Zoning

Ecological features and human activities vary in different places so that management plans could be developed with different strategies suitable to specific requirements. Zoning is one of the bases for planning by clearly identifying boundaries of areas for different

management purposes. The zoning of this M/P consists of three zones: 1) core protected zone, 2) buffer zone and 3) transition zone with an application of the zoning concept of the Biosphere Reserve of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

(2) Adaptive Management

Human activities such as encroachment with agriculture, over-hunting, over-fishing and introduction of alien species present a high risk of significant disturbance to the wetland ecosystem. The impacts from these human activities should be closely monitored and quantified to initiate suitable management actions regulating those activities. This flexible and systematic decision-making process based on sound data is regarded as adaptive management. Institutional set up, which makes this management system function, is critically important.

(3) Wise Use

It is essential that management actions regulating some human activities in the wetland be accepted by local people. However, it may be difficult if management actions largely restrict necessary economic activities. Since the Anzali Wetland holds economic values supporting the livelihood of many people, economic activities should continue without over exploitation. The conservation and economic activities should be balanced to attain sustainability of natural resources with the use of those values under control.

(4) Participatory Conservation

Public understanding and agreement are essential to carry out management actions; therefore, the public participation, particularly by the local people is critical and participatory conservation is also an important strategy of this master plan.

Stakeholders in the conservation of the Anzali Wetland include primarily hunters, farmers and fishermen living around the wetland. It is essential that those stakeholders understand the values of the Anzali Wetland since a clear understanding of the values can lead to practical directions in conservation. Stakeholder meetings gathering the views and ideas of the local residents were conducted and incorporated into the master plan.

4.3 Environmental Zoning

(1) Proposed Zoning

Based on the existing zoning plan of DOE and the recommendation of the Ramsar guidelines, it is proposed to introduce three zones: the core protected zone, buffer zone and

transition zone with the following policy and zoning criteria for ecological management of the Anzali Wetland.

Zone	Main Policy	Zoning Criteria
Core Protected Zone a) Conservation Sub-Zone	Non-consumptive use of natural resources	Legally designated protected areas of the wetland (including proposed areas for legal protection): wildlife habitats with richer biodiversity and higher wildlife populations compared with those of the wise use sub-zone
b) Wise Use Sub-zone	Restricted consumptive use of natural resources	Not legally designated protected areas (areas other than the conservation sub-zone)
Buffer Zone	Reduction of impact on water quality of the wetland: Promotion of organic farming	Ecotone: A mixture of areas where an ecosystem transfer to another takes place and such an area is often rich in biodiversity (edge effect). Ecotone for the Anzali Wetland is defined mainly as the water fluctuation zone that is 500 m from the border of the wetland.
Transition Zone	Restricted development avoiding significant impacts to the wetland	The range of areas that can cause significant impact to the wetland: about 3 km from the boarder of the buffer zone.

The whole area of the Anzali Wetland is designated as the core protected zone in accordance with the Ramsar guidelines. The core protected zone is largely divided into the conservation sub-zone and wise-use zone. The conservation zone includes wildlife refuges, protected areas and no-hunting areas. The wise use zone includes marshes and the lagoon.

The buffer zone covers the range of water fluctuation due to changes in the level of water in the Caspian Sea. This type of ecosystem is usually considered as an ecotone, which holds rich biodiversity but in the case of Anzali, the wetland is mainly surrounded by tree plantations and agricultural areas, primarily rice fields.

The transition zone is the area surrounding the buffer zone in which sustainable use is promoted. The boarder of this zone is roughly the road from Kohman to Rezvan Sharh. Industries, factories and townships are included in this zone. The width is determined referring to the feeding area of waterfowl and spawning ground of anadromous fish. The city of Bandar Anzali and the other small towns are included in this transition zone.

(2) Regulatory Framework in Each Zone

Different regulations should be imposed according to the management aims of each zone, which are involved with land tenure, restrictions over development projects and other human activities. The following proposed regulations should be discussed and agreed upon among the stakeholders including DOE, MOJA/NRGO and PSO. This involvement of stakeholders is particularly important in the buffer zone and transition zone since there

are many privately owned lands in both zones.

1) Core Protected Zone

A considerable part of the core zone is not legally protected (approximately two thirds of the wetland), which makes the management of human activities in the wetland difficult. It is, therefore, proposed that the whole area of the wetland be clearly designated as a management area of DOE. With regard to this management in the legal status of the wetland, two important issues should be addressed.

First, there has to be a general agreement among the stakeholders, including those involved in wise use activities such as ecotourism and controlled fishing and hunting. Another management issue is the land tenure of privately owned lands within the wetland. Any private lands within the core protected zone should be transferred to the government so that regulations can be imposed and observed properly.

Regulations in the Conservation Sub-zone prohibit any consumptive use of natural resources such as harvesting any vegetation and wildlife. However, it is proposed that entering this area be allowed for the purpose of ecotourism. This is based on the wise use concept, and restricted ecotours, particularly from October to December, would take advantage of natural resources without causing serious impact to migratory birds. Regular hunting and fishing are allowed in the wise use sub-zone, but the regulations should be strictly observed. The bag limits and species for harvest should be examined and determined based on the annual monitoring data.

2) Buffer Zone

The majority of this zone is agricultural area so that it is proposed that the use of pesticides and fertilizers be reduced by the Integrated Pest Management (IPM) and organic agriculture being promoted in this zone. Furthermore, waste water treatment facilities should be installed in all houses and commercial and industrial enterprises. New development should be prohibited in the buffer zone in accordance with the existing zoning regulation of DOE[2].

3) Transition Zone

For the last two years, DOE has regulated rural development in this zone, and it is proposed that DOE continue this policy. As for the present commercial and industrial enterprises, water treatment facilities should be installed. When any development projects are proposed

[2] For the last two years, DOE has announced the zone as the regulated area and been refusing permits for any development within this zone.

within this zone, any potential negative impact to the wetland should be carefully analyzed in an environmental impact assessment (EIA). In this assessment, indirect impacts from all proposed development projects should be analyzed with the goal of maintaining the ecological balance of the Anzali Wetland in a long-term.

(3) Necessary Arrangements in Implementation of Proposed Zoning Plan

It is proposed to clearly mark the boundaries of the proposed zones to introduce different regulations. However, fencing is not practical since it hampers movements of wildlife and that placing signboards on the borders between zones is suggested. In order to practice different regulations in each zone, collaboration between MOJA/NRGO, the provincial government and lower administrative divisions (e.g., municipalities), HUDO, the governor's engineering office, agricultural cooperatives, and DOE is essential. In order to ensure the implementation of the zoning plan, it should be approved by the Supreme Council for the Environment with representatives of all related government bodies. If this is difficult, at least a local ordinance should be issued by the Provincial Government. The proposed zoning plan should be reviewed according to the changes in the water level of the Caspian Sea. The boundaries should be reviewed once every 5 years based on the monitoring.

4.4 Conservation of Wildlife

The wildlife conservation plan mainly consists of conservation of threatened species and control of alien species.

(1) Conservation of the Threatened Species

The status and conservation needs of the threatened species targeted in this plan are summarized below.

Species	Status and Conservation Needs
Haliaeetus albicilla (White-tailed Eagle)	Status: Main diets of the eagle include fish and waterfowl. Only one pair of this species is left in Anzali Wetland. Conservation Needs: It builds a nest in a large tree in March. The pair of *Haliaeetus albicilla* uses a large poplar tree at present. The tree should be protected, and no one should be allowed to go near the area, especially during the nesting and breeding season. A substitute tree is needed in case the tree dies, and if this is difficult, artificial breeding should be considered.
Aythya nyroca (Ferruginous Pochard)	Status: Main habitat of the species is shallow water (1 to 2 m deep) and well-vegetated areas. Conservation Habitats with abundant submerged plants, fish and benthos should be protected. Improvement of water quality and maintenance of water depth is necessary. Habitats in Selkeh and Sorkhankol should, therefore, be protected.
Vimba vimba persa (Baltic Vimba)	Status: This fish inhabits the western part especially in summer. It requires high concentration of dissolved oxygen and enters lower reaches of rivers for spawning in May to July. Spawning takes place upstream on gravel. Conservation Needs: It enters the rivers through the Siahkeshim, and adequate depth of water is necessary to move during the spawning season. Linkage of different rivers is indispensable for the movements so that any obstacles such as a barrage should be avoided downstream of the rivers.
Lutra lutra (Eurasian Otter)	Status: Carnivorous mammal species which is in the highest position in Anzali Wetland ecosystem. It feeds on fish and frogs. Although the animal is protected as a non-game species, it is still hunted for its high quality fur. Conservation Needs: It inhabits Sorkhankol and Selkeh, and enters rivers and the Caspian Sea. Hunting of the animals should be strictly prohibited.

The conservation program consists of protection of sensitive areas, installation of signboards and control of illegal activities. The areas to be protected for the threatened species are:

- Siahkeshim: nesting area of *Haliaeetus albicilla* (on the large Poplus tree) and *Phalacrocorax pygmaeus* (on the Salix tree).
- Selkeh: wintering area of *Aythya nyroca* and hunting area of predatory birds.
- Sorkhankol: spawning ground of threatened wildlife such as *Abramis brama orientaris* and *Rutilus frisii kutum*, and feeding area of *Lutra lutra*.

Signboards should be installed, especially in the above-mentioned sensitive areas, indicating the ecological status of the targeted species and their conservation needs.

Illegal activities including hunting, fishing and any other forms of harvest should be strictly prohibited. Environmental awareness of the potential violators should be raised by distribution of handbooks, lectures and explanation of penalties.

(2) Control of the Alien Species

Azolla is a type of alien floating water fern, which has recently overgrown in the wetland. The removal of thick mats of the *Azolla* should be carried out in order to reduce its adverse effects on water quality and habitats. It is proposed that at least 30% of the *Azolla* be removed from the wetland as a means of the environmental restoration. In addition to *Azolla*, *Hemiculter leucisculus*, *Gasterosteus aculeatus*, *Liza aurata* (fish) and Comb jellyfish inhabit the wetland as alien species. They have not shown apparent negative consequences in the wetland ecology at present. However, as the distribution and abundance of native wildlife are often negatively affected by alien species, the release of alien species should be proactively controlled.

4.5 Conservation of Habitats

The Anzali Wetland maintains a rich ecosystem, abundant wildlife and beautiful landscape. The conservation of wildlife habitats is as important as the conservation of threatened species. Their regulation and rehabilitation are, therefore, proposed as conservation measures to maintain the ecological balance of the wetland.

(1) Strengthening of Regulations

1) Construction of Guard Stations

DOE has reported that there is a dramatic reduction in poaching where guard stations are established. There are six guard stations in the Wetland at present: Ghalam Godeh, Selke, Siahdarvishan, Esfand and Sorkhankol and Cargon.

In order to regulate illegal activities up to a sufficient level, it is proposed to construct three more guard stations at 1) Chokam newly announced no-hunting area, 2) the southern part of the lagoon to regulate the illegal activities in the wide lagoon and 3) the eastern part where the approach from other guard stations is difficult and control of the illegal hunting is also difficult.

2) Capacity Development of Rangers

The capacity development of rangers is required. They should learn about the wetland ecosystem including names of species, ecological features of wildlife, status of the wetland ecosystem, understanding the importance of the management system, etc. Seminars and workshops should be held at least once a year.

3) Regulation of Motorboats

The noise of motorboats in the wetland is considered as a disturbing influence on birds and other wildlife. Moreover, the "wash" caused by fast boats causes bank erosion and damages fish spawning sites. It is necessary to control the motorboat traffic. The noise should be reduced by introducing a speed limit and quieter engines (possibly electrically driven). Some parts, such as important bird habitats and fish spawning areas, should be closed to traffic. Also, the number of motorboats should be controlled.

(2) Rehabilitation and Maintenance of Habitat

Management activities, including creating deeper pools for fish or small islands, partially cutting dense stands of *Phragmites* (reed) and *Typha* (bulrush), planting trees and extending areas of open water for waterfowl, are identified as potential management tools at present, and those should be implemented according to scientific data. Systematic monitoring should be carried out to analyze ecological consequences as the wetland ecosystem is dynamic and changes over time.

1) Rehabilitation and Maintenance of Habitat in Siakeshim

In the middle of Siakeshim, there is a decrease in the waterfowl habitats and hunting space of *Haliaeetus albicilla*. In 1982, aerial photos indicated that more than 10 ha of open water were distributed in Siakeshim. Most of this is now covered with reed beds.

Therefore, it is proposed to remove the reed beds in two areas of 200 m x 200 m and 400 m x 400 m to create open water as a measure for rehabilitation of habitat and to monitor the ecological response to this management action.

It is also proposed to provide new channels to improve the water flow in the stagnating areas in Siakeshim. However, there are some risks associated with this plan including physical disturbance, mobilization of pollutants, and the disposal of a large volume of dredging so that an EIA should be conducted before implementation.

2) Measures for Solid Waste Inflow

Rubbish entering the wetland is detrimental to wildlife habitats. The collection and proper disposal of garbage should be carried out in the wetland and rivers. A floating boom should be installed at the mouths of rivers for collection of the garbage and the garbage trapped by the floating booms should be periodically collected and disposed of in the sanitary landfill.

4.6 Promotion of Wise Use

Anzali is one of the major sightseeing spots in Iran, and ecotourism in the wetland will be an effective mean of generating sustainable benefits to the local society with the application of the wise use principle. Furthermore, beneficial use of other natural resources such as *Azolla* and *Phragmites* should be promoted for wise use of the Wetland.

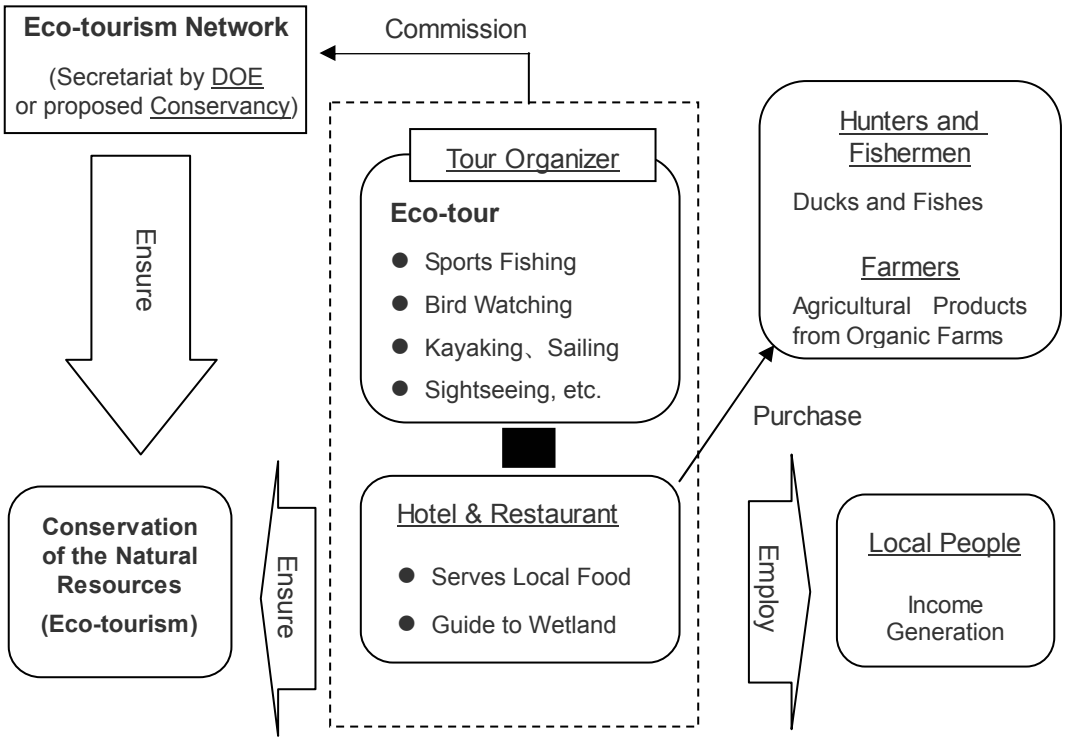
(1) Development of Ecotourism

1) Ecotourism Resources

Anzali Wetland has been used for small-scale tourism, mainly motor boating. However, the ecotourism in the wetland has not been fully developed, and there is some development potential with sustainable use of natural resources. Potential resources for the ecotourism are abundant birds (wintering birds, breeding birds, resident birds) for watching and hunting, fish, popular lotus and some facilities (bird watching towers, bird blinds, etc).

2) Structuring of the Ecotourism Network

Implementation of ecotourism is the responsibility of tour organizers, but it is suggested that DOE support the development of the ecotourism in the wetland. DOE should act as the center of the ecotourism network involving a variety of stakeholders. The network of stakeholders for ecotourism is shown below.



3) Nature interpreter Training

Nature interpreters who can explain how to experience the nature and culture of the area should be trained for ecotourism. Candidates for ecotourism nature interpreters are DOE staff, tour guides, fishermen, hunters and the people who are interested in the environment of the Wetland. The number of nature interpreters initially required will be about 5 to 10 persons.

4) Preparation of Infrastructure

For attractive ecotourism, the following infrastructure should be prepared. They should be constructed as public facilities and maintained by DOE, while private facilities such as boats, canoes and fishing rods should be prepared by each tour organizer.

a) Visitor Centre (Hosseinbekandeh)
b) Access routes
c) Jetty (Visitor Center and Park)
d) Bike tracks (Pilalibagh and southern shore of the lagoon)
e) Watchtowers (Selke and former research center at Sorkhankol)
f) Blinds (Hosseinbekandeh, Chokam and Pilalibagh)
g) Park (Western part of Abkenar)

5) Implementation of Ecotourism

An ecotourism program should be prepared based on available natural resources. The number of participants in the ecotourism should be limited to about 50 persons/day to avoid negative impacts to the Wetland. DOE should issue one day license for tourists for fishing activity in the ecotourism. The ecotourism route should be established outside of the protected area as much as possible except for some observation points such as Selke, Sorkhankol and Siakeshim.

(2) Sustainable Use of Natural Resources

1) Sustainable Hunting and Fishing

The appropriate number of hunting and fishing licenses should be determined by research and monitoring of the availability of resources. The bag limits and license fees should also be evaluated and revised annually. The preliminary proposed bag limits and license fees are as shown below.

License	Proposed Bag Limits and License Fees
Regular Hunting License (weapon)	6 birds/day for 3 days/week, 80,000 Rials
Trapping License	10 birds/day for 3 days/week, 500,000 Rials
Rent License	20 birds/day for 3days/week (weapon and trap), 1,500,000 Rials
Fishing License (rod and reel)	Unlimited, 12,000 Rials

Besides the above licenses, Fishery Department issues about 350 licenses to net fishing gears users. Those licenses should be reduced. The license for sport fishing proposed for ecotourism should be issued by DOE with a license fee of about 1,000 Rials/day.

2) Beneficial Use of Natural Resources

The beneficial use of the natural resources in the Wetland will encourage the wetland conservation activities of the stakeholders. *Azolla* is one of the alien species and detrimental to the ecosystem due to overgrowth. They should be removed from the Wetland. *Azolla* can be used for livestock feed and also as fertilizer according to the pilot activity in the study. This would be an example of the beneficial use of natural resources. The beneficial use of other natural resources such as reeds should be studied and promoted.

4.7 Monitoring and Feedback

(1) Environmental Monitoring for Adaptive Management

Scientific data are insufficient at present for making appropriate management plans. Therefore the improvement of monitoring activities is critical and should be implemented so that an adaptive management having a system where a decision is made based on monitoring data with feedback can be successfully operated (Section 4.2.2). The wetland ecosystem is very dynamic, and is affected by numerous factors, such as the incoming pollution load and sediment from streams, the water level of the Caspian Sea, etc. In order to manage the Anzali Wetland, the ecological dynamics of the Wetland should be studied. The following five environmental monitoring programs are proposed:

1) Wetland ecological census (every 5 years),
2) Annual ecological monitoring,
3) Eco-tourism monitoring, and
4) Environmental monitoring by universities.

(2) Environmental Research

Scientific data on the Anzali Wetland and information on its use are still incomplete. Collection of scientifically sound data is essential for efficient wetland management and effective environmental education. Thus, the following research programs are proposed.

1) Basic ecological status of fauna and flora including habitat requirements
2) Formation of the Anzali Wetland system
3) Potential for algal blooms
4) Bioaccumulation of pesticide in Anzali Wetland
5) Damage to *Nelumbium maciferum* caused by diseases and harmful insects,

4.8 Institutional and Organizational Arrangement

In order to implement the proposed wetland ecological management, DOE needs to enact detailed rules for zoning, control of illegal activities, etc., in discussion with relevant organizations. Establishment of an "Anzali Wetland Conservancy" for integrated management of the wetland is also recommended as proposed in Chapter 9.

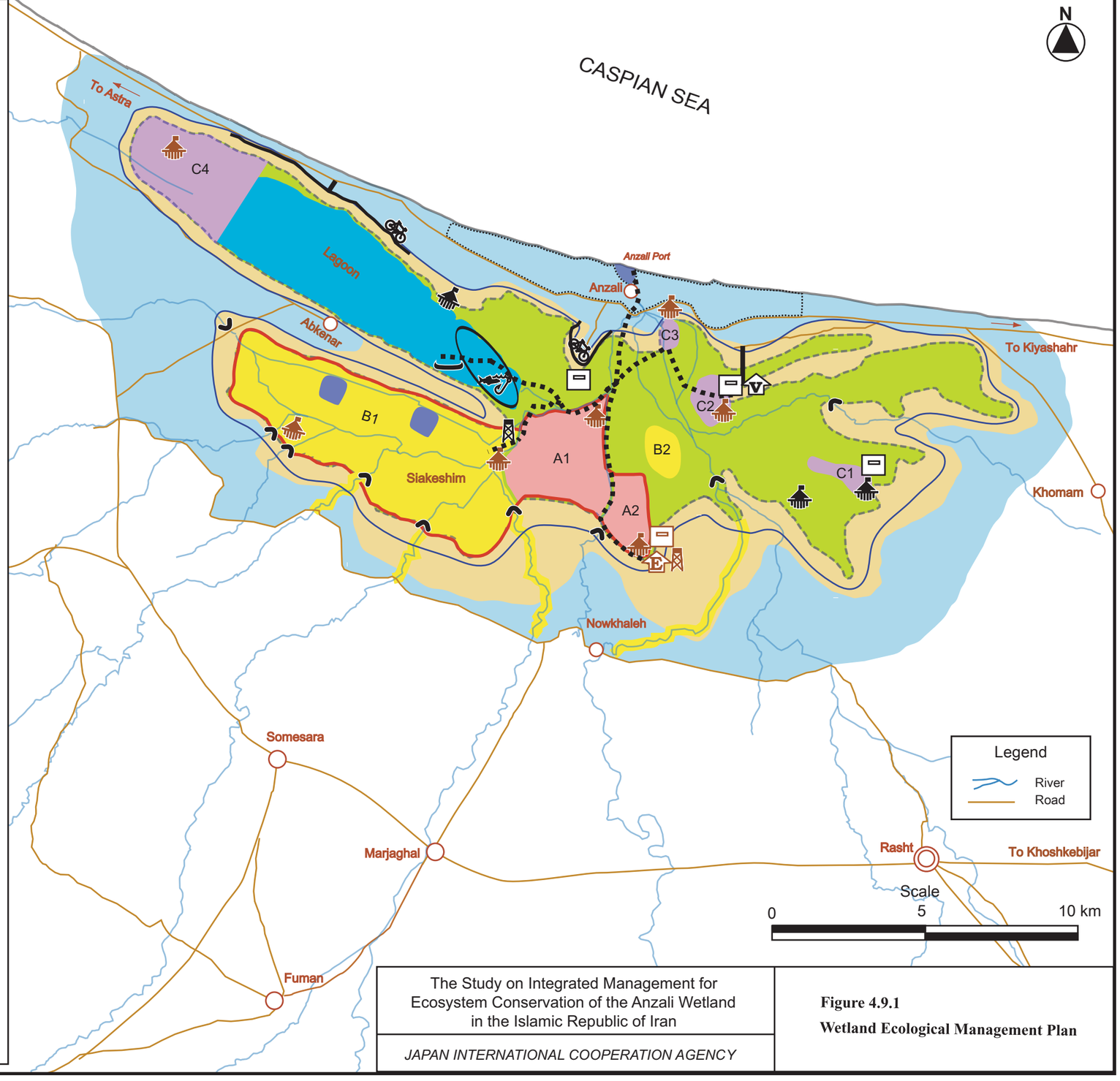
4.9 Summary of Proposed Wetland Ecological Management Plan

The projects/measures proposed in the proposed wetland ecological management plan are summarized as below and illustratively shown in Figure 4.9.1.

Sub-component	Proposed Measures	Organization
Environmental Zoning	(1) Establishment of environmental zones (2) Enforcement of zoning	DOE, HUDO, MOJA DOE, HUDO, MOJA
Conservation of Wildlife	(1) Conservation of the threatened species (2) Control of the alien species	DOE, PSO DOE
Conservation of Habitat	(1) Strengthen the regulations 1) Construction of guard stations 2) Capacity development of rangers 3) Regulation of motorboats (2) Rehabilitation and maintenance of habitat 1) Rehabilitation of habitat 2) Measures for solid waste inflow	 DOE DOE DOE, PSO DOE DOE, MOE
Promotion of Wise Use	(1) Development of ecotourism 1) Structuring of ecotourism network 2) Nature interpreter training 3) Preparation of infrastructure 4) Implementation of ecotourism (2) Sustainable use of natural resources 1) Sustainable hunting and fishing 2) Beneficial use of *Azolla*	 DOE, CHTO, PSO DOE, CHTO DOE, CHTO DOE, CHTO DOE, MOJA DOE, MOJA
Monitoring and Feedback	(1) Environmental monitoring for adaptive management (2) Environmental research	DOE, MOJA DOE, MOJA

Proposed Projects/Measures

1. Envirnomental Zoning
(1) Establishment of Environmental Zones
1) Core Protected Zone
1-1) Conservation Zone
A. Wildlife Refuge
(A1 Sorkhankol, A2 Selke)
B. Protected Area
(B1 Siakeshim, B2 Spawning Ground)
C. No Hunting Area
(C1 Chokam, C2 Hossein Bekandeh, C3 Ghalm Godeh, C4 Wintering Habitat)
1-2) Wise-use Zone
Lagoon
Marsh
2) Buffer Zone
Water Fluctuation Line
3) Transition Zone
(2) Enforcement of Zoning
2. Conservation of Wildlife
(1) Conservation of Threatened Species
(2) Control of Alien Species
3. Conservation of Habitat
(1) Strengthening of Regulations
Guard Station (Proposed)
Guard Station (Existing)
(2) Rehhabilitation and Maintenance of Habitat
Floating Boom
Open Water (New habitat)
4. Promotion of Wise Use
(1) Development of Ecotourism
Eco-tourism Boat Route
Bicycle Track
Access Road
Education Center (existing)
Watch Tower (proposed)
Watch Tower (existing)
Visitor Center
Bird Hide (proposed)
Bird Hide (existing)
Sports Fishing Area
Kayak Station
(2) Sustainable Use of Natural Resources
5. Monitoring and Feedback
(1) Enironmental Monitoring for Adaptive Management
(2) Environmental Research



The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland in the Islamic Republic of Iran

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 4.9.1
Wetland Ecological Management Plan

4.10 Cost Estimate

The estimated costs of the proposed wastewater management plan at the price level of 2004 are summarized as below. The total project cost (investment cost) is estimated at 30,810 million Rials up to 2019 and the average annual operation and maintenance cost is 1,294 million Rials/year.

Proposed Projects/Measures	Project Cost (million Rials)	O&M Cost	
		Overall (million Rials)	Annual Average (million Rials/Year)
1. Environmental Zoning			
(1) Environmental zoning	18,000	0	0
(2) Enforcement of zoning	175	732	49
2. Conservation of Wildlife			
(1) Conservation of the threatened species	175	262	20
(2) Control of alien species	2,076	420	32
3. Conservation of Habitat			
(1) Strengthen the regulations	737	2,974	228
(2) Rehabilitation and maintenance of habitat	449	690	111
4. Promotion of Wise Use			
(1) Development of ecotourism	9,199	3,298	392
(2) Sustainable use of natural resources	0	524	35
5. Monitoring and Feedback			
(1) Environmental monitoring for adaptive management	0	5,656	377
(2) Environmental research	0	700	50
Total	30,811	15,256	1,294

Source: JICA Study Team

4.11 Implementation Program

(1) Executing Organization

The organizations to be involved in implementation of the proposed watershed management plan are DOE, MOJA, HUDO, PSO, MOE and CHTO as mentioned in the previous Section 4.9.

(2) Prioritization for Implementation

For the preparation of the implementation schedule for the proposed wetland ecological management plan, the proposed projects/measures are prioritized based on the evaluation criteria mentioned in Chapter 3 as below.

Criteria / Project		Effect		Urgency	Efficiency	Conformity with National Policy	Response by Executing Organization	Required Level of Environmental Awareness	Project Maturity	Required Capacity of Executing Organization	Investment Cost	Total Score
		Wetland Ecology	Wetland Sustainability									
1	Environmental Zoning	A	A	A	A	B	A	B	B	B	B	B(25)
(1)	Establishment of Environmental Zones	A	A	A	A	B	A	B	B	A	A	A(27)
(2)	Enforcement of zoning	A	A	A	A	B	B	B	B	C	C	B(22)
2	Conservation of Wildlife	A	B	B	A	A	B	B	B	B	A	B(22)
(1)	Conservation of the threatened species	A	B	A	A	A	B	B	B	B	A	B(23)
(2)	Control of Alien Species	A	A	B	A	A	A	B	B	B	B	A(25)
3	Conservation of Habitat	A	A	B	A	B	A	B	B	B	C	B(23)
(1)	Strengthen the Regulation	A	A	B	A	B	B	B	A	A	B	B(25)
1)	Construction of Guard Station	A	A	B	A	B	A	B	A	A	C	B(25)
2)	Capacity Development of Rangers	A	A	B	A	B	B	B	A	A	B	B(25)
3)	Regulation of Motorboats	A	B	B	A	B	B	A	B	B	B	B(21)
(2)	Rehabilitation and Maintenance of Habitat	B	A	B	B	B	A	B	B	B	C	C(18)
1)	Rehabilitation of Habitat	B	A	B	B	B	A	B	B	B	C	C(18)
2)	Measure for Solid Waste Inflow	B	B	B	B	B	B	B	B	B	B	C(15)
4	Promotion of Wise Use	B	A	A	A	A	A	A	A	A	B	A(26)
(1)	Development of Ecotourism	B	A	A	A	A	A	A	A	A	B	A(26)
1)	Structuring of Ecotourism Network	B	A	A	A	A	A	A	A	A	B	A(26)
2)	Nature Interpreter Training	B	A	B	B	A	A	A	A	A	B	B(23)
3)	Preparation of Infrastructure	B	A	B	B	A	B	A	A	A	B	B(22)
4)	Implementation of Ecotour	B	A	B	A	A	A	A	A	A	B	B(25)
(2)	Sustainable use of natural resources	B	A	B	A	A	A	B	A	A	B	B(24)
5	Monitoring and Feedback	A	A	A	A	B	B	A	B	A	B	A(26)
(1)	Environmental monitoring for adaptive management	A	A	A	A	B	B	A	A	B	A	A(27)
(2)	Environmental research	A	A	B	A	B	B	B	B	B	B	B(23)
Weight		3	3	1	2	1	1	1	1	1	1	-

(3) Implementation Schedule

Based on the prioritization evaluation mentioned above, the implementation schedule for the proposed wetland ecological management plan until the target year of 2019 is proposed as below.

Proposed Measures		Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1. Environmental Zoning																
(1)	Establishment of Environmental Zones															
(2)	Enforcement of Zoning															
2. Conservation of Wildlife																
(1)	Conservation of the Threatened Species															
(2)	Control of Alien Species															
3. Conservation of Habitat																
(1)	Strengthen of the Regulation															
1)	Construction of Guard Station															
2)	Capacity Development of Rangers															
3)	Regulation of Motorboats															
(2)	Rehabilitation and Maintenance of Habitat															
1)	Rehabilitation of Habitat															
2)	Measure for Solid Waste Inflow															
4. Promotion of Wise Use																
(1)	Development of Ecotourism															
	1) Structuring of Ecotourism Network															
	2) Nature Interpreter Training															
	3) Preparation of Infrastructure															
	4) Implementation of Ecotour			Trial Activity						Full Activity						
(2)	Sustainable Use of Natural Resources															
5. Monitoring and Feedback																
(1)	Environmental Monitoring for Adaptive Management															
(2)	Environmental Research															

(4) Priority Projects

Among the projects/measures to be implemented in the first five year, that is, the Forth Five-year Development Plan period, the projects/measures to be commenced immediately are selected as priority projects. The priority projects in the proposed wetland ecological management plan are selected as follows:

1) Establishment of environmental zones
2) Development of ecotourism
3) Environmental monitoring for adaptive management

CHAPTER 5 WATERSHED MANAGEMENT PLAN

5.1 Introduction

The watershed of the Anzali Wetland, especially the upper watershed, is the main source of the sediment load to the Wetland. Roughly 80% of the total sediment load into the Wetland (approximately 400,000 tons/year) come from the upper watershed. Overgrazing, deforestation, and limited erosion control works are among the main causes of the erosion problem in the watershed. In addition, these are the causes of other problems, such as (i) degradation of the mountain ecosystems that constitute a major part of the Greater Anzali Ecosystem, (ii) economic problems of graziers and other local residents who depend on natural resources in the rangelands and forests, and (iii) weakening the capacity of the watershed to recharge and regulate water, and to control disasters, such as flooding and debris flow.

5.2 Objectives and Strategies

5.2.1 Objectives

The Anzali watershed has been degraded over time by human activities such as over-grazing, deforestation, and road construction. The principle objective of the watershed management plan is to improve the wetland environment through:

- reduction of sediment inflow from the watershed into the wetland; and
- restoration and protection of the fabric of the watershed to enhance the biodiversity of the entire Anzali watershed.

5.2.2 Strategies

A principle theme underlying all the components of the watershed management plan is "sustainable management". Therefore, the proposed watershed plan becomes a holistic program, not only for solving the physical problems (soil erosion, land slides, land degradation, etc.), but also for improving social problems (livelihood, conflict with graziers, etc.) in the watershed. The strategies employed in planning the watershed management plan are:

1) Control of further progression of erosion problems;
2) Promotion of participatory resource management;
3) Livelihood development for graziers;
4) Improvement of the livestock resettlement program;

5) Establishment of an effective institutional set-up; and
6) Capacity development of provincial and local offices.

The livestock resettlement program is regarded as an existing program since the program is on-going and was already programmed into the 4th 5-year plan (2005-2009).

5.3 Soil Erosion Control

(1) Soil Erosion Control

There are various techniques to control erosion, and the choice of these measures depends on the stage of the erosion as well as other factors, such as topography, geology, and rainfall. In order to select the erosion control measures applicable to the study area, a model area (175 ha) was selected upstream of Masuleh Town. Similar erosion control works should be implemented throughout the 76.7 km^2 of degraded areas in the upper watershed. The total quantities of erosion control works for the entire degraded areas are estimated based on the model area as below.

Type	Measures	Required Facility	Area (km^2)	Total numbers/areas
Structural Measures	Concrete Check Dams	1.7 nos./100 ha	76.7	131 nos.
	Gabion Check Dams	37 nos./100 ha	76.7	2,836 nos.
	Wooden Dams	12 nos./100 ha	76.7	920 nos.
	Contour Bunds	2.5 km/100 ha	76.7	191 km
Biological Measures	Straw Matting	10 ha/100 ha	76.7	7.67 km^2
	Seeding	All areas	76.7	76.7 km^2
	Fertilizing	All areas	76.7	76.7 km^2

Source: JICA Study Team

Also, many existing erosion control facilities in the upper watershed have been left malfunctioning. There is an urgently need to repair and maintain them since the situation could cause serious damage (e.g., debris flow and floods) to the downstream areas. Periodical monitoring and adequate maintenance of constructed soil erosion facilities are necessary for keeping those facilities effective.

Although the total quantities of erosion control works for the entire watershed are roughly estimated, a long-term plan for soil erosion control should be prepared and detailed execution studies for the respective degraded areas should be carried out prior to the application of control measures based on the actual site conditions.

(2) Prevention of Landslides and Slope Collapse

Landslides and slope collapse are sources of sediment to the wetland. They are caused by road construction works in the forest and rangeland areas. For the landslides, a control work or restraint work should be applied. The control work includes drainage work, soil removal work and buttress fill work. The restraint work includes pile work, anchor work and retaining wall work. Slope collapse is usually caused by a surface failure of the slope. It can be controlled by a combination of shotcrete, soil nails, and protection walls with gabions beside the road.

Landslides occur in a relatively wide area and even on gentle slopes in the areas of particular geology and geological structures called "Landslide Morphology". Recognition of this particular morphology enables prediction of the distribution or location of landslide areas. Therefore, the potential landslide areas should be found by conducting a careful field survey at the planning stage of new road construction to minimize the landslide problem as much as possible.

(3) Effect of Soil Erosion Control Works

Assuming that devastated areas of rangelands (grass lands to bare lands) are returned to grass land by the proposed erosion control works, as much as 58,700 tons/year of sediment yield may be reduced as below.

(Unit: tons/year)

Area		Current		Reduction in Sediment Load <1	After Implementation of Measures <2	
Bare land		119,300		0	119,300	
Rangeland	Bare	58,100		41,500	16,600	
	Grass	6,700	64,800	0	6,700	28,300
Forest	Grass	14,100		17,200	3,100	
	Forest	125,500	139,600	0	125,500	128,600
Total		323,700		58,700	276,200	

Note: Bulk density of soil is estimated at 1.3.
<1 41,500 = 415 x 77 x 1.3 and 17,200 = 109 x 182 x 1.3 x 2/3
<2 Measures include grazing control, reforestation, and erosion control works.
Source: JICA Study Team (2004)

5.4 Forest and Rangeland Management

(1) Introduction

The LANDSAT image analysis identified that about 182 km^2 of forestlands and 77 km^2 of rangelands were in degraded condition. The proposed forest and rangeland management plan aims to restore as much vegetation as possible in the degraded areas and protect natural resources of the whole watershed from degradation in order to enhance the functions of the watershed for the wetland environment. This is in line with the NRGO

target, which is to restore the vegetation of the watershed up to the level of 1963. The proposed management plan also pays attention to making a balance between the restoration of vegetation and livelihood development for local people (graziers/forest dwellers) by adopting the concept of participatory resource management.

The forest and rangeland management plan is composed of eight (8) components, namely, i) pilot activity of participatory resource management, ii) reforestation of the degraded forests, iii) reforestation of the margin areas, iv) forest management under forestry plans, v) conservation of protected forests, vi) rangeland management, vii) preparation of regulations necessary for participatory resource management and viii) improvement of the livestock resettlement program.

(2) Pilot Activity of Participatory Resource Management

The main objective of the pilot activity is to enable NRGO to go through the process of participatory resource management and to obtain the knowledge and lessons necessary for formulating a participatory resource management plan and its supporting regulations. The pilot activity would be undertaken in the major four townships (Rezvanshahr, Fuman, Shaft and Masal) in the watershed to involve all the local NRGO offices in the process. The estimated area of pilot site is assumed as 500 ha in the forestland. Target families for the pilot activity should be forest dwellers or graziers who stay in the forest. The estimated number of participants per pilot site would be 50 – 100 families and the period of the pilot activity is five (5) years.

(3) Reforestation of Degraded Forests (70 km^2)

This aims to reforest the degraded forests of 70 km^2 below EL. 1,500 m to improve the functions of forests in the upper watershed. Major activities of the reforestation plan are i) survey and mapping and ii) reforestation activities (land preparation, planting, maintenance, thinning and protection). The proposed reforestation activities will be contracted out to private firms in the initial stage, but NRGO should instruct contractors to hire as many local people as possible in reforestation and forest management. After 2008/2009, the participatory management concept should be introduced in forest management. Consequently, reforestation and forest management of the degraded forests in Masulehroudkhan and Plangvar sub-watersheds will be carried out by local people (graziers/forest dwellers). The activities undertaken in the pilot activity of participatory resource management can be replicated in those areas. The experts hired for the pilot activity will be used for such activities.

(4) Reforestation in the Margin Areas (112 km^2)

The reforestation in the margin areas, which were originally forest areas, should be determined based on an assessment of whether or not all the areas could be reforested as the margin areas are part of major grazing grounds. According to the assessment, the stocking capacity of the rangeland (259 km^2) is estimated at 77,700 units at minimum, while the number of livestock after implementation of the livestock resettlement program will be reduced to 76,000 units. Therefore, the degraded margin area of 112 km^2 can be reforested. In the implementation, it is proposed that reforestation and forest management works for the margin areas should be undertaken by the retired graziers under the concept of participatory resource management. External experts should be hired for the implementation of the plan, especially to organize graziers and assist them in forest management.

(5) Forest Management under Forestry Plans

Four (4) sub-watersheds, i.e., Chahroud; Morghak; part of Pasikhan; and Siahroud, are presently managed by private firms in accordance with the forestry plans prepared by NRGO. The forestry plans seem technically appropriate, but there are some problems found such as improper road construction, improper exploitation, a social conflict with graziers, etc. It is proposed to take the following actions in the four sub-watersheds.

1) to request contractors to hire graziers/forest dwellers as casual laborers for forestry works.
2) to assist graziers/forest dwellers in organizing themselves to make a forest cooperative and provide necessary technical assistance.
3) to make an arrangement with contractors to subcontract part of the forestry works to the organized cooperatives of graziers.
4) to contract out the management works for some series of the sub-watersheds to the organized cooperatives of graziers

(6) Conservation of Protected Forests

There are many protected forests in the watershed as below. They should be conserved and maintained by both DOE and NRGO as they have been doing.

Protected area	No. of site	Area
Shaft-Siahmezgi forest	1 site	39,511 ha
Protected forests	29 sites	3,250 ha
Conservation of genetic flora	25 sites	10~100 ha/site

Source: NRGO Guilan

(7) Rangeland Management

As analyzed in section 5.4.4 (4) "Reforestation in the Margin Areas (112 km^2)", the number of livestock remaining after the resettlement program can balance with the stock capacity of the grasslands in the upper watershed. However, an inventory survey should be conducted after the resettlement program so as to identify the remaining graziers and livestock that will depend on the rangeland.

The rangeland should be managed by the remaining graziers in a sustainable manner since they are the main users of the area and responsible for its sustainability. In order to empower the remaining graziers, the following activities, which are the same as those for participatory resource management, will be undertaken by NRGO.

1) Organization of graziers
2) Demarcation of areas
3) Contract with graziers' organization
4) Assistance to graziers in rangeland management and livelihood development

On the other hand, the graziers should carry out the regular works such as grazing season control, rotated grazing, monitoring of grazing land, etc. and contracted works such as erosion control works, maintenance works for control structures and rangeland, etc. The rangelands should be managed by the remaining graziers under the concept of participatory resource management with assistance from the external experts.

(8) Development of Regulations Necessary for Participatory Resource Management

To promote participatory resource management projects, new regulations (decrees), especially on the management of resources and lands, should be prepared by 2007/08. The following rights should be secured for a certain period by the new regulations.

1) Control over resources in the assigned area
2) Land use/management (Land use rights)

Implementation guidelines for a resource management project should also be prepared by 2007/08 so that the local staff of NRGO and the contractors (local consultants/NGOs and local people) can use them as guides for implementation.

(9) Improvement of the Livestock Resettlement Program

Although the livelihood resettlement program is treated as a precondition, the following improvements should be undertaken in order to minimize adverse social issues derived from the resettlement program.

1) Preparation of a Field Handbook
2) Training of Local NRGO Staff
3) Strengthening of the Forestry Conservation Committee

5.5 Plain Area Management

Due to the favorable combination of flat topography and the presence of paddy fields that dominate this area of the watershed, the amount of sediment run-off from the plain area is approximately 74,000 ton/year, and this is considered to be low compared to the total amount of sediment load from the entire basin which is approximately 400,000 ton/year. Thus, no quantitative target for the reduction of sediment load from the plain area is set here. However, there are various measures that can reduce the amount of the sediment runoff from the plain area. It is important that a long-term plan for run-off control of the entire plain area be formulated so as to determine effective measures with their potential sites.

(1) Source-level Control of Sediment Runoff in the Plain Area

The relatively small amount of sediment runoff in the plain area does not warrant large-scale structural measures from the perspective of protection of the wetland alone. However, there are various measures to control sediment runoff at each source level such as conservation of farmlands, control of sediment from construction sites, removal of sediment from urban areas, etc. They can be promoted to minimize sediment runoff from the plain area.

(2) Measures to Control Inflow of Sediment into Wetland

As a measure to intercept the sediment from entering the wetland, sediment trap basins are considered at the river mouths of Palangvar River and the Morghak/Khalkaii River, which enter the Siakeshim Protected Area, the primary resting area for migratory birds. The proposed size of the trap basins is about 10,000 m^2 (200 m long x 50 m wide) each. With these two trap basins, inflow sediment of 64,000 ton/year is reduced to 39,000 ton/year. A trap rate is about 40% (or 25,000 ton/year).

It is necessary to remove the sediment trapped in the basin and removal cost is estimated at about 25,000 USD/year. According to MOJA, it would be possible to encourage local people to use the sediment from the traps as construction material (aggregate) to minimize the operation and maintenance cost.

Another potential alternative to control inflow of sediment is to construct open waters within the wetland (e.g., Siakeshim) with a dual objective of ecological management and sediment trapping.

(3) River Management for Extreme Conditions

Many wetlands in Iran (e.g., Uromieyeh Lake) have been devastated by the combined impacts of draughts in recent years and increased use of river water for irrigation. Fortunately, the Anzali Wetland has not experienced such devastation. The Anzali Wetland itself has substantial water regulating capacity and is connected to the Caspian Sea. For these reasons, the wetland seems relatively insensitive to extreme draughts as well as major storms. Thus, artificial management of discharges by construction of dams and weirs should be kept as minimal as possible. Moreover, construction of large facilities in rivers and other river works could damage the natural functions of the rivers (e.g., spawning of certain fish species).

A potential option to counter an extreme draught is to take more water from Sefidroud River through Fuman Tunnel. In the case of flooding, paddy fields may be used for temporary storage of water.

There is no doubt that the water level of the Caspian Sea has a major impact on the environmental conditions of the wetland. However, the fluctuation of the Caspian is a natural phenomenon, and it progresses in the time scale of years to decades. Thus, unless an extreme condition that jeopardizes the existence of the wetland occurs (e.g., rapid and substantial drop of the Caspian level), no active control of water level by manmade structures e.g. construction of weirs to regulate outflow from the Wetland, is recommended.

5.6 Livelihood Development

(1) Survey on Livelihood Development of Graziers

By the implementation of the on-going livestock resettlement program, the livelihoods of the following local people will be much affected. The development of alternative livelihood measures will be essential for successful livestock resettlement and sustainable forest and rangeland management.

Target people	Direct adverse effect in case there is no livelihood support
Resettlers	a. Increase of the jobless in urban areas and major villages b. Increase of illegal cutting/grazing
Retired graziers	a. Increase of illegal cutting/grazing b. Opening of forests for farming
Remaining graziers	a. Increase of number of livestock (overgrazing)
Other forest dwellers	a. Increase of illegal cutting/grazing b. Opening of forests for farming

As no data on the existing graziers is available, a survey on the livelihood improvement of graziers was carried out in the course of the Study with the following scope of work by a participatory rural appraisal method.

Study area	Upper Watershed
Target people	Graizers who reside in the forest in the upper watershed
Sampled villages	6 villages
Method of study	Interview survey, Participatory planning method, Market research
Study items	- Socio-economic conditions of graziers - Structure of villages - Potential livelihood options - Marketability of major products and market potential - Adaptability of the participatory planning method

The results of the participatory study on livelihood improvement are summarized in the following table.

Study items	Summary of results
Socio-economic condition (1) Major sources of income (2) Estimated annual income (3) Number of livestock	 Livestock razing, tea cultivation, horticulture, sericulture, etc. Approximately 26.5 million Rials per family Most (about 80 %: 86 families) of respondents raise 50 – 200 head of sheep.
Structure of village	All the sampled villages are Talesh origin. Though their traditional lifestyle has gradually changed from the seasonal-migrant life-style to the settlement-typed life-style, their traditional norms (e.g., the way of decision making, participation of collective work, etc.) still exist among the villagers. Recently, the population structure of the sampled villages have become hollow since the young generation have been migrating to towns/cities to find other job opportunities.
Potential livelihood options	The following livelihood options are enumerated as possible options. Farming (paddy, horticulture), Livestock raising (semi-industry), Fishery, Poultry, Handicrafts, Tourism, Transportation, Sericulture, Tea cultivation, Tree planting. Among others, the NGO concluded that the following livelihood options were considered as potential livelihood options considering natural conditions, preference of graziers, their capability and experience, marketability, and technology required for implementation. a. Cattle farming (semi-industrial) b. Sericulture c. Poultry d. Fish culture (cold and warm) e. Tree planting (in farmlands)

Study items	Summary of results
Marketability	Annual gross incomes of the potential livelihood options are estimated based on the present marketing conditions of products. Cattle farming: 150 – 175 million Rials/20 head of cattle Sericulture: 20 million Rials/25-30 boxes of silk worm eggs Poultry: 300-320 million Rials/1 season production Fish culture: 75 million Rials /1 season production (10,000 pcs.)

Source: The Study on Livelihood Improvement for Graziers (CENESTA, 2004)

(2) Capacity Development of NRGO Provincial and Local Offices

NRGO is also aware of the importance of livelihood development. The livelihood development should enable local people to find alternative livelihoods by themselves. However, many of NRGO staff as well as other organizations have little experience in participatory livelihood development/community development. It is proposed to conduct a pilot activity of participatory livelihood development for capacity development of the NRGO provincial and local offices. Their capabilities in the following fields should be enhanced through a series of training.

1) Participatory planning method
2) Business planning
3) Training needs assessment
4) Development of linkages with other organizations
5) Monitoring and evaluation of business operation

(3) Livelihood Development of Local People in Forest and Rangeland Management

Many of the graziers except those relocated to the outside of the upper watershed are expected to participate in the forest and rangeland management as an alternative livelihood measure. Provided that 60 % of the retired graziers who will have to quit grazing activity but stay in the forest in the sub-watersheds will participate in the reforestation of the margin areas of 112 km^2, they can earn supplemental annual income ranging from 0.5 ~ 13.6 million Rials/family (4.4 million Rials/family on average) in addition to compensation.

This amount is equivalent to about 28 % of the average annual income in the rural areas of the province (16 million Rials/family).

For the graziers that remain, the vegetative erosion control and rangeland management works will be contracted out to them. They can earn supplemental annual income ranging from 2.2 ~ 9.5 million Rials/family (7.3 million Rials/family on average) in addition to the income from grazing activity. This income from the management work would be equivalent to that from 73 head of goats.

5.7 Environmental Monitoring for Watershed Management

A major issue in planning the watershed management plan was lack of monitoring data. For instance, there is no recent data on the number of graziers or livestock as pointed out in previous sections. Lack of data/information makes the planning difficult as well as unreliable. To enable the organizations (MOJA/NRGO) to develop a realistic plan and manage the watershed flexibly based on the conditions at the field level, monitoring, evaluation and feedback to planning are necessary. It is therefore proposed that the following monitoring activities should be carried out.

1) Monitoring of soil erosion controls
2) Monitoring of land use/vegetation cover
3) Monitoring of rangeland management
4) Monitoring of forest management
5) Monitoring of the resettlement program

5.8 Institutional and Organizational Arrangements

(1) Coordination among Relevant Organizations

Many organizations are involved in the watershed management of the Anzali Wetland watershed, and co-ordination among these organizations is very important for integrated environmental management. The following institutional and organizational arrangements are proposed.

1) Close coordination of NRGO and WMD of MOJA
2) Coordination for protected forest management,
3) Information sharing between NRGO, WMD and RWO,

(2) Capacity Development for Sustainable Watershed Management

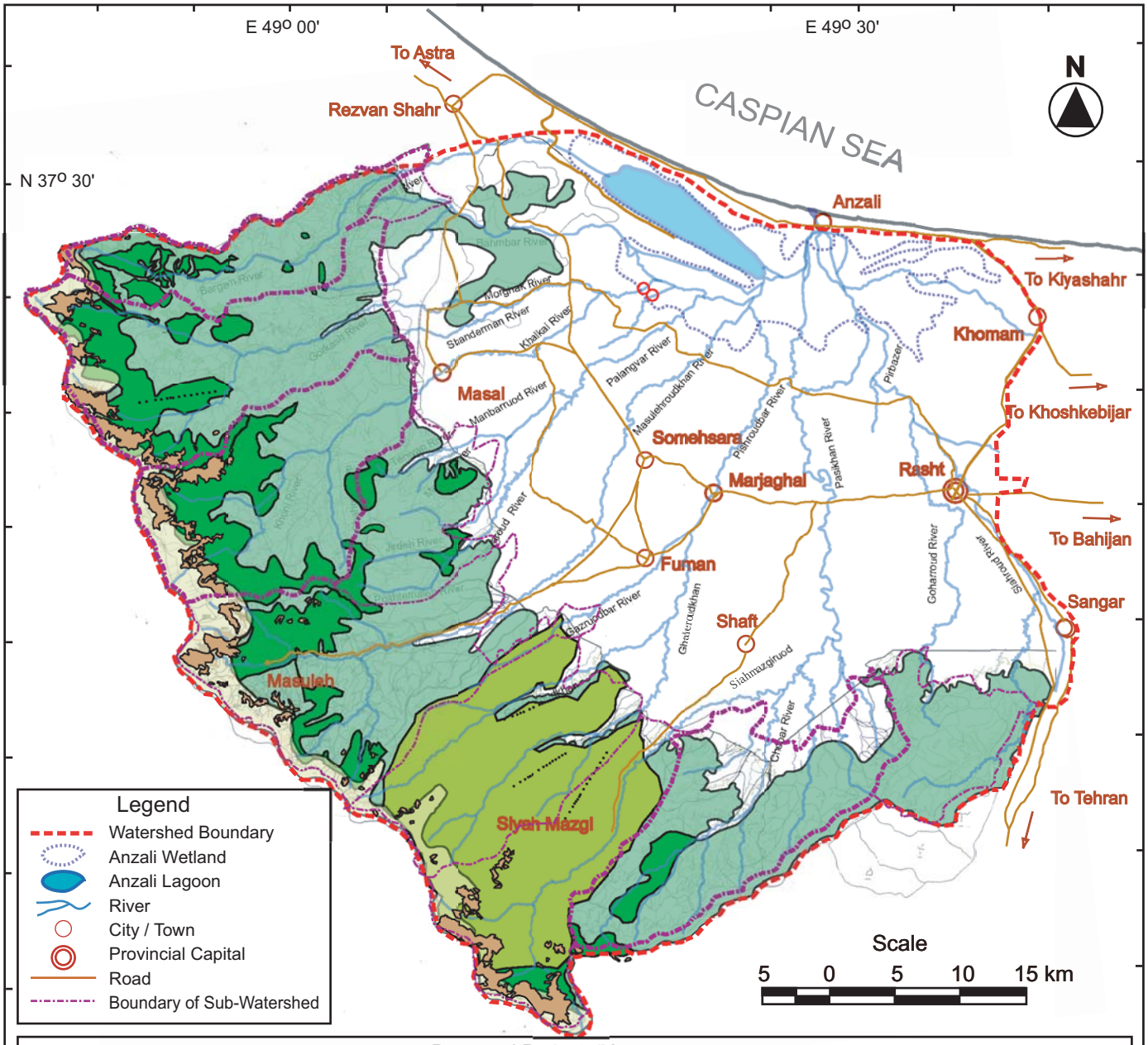
Capacity development of the executing organizations (MOJA/NRGO) is an essential element to implement the proposed plan smoothly and attain its objectives. Due attention should be paid to the following components during the project period, especially in the initial stage of the plan.

1) Capacity development for participatory resource management,
2) Capacity development for long-term vision and plans, and
3) Capacity development for environmental monitoring.

5.9 Summary of Proposed Watershed Management Plan

The projects/measures proposed in the watershed management plan are summarized as below and illustratively shown in Figure 5.9.1.

Sub-components	Proposed Projects/Measures	Executing Organizations
Soil Erosion Control and Prevention of Land Slides	(1) Soil erosion control	
	1) Vegetative measures	MOJA (NRGO)
	2) Structural measures	MOJA
	(2) Prevention of landslides	MOJA
Forest and Rangeland Management	(1) Pilot activity of participatory resource management	NRGO
	(2) Reforestation of degraded forests (70 km^2)	NRGO
	(3) Reforestation in the margin areas (112 km^2)	NRGO
	(4) Forest management under forestry plan	NRGO
	(5) Conservation of protected forests	NRGO
	(6) Rangeland management by graziers	NRGO
	(7) Development of regulations necessary for participatory resource management	NRGO
		NRGO
	(8) Improvement of the livestock resettlement program	NRGO
Plain Area Management	(1) Source-level control of sediment runoff in plain area	MOJA
	(2) Measures to control inflow of sediment into the Wetland	MOJA
	(3) River management for extreme conditions	MOJA, MOE
Livelihood Development	(1) Capacity development of NRGO provincial and local offices	NRGO
	(2) Livelihood development of local people in forest and rangeland management	NRGO
Environmental Monitoring plan	(1) Monitoring of soil erosion controls	MOJA
	(2) Monitoring of land use/vegetation cover	MOJA
	(3) Monitoring of rangeland management	NRGO/MOJA
	(4) Monitoring of forest management	NRGO
	(5) Monitoring of livestock resettlement program	NRGO
Institutional Arrangement	(1) Coordination among relevant organizations	
	1) Coordination of NRGO and WMD	NRGO & MOJA
	2) Coordination of NRGO and DOE	NRGO & DOE
	3) Information sharing among NRGO, WMD and RWO	NRGO, WMD, RWO
	(2) Capacity development for sustainable watershed management	
	1) Capacity development for participatory resource management	NRGO
		NRGO & MOJA
	2) Capacity development for long-term visions and plans	NRGO & MOJA
	3) Capacity development for environmental monitoring	



Proposed Projects/Measures

1. Erosion Control Work
   (1) Erosion Control Work: 76.7km^2 (Concrete Check Dam, Gabion Check Dam, Wooden Check Dam, Counter Bund, Seeding with Fertilizing) ( )
   (2) Prevention of Landslides
2. Forest and Rangeland Management
   (1) Pilot Activity of Participatory Resource Management
   (2) Reforestation of 182km^2 ( )
   (3) Forest Management under Forestry Plan ( )
   (4) Conservation of Potected Forests ( )
   (29 places 3,250 ha, Shaft-Siahmezgi Forest 39,511 ha)
   (5) Rangeland Management by Graziers ( )
   (6) Regulation for Participatory Resource Management
   (7) Improvement of Livestock Resettlement Program
3. Plain Area Management
   (1) Source-level Control of Sediment Runoff
   (2) Measures to Control Inflow of Sediment to Wetland ( )
4. Livelihood Development
   (1) Capacity Development of NRGO Provincial and Local Offices
   (2) Livelihood Improvement of Local People in Forest and Rangeland Management
5. Environmental Monitoring
   Monitoring of Soil Erosion Controls, Land Use/Vegetation Cover, Rangeland Management, Forest Management and Livestock Resettlement Program
6. Institutional Arrangement
   (1) Coordination among Relevant Organizations
   (2) Capacity Development for Sustainable Watershed Management

The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland in the Islamic Republic of Iran

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Figure 5.9.1

Watershed Management Plan

5.10 Cost Estimate

The estimated costs of the proposed wastewater management plan at the price level of 2004 are summarized as below. The total project cost (investment cost) is estimated at 726,785 million Rials up to 2019 and the average annual operation and maintenance cost is 2,889 million Rials/year.

Proposed Projects/Measures	Project Cost (million Rials)	O&M Cost	
		Overall (million Rials)	Average (million Rials/year)
1. Soil Erosion Control and Prevention of Landslides <1			
(1) Soil Erosion Control			
1) Vegetative measures (7,666 ha)	60,775	-	-
2) Structural measures (6 basins)	146,230	10,164	678
(2) Prevention of Landslides	57,960	4,000	267
2. Forest and Rangeland Management			
(1) Pilot activity of participatory resource management	13,070	-	-
(2) Reforestation of degraded forests (70 km^2)	59,559	-	-
(3) Reforestation in the margin areas (112 km^2)	97,424	-	-
(4) Forest management under forestry plans (4 basins)	Regular work <2		
(5) Conservation of protected forests	Regular work <2		
(6) Rangeland management (7 basins) by graziers	8,923	23,377	1,496
(7) Development of regulations necessary for participatory resource management	236	-	-
(8) Improvement of the livestock resettlement program	3,666	-	-
3. Plain Area Management (Control of Sediment Run-off)			
(1) Source-level control of sediment runoff in plain area <1	83	-	-
(2) Measures to control inflow of sediment into the wetland	628	2,163	144
(3) River management for extreme conditions	-	-	-
4. Livelihood Development			
(1) Capacity development of NRGO provincial and local offices	3,477	-	-
(2) Livelihood improvement of local people in forest and rangeland management <3	-	-	-
5. Environmental Monitoring Plan			
(1) Monitoring of soil erosion effects	-	185	12
(2) Monitoring of land use / vegetation cover	-	83	6
(3) Monitoring of rangeland management	-	245	16
(4) Monitoring of forest management	-	594	40
(5) Monitoring of livestock resettlement program		2,520	168
6. Institutional Arrangement			
(1) Coordination among relevant organizations			
1) Coordination of NRGO and WMD <1	Regular work <2		
2) Coordination of NRGO and DOE <1	Regular work <2		
3) Information sharing among NRGO, WMD and RWO <1	Regular work <2		
(2) Capacity development for sustainable watershed management			
1) Capacity development for participatory resource management	1,023	-	-
2) Capacity development for long-term vision and planning	510	-	-
3) Capacity development for environmental monitoring	-	-	-
Total Project Cost excluding the Resettlement Program	453,564	43,331	2,889
Project Cost of Livestock Resettlement Program	273,221	-	-
Total Project Cost including the Resettlement Program	726,785	43,331	2,889

Note: <1 The items include "preparation of long-term plans and execution studies"; <2 Activities should be done within the regular work of the respective offices; <3 The cost of "Livelihood improvement of local people" is not counted since all activities related to this work are already included in "Forest and Rangeland Management".

5.11 Implementation Program

(1) Executing Organization

The organizations to be involved in implementation of the proposed watershed management plan are MOJA, NRGO and DOE.

(2) Prioritization for Implementation

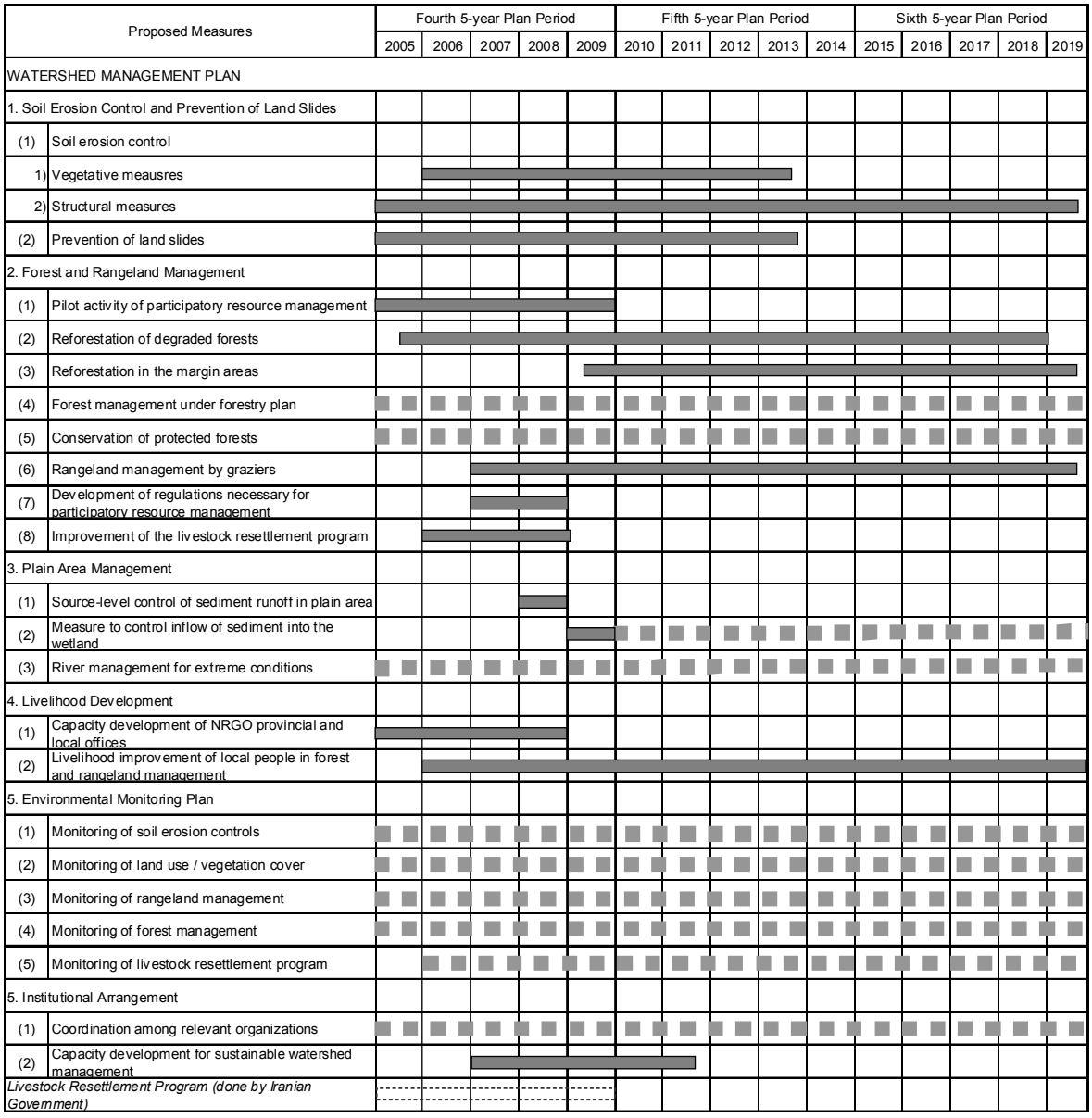
For the preparation of an implementation schedule for the proposed watershed management plan, the proposed projects/measures are prioritized as below based on the evaluation criteria mentioned in Chapter 3.

Planned Activities	Effect	Urgency	Efficiency	Social impact	Capacity	Conformity	Cost	Overall Evaluation
1. Soil Erosion Control and Prevention of Landslides								
(1)Soil erosion control								
1)Vegetative measures	A (4)	A (4)	A (4)	A (4)	A (2)	A (2)	B (1)	A (21)
2)Structural measures	A (4)	A (4)	A (4)	B (2)	A (2)	A (2)	B (1)	A (19)
(2) Prevention of landslides	A (4)	B (2)	A (4)	B (2)	C (0)	B (1)	B (1)	B (14)
2. Forest and Rangeland Management								
(1)Pilot activity of participatory resource management	A (4)	A (4)	B (2)	A (4)	B (1)	A (2)	A (2)	A (19)
(2)Reforestation of degraded forests	A (4)	A (4)	A (4)	B (2)	A (2)	A (2)	B (1)	A (19)
(3)Reforestation in the margin areas	B (2)	B (2)	B (2)	A (4)	B (1)	A (2)	B (1)	B (14)
(4)Forest management under forestry plans	*Not evaluated <1*							
(5)Conservation of protected forests	*Not evaluated <1*							
(6)Rangeland management by graziers	A (4)	A (4)	A (4)	A (4)	B (1)	A (2)	A (2)	A (21)
(7)Development of regulations necessary for participatory resource management	B (2)	B (2)	B (2)	A (4)	B (1)	A (2)	A (2)	B (15)
(8)Improvement of the livelihood resettlement program	B (2)	A (4)	B (2)	A (4)	B (1)	A (2)	A (2)	B (17)
3. Plain Area Management								
(1)Source-level control of sediment runoff in plain area	B (2)	B (2)	B (2)	B (2)	B (1)	B (1)	B (1)	C (11)
(2)Measures to control inflow of sediment into the Wetland	A (4)	B (2)	A (4)	C (0)	B (1)	B (1)	C (0)	C (10)
(3)River management for extreme conditions	B (2)	B (2)	B (2)	B (2)	B (1)	B (1)	B (1)	C (11)
4. Livelihood Development								
(1)Capacity development of NRGO provincial and local offices	A (4)	A (4)	B (2)	A (4)	B (1)	A (2)	A (2)	A (19)
(2)Livelihood improvement of local people in forest and rangeland management	*Not evaluated <2*							
5. Institutional Arrangement								
(1)Coordination among relevant organizations	B (2)	A (4)	B (2)	C (0)	A (2)	A (2)	A (2)	B (14)
(2)Capacity development for sustainable watershed management	A (4)	B (2)	B (2)	B (2)	B (1)	A (2)	A (2)	B (15)
Weight	2	2	2	2	1	1	1	-

Note: Scores for criteria: A = 2, B = 1, C = 0
Overall evaluation: A: 22~18, B: 17~14, C: 13~9, D: below 9
<1 Regular works are not evaluated in the evaluation.
<2 This is not evaluated since all activities related to this work are already included in "Forest and Rangeland Management".

(3) Implementation Schedule

Based on the prioritization evaluation mentioned above, the implementation schedule for the proposed watershed management plan up to the target year of 2019 is proposed as below.



(4) Priority Projects

Among the projects/measures to be commenced in the first five years, that is, the Forth Five-year Development Plan period, the projects/measures to be commenced immediately are selected as priority projects. The priority projects in the proposed watershed

management plan are selected as follows:

1) Vegetative erosion control measures
2) Structural erosion control measures
3) Pilot activity of participatory resource management
4) Reforestation of the degraded forests
5) Livelihood development (Capacity development of NRGO offices)

CHAPTER 6 WASTEWATER MANAGEMENT PLAN

6.1 Introduction

The Anzali Wetland receives roughly 65,300 tons/year of COD, 6,930 tons/year of T-N, and 819 tons/year of T-P, from various pollution sources in the watershed, and the resulting water pollution is one of the most serious environmental problems in the wetland. It is affecting the entire ecosystem of the wetland, as exemplified by the overgrowth of macrophytes, fish kills due to low dissolved oxygen levels in water, change in the composition of fish species, and various other ecological changes. In order to control water pollution, the various organizations like DOE, MOJA and GWWC are making efforts in managing wastewater generated from domestic, industrial and agricultural activities. However, these efforts are still limited, and the greater part of the wastewater is discharged without any treatment. Because all wastewaters from the watershed accumulate in the wetland, more integrated efforts are needed to make significant improvement in water quality in the wetland. Thus, a comprehensive wastewater management plan covering all major pollution sources is proposed below.

6.2 Objective and Strategies

6.2.1 Objective

The objective of the wastewater management plan is as follows:

- To improve and maintain the water quality of the Anzali Wetland at a level acceptable for its ecosystem, by implementing affordable and effective wastewater management

6.2.2 Strategies

To achieve the above objectives, the following strategies are to be employed:

1) Setting of targets for wastewater management;
2) Management of domestic wastewater in the urban areas;
3) Management of domestic wastewater in the rural areas;
4) Management of industrial effluent
5) Management of livestock waste; and
6) Management of pollution from farmland.

(1) Target of Ambient Water Quality

The acceptable level of ambient water quality in the wetland was set at 30 mg/L of COD, 2.0 mg/L of T-N and 0.20 mg/L of T-P in 2019. Also, the pollution load reduction targets for the 2019 level were set at 44% for COD, 32% for T-N and 52% for T-P for the eastern part of the wetland and 10 % for COD, 7 % for T-N and 12 % for T-P for the western part as shown below.

(Unit: ton/year)

Item		Western Side	Eastern Side	Total
COD	Future Prediction	23,718 (100%)	63,433 (100%)	87,151 (100%)
	Target Level	21,292 (90%)	35,237 (56%)	56,529 (65%)
	Required Reduction	2,426 (10%)	28,196 (44%)	30,141 (35%)
T-N	Future Prediction	2,748 (100%)	5,838 (100%)	8,586 (100%)
	Target Level	2,543 (93%)	3,945 (68%)	6,488 (76%)
	Required Reduction	205 (7%)	1,893 (32%)	2,098 (24%)
T-P	Future Prediction	280 (100%)	840 (100%)	1,111 (100%)
	Target Level	246 (88%)	401 (48%)	647 (58%)
	Required Reduction	34 (12%)	439 (52%)	466 (42%)

Source: JICA Study Team

(2) Target for Toxic Material and Heavy Metals

Pollution sources of toxic materials and heavy metals are industrial effluent and agricultural chemicals. No serious pollution from toxic materials or heavy metals has been reported so far. The target for toxic material and heavy metals is to maintain the effluent standards and present consumption level of agricultural chemicals.

6.3 Management of Domestic Wastewater in Urban Areas

(1) Introduction

The urban domestic wastewater is the biggest pollution source in the watershed and is projected to account for 60 - 70 % of total pollution load in 2019. In order to achieve the target of pollution load reduction, the following measures are proposed for management of domestic wastewater in the urban areas.

1) Sewerage system development with advanced treatment process, of which

service population will cover more than 43,000 residents in the eastern area and more than 748,000 residents in the western area.

2) Promotion of installation of individual wastewater treatment facilities outside of sewerage service areas in the urban areas.
3) Promotion of use of detergent with low phosphorus, in order to reduce phosphorous pollution load discharged into the wetland

(2) Sewerage System Development

As mentioned in the strategy, the pollution load reduction targets in 2019 are 28,200 ton/year of COD, 1,900 ton/year of T-N and 440 ton/year of T-P in the eastern part of the Anzali Wetland and 1,900 ton/year of COD, 210 ton/year of T-N and 25 ton/year of T-P in the western part. Since conventional treatment process is not capable of reducing phosphorous to the target level, advance treatment process is required for wastewater treatment plants in the sewerage systems. These pollution load reduction rates are equivalent to a service population of 785,000 in the eastern part and 53,000 in the western part, in case of introduction of advanced treatment process. To achieve the targets, the following sewerage system developments are proposed.

Basin	Sewerage Projects	Service Population	Proposed Capacity (m^3/day)
Eastern Part	Rasht (Phase 1)	253,820	80,000
	Rasht (Phase 2)	378,280	80,000
	Anzali (Phase 1)	77,920	34,000
	Anzali (Phase 2)	51,000	20,000
	Sub-total	761,020	214,000
Western Part	Somehsara	56,980	12,700
	Sub-total	56,980	12,700
Total		818,000	226,700

Source: JICA Study Team

(3) Individual Wastewater Treatment outside Sewerage Service Areas

It is estimated that about 5% of the urban population, or 113,000 residents in 2019, will not be covered by the sewerage service area. It is proposed to install individual wastewater treatment facilities (septic tanks) for the areas outside the sewerage service area. The number of the individual wastewater treatment facilities to be set by 2019 is estimated at 22,600 sets. Regarding the large scale building/apartments or housing estates which discharge wastewater of more than 100 m^3/day, they have to have a secondary treatment process to meet the effluent standards according to the by-law.

(4) Promotion of Low Phosphorus Detergent Use

The removal of phosphorus at a stage of wastewater treatment is possible using flocculants, but it will be costly. Therefore, in addition to the sewerage system development, promotion of low phosphorus detergent use is proposed for reduction of phosphorus as adopted in Japan, USA and EU countries. The promotion should be started from research for development as no low phosphorus detergents are available in Iran at present.

6.4 Management of Domestic Wastewater in Rural Areas

(1) Introduction

The rural domestic wastewater accounts for only a few percent of total COD and T-P load on the wetland at present. However, it is recommended to take action to reduce the pollution load in the rural areas in order not only to mitigate environmental impact to the wetland, but also to improve living conditions in the rural areas.

(2) Community Wastewater Treatment System

The target of RWWC is to achieve a service coverage ratio of 40% by 2022. However, reviewing the present progress, the target service coverage ratio in 2019 should be lowered to 15% of the rural population rather than the said 40% assuming the service coverage increase by 5% for every 5 years. For the proposed target, the service population in the rural area will increase as shown below.

Item	2004	2009	2014	2019
Population	394,100	393,200	392,700	392,700
Service Population (Service Ratio)	0 (0%)	18,300 (5%)	39,300 (10%)	58,900 (15%)
Number of Villages	-	7	14	21

Source: JICA Study Team

6.5 Management of Industrial Effluent

(1) Introduction

The industrial production is expected to increase by 2.75 times of the present production in 2004 by 2019, and the industrial effluent will increase from 6,600 m^3/day to 21,000 m^3/day. Also, the industrial effluent may include heavy metals and toxic material. Serious environmental impact is expected if no measure is taken.

It is proposed to construct a wastewater treatment system and also to establish a strict monitoring system for the effective management of industrial effluent. To effectively manage the industrial effluent in the watershed, the following measures are proposed.

1) Promotion of centralization of factories in industrial cities,
2) Introduction of centralized wastewater treatment systems in the industrial cities, and
3) Strengthening of the monitoring activities by DOE.

(2) Centralization of Factories

There are five existing industrial cities and one planned in the watershed. The centralization of factories in the industrial cities should be promoted in the following manner:

1) New industrial factories which have environmental impact should be constructed in the industrial cities,
2) Existing industrial factories which have an environmental impact should be moved to the industrial cities within a certain period such as 5-10 years, or should have a complete wastewater treatment system.

(3) Introduction of Centralized Wastewater Treatment Systems

A centralized wastewater treatment system is proposed for effective management of industrial effluent from the industrial cities. The required treatment capacities are roughly estimated as below.

Industrial City	Area (ha)	Treatment Capacity (m^3/day)	Owner
Rasht	420	14,000	RICC
Anzali	85	5,000	MOIM
Shaft	38	500	MOIM
Somehsara	100	500	MOIM
Fuman	14	500	MOIM
Masal	20	500	MOIM

Source: JICA Study Team

(4) Strengthening of Monitoring Activities by DOE

DOE Guilan, Human Environmental Department is expected to play an important role to strictly monitor the industrial effluent from each industrial factory. There are about 50 water quality parameters in the Iranian effluent standards, including heavy metals and other toxic materials. However, monitoring by DOE Guilan only covers 30 parameters, and those do not include heavy metals or toxic materials. The monitoring by DOE should be strengthened for protection of the wetland. For strengthening of the monitoring activities, DOE Guilan, Human Environmental Department also should be strengthened by the addition of a new water quality laboratory (under construction) and increase of technical staff.

6.6 Management of Livestock Waste

(1) Introduction

There live 862,000 head of cows, buffalo, sheep and goats in the watershed. They are kept in farmers' barns, industrial animal husbandries, grazing land of the plain area and grazing land of the mountain area. Among them, the pollution loads to the wetland from farmers' barns and grazing land of the mountain area would be limited because of low grazing densities and locations. On the other hand, the wastes from industrial animal husbandry and grazing land in the plain area are point sources and may cause some pollution to the wetland. The measures for those wastes should be considered.

(2) Treatment of Livestock Waste from Industrial Animal Husbandry

There are 17 industrial animal husbandries in the watershed, which feed more than 3,000 head of cows. Each industrial animal husbandry feeds more than 20 head. The livestock waste from the industrial animal husbandries should be treated to meet the effluent standard. Any newly established industrial animal husbandry has to be equipped with a proper wastewater treatment facility and storage of livestock manure according to the regulations of DOE. On the other hand, the existing industrial animal husbandries are not subject to the said regulation. It is therefore proposed to oblige the existing industrial animal husbandries to install a facility for the storage of livestock manure for reuse and a treatment facility for wastewater.

(3) Control of Livestock Waste in Grazing Land in the Plain Area

About 20,000 head of livestock are fed in the grazing land in the plain area. Where the grazing area is located near a river channel or the wetland, livestock waste will pollute the river water which finally flows into the Anzali Wetland or the wetland water. It is proposed to install watering points to keep livestock away from river channels and also to provide a buffer zone to prevent direct drainage into the rivers or the wetland. The buffer zone consists of a grass zone and trees on small dikes between the grazing area and the river channel.

6.7 Management of Pollution from Farmland

(1) Introduction

The Agricultural Support Center of MOJA has been implementing programs to reduce the uses of chemical fertilizers and other agricultural chemicals, such as pesticides and fertilizers. As a result, the application rate of phosphorous in the area has been reduced to approximately 1/10 of previous levels in the last 10 years, and as many as 20,000 ha, or

some 22% of the agricultural areas, received biological pest management in 2002. However, it is estimated that about 6,000 ton of nitrogen, 324 ton of phosphate, and 500 ~ 600 ton/year of agrochemicals were used in the area last year.

At this point, it is difficult to evaluate whether further reduction of fertilizers and other agricultural chemicals is practical, as such decisions could affect the livelihood of local farmers, and more discussions and research are needed. Nevertheless, it is necessary to at least tighten the control of fertilizes and other agrochemicals for the conservation of the Anzali Wetland. Considering the need to balance the production and environmental conservation, the master plan proposes the following programs.

(2) Promotion of Farming with Less Input

1) Promotion of use of compost such as livestock manure and/or *Azolla*

Traditionally, farmers use livestock waste as one of the farm inputs in the study area. Although it might possibly cause water pollution by COD, T-N and T-P if it is excessively dosed, livestock waste-based compost should be further promoted to minimize the use of chemical fertilizers, especially nitrogen-based ones (e.g., urea, ammonium sulfate, etc.). The following actions should be considered to promote the use of compost.

1) provide a subsidy for using organic materials
2) give added value to products organically grown (e.g., promotion of the product brand "Organic Rice from Guilan Province")
3) develop a network with industrial livestock raisers to encourage recycling livestock waste
4) coordinate between DOE and the Agricultural Service Center/Cooperatives to promote the use of *Azolla* as green manure.

As discussed in Chapter 4, the use of compost/organic materials should first focus on the buffer zone to minimize the pollution load to the wetland.

2) Expansion of Integrated Pest Management through Farmer Field Schools

Integrated pest management (IPM) has been promoted by MOJA since 1999 as one of their extension programs. The main principle of IPM is to increase farm profit of individual farmers through reducing the expenses for external farm inputs while maintaining the productivity. However, the coverage of the IPM activity has been limited, and the IPM practices seem unfamiliar to farmers in the study area. It is, therefore, proposed that two groups of two experts on IPM conduct 10 Farmer Field Schools every year at different sites, and give guidance to about ten families of farmers at each school for several months. The farmers who get the guidance are expected to be trainers and disseminate knowledge to

his/her neighbors. The proposed IPM program should be concentrated in the buffer zone at the beginning, and thence, expanded to the transition zone gradually.

(3) Proper Use of Agricultural Chemicals and Water Management

Farming practices on farm input application and water management are crucial for the control of pollution loads from farmlands. Diazinon is the main agricultural chemical presently used in the area. Since it has the property of being easily hydrolyzed and reduced in paddy fields, due attention should be paid to water management to minimize the discharge to river systems before decomposition. The Agricultural Service Center should emphasize the importance of water management at the field level in addition to the extension works on the uses of agricultural chemicals and fertilizers.

6.8 Environmental Monitoring for Wastewater Management

The wastewater management plan was prepared based on limited information on the environmental condition of the Anzali Wetland and the situation of pollution sources in the basin. The following monitoring programs should be implemented to monitor the effectiveness of the proposed measures, and the plan should be revised periodically so as to reflect the actual conditions in the field.

1) Monitoring of domestic wastewater treatment
2) Monitoring of industrial factories
3) Monitoring of agricultural activity
4) Monitoring of pollution load to the wetland
5) Monitoring of ambient water quality

6.9 Institutional and Organizational Arrangements

In order to effectively implement the proposed wastewater management plan, the following institutional arrangement is proposed.

(1) Revision of Regulations Related to Effluent Standards

There appear to be conflicting regulations about the effluent standards, pollution charges related to effluent, pollution tax on industry, and fines and punitive measures associated with pollution. These regulations should be clarified and unified under a clear legal framework for pollution control.

(2) Establishment of Ambient Water Standards

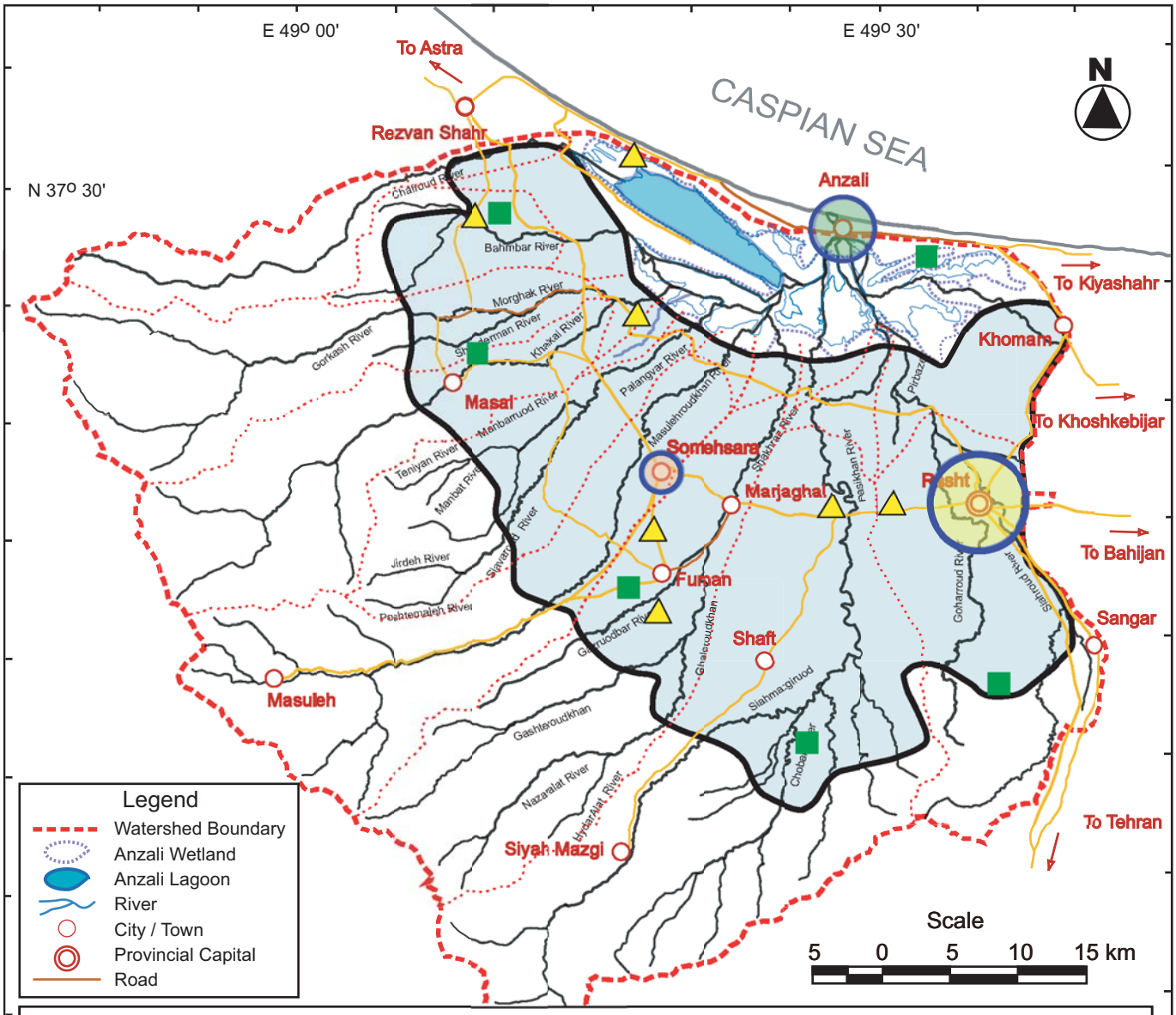
Iran has no standard or guideline for ambient water quality. It is recommended that ambient water quality standards should be established for different water bodies (rivers,

lakes, coastal wetlands, etc.) taking into consideration the ideal water quality, the current situation and uses of the water bodies.

6.10 Summary of Proposed Wastewater Management Plan

The projects/measures proposed in the wastewater management plan are summarized as below and illustratively shown in Figure 6.10.1.

Sub-Components	Proposed Projects/Measures		Executing Organizations
Management of Domestic Wastewater in Urban Area	(1)	Rasht Sewerage System Development Project Phase 1 Service Population: 253,816 residents Treatment Capacity: 80,000 m^3/d Phase 2 Service Population: 378,284 residents Treatment Capacity: 80,000 m^3/d	GWWC
	(2)	Anzali Sewerage System Development Project Phase 1 Service Population: 77,920 residents Treatment Capacity: 34,000 m^3/d Phase 2 Service Population: 51,000 residents Treatment Capacity: 20,000 m^3/d	GWWC
	(3)	Somehsara Sewerage System Development Project Service Population: 56,980 residents Treatment Capacity: 12,700 m^3/d	GWWC
	(4)	Promotion of Individual Wastewater Treatment Facilities outside of Sewerage Service Area Target Population: 113,000 residents Number of Septic Tank Installation: 22,600 units	DOE
	(5)	Promotion of Low Phosphorous Detergent Use	DOE
Management of Domestic Wastewater in Rural Area	(1)	Community Wastewater Treatment System Development Service Population: 57,000 residents Sites: 21 villages	RWWC
Management of Industrial Effluent	(1)	Centralization of Industrial Factories Sites: Six Industrial Cities (Anzali, Rasht, Somehsara, Fuman, Shaft and Masal)	DOE/MOIE
	(2)	Construction of Centralized Wastewater Treatment System Sites: Six Industrial Cities (Anzali, Rasht, Somehsara, Fuman, Shaft and Masal) Total Treatment Capacity: 21,000 m^3/day	DOE/MOIE/ Private company
	(3)	Strengthening of Monitoring Activities by DOE	DOE
Management of Livestock Waste	(1)	Treatment of livestock waste from industrial animal husbandry Sites: 17 sites of existing industrial animal husbandries	DOE
	(2)	Control of livestock waste in grazing lands in the plain area	DOE
Management of Pollution from Farmland	(1)	Promotion of farming with less input 1) Promotion of use of compost such as livestock manure and/or *Azolla* 2) Expansion of Integrated Pest Management through Farmer Field School	MOJA
	(2)	Proper Use of Agricultural Chemicals and Water Management	MOJA



Proposed Projects/Measures

1. Management of Domestic Wastewater in Urban Area
   - (1) Rasht Sewerage System Development Project
   - (2) Anzali Sewerage System Development Project
   - (3) Somehsara Sewerage System Development Project
   - (4) Promotion of Individual Wastewater Treatment Facilities outside Sewerage Service Area
   - (5) Promotion of Low Phosphorous Detergent Use
2. Management of Domestic Wastewater in Rural Area
   - (1) Community Wastewater Treatment System Development
     The designs for seven villages ( ) were completed.
3. Management of Industrial Effluent
   - (1) Centralization of Industrial Factories ( )
   - (2) Construction of Centralized Wastewater Treatment System
   - (3) Strengthening of Monitoring Activities by DOE
4. Management of Livestock Waste
   - (1) Treatment of Livestock Waste from Industrial Animal Husbandry
   - (2) Control of Livestock Waste in Grazing Lands in the Plain Area
5. Management of Pollution from Farmland ( )
   - (1) Promotion of Farming with Less Input
   - (2) Coordination between Monitoring and Agricultural Extension
6. Environmental Monitoring for Wastewater Management
   Monitoring of Domestic Wastewater Treatment, Industrial Factories, Agricultural Activity, Pollution Loads to the wetland, and Ambient Water Quality

The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland in the Islamic Republic of Iran

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.10.1

Wastewater Management Plan

6.11 Cost Estimate

The estimated costs of the proposed wastewater management plan at the price level of 2004 are summarized as below. The total project cost (investment cost) is estimated at 2,450,000 million Rials up to 2019 and the average annual operation and maintenance cost is 42,630 million Rials/year.

Proposed Projects/Measures	Project Cost (million Rials)	O&M Cost	
		Overall (million Rials)	Average Annual (million Rials/year)
1. Management of Domestic Wastewater in Urban Areas			
(1) Rasht Sewerage System Development Project			
1) Rasht sewerage (Phase 1), for 253,816 residents	741,088	274,218	25,810
2) Rasht sewerage (Phase 2), for 378,284 residents	588,426		
(2) Anzali Sewerage System Development Project			
1) Anzali sewerage (Phase 1), for 77,920 residents	510,018	90,161	8,443
2) Anzali sewerage (Phase 2), for 51,000 residents	177,633		
(3) Somehsara Sewerage System Development Project for 56,980 residents	214,380	33,984	4,076
(4) Promotion of Individual Wastewater Treatment	28,250	283	283
(5) Promotion of Low Phosphorous Detergent	0	1,940	194
2. Management of Domestic Wastewater in Rural Areas			
(1) Community Wastewater Treatment System Development			
1) Initial Stage for Seven Villages	19,830	8,349	1,089
2) Second Stage	19,830		
3) Third Stage	19,830		
3. Management of Industrial Effluent			
(1) Centralization of Industrial Factories	1,330	0	0
(2) Construction of Centralized Wastewater Treatment System			
1) Rasht industrial city	67,500	17,249	2,052
2) Anzali, Somehsara, Fuman and other industrial cities	60,750		
(3) Strengthening of Monitoring Activities by DOE	0	4,095	273
4. Management of Livestock Waste			
(1) Treatment of Livestock Waste from Industrial Animal Husbandry	500	260	20
(2) Control of Livestock Waste in Grazing Lands in the Plain Area	500	300	84
5. Management of Pollution from Farmland			
(1) Promotion of Farming with Less Input			
1) Expansion of use of compost such as livestock manure and/or *Azolla*	0	3,960	402
2) Expansion of integrated pest management through farmer field school			
3) Promotion of Proper farming practice			
6. Environmental Monitoring	0	5,250	350
Total	2,449,866	439,766	42,634

6.12 Implementation Program

(1) Executing Agencies

The organizations to be involved in implementation of the proposed wastewater management plan are GWWC, RWWC, DOE, MOJA, MOIM and private firms as mentioned in Section 6.10.

(2) Prioritization for Implementation

For the preparation of an implementation schedule for the proposed wastewater management plan, the proposed projects/measures are prioritized as below based on the evaluation criteria mentioned in Chapter 3.

Criteria / Proposed Projects/Measures	1		2	3	4	5	6	7	8	9	Overall Evaluation
	a	b	a						a	a	
1.Management of Domestic Wastewater in Urban Areas											
(1)Rasht Sewerage System Development Project	A	C	A	A	C	B	A	A	A	B	A (21)
(2)Anzali Sewerage System Development Project	A	C	A	A	C	B	A	A	A	B	A (21)
(3)Somehsara Sewerage System Development Project	B	C	A	B	C	B	A	A	A	B	A (17)
(4)Promotion of Individual Wastewater Treatment	B	C	B	C	C	C	C	A	B	C	C (6)
(5)Promotion of Low Phosphorous Detergent	A	C	A	B	B	C	C	A	C	C	B (11)
2.Management of Domestic Wastewater in Rural Areas											
(1)Community Wastewater Treatment System Development	B	C	B	B	B	B	A	A	A	B	A (17)
3.Management of Industrial Effluent											
(1)Centralization of Industrial Factories	B	B	C	B	B	B	A	A	A	A	A (19)
(2)Construction of Centralized Wastewater Treatment System											
1)Rasht	A	B	A	A	B	B	B	A	B	B	A (21)
2)Others	B	B	B	C	B	B	B	A	B	B	B (14)
(3)Strengthening of Monitoring Activities by DOE	B	A	B	A	A	B	B	A	B	B	A (21)
4.Management of Livestock Waste											
(1)Treatment of Livestock Waste from Industrial Animal Husbandry	B	C	B	A	B	B	B	A	B	B	A (16)
(2)Control of Livestock Waste in Grazing Lands in the Plain Area	B	C	B	C	B	C	C	A	B	A	C (9)
5.Management of Pollution from Farmland											
(1)Promotion of Farming with Less Input	B	B	B	B	A	A	B	A	B	B	A (19)
Weight	2	2	1	2	1	2	2	1	1	1	-

Note: Criteria 1=Effect, a. Reduction of organic pollution, b. Reduction of heavy metals and toxic materials; 2= Efficiency, a. Quickness of response, 3= Urgency, 4= Cost, 5= Capacity of executing organization, 6= Conformity with national policy; 7= Environmental impact, 8= Social impact, a. Improvement of public health; 9= Other criteria, a. Difficulty on technical point; Score A=2, B=1, C=0; Overall Evaluation, A: more than 30, B: 20-30, C: less than 20; Source: JICA Study Team

(3) Implementation Schedule

Based on the prioritization evaluation mentioned above, the implementation schedule of the proposed wastewater management plan up to the target year 2019 is proposed as below.

Proposed Measures	Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WASTEWATER MANAGEMENT PLAN															
1. Management of Domestic Wastewater in Urban Area															
(1) Rasht Sewerage System Development Project															
1) Rasht Sewerage (Phase 1)	■	■	■	■	■										
2) Rasht Sewerage (Phase 2)						■	■	■	■	■	■	■	■	■	■
(2) Anzali Sewerage System Development Project															
1) Anzali Sewerage (Phase 1)	■	■	■	■	■										
2) Anzali Sewerage (Phase 2)						■	■	■	■	■	■	■	■	■	■
(3) Somehsara Sewerage System Development Project	■	■	■	■	■	■	■	■	■	■					
(4) Promotion of Individual Wastewater Treatment											■	■	■	■	■
(5) Promotion of Low Phosphorous Detergent						■	■	■	■	■	■	■	■	■	■
2. Management of Domestic Wastewater in Rural Area															
(1) Community Wastewater Treatment System Development															
1) First Stage (Seven Villages)		■	■	■	■										
2) Second Stage & Third Stage						■	■	■	■	■	■	■	■	■	■
3. Management of Industrial Effluent															
(1) Centralization of Industrial Factories		■	■	■											
(2) Construction of Centralized Wastewater Treatment															
1) Anzali	■			■	■										
2) Rasht			■	■	■										
3) Others						■	■	■	■	■	■	■	■	■	■
(3) Strengthening of Monitoring Activities by DOE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4. Management of Livestock Waste															
(1) Treatment of Livestock Waste from Industrial Animal Husbandry		■	■	■	■	■	■	■	■	■	■	■	■	■	■
(2) Control of Livestock Waste in Grazing Lands in the Plain Area											■	■	■	■	■
5. Management of Pollution from Farmland															
(1) Promotion of Low External Input Farming															
1) Expansion of use of compost such as livestock manure and/or Azolla	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2) Expansion of integrated pest management through farmer field school	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3) Promotion of proper farming practice	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
(2) Coordination between Monitoring and Agricultural Extension	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

(4) Priority Projects

Among the projects/measures to be commenced in the first five year, that is, Forth Five-year Development Plan period, the projects/measures to be commenced immediately are selected as priority projects. The priority projects in the proposed wastewater management plan are selected as follows:

1) Rasht Sewerage System Development Project (Phase 1)
2) Anzali Sewerage System Development Project (Phase 1)
3) Strengthening of Monitoring Activities by DOE
4) Construction of a Centralized Wastewater Treatment System in Rasht Industrial City

CHAPTER 7 SOLID WASTE MANAGEMENT PLAN

7.1 Introduction

As discussed in Chapter 2, the waste collection coverage is only 65% on a population basis, and no collection service is provided in rural areas. Consequently, illegal dumping is ubiquitous and as much as 66 tons/day of solid waste is dumped into the tributaries of the Anzali Wetland. Even in urban areas where a door-to-door collection service is provided almost everyday, dumping into rivers and open spaces is common due to the low environmental awareness of the residents. Environmental contamination around the existing dumping sites is also a concern as no leachate control is practiced at any of the dumping sites, including the Anzali dumping site located adjacent to the Wetland. There is no established system to manage the hazardous wastes, and management of non-hazardous waste is a potential issue in the future. Given these situations, drastic improvement of solid waste management is needed.

7.2 Objectives and Strategies

7.2.1 Objectives

The solid waste management problem in the area is the manifestation of poor environmental management in the area, and the resulting scattering of uncollected waste is both a public health concern and is the main reason for the downstream contamination of Anzali Wetland by solid waste. Thus, the informal disposal of uncollected solid waste and open dumping should be controlled urgently. In addition, industrial waste, especially hazardous wastes, must be controlled carefully, as their environmental impact can be significant. The objectives of the Solid Waste Plan are thus:

1) To reduce uncollected disposal of municipal solid waste by proper management, including the prevention of its flowing to the Wetland, and
2) To implement proper control of industrial solid waste.

7.2.2 Strategies

To achieve the above objectives, the following strategies should be employed.

(1) Environmental Awareness Raising

The environmental awareness is expected to become more important in the future, as the residents would face increasingly difficult waste management issues, such as reduction of the amount of waste, construction of landfills, reduction in excessive solid waste

management cost by reducing collection frequencies and points, etc. These measures require people's understanding about their necessity, and people's cooperation and active participation in these measures.

(2) Provision of Efficient Municipal Solid Waste Collection Service to the Whole Area

Rural areas had had no waste collection service at all. The new solid waste law promulgated recently finally made it mandatory to provide solid waste management in rural areas. Thus, the main strategy is to develop a system of waste collection systems in rural areas. In the urban areas, where rather excessive collection service has been provided, the improvement of service efficiency is the primary direction.

(3) Proper Disposal of Municipal Solid Waste

The government is pursuing a strategy to construct composting plants to separate, recycle and stabilize waste before final disposal. There is already a composting plant in Rasht, and another composting plant will open in 2006 in Abkenar. Thus, waste reduction using these facilities is considered in the plan. In addition, new sanitary landfills should be constructed as the existing dumping sites were not properly designed or constructed.

(4) Control of Hazardous Waste and Infectious Waste

The amount of hazardous industrial solid waste containing toxic substances, such as heavy metals, is limited, but it could pose a significant environmental threat to the wetland located downstream. Thus, some urgent measures to control hazardous waste should be implemented. The same can be said about infectious waste.

7.3 Municipal Solid Waste Management

(1) Environmental Awareness Raising

The illegal dumping of waste may be a long-term habit of the local people. It is necessary to raise the environmental awareness of the people. The effective way will be to encourage the people to participate in solid waste management activities. One idea is a recycling activity by the community. It is proposed to establish a system for collaboration among the municipalities, people and recyclers and also participation of NGOs will be helpful for smooth implementation of the recycling activities.

The subject recyclables are glass bottles, PET bottles, steel and paper. The proposed frequency is once a month and the money earned should be used as an incentive for the people to continue the recycling. In parallel with recycling activities, various environmental education programs such as utilization of the media, seminars and

workshops, should be held. Site visits to solid waste treatment facilities should also be prepared in order to have the people understand importance of the recycling activity.

(2) Provision of Efficient Municipal Waste Collection to the Whole Area

According to the new municipal law, the counties consisting of urban municipalities (Shahrs) and villages (Dehestans) are responsible for the solid waste management in their whole administrative area. At present, the urban municipalities have been providing the waste collection services for 6 to 7 days a week for every household, while the villages have not started the waste collection services yet. In order to start the collection services in the villages, it is necessary to procure collection vehicles and establish the disposal system. The required number of the collection vehicles will be 30 – 40 nos.

Extension of collection service to the villages will be costly. Thus, it is proposed to reduce the solid waste management cost in urban municipalities by changing the collection frequency and collection points. Referring to the practice in Japan, the proposed collection frequency is 3 – 4 times a week and the proposed collection points are arranged for every 10-20 households. By this change, the present solid waste management cost in the municipalities will be reduced by about 40%. This change will also result in reduction of the solid waste volume.

(3) Proper Disposal of Municipal Solid Waste

1) Composting of Municipal Solid Waste

It is not easy to find a proper disposal site in the watershed, especially in the plain area such as Anzali municipality. It is therefore needed to reduce the waste volume as much as possible by composting the waste. One composting plant is under operation in Rasht municipality and one composting plant is planned by Anzali municipality. For the sustainable operation, the composting plants should be utilized by several municipalities. Based on the comparative study, it is proposed to divide ten municipalities into two groups as follows:

- Group A: Rasht, Sangar and Khomam
- Group B: Anzali, Somehsara, Fuman, Masal, Toolem, Shaft and Masuleh

Two composting plants are needed including the existing one in Rasht. One is for Group A, and another is for Group B. For Group A, a composting plant with a capacity of 510 ton/day should be added to the existing Rasht composting plant with a capacity of 250 ton/day. For Group B, a composting plant with a 385 ton/day is required. As for the plant for Group B, the plant planned by Anzali municipality with a capacity of 300 ton/day can be utilized for the time being. It will be completed in 2006. The volume of waste for

composting will be reduced by about 25 - 40 %.

2) Construction of Sanitary Landfills

There are several dumping sites in the watershed. Among them, Sarawan site in Rasht township and Anzali site in Anzali municipality are major ones. However, none of them has a leachate treatment facility. In order to reduce influence to the Anzali Wetland, proper treatment will be necessary. It is proposed to construct a sanitary landfill closing the present dumping sites. Considering the present situation, two sanitary landfills will be necessary. One is for the Group A mentioned before in Rasht township and one for the Group B in Anzali municipality. The required area of Rasht landfill site is estimated at 12 ha and that of Anzali site at 6 ha. These landfill sites will be located near the proposed composting plants.

3) Closure of Present Open Dumping Site

The present open dumping sites in Sarawan and Anzali are to be closed. It is very important to close the open dumping sites carefully. They should be covered with soil firmly and be vegetated. Also, it is better to install gas releasing pipes from the surface of the dumping sites. Even after closure, long-term monitoring of the leachate and underground water around the closed sites will be necessary.

7.4 Industrial and Medical Solid Waste Management

(1) Proper Treatment of Hazardous Solid Waste

1) Pretreatment Facility for Solid Waste Containing Heavy Metals

The hazardous waste can be disposed of in the municipal landfill sites with proper treatment. A pre-treatment to mix with concrete cement is proposed. The pre-treatment facility should have a capacity of 110 kg/day to cover the hazardous waste amount of 104 ton/year in year 2019.

2) Proper Treatment of Infectious Waste

For treatment of the infectious medical waste, a new incinerator with a capacity of 400 kg/hour has been constructed by Rasht municipality and it will be able to incinerate the amount of 1.8 ton/day in 2019, so that it is proposed to establish a system to separate the infectious waste at hospitals and collect them from hospitals.

(2) Non-hazardous Industrial Solid Waste Management

1) Promotion of Reduction and Recycling of Non-hazardous Industrial Solid Waste

The economic growth in the area is assumed at 5%, and the amount of non-hazardous industrial waste will also increase with the economic growth. It may become necessary to reduce the disposal volume in the future. As the industrial waste is relatively uniform, and relatively easy to recycle both physically and economically, it is proposed to promote a recycling industry for wood waste, plastic waste, organic waste, steel waste, etc. An incinerator for the industrial waste is also proposed to reduce the waste volume.

2) Establishment of Regulations for Industrial Solid Waste Control

Disposal of any industrial or medical solid waste should be monitored strictly. All the factories, hospitals and solid waste treatment companies should be obliged to submit an annual report for monitoring. Introduction of a licensing system is proposed to regulate and control the activities of private solid waste treatment companies. Licenses should be renewed in a certain interval, for instance every 5 years. A guideline for disposal of the industrial and medical solid wastes should be prepared for proper control.

7.5 Institutional and Organizational Arrangements

The cost for the proposed solid waste management system will be higher than the present system. In order to ease the budget pressure to the local governments, it is recommended to charge a solid waste management fee to the residents, may be as municipal tax. While a full cost recovery is desirable, it would cost a household with 4 members 163,000 Rials/year in urban municipality and 311,000 Rials/year in rural area. Though the amount is still within the affordable level, it would be difficult to raise the tax at once. Thus, the support from the local and central governments may be necessary in the beginning.

In order to effectively and efficiently implement the proposed solid waste management plan, close coordination among relevant organizations is required. It is proposed to hold "Solid Waste Improvement Meetings (SWIM)" for coordination among stakeholders. SWIM should have three sub-meetings: meetings on municipal solid waste (SWIM-M), meetings on infectious waste from hospital (SWIM-H), and meetings on industrial hazardous waste (SWIM-I). SWIM-M should be coordinated by DOE and SWIM-H by Guilan Physician & Science University. SWIM-I should be coordinated by Guilan Industries & Mining Organization. The SWIM should be held once or twice a year to exchange opinions among the stakeholders. The sub-meetings can be held when necessary.

7.6 Environmental Monitoring for Solid Waste Management

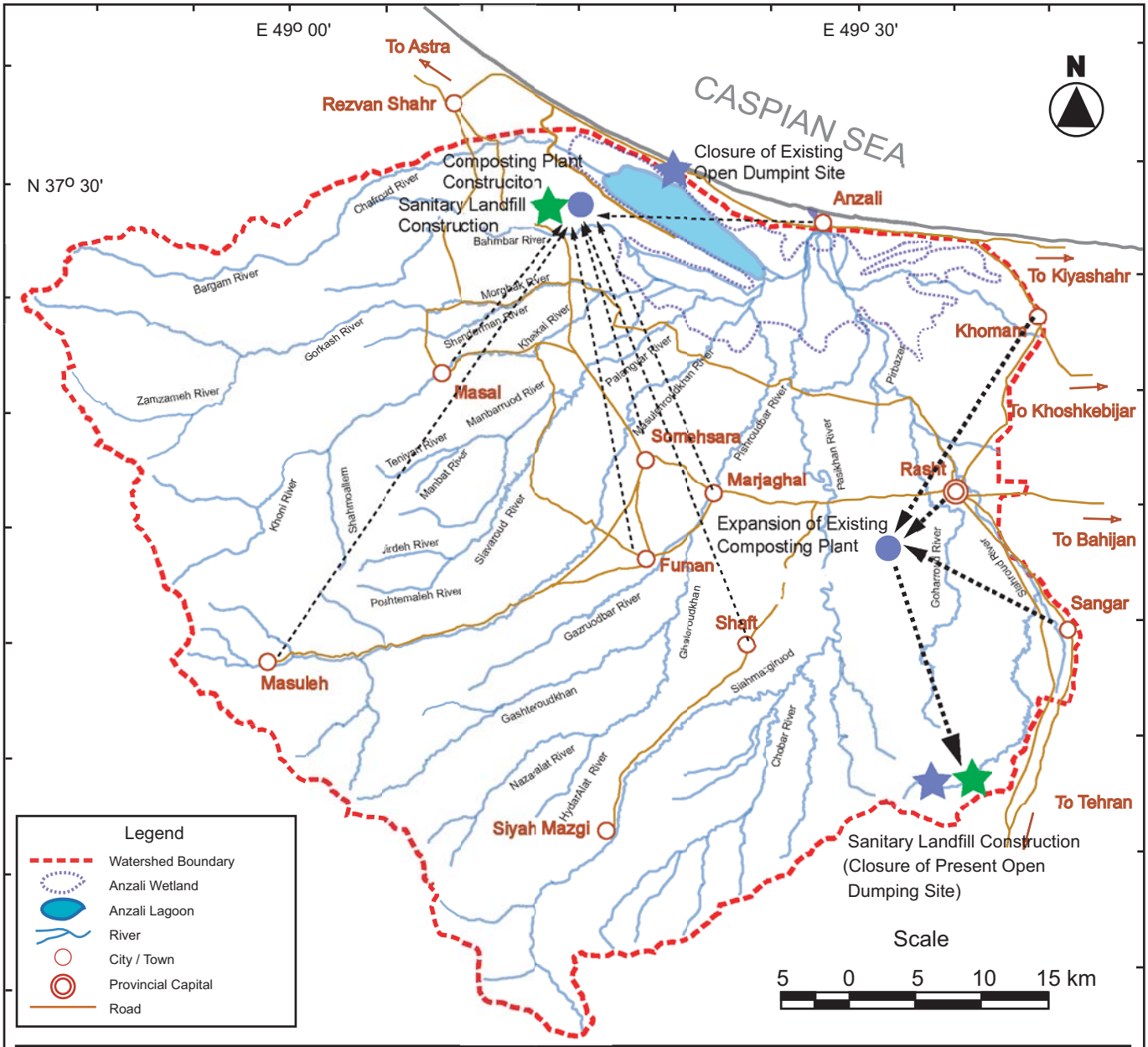
Lack of information is one of the major obstacles for effective solid waste management in the area. Thus, a series of monitoring programs are proposed. Considering the current capacities of municipalities and DOE, the proposed monitoring programs are minimal. However, the information required to optimize solid waste management evolves as the solid waste management becomes sophisticated. Thus, periodical review of required information is necessary. The proposed monitoring activities are as follows:

1) Monitoring of Municipal Waste Management in Urban Areas
2) Monitoring of Municipal Waste Management in Rural Areas
3) Monitoring of Recycling Activity
4) Monitoring of Leachate
5) Monitoring of Industrial Solid Waste Management
6) Monitoring of Medical Waste Management

7.7 Summary of Proposed Solid Waste Management Plan

The projects/measures proposed in the solid waste management plan are summarized as below and illustratively shown in Figure 7.7.1.

Sub-components	Proposed Projects/Measures	Executing Organizations
Municipal Solid Waste Management	(1) Environmental awareness raising 1) Participatory recycling activity 2) Linkage to environmental education (2) Provision of efficient municipal waste collection service to the whole area 1) Provision of waste collection to villages 2) Change of collection frequency and collection points in urban areas (3) Proper disposal of municipal solid waste 1) Composting of municipal solid waste 2) Sanitary landfill construction (Rasht, Anzali) 3) Closure of present open dumping sites	Municipalities
Industrial and Medical Solid Waste Management	(1) Proper treatment of hazardous industrial solid waste 1) Construction of pretreatment facility for solid waste containing heavy metals 2) Establishment of separation and collection system for infectious waste (2) Non-hazardous industrial solid waste management 1) Promotion of reduction/recycling of industrial solid waste 2) Establishment of regulations to control industrial solid waste	 IMO MOH IMO DOE
Environmental Monitoring for Solid Waste Management	(1) Monitoring of municipal waste management in urban areas (2) Monitoring of municipal waste management in rural areas (3) Monitoring of recycling activities (4) Monitoring of leachate from landfills (5) Monitoring of industrial waste management (6) Monitoring of medical waste management	Municipalities Municipalities Municipalities DOE IMO MOH



Proposed Projects/Measures

1. Municipal Solid Waste Management
   (1) Environmental Awareness Raising
      1) Participatory Recycling Activity
      2) Linkage to Environmental Education
   (2) Provision of Efficient Waste Collection Service to the Whole Area
      1) Provision of Waste Collection to Villages
      2) Change of Collection Frequency and Collection Point in Urban Areas
   (3) Proper Disposal of Municipal Solid Waste (▬▬►)
      1) Composting of Municipal Solid Waste (●)
      2) Sanitary Landfill Construction (Rash, Anzali) (★)
      3) Closure of Present Open Dumping Site (★)

2. Industrial and Medical Solid Waste Management
   (1) Proper Treatment of Hazardous Solid Waste
      1) Pretreatment Facility for Solid Waste Containing Heavy Metals
      2) Establishment of Separation and Collection Sytem for Infectious Waste
   (2) Non-hazardous Industrial Solid Waste Management
      1) Promotion of Reduction/Recycling for Industrial Solid Waste
      2) Establishment of Regulations to Control Industrial Solid Waste

3. Environmental Monitoring for Solid Waste Management
   Monitoring of municipal waste in urban and rural areas, recycling activities, leachate from landfills, industrial waste management, and medical waste management

The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland in the Islamic Republic of Iran

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 7.7.1
Solid Waste Management Plan

7.8 Cost Estimate

The estimated costs of the proposed solid waste management plan at the price level of 2004 are summarized as follows. The total project cost (investment cost) is estimated at 146,240 million Rials up to 2019 and the average annual operation and maintenance cost is 35,870 million Rials/year.

Proposed Projects/Measures	Project Cost (million Rials)	O&M Cost	
		Overall (million Rials)	Average Annual (million Rials/year)
1. Municipal Solid Waste Management			
(1) Environmental awareness raising			
1) Participatory recycling activity	0	0	0
2) Linkage to environmental education	0	0	0
(2) Provision of efficient municipal waste collection service to the whole area			
1) Provision of waste collection to villages	22,471	61,717	5,740
2) Change of collection frequency and collection points in urban areas	99,180	284,044	16,633
(3) Proper disposal of municipal solid waste			
1) Composting of municipal solid waste	17,083	178,557	11,904
2) Sanitary landfill construction (Rasht)	3,817	8,372	558
3) Sanitary landfill construction (Anzali)	3,089	3,892	259
4) Closure of present open dumping sites	0	0	0
2. Industrial and Medical Solid Waste Management			
(1) Proper treatment of hazardous industrial solid waste			
1) Construction of Pretreatment facility for solid waste containing heavy metals	600	1,793	119
2) Establishment of separation and collection system for infectious waste	0	6,459	428
(2) Non-hazardous industrial solid waste management			
1) Promotion of reduction/recycling of industrial solid waste	0	0	0
2) Establishment of regulations to control industrial solid waste	0	0	0
3. Environmental Monitoring for Solid Waste Management	0	3,494	233
Total	146,240	548,328	35,874

Source: JICA Study Team

7.9 Implementation Program

(1) Executing Organizations

The organizations to be involved in implementation of the proposed solid waste management plan are municipalities, IMO, MOH, and DOE as mentioned in Section 7.6.

(2) Prioritization for Implementation

For the preparation of an implementation schedule for the solid waste management plan, the proposed projects/measures are prioritized as below based on the evaluation criteria mentioned in Chapter 3.

Criteria / Project			Bad Effect without the Project		Efficiency	Policy Needs		Required Level of Public Environmental Awareness	Project Maturity	Required Ability of Concerning Organization	Investment Cost	Total Score
			Conservation of the Wetland	Public Health		Conformity to National Strategy	Positiveness of Major Executing Organization					
1	Environmental Awareness Raising											
(1)	Participatory Recycling Activity		A	A	C	B	B	A	B	B	A	A(20)
(2)	Linkage to Environmental Education		A	A	C	B	C	B	C	C	A	B(13)
2	Provision of Efficient Waste Collection Service to the Whole Area											
(1)	Provision of Waste Collection Services to Villages		A	A	A	A	A	A	C	C	B	A(21)
(2)	Change of Collection Frequency and Collection Point in Urban Areas		C	C	A	B	C	C	C	C	A	C (5)
3	Proper Disposal of Municipal Solid Waste											
(1)	Composting of Municpal Solid Waste		A	A	A	B	A	A	A	B	C	A(24)
(2)	Sanitary Landfill Construction	(1) Rasht	B	B	A	B	C	A	C	C	B	B(12)
		(2) Anzali	B	B	A	B	C	A	C	C	B	B(12)
(3)	Closure of Present Open Dumping Site		A	A	B	C	C	A	C	C	A	B(15)
4	Proper Treatment of Hazardous Solid Waste											
(1)	Construction of Pre-treatment Facility for Solid Waste Containing Heavy Metals		C	A	A	A	A	A	C	C	A	A(18)
(2)	Establishment of Separation and Collection System for Infectious Waste		C	A	A	A	A	A	A	B	A	A(23)
5	Non-hazardous Industrial Solid Waste Management											
(1)	Promotion of Reduction and Recycling of Industrial Solid Waste		C	C	B	C	C	C	C	C	A	C (3)
(2)	Establishment of Regulations for Industrial and Medical Solid Waste		A	A	A	B	C	B	C	C	A	B(15)
Weight			2	2	1	1	2	2	2	1	1	-

(3) Implementation Schedule

Based on the prioritization evaluation mentioned above, the implementation schedule of the proposed solid waste management plan up to the target year of 2019 is proposed as below.

Proposed Measures		Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SOLID WASTE MANAGEMENT PLAN																
1. Municipal Solid Waste Management																
(1) Environmental Awareness Raising																
1)	Participatory Recycling Activity															
a)	Pilot Activities by Volantary Groups															
b)	Extention of Target Groups															
c)	Full Activity															
(2) Provision of efficient municipal waste collection service to the whole area																
1)	Provision of waste collection services to villages															
a)	Phase 1 (Villages along the rivers)															
b)	Phase 2 (Villages near the Anzali wetland)															
c)	Phase 3 (Villages away from the Anzali wetland)															
2)	Change of collection frequency and collection point in urban areas															
1)	Trial Operation in selected cities															
2)	Extension of Target cities															
3)	Full Operation in selected cities															
(3) Proper disposal of municipal solid waste																
1)	Composting of municipal solid waste															
2)	Sanitary landfill construction															
1)	Rasht															
2)	Anzali															
3)	Closure of present open dumping sites															
2. Industrial and Medical Solid Waste Management																
(1) Proper treatment of hazardous solid waste																
1)	Construction of pretreatment facility for solid waste containing heavy metals															
2)	Establishment of separation and collection system for infectious waste															
(2) Non-hazardous industrial solid waste management																
1)	Promotion of reduction and recycling of industrial solid waste															
2)	Establishment of regulations for industrial and medical solid waste															
3. Environmental monitoring																
(1)	Monitoring of Municipal Waste Management in Urban Areas															
(2)	Monitoring of Municipal Waste Management in Rural Areas															
(3)	Monitoring of Recycling Activities															
(4)	Monitoring of Leachate															
(5)	Monitoring of Industrial Waste Management															
(6)	Monitoring of Medical Waste Management															

(4) Priority Projects

Among the projects/measures to be commenced in the first five years, that is, the Forth Five-year Development Plan period, the projects/measures to be commenced immediately are selected as priority projects. The priority projects in the proposed solid waste management plan are selected as follows:

1) Environmental awareness raising of residents
2) Provision of waste collection service to villages
3) Composting of municipal solid waste
4) Pre-treatment facility for solid waste containing heavy metals
5) Establishment of separation and collection system for infectious waste

CHAPTER 8 ENVIRONMENTAL EDUCATION PLAN

8.1 Introduction

Environmental education, awareness raising, and public participation are three vitally important aspects of the master plan that are essential for the successful implementation of any management plan in this master plan. Considering that these are important to everybody, while the needs and approaches are different from stakeholder to stakeholder, separate, action-oriented programs were proposed for different target groups, namely decision makers, religious leaders, business and industries, farmers and farming communities, general public and tourists, NGOs and journalists, students, teachers and professionals.

8.2 Objectives and Strategies

8.2.1 Objectives

The objectives of the Environmental Education Plan are:

1) To increase the level of environmental awareness and understanding through effective provision of information and life-long learning, so that all stakeholders are more able to adopt environmentally sustainable behaviors and make environmentally focused decisions.
2) To increase the level of all stakeholders' participation in decision making about their local environment so that they are more committed to and engaged in bringing about sustainable development.

This Plan describes the action that is proposed at a provincial level. Some of these recommendations will also need to be pursued at a national level and will have national level implications.

8.2.2 Strategies

(1) Target Groups

The strategies below focus on the following target groups.

- Students at schools and universities
- Teachers and university staff
- Decision makers in government and non government organizations
- Islamic leaders
- Business leaders

- Farmers and rural communities
- The general public and tourists
- NGOs and Journalists

(2) To Create Basic Frameworks for Environmental Education, Awareness Raising and Public Participation

There are essentially no frameworks or systems of environmental education, awareness raising and participation, on which various activities can be built on. Thus, the first strategy is to create basic systems. This will include the integration of environmental education into the formal education at all levels in a structured and systematic way, development of an environmental education statement, development of a strategy for farmers and rural education, and the development of a system of public participation in development activities.

(3) To Build the Capacities of Key People

In order to deliver environmental education or to develop environmental awareness among stakeholders, the capacities of key people delivering these concepts have to be develop. This will include, the development of teacher training programs, training for decision makers in government and non government organizations, and seminar series for business leaders and Islamic leaders.

(4) To Create Resources to Support Environmental Education, Awareness Raising, and Public Participation

The third strategy is to create resources required to promote environmental education, awareness raising, and public participation. This will include establishment of a Wetland Education Centre and a regular program of courses for students, establishment of a network of demonstration farms and an organic farms accreditation system, publication of a State of the Wetland Report for the general public, the publication of a Teachers Handbook on Environmental Education, and the establishment of networks of people involved in environmental education, awareness raising, and public participation.

8.3 Environmental Education in Schools and Higher Education

8.3.1 Environmental Education in Schools

The year 2005 will see the start of UNESCO's decade of "education for sustainable development" and UNESCO will encourage schools to adopt a more sustainable development focus for education to replace the current environmental education. The organizations responsible for implementing this plan should be aware of this changing

definition and to ensure that the activities proposed meet the current and future needs of society. The environmental education activities proposed in the Plan are described below.

(1) Development of an Environmental Education Statement

The Schools Environment Group should develop a short statement about environmental education to be sent to all schools. The statement should explain clearly what environmental education is, and provide ideas on how environmental can be taught in schools. The statement should be based on current international statements developed by UNESCO, adapted for an Iranian context.

(2) Preparation of a Teacher's Handbook on environmental education

A Teachers Handbook on Environmental Education should be produced. The book should contain concise general information about local, national and global environmental issues.

(3) Preparation of resources to support environmental education

A text book, various educational materials, web site, etc. on "The Anzali Wetland" should be produced and should be used to support teaching of the regional Guilan element of the Curriculum in High Schools and in other subjects as appropriate.

(4) Development of Teacher Training courses

Three kinds of Teacher Training courses should be developed. They are a pre-service teacher training course, in-service training course and training course on "How to be an Environmental Education Trainer".

(5) Establishment of a Wetland Education Centre and programs

A Wetland Education Centre for Schools should be established. The Centre should consist of a classroom and other education facilities such as education trails, and bird-watching facilities. As a part of this study, a Wetland Education Center and a set of facilities have already been constructed in Selkeh, and these facilities are readily available (see Chapter 12). The Centre should have a full-time staff member provided by DOE and supported by the Ministry of Education, and offer programs to all the schools in the Wetland Area. The Ministry of Education should create a system that ensures that all students in the area around the wetland have an opportunity to participate in the courses.

(6) Establishment of an Eco Schools scheme

An Eco Schools scheme for Guilan Province Schools should be developed. It involves schools undertaking environmental audits and then, with the support of staff, students and

the community implementing environmental improvements. In the first two years of the scheme, the focus should be on solid waste management, and support the implementation of the Solid Waste Management Plan. Other themes should be adopted after this. Up to 20 schools should join the scheme each year and be supported through teachers meetings and a newsletter.

(7) Establishment of an Environmental Education support network

The Schools Environment Group should establish an "Environmental Education Network" of people and organizations willing to support environmental education initiatives, including teachers, NGOs, University Students and Professors, and others willing to support environmental education

8.3.2 Environmental Education in Higher Education

(1) Review of the Higher Education provision of Environmental Education.

The Higher Education Environment Group (HEEG) should review the provision of environmental education in the Universities and Vocational Training Centers in the watershed area. The review should include a number of consultation events and the outcomes should be matched with the future human resources needed to support sustainable development in the Watershed and Iran.

(2) Development of New Bachelor and Masters Courses

On the basis of this Review, the HEEG should plan for the development and delivery of new courses to meet current and future needs. It is not possible to be specific about the courses that will be developed but they should include both courses at Bachelors and Masters Level

(3) Key University Staff to gain international experience through Masters Courses and Academic Links

Key members of the HEEG should participate in Environmental Planning and Management courses at Universities in other countries with an international reputation in these areas, to build capacity for the development and delivery of courses in Guilan.

(4) Development of an international "Wetland Management" Masters Course in partnership with the Ramsar Convention Bureau and other International Partners.

The lecturers for the course would come from both Iran and overseas. The course would be part lecture based in Guilan and part experience based in a wetland in the home country of the students.

(5) Development of the "Greening" of Higher Education

The HEEG should build on international experience and develop an Environmental Management System to enable the "Greening of Higher Education" and encourage the adoption of this system. The development of a system should be launched at a special Conference at Guilan University.

8.4 Public Awareness Raising and Participation

The target groups for public awareness raising and participation are classified into decision-makers, religious leaders, business and industry, farmers and the farming community, the general public and tourists, and NGO's and Journalists. The proposed activities are as follows:

Stakeholder	Proposed Activities
Decision-makers	1) Review of current activities and development of an action plan, 2) Training of managers and decision makers and creation of short courses for local, government, and 3) Preparation of publications for key staff and organizations on awareness raising and participation.
Religious leaders	1) Islam and Environment Seminars, 2) Preparation of a handbook on Islam and the Environment, and 3) Preparation of a short leaflet for the general public attending mosques.
Business and industry	1) Business and the environment seminar series, 2) Publications to encourage and support business/industry to adopt better environmental practices, 3) Selection of pilot businesses/industries for environmental audits and adoption of environmental management systems, and 4) More focus on supporting local community environmental initiatives by businesses.
Farmers and farming community	1) Review and Strategy Development, 2) Training of MOJA, NRGO, DOE and other organizations, 3) Establishment of a small grant scheme and a network of demonstration farms, 4) Development of environmental courses for farmers, 5) Development of a range of appropriate environmentally focused publications and other media for farmers/foresters, and 6) Pilot an organic farming accreditation scheme and sustainable forest management scheme.
General public and tourists	1) Establishment of a Wetland Information Centre, 2) Preparation of an Annual State of the Wetland Report by DOE, 3) An annual single, but large and high profile awareness raising campaign, 4) Specific information to be targeted at different groups, 5) A small grant scheme to support community improvements, 6) Development of a range of courses by the Community Learning Centers, and 7) Pilot consultation with the general public on planning issues.
NGOs and journalists	1) Increasing NGO participation, 2) Training of NGOs in the watershed, 3) A small grant scheme for NGOs in Guilan, and 4) A training course for journalists.

8.5 Summary of Proposed Environmental Education Plan

The projects/measures proposed in the proposed environmental education plan are summarized as follows:

Sub-Components	Proposed Projects/Measures	Executing Organization
Environmental Education	(1) Environmental Education in Schools 1) Development of an Environmental Education Statement 2) Preparation of a Teacher's Handbook on environmental education 3) Preparation of resources to support environmental education 4) Development of Teacher Training courses 5) Establishment of a Wetland Education Centre and programs 6) Establishment of an Eco Schools scheme 7) Establishment of an Environmental Education support network	Ministry of Education, SEG, HEEG
	(2) Environmental Education in Higher Education 1) Review of higher education provisions for environmental education 2) Development of new bachelor and masters courses 3) Key university staff to gain international experience through master courses and academic links 4) Development of an international "wetland management" masters course 5) Development of "greening" of higher education	
Public Awareness Raising and Participation	(1) Professional Development for Decision Makers 1) Review of current provision and development of an action plan 2) Training for managers and decision makers 3) Preparation of publications for key staff and organizations 4) Training for local government	Ministry of Education, Wetland Professional Development Team, Islam and Environment Group, Business and Environment Association, Rural Environment Group, Rural Advisers Network, Wetland Environmental Action Group
	(2) Religious Leaders 1) Islam and the Environment seminars 2) Preparation of a handbook on Islam and the environment 3) Preparation of a short leaflet for the general public attending Mosques	
	(3) Business and Industry 1) Business and Environment Seminar series 2) Publications to encourage and support business/industry 3) Pilot business/industry for environmental audits and adoption of environmental management systems 4) More focus on supporting local community environmental initiatives by business	

Public Awareness Raising and Participation	(4) Farmers and Rural Communities 1) Review and strategy development 2) Training of MOJA, NRGO,DOE and other organizations 3) Establishment of a small grant scheme and a network of demonstration farms 4) Development of environmental courses for farmers 5) Development of a range of appropriate environmentally focused publications and other media for farmers/foresters 6) Pilot organic farming accreditation scheme and sustainable forest management scheme	
	(5) General Public and Tourists 1) Establishment of a Wetland Information Center 2) Preparation of an annual state of the Wetland report 3) An annual awareness raising campaign 4) Specific information to be targeted at different groups 5) Establishment of a small grant scheme to support community improvement 6) Development of a range of course for presentation by the community learning centers 7) Pilot consultation with the general public on planning issues	Ministry of Education, Wetland Professional Development Team, Islam and Environment Group, Business and Environment Association, Rural Environment Group, Rural Advisers Network, Wetland Environmental Action Group
	(6) NGOs and Journalists 1) Increase of NGO participation 2) Training to NGOs in the watershed 3) Establishment of a small grant scheme for NGOs in Guilan 4) Establishment of training course for journalists	

8.6 Cost Estimate

The estimated costs of the proposed environmental education plan at the price level of 2004 are summarized as below. The total project cost (investment cost) is estimated at 1,180 million Rials up to 2019 and the average annual operation and maintenance cost is 2,560 million Rials/year.

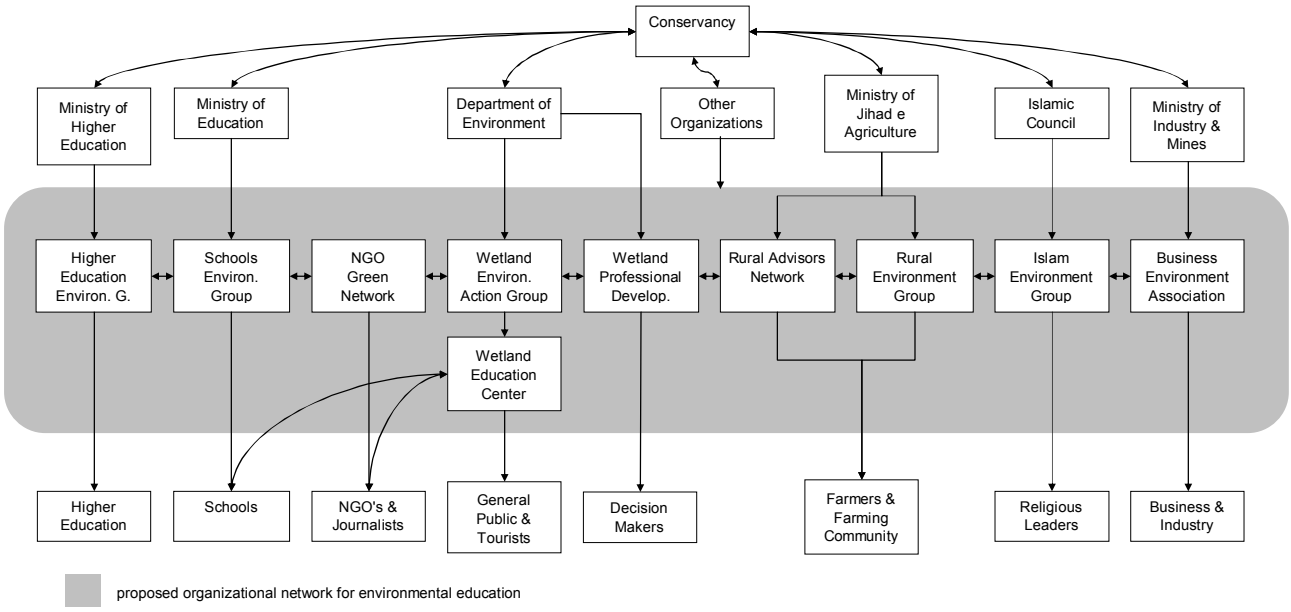
Proposed Projects/Measures	Project Cost (million Rials)	O&M Cost	
		Overall (million Rials)	Average Annual (million Rials/Year)
1. Environmental Education			
(1) Environmental Education in Schools	0	3,324	222
(2) Environmental Education in Higher Education	0	4,838	323
2. Public Awareness Raising and Participation			
(1) Decision Makers	0	2,416	161
(2) Religious Leaders	0	1,052	70
(3) Business and Industry	0	1,825	122
(4) Farmers and Rural Communities	0	9,715	648
(5) General Public and Tourists	1,175	11,140	743
(6) NGOs and Journalists	0	4,150	277
Total	1,17	38,460	2,564

Source: JICA Study Team

8.7 Implementation Program

(1) Executing Organizations

The organizations to be involved in implementation of the proposed environmental education plan are all the stakeholder organizations, NGOs and representatives of the local people as mentioned in the previous Section 8.5. Figure below shows the proposed network of the stakeholders for environmental education, awareness raising and public participation.



(2) Prioritization for Implementation

For the preparation of an implementation schedule for the proposed environmental education plan, the proposed projects/measures are prioritized as below based on the evaluation criteria mentioned in Chapter 3.

Criteria / Project		Necessity	Urgency	Efficiency	Impact on Environ.	Cost	Capacity	Policy	Overall Evaluation
1	**Environmental Education**								
(1)	Environmental Education in Schools	A	A	A	B	B	B	A	A(11)
(2)	Environmental Education in Higher Education	B	A	A	B	C	B	A	B (9)
2	**Public Awareness Raising and Participation**								
(1)	Decision Makers	A	B	A	A	B	B	A	A(11)
(2)	Religious Leaders	B	C	B	B	A	C	C	C (5)
(3)	Business and Industry	A	B	B	A	A	C	B	B (9)
(4)	Farmers and Rural Communities	A	A	A	A	B	B	A	A(12)
(5)	General Public and Tourists	A	B	B	A	C	B	A	B (9)
(6)	NGOs and Journalists	B	C	B	B	A	B	A	B (8)

(3) Implementation Schedule

Based on the prioritization evaluation mentioned above, the implementation schedule of the proposed environmental education plan up to the target year of 2019 is proposed as below.

Proposed Measures		Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ENVIRONMENTAL EDUCATION PLAN																
1. Environmental Education																
(1)	Environmental Education in Schools 1) education statement, 2) teacher's handbook, 3) preparation of resources, 4) teacher training course, 5) wetland education program															
	Environmental Education in Schools 6) eco school scheme, 7) establishment of support network															
(2)	Environmental Education in Higher Education. 1) review, 2) develop bachelor/master courses, 3) international experiences															
	Environmental Education in Higher Education 4) develop international "wetland management" course															
	Environmental Education in Higher Education 5) greeing of higher education															
2. Public Awareness Raising and Participation																
(1)	Decision Makers 1) review, 2&4) training of manager. & local governvment, 3) preparation of publications															
(2)	Religious Leaders 1) Islam and the environment seminars															
	Religious Leaders 2) prep. hadbook, 3) prep. leaflet															
(3)	Business and Industry 1) business & environment seminar series															
	Business and Industry 2) publication, 3) pilot business/industry EMS, 4) support of local comm. environ. initiatives															
(4)	Farmers and Rural Communities 1) review, 2) training, 3) small grant, 4) environ. course, 5) publications															
	Farmers and Rural Communities 6) pilot organic farming accrediation															
(5)	General Public and Tourists 2) annual statement, 3) awareness raising campaign, 4) information dissemination															
	General Public and Tourists 1) wetland info center, 5) small grant, 6) course preparation, 7) public consultation															
(6)	NGOs and Journalists 1) NGO participation, 2) NGO training, 3) small grant, 4) journalist training															

(4) Priority Projects

The projects/measures to be commenced immediately are selected as priority projects. The priority projects in the proposed environmental education plan are selected as follows:

1) Environmental education in schools
2) Environmental awareness raising and participation for decision makers
3) Environmental awareness raising and participation for farmers and rural communities

CHAPTER 9 INSTITUTIONAL PLAN FOR IMPLEMENTATION

9.1 Introduction

Successful environmental conservation of the Anzali Wetland and its watershed ultimately depends on how each organization and stakeholder fulfills its and his/her responsibility in implementing the proposed components of the master plan presented above. However, as reviewed in Chapters 2 and 3, there is poor communication and co-ordination, both within and between organizations, and this would prevent effective use of available information and human and financial resources. Therefore, the master plan's sixth component, the Institutional Plan for Implementation, was proposed to improve coordination among various organizations and stakeholders and achieve integrated management of the wetland and its watershed envisioned in the master plan.

9.2 Objective and Strategy

9.2.1 Objective

The objective of institutional development can be summarized as:

- Improve inter- and intra-organization coordination, and clarify environmental management responsibilities to improve the efficiency of environmental service provision.

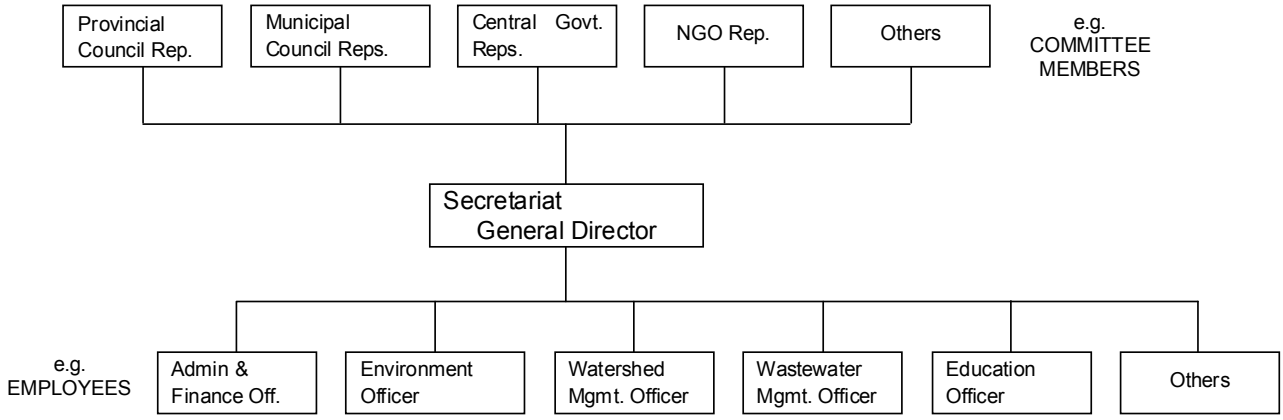
9.2.2 Strategy

Given the size of the government machine, the establishment of yet another new body should always be avoided if possible. However, as indicated in section 2.9 above, existing institutional arrangements are not providing the degree of co-ordination and integration needed for the proper environmental management of Anzali Wetland and its watershed. In the circumstances, the study proposes establishment of a body referred to as a "Conservancy", which is a recognized forum of stakeholders and a body that can execute the decisions of the forum. The main strategy of the Institutional Plan is thus "establishment of a Conservancy".

9.3 Proposed Institutional Plan for Implementation

(1) Establishment of the Anzali Wetland Conservancy

The model conservancy would have the following organizational structure. A conservancy acts as both a representative body and a management institution.



(2) Functions of the Conservancy

The committee would meet frequently (perhaps monthly) and would direct the work of the executive. Apart from guiding the regular management of Anzali Wetland, such a forum would clearly facilitate dialogue on major planning issues, which in the past has been lacking. There are many management issues to be addressed in the Wetland. Some of them are already being managed effectively by existing institutions. Some are not being managed at all. An overview of the whole management picture indicates that the major issues which could best be handled by a single management body (conservancy) are as follows:

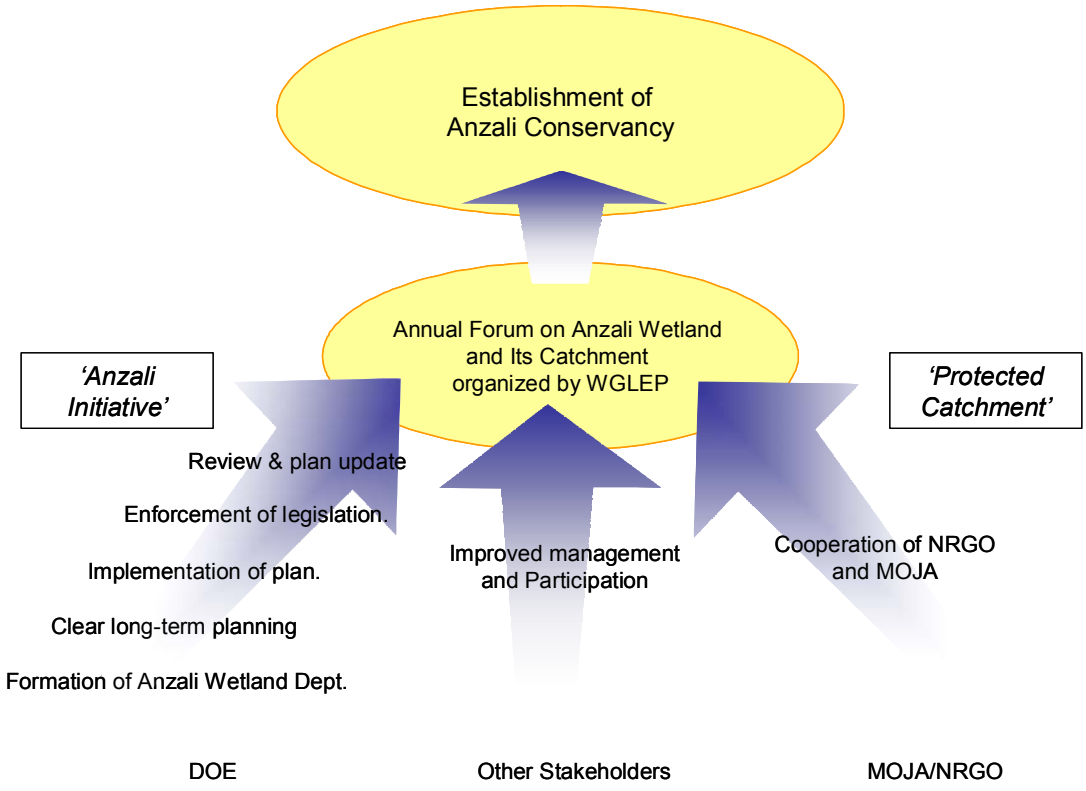
1) Designation of new Protected Areas (PAs), or expansion of existing PAs.
2) Conservation activities in the protected areas.
3) Protection, restoration and enhancement of the environment
4) Elaboration of regulations or guidelines on water-related issues
5) Tourism development
6) Licensing issues
7) Enforcement/patrolling/guarding.

(3) Funding of the Conservancy

If a new "Conservancy" body is formed, it would need to have adequate and sustainable statutory sources of funding. The core funding would probably come from central government via MPO, along with contributions from the municipalities. In addition, it would be expected that various existing sources of income would be transferred to the Conservancy, thus making it self-sufficient. Some or all of: the existing boat licensing fees, the DOE hunting and fishing licenses, DOE "abandan" rental fees, contributions from local industries, local tourism tax, etc.

(4) Preparatory Steps

The concept of the Anzali Wetland Conservancy has been developed, discussed and refined during the two-year course of the present study. However, as establishment of the Conservancy may take a long term, it is recommended to take some preparatory steps by existing institutions as illustrated below. These would both achieve some of the objectives of the conservancy in the short term, and help the process of establishing the conservancy when the time comes.



(5) Establishment of the Anzali Wetland Department

DOE currently provides the most noticeable government presence in Anzali Wetland, and it has the staff, facilities and equipment to make that presence felt even more strongly. It has been suggested above that the initial staff of the conservancy could be created by transferring existing staff from DOE. As a preparatory step, the executive part of the conservancy could effectively be established as a new "Anzali Wetland Department" of DOE Guilan. The new department should be tasked with introducing and taking forward a new "Anzali Initiative", which would have a strong public awareness focus. If DOE ultimately continues to be the main organization involved in management of the wetland, then it must operate according to a clear long-term plan for the Wetland.

(6) Formation of Anzali Sub-Group of WGLEP

The strengthening of DOE management would not necessarily help to facilitate the participation of all relevant stakeholders, as would occur within the proposed conservancy body. In preparation for the conservancy, such participation could, perhaps, best be achieved at the provincial level, through the Provincial Thematic Working Group on Land use, Environment and Population (WGLEP). However, this has not been functioning as an active committee, and only held its first meeting in June 2004. The challenge would be to convert this into an effective body for co-ordination between stakeholders, and for management of the wetland and its watershed. It is proposed for WGLEP to form an Anzali Sub-Group, which can meet frequently to co-ordinate and integrate the work of the various stakeholders in the Wetland and the watershed.

(7) Annual Anzali Forum

It seems that the Anzali sub-committee of WGLEP can become moribund unless they have a stimulus and a specific function. One method of providing the required stimulus is to run an annual 'Forum on Anzali Wetland and its Catchment', at which all stakeholder organizations can report on their progress over the previous year, and their plans for the forthcoming year. At the same time an annual 'State of the Anzali Environment Report' could be published, so that progress can be monitored and publicized.

9.4 Capacity Development of Stakeholders

(1) In-country Cross-sectoral Training

The individual organizations do provide training for their own staff, e.g. DOE provides short courses on a number of technical topics, both locally and in Tehran. What is needed is "mix and match" training, in which staff from several different parts of government (and also from outside government) are brought together for environmental management training, to include working together on practical planning and management case studies. This cross-sectoral training would be in relation to specific aspects of wetland management and watershed management. Such training needs to start by ensuring that participants have a real understanding of environmental management, and appreciate the nature of an ecosystem approach to planning and management.

(2) DOE "Apprenticeship" Training

There will be a continuing need for internal training, particularly to build up the knowledge base of new recruits. DOE staff who have worked in the wetland as guards and ecologists over many years, have an "institutional memory" which is extremely valuable. A

concerted effort must be made, using on-the-job training or "apprenticeship", to ensure that this institutional memory is not lost when experienced staff retire.

(3) Overseas Exchange Visits

Overseas capacity-building visits to Japan and UK have been made by Iranian counterparts during the study. A continuing program of exchange visits (i.e. in which members of overseas wetland organizations also visit Iranian counterparts in Guilan) would help to continue the processes of confidence-building and capacity-building.

9.5 Summary of Proposed Institutional Plan for Implementation

The projects/measures proposed in the proposed environmental education plan are summarized as follows:

Sub-Components	Proposed Projects/Measures	Executing Organization
Establishment of Anzali Wetland Conservancy	(1) Establishment of Anzali Wetland Department (2) Formation of Anzali Sub-Group of WGLEP (3) Annual Anzali Forum	DOE, MOJA, NRGO, MOE, CHTO, MORT, WGLEP, Municipalities, and NGOs
Capacity Development	(1) In-country cross-sectoral training (2) DOE "apprenticeship" training (3) Overseas exchange visits	

9.6 Cost Estimate

The estimated costs of the proposed environmental education plan at the price level of 2004 are summarized as below. The total project cost (investment cost) is estimated at 1,320 million Rials up to 2019 and the average annual operation and maintenance cost is 2,530 million Rials/year.

Proposed Projects/Measures	Project Cost (million Rials)	O&M Cost	
		Overall (million Rials)	Annual Average (million Rials/year)
1. Establishment of Anzali Wetland Conservancy			
(1) Establishment of Anzali Wetland Department	890	33,360	2,224
(2) Formation of Anzali Sub-Group of WGLEP	0	870	58
(3) Annual Anzali Forum	0	1,005	67
2. Capacity Development			
(1) In-country cross-sectoral training	0	2,685	179
(2) DOE "apprenticeship" training	159	0	0
(3) Overseas exchange visits	270	0	0
Total	1,319	37,920	2,528

Source: JICA Study Team

9.7 Implementation Program

(1) Executing Organizations

The organizations to be involved in implementation of the proposed institutional plan are DOE, MOJA, NRGO, MOE, CHTO, MORT, WGLEP, Municipalities and NGOs as mentioned in the previous Section 9.5.

(2) Prioritization for Implementation

Based on the prioritization evaluation mentioned above, an implementation schedule for the proposed institutional plan up to the target year of 2019 is proposed as below.

No.	Proposed Projects/Measures	Contribution to Management		Physical outcomes	Ease of implement-tation	Support of Executing Organizations.	Costs	Overall Evaluation
		Communi., coord. & integration	Efficiency & effectiveness					
1	Establishment of Anzali Wetland Conservancy							
(1)	Establishment of Anzali Wetland Department	A	A	A	B	A	B	A (10)
(2)	Formation of Anzali Sub-Group of WGLEP	A	A	A	B	B	A	A (10)
(3)	Annual Anzali Forum	A	B	B	A	A	A	A (10)
2	Capacity Development							
(1)	In-country cross-sectoral training	A	A	B	B	B	A	B (9)
(2)	DOE "apprenticeship" training	C	A	B	A	B	A	B (8)
(3)	Overseas exchange visits	C	C	C	B	A	C	C (3)

Source: JICA Study Team

(3) Implementation Schedule

The implementation schedule of the proposed projects/measures up to the target year of 2019 is shown.

Proposed Measures		Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
INSTITUTIONAL DEVELOPMENT PLAN																
1. Establishment of Anzali Wetland Conservancy																
(1)	Establishment of Anzali Wetland Department															
(2)	Formation of Anzali Sub-Group of WGLEP															
(3)	Annual Anzali Forum															
2. Capacity Development																
(1)	In-country cross-sectoral training															
(2)	DOE "apprenticeship" training															
(3)	Overseas exchange visits															

(4) Priority Projects

The proposed institutional plan for implementation aims to establish the Anzali Wetland Conservancy. Therefore, that first step should have the highest priority. The priority projects in the proposed institutional plan are as follows:

1) Establishment of Anzali Wetland Department in DOE Guilan
2) Formation of Anzali Sub-group in WGLEP

CHAPTER 10 EVALUATION OF MASTER PLAN

10.1 Introduction

The proposed master plan is evaluated with respect to i) economic and financial aspects, ii) environmental and social aspects, and iii) technical aspects in order to confirm viability of the proposed plan.

The economic evaluation is carried out in order to assess whether the proposed projects are worth implementing from an economic point of view and the financial evaluation is to assess the financial viability of the proposed projects by estimating percentage of budget for relevant agencies on the necessary cost of the proposed projects and also revenue of some projects which are supposed to collect user charges. The projects proposed in the master plan are designed to improve the environmental conditions of the wetland and its watershed. Nevertheless, some projects could also bring adverse impacts on the environment. Thus, such potential impacts are evaluated, and mitigating measures are proposed. Similarly, the social aspects of the projects are evaluated in order to make sure that the projects do not have major undesirable social impacts. The technical evaluation considers whether the proposed projects are technically appropriate or not from the technical levels of executing agencies and other technical requirements.

10.2 Estimated Cost and Implementation Schedule

(1) Estimated Costs of the Master Plan

The estimated project costs and operation and management costs of the sub-plans are summarized as below.

(Unit: billion Rials)

Sub-plans	Project Cost	Total O&M Cost*
(1) Wetland Ecological Management Plan	30.8	15.3
(2) Watershed Management Plan	726.8	43.3
(3) Wastewater Management Plan	2,449.9	439.8
(4) Solid Waste Management Plan	146.2	548.3
(5) Environmental Education Plan	1.2	38.5
(6) Institutional Plan	1.3	37.9
Total	3,356.2	1,123.1

Note: *- Total operation and maintenance (O&M) cost for 15 years of master plan period.

The annual disbursement schedule of the above costs is shown in Table 10.2.1.

(2) Implementation Schedule of the Master Plan

The projects/measures proposed in each sub-plan are illustratively shown in Figure 10.2.1. The implementation schedules of the above sub-plans are shown in Chapter 4 to Chapter 9, respectively.

Table 10.2.1 Disbursement of Project Cost and O&M Cost for the Compornent Plans of the Master Plan (1/2)

(Unit: million Rials)

Compornent Plan	Year 1 2005	Year 2 2006	Year 3 2007	Year 4 2008	Year 5 2009	Year 6 2010	Year 7 2011	Year 8 2012	Year 9 2013	Year 10 2014	Year 11 2015	Year 12 2016	Year 13 2017	Year 14 2018	Year 15 2019	Total
Wetland Ecological Management Plan																
Project Costs	0	0	3,069	532	3,980	6,473	5,058	4,336	3,600	3,600	0	0	163	0	0	30,811
1. Environmental Zoning	0	0	58	0	0	3,600	3,600	3,658	3,600	3,600	0	0	58	0	0	18,175
2. Conservation of Wildlife	0	0	2,134	0	0	0	0	58	0	0	0	0	58	0	0	2,251
3. Conservation of Habitat	0	0	818	246	0	122	0	0	0	0	0	0	0	0	0	1,186
4. Promotion of Wise Use	0	0	58	286	3,980	2,751	1,458	619	0	0	0	0	47	0	0	9,199
O&M Costs	252	508	752	773	853	851	1059	1386	1206	1206	1276	1206	1446	1276	1206	15,256
1. Zoning and Ecological Management	85	85	43	43	43	43	43	43	43	43	43	43	43	43	43	732
2. Conservation of Wildlife	0	0	20	55	55	55	55	55	55	55	55	55	55	55	55	682
3. Conservation of Habitat	0	0	20	246	316	287	287	357	287	287	357	287	287	357	287	3,664
4. Promotion of Wise Use	0	0	40.32	40.32	50.32	77.32	285.32	302.32	432.32	432.32	432.32	432.32	432.32	432.32	432.32	3,822
5. Monitoring and Feedback	167	423	628	388	388	388	388	628	388	388	388	388	628	388	388	6,356
Total Cost of Wetland Ecological Management Sub-plan	252	508	3,821	1,305	4,833	7,324	6,117	5,722	4,806	4,806	1,276	1,206	1,609	1,276	1,206	46,067
Price Contingency (3%/year)	4	23	293	142	688	1,294	1,297	1,421	1,373	1,559	465	488	720	626	646	11,039
Total Cost with Price Escalation	256	531	4,114	1,447	5,521	8,618	7,414	7,143	6,179	6,365	1,741	1,694	2,329	1,902	1,852	57,105
Watershed Management Plan																
Project Costs	98,847	48,669	132,625	109,458	97,686	44,711	48,010	45,251	33,255	28,652	19,655	8,484	5,790	3,204	2,487	726,785
1. Soil Erosion Control and Prevention of Land Slides	17,601	21,719	32,925	31,604	41,681	25,211	27,650	21,519	15,975	15,606	11,215	1,129	1,129	0	0	264,965
2. Forest and Rangeland Management	4,336	12,461	12,040	15,951	18,153	19,372	20,360	23,732	17,281	13,045	8,439	7,356	4,661	3,204	2,487	182,877
3. Plain Area Management	0	0	0	83	628	0	0	0	0	0	0	0	0	0	0	711
4. Livelihood Development	1,110	1,152	1,152	64	0	0	0	0	0	0	0	0	0	0	0	3,477
5. Institutional Arrangement	0	128	511	511	256	128	0	0	0	0	0	0	0	0	0	1,533
6. Project Cost for the Livestock Resettlement Program	75,801	13,209	85,997	61,246	36,968	0	0	0	0	0	0	0	0	0	0	273,221
O&M Costs	65	275	990	2,500	3,360	4,679	4,605	3,954	3,705	3,317	3,281	3,190	3,162	3,119	3,130	43,331
1. Soil Erosion Control and Prevention of Land Slides	0	175	175	438	438	1,044	1,044	1,088	1,381	1,381	1,381	1,405	1,405	1,405	1,405	14,164
2. Rangeland Management	0	0	653	1,699	2,447	2,790	2,790	2,170	1,797	1,518	1,579	1,506	1,497	1,461	1,472	23,377
3. Plain Area Management	0	0	0	0	0	216	216	216	216	216	216	216	216	216	216	2,163
4. Environmental Monitoring	65	100	162	364	476	629	555	479	311	202	105	64	44	37	37	3,627
Total Cost of Watershed Management Sub-plan	98,912	48,944	133,615	111,959	101,046	49,390	52,615	49,205	36,960	31,969	22,935	11,675	8,951	6,323	5,617	770,115
Price Contingency (3%/year)	1,484	2,224	10,263	12,217	14,388	8,725	11,153	12,219	10,562	10,369	8,350	4,728	4,003	3,102	3,007	116,793
Total Cost with Price Escalation	100,395	51,168	143,879	124,175	115,434	58,115	63,768	61,423	47,522	42,338	31,285	16,403	12,954	9,424	8,623	886,908
Wastewater Management Plan																
Project Costs	185,444	259,670	298,151	362,941	354,820	120,423	96,644	163,404	171,504	174,729	64,799	64,799	63,869	34,208	34,463	2,449,866
1. Management of Domestic Wastewater in Urban Areas	185,178	254,294	292,775	320,315	319,303	100,508	74,979	159,489	167,589	170,559	55,384	55,384	54,454	24,793	24,793	2,259,796
2. Management of Domestic Wastewater in Rural Areas	0	4,860	4,860	4,860	5,250	3,915	3,915	3,915	3,915	4,170	3,915	3,915	3,915	3,915	4,170	59,490
3. Management of Industrial Effluent	266	266	266	37,766	30,266	16,000	17,750	0	0	0	5,400	5,400	5,400	5,400	5,400	129,580
4. Management of Livestock Waste	0	250	250	0	0	0	0	0	0	0	100	100	100	100	100	1,000
O&M Costs	6,328	9,412	12,352	16,215	19,333	25,272	29,139	32,736	36,333	41,618	41,837	42,001	42,281	42,281	42,634	439,766
1. Management of Domestic Wastewater in Urban Areas	5,441	8,360	11,280	14,199	17,119	22,799	26,396	29,993	33,590	38,522	38,522	38,522	38,522	38,522	38,522	400,303
2. Management of Domestic Wastewater in Rural Areas	0	165	165	165	363	528	528	528	528	726	891	891	891	891	1,089	8,349
3. Management of Industrial Effluent	273	273	273	1,217	1,217	1,311	1,581	1,581	1,581	1,736	1,736	1,900	2,170	2,170	2,325	21,344
4. Management of Livestock Waste	0	0	20	20	20	20	20	20	20	20	74	74	84	84	84	560
5. Management of Pollution from Farmland	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	3,960
6. Environmental Monitoring	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	5,250
Total Cost of Wastewater Management Sub-plan	191,772	269,082	310,502	379,156	374,152	145,694	125,783	196,140	207,837	216,347	106,636	106,800	106,149	76,489	77,097	2,889,632
Price Contingency (3%/year)	2,877	12,230	23,851	41,373	53,276	25,739	26,661	48,706	59,394	70,171	38,823	43,254	47,464	37,522	41,268	572,608
Total Cost with Price Escalation	194,648	281,312	334,353	420,528	427,428	171,433	152,444	244,845	267,230	286,518	145,459	150,053	153,614	114,011	118,365	3,462,240
Solid Waste Management Plan																
Project Costs	32,478	6,764	7,334	7,524	6,384	16,454	5,624	7,904	15,000	6,194	9,804	5,624	6,764	6,764	5,624	146,239
1. Provision of Efficient Waste Collection Services to the Whole Area	14,795	6,764	7,334	7,524	6,384	16,454	5,624	7,904	8,094	6,194	9,804	5,624	6,764	6,764	5,624	121,651
2. Composting of Municipal Solid Waste	17,083	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17,083
3. Sanitary Landfill Construction	0	0	0	0	0	0	0	0	6,906	0	0	0	0	0	0	6,906

Table 10.2.1 Disbursement of Project Cost and O&M Cost for the Compornent Plans of the Master Plan (2/2)

(Unit: million Rials)

Compornent Plan	Year 1 2005	Year 2 2006	Year 3 2007	Year 4 2008	Year 5 2009	Year 6 2010	Year 7 2011	Year 8 2012	Year 9 2013	Year 10 2014	Year 11 2015	Year 12 2016	Year 13 2017	Year 14 2018	Year 15 2019	Total
4. Proper Treatment of Hazardous Industrial Solid Waste	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600
O&M Costs	26,007	31,287	31,542	32,698	33,411	36,969	37,508	38,565	38,218	38,840	39,393	39,850	40,630	41,417	41,994	548,329
1. Provision of Efficient Waste Collection Services to the Whole Area	18,240	18,843	18,743	19,591	20,011	23,396	23,680	24,505	24,402	24,821	25,068	25,351	25,906	26,460	26,745	345,761
2. Composting of Municipal Solid Waste	6,328	10,820	11,088	11,347	11,600	11,766	12,013	12,177	12,423	12,587	12,887	13,054	13,273	13,471	13,723	178,557
3. Sanitary Landfill Construction	922	960	964	1,009	1,046	1,049	1,053	1,056	562	597	599	601	603	605	640	12,265
4. Proper Treatment of Hazardous Industrial Solid Waste	402	516	519	522	526	529	533	566	570	574	578	583	588	620	625	8,252
5. Environmental Monitoring	114	149	229	229	229	229	229	261	261	261	261	261	261	261	261	3,494
Total Cost of Solid Waste Sub-plan	58,484	38,051	38,876	40,222	39,795	53,423	43,132	46,469	53,218	45,034	49,197	45,474	47,394	48,181	47,618	694,568
Price Contingency (3%/year)	877	1,729	2,986	4,389	5,666	9,438	9,142	11,539	15,208	14,607	17,911	18,417	21,192	23,636	25,489	182,227
Total Cost with Price Escalation	59,361	39,781	41,862	44,611	45,461	62,861	52,274	58,008	68,426	59,640	67,109	63,891	68,586	71,817	73,107	876,795
Environmental Education Plan																
Project Costs	0	0	0	0	0	587	0	0	0	0	587	0	0	0	0	1,175
1. Public Awareness Raising and Participation (General Public and Tour	0	0	0	0	0	587	0	0	0	0	587	0	0	0	0	1,175
O&M Costs	1,932	2,201	2,301	2,201	2,401	2,954	3,106	2,493	2,961	2,484	2,695	3,224	2,536	2,488	2,486	38,460
1. Environmental Education in Schools	141	179	229	129	229	174	314	178	284	194	323	264	294	148	244	3,324
2. Environmental Education in Higher Education	479	491	476	476	476	486	486	61	496	46	126	576	46	71	46	4,838
3. Professional Development for Decision Makers	0	109	99	99	99	199	199	209	199	199	199	199	199	209	199	2,416
4. Public Awareness Raising and Participation (Religious Leaders)	26	26	26	26	26	99	161	99	36	99	36	224	36	99	36	1,053
5. Public Awareness Raising and Participation (Business and Industry)	40	40	40	40	40	235	235	235	235	235	90	90	90	90	90	1,825
6. Public Awareness Raising and Participation (Farmers and Rural Com	516	466	541	541	641	741	691	691	691	691	741	691	691	691	691	9,715
7. Public Awareness Raising and Participation (General Public and Tour	320	480	480	480	480	810	810	810	810	810	970	970	970	970	970	11,140
8. Public Awareness Raising and Participation (NGOs)	410	410	410	410	410	210	210	210	210	210	210	210	210	210	210	4,150
Total Cost of Environmental Education Sub-plan	1,932	2,201	2,301	2,201	2,401	3,541	3,106	2,493	2,961	2,484	3,282	3,224	2,536	2,488	2,486	39,635
Price Contingency (3%/year)	29	100	177	240	342	626	658	619	846	806	1,195	1,306	1,134	1,220	1,331	10,628
Total Cost with Price Escalation	1,960	2,301	2,478	2,441	2,743	4,166	3,764	3,111	3,807	3,289	4,477	4,529	3,670	3,708	3,817	50,262
Institutional Plan																
Project Costs	1,319	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,319
1. Establishment of Anzali Wetland Department	890	0	0	0	0	0	0	0	0	0	0	0	0	0	0	890
2. DOE 'Apprenticeship' Training	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159
3. Overseas Exchange Visits	270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270
O&M Costs	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	37,920
1. Establishment of Anzali Wetland Department	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	2,224	33,360
2. Formation of Anzali Sub-Group of WGLEP	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	870
3. Annual Anzali Forum	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	1,005
4. In-country Cross-sectoral Training	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	2,685
Total Cost of Institutional Sub-plan	3,847	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	2,528	39,239
Price Contingency (3%/year)	58	115	194	276	360	447	536	628	722	820	920	1,024	1,130	1,240	1,353	9,823
Total Cost with Price Escalation	3,905	2,643	2,722	2,804	2,888	2,975	3,064	3,156	3,250	3,348	3,448	3,552	3,658	3,768	3,881	49,062
Grand Total at June 2004 Price	**355,198**	**361,314**	**491,643**	**537,371**	**524,755**	**261,900**	**233,281**	**302,555**	**308,310**	**303,167**	**185,854**	**170,906**	**169,168**	**137,284**	**136,552**	**4,479,255**
- Total Project Cost at June 2004 Price	**318,088**	**315,103**	**441,179**	**480,455**	**462,869**	**188,647**	**155,336**	**220,895**	**223,359**	**213,175**	**94,845**	**78,907**	**76,586**	**44,176**	**42,574**	**3,356,195**
- Total O&M Cost at June 2004 Price	**37,110**	**46,211**	**50,465**	**56,916**	**61,886**	**73,252**	**77,944**	**81,660**	**84,950**	**89,992**	**91,009**	**91,998**	**92,582**	**93,108**	**93,978**	**1,123,061**
Total Price Contingency (3%/year)	5,328	16,422	37,765	58,637	74,721	46,268	49,447	75,131	88,106	98,331	67,665	69,216	75,643	67,346	73,093	903,118
- Price Contingency of the Project Cost (3%/year)	4,771	14,321	33,888	52,426	65,909	33,327	32,926	54,853	63,830	69,142	34,531	31,957	34,245	21,671	22,789	570,587
- Price Contingency of the O&MCost (3%/year)	557	2,100	3,876	6,211	8,812	12,941	16,521	20,278	24,276	29,188	33,134	37,259	41,398	45,675	50,304	332,531
Grand Total with Price Contingency	**360,526**	**377,736**	**529,408**	**596,007**	**599,475**	**308,168**	**282,727**	**377,686**	**396,416**	**401,497**	**253,519**	**240,122**	**244,811**	**204,630**	**209,645**	**5,382,373**
- Total Project Cost with Price Contingency	**322,859**	**329,425**	**475,067**	**532,881**	**528,778**	**221,974**	**188,262**	**275,748**	**287,189**	**282,317**	**129,376**	**110,865**	**110,831**	**65,847**	**65,363**	**3,926,782**
- Total O&M Cost with Price Contingency	**37,667**	**48,311**	**54,341**	**63,126**	**70,697**	**86,193**	**94,466**	**101,938**	**109,226**	**119,180**	**124,143**	**129,257**	**133,979**	**138,783**	**144,282**	**1,455,592**

Environmental Education Plan

Environmental Education
- Environmental education in schools and universities

Public Awareness Raising and Participation
- Decision makers, religious leaders, business and industry, farmers and rural communities, general public and tourists, and NGOs and journalists

Institutional Plan

Establishment of Anzali Wetland Conservancy
- Establishment of Anzali Wetland Department
- Formation of Anzali Sub-Group of WGLEP
- Annual Anzali Forum

Capacity Development
- In-country cross sectoral training
- DOE "apprenticeship" training
- Overseas exchange visits

Watershed Management Plan

Soil Erosion Control and Prevention of Land Slides
- Soil erosion control
- Prevention of land slide

Forst and Rangeland Management
- Pilot activity of participatory resource management
- Reforestation of degraded forests (70 km^2)
- Reforestation of margin areas (112 km^2)
- Forest management under forestry plan
- Conservation of protected forests
- Rangeland management by graziers
- Development of regulations necessary for participatory resource management
- Improvement of livestock resettlement program

Plain Area Management
- Source-level control of sediment runoff in plain area
- Measures to control inflow of sediment into wetland
- River management for extreme conditions

Livelihood Development
- Capacity development of NRGO provincial and local offices
- Livelihood improvement of local people in forest and rangeland management

Environmental Monitoring plan
- Monitoring of soil erosion controls, land use/ vegetation cover, rangeland management, forest management, livestock resettlement program

Institutional Arrangement
- Coordination among relevant organizations
- Capacity development for sustainable watershed management

Wetland Ecological Mangement Plan

Environmental Zoning
- Establishment of environmental zones
- Enforcement of zoning

Conservation of Wildlife
- Conservation of threatened species
- Control of the alien species

Conservation of Habitat
- Strengthening of the regulations
- Rehabilitation and maintenence of habitat

Promotion of Wise Use
- Development of ecotourism
- Sustainable use of natural resources

Monitoring and Feedback
- Environmental monitoring for adaptive management
- Environmental Research

Environmental Zoning

I. Core Protected Zone
- Wildlife Refugee
- Protected Area
- Non Hunting Area
- Lagoon
- Marsh

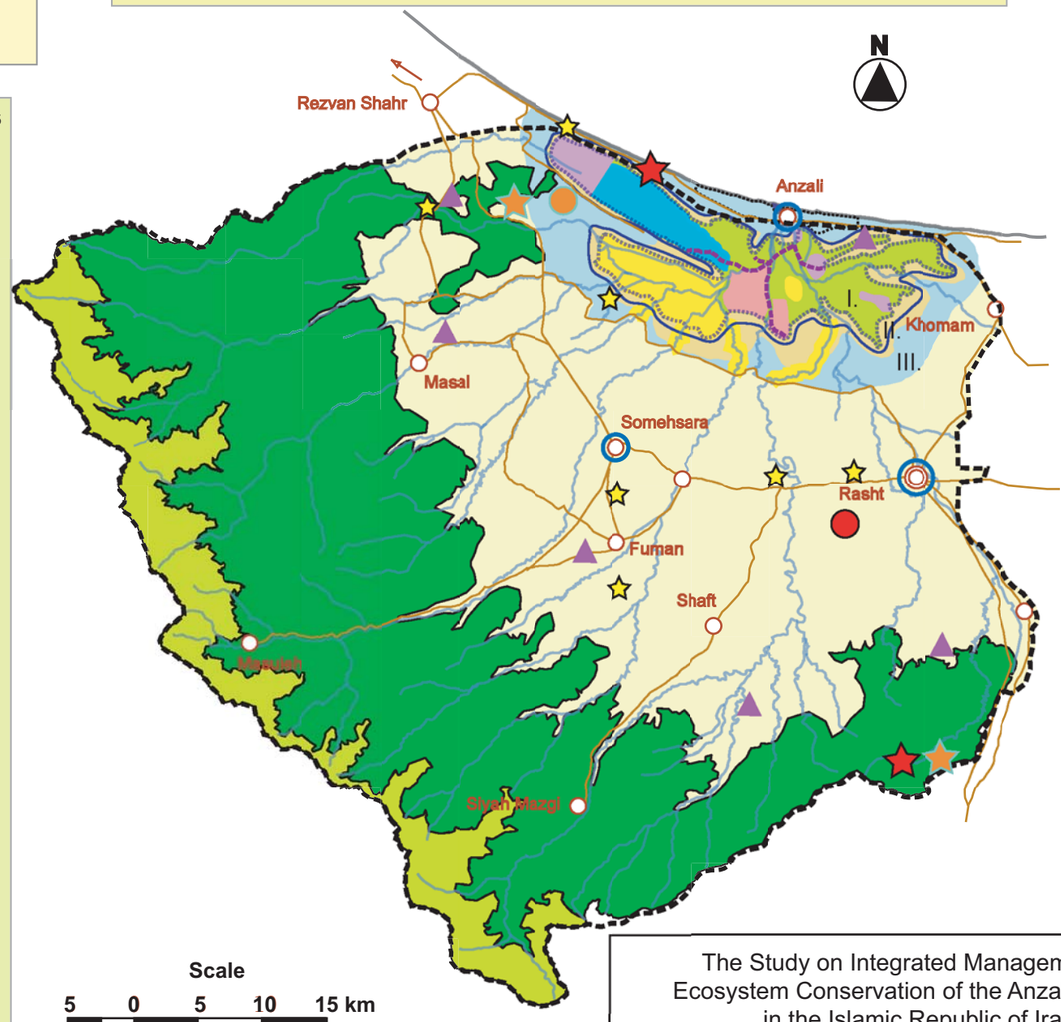
II. Buffer Zone

III. Transition Zone

River

Road

Eco-tourism Route



Solid Waste Management Plan

Municipal Solid Waste Management
- Environmental awareness raising
- Provision of efficient municipal waste collection service to the whole area
- Proper disposal of municipal solid waste

Composting of municipal solid waste (proposed)

Composting of municipal solid waste (existing)

Sanitary landfill construction (Rasht, Anzali)

Closure of present open dumping sites

Industrial and Medical Solid Waste Management
- Proper treatment of hazardous solid waste
- Non-hazardous industrial solid waste management

Environmental Monitoring
- Monitoring of management of recycling activities, leachate from landfills, industrial waste management, and medical waste management

Wastewater Management Plan

Management of Domestic Wastewater in Urban Area
- Sewerage system development (Rasht, Anzali, Somehsara)
- Promotion of individual wastewater treatment facilities outside of sewerage service area
- Promotion of low phosphorous detergent use

Management of Domestic Wastewater in Rural Area
- Community wastewater treatment system development

Management of Industrial Effluent
- Centralization of industrial factories
- Construction of centralized wastewater treatment system
- Strengthening of monitoring activities by DOE

Management of Livestock Waste
- Treatment of livestock waste from industrial animal husbandry
- Control of livestock waste in grazing lands in the plain area

Management of Pollution from Farmland
- Promotion of farming with less input

Environmental Monitoring
- Monitoring of domestic wastewater treatment, industrial factories, agricultural activities, pollution load to the wetland, and ambient water quality

The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland in the Islamic Republic of Iran

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 10.2.1
Propsed Projects in the Master Plan

10.3 Economic Evaluation

(1) Approach to the Economic Evaluation of the Proposed Master Plan

Economic benefits of the proposed master plan for environmental conservation are not easy to quantify because the proposed master plan involves various intangible benefits such as protecting threatened species or improving water quality and also the effects of the proposed measures are not easy to predict. Therefore, the benefits of the proposed plan are firstly identified qualitatively in the economic evaluation in the Study. Then, monetary evaluations for the selected benefits are attempted as much as possible. Based on these analyses, the economic viability of the proposed plan is judged.

(2) Basic Assumptions for Economic Evaluation

The economic evaluation was conducted under the following basic conditions and assumptions.

a) The economic life of the project was assumed to be 50 years since this type of environmental conservation project takes a longer time to deliver a return than that of ordinary infrastructure development projects.
b) The project costs in the project period were estimated based on June 2004 constant prices in Iranian Rials.
c) The economic analysis was conducted at domestic price levels in Iran.
d) The price contingencies, taxes and other kinds of transfer payments were excluded from the estimated financial costs for estimation of the economic costs by applying a conversion factor of 0.9 to the financial cost items.
e) Based on reference to other development studies in Iran, a social discount rate for the economic analysis was applied at 12%.
f) Regarding the "without-project" case as a base for the economic analysis, it is supposed that the environmental conditions in the Anzali wetland and its watershed area would be degraded further by uncontrolled human interventions without adequate environmental management. On the other hand, it is supposed that current environmental conditions would be improved or maintained at least in the "with-project case". By considering the difference in the environmental conditions between the without-project and with-project cases as the economic benefit of the project implementation, the net present value (NPV), benefit-cost ratio (B/C) and economic internal rate of return (EIRR) are calculated for the assessment of the economic viability of the Project based on the projected economic cash flow.

(3) Economic Benefit of Wetland Ecological Management

The proposed wetland ecological management plan (WEMP) consists of the following major components; 1) environmental zoning, 2) conservation of wildlife, 3) conservation of habitat, 4) promotion of wise use and 5) monitoring and feedback. The economic benefits accrued from these measures are summarized below.

Economic Benefits of Wetland Ecological Management
1) Economic activities - Increase of hunting and fishery values (Fishery: about 10 billion Rials/year, hunting: about 3 billion Rials/year, at present) - Increase of tourists (about 40,000 tourists/year, about 3 billion Rials/year, at present)
2) Environmental service - Improvement of management of protected areas, and other habitats. - Maintenance of water purification function of the Wetland - Support of external ecosystem for wildlife
3) Existence value - Contribution to the maintenance of the threatened species including their genetic resources. - Increase in aesthetic value of the Wetland - Maintenance of bequest values of the Wetland
4) Environmental education and public awareness - Increase of opportunities for environmental education for public awareness, and scientific research

According to the "The value of the world's ecosystem services and natural capital" (Robert Costanza et al., NATURE, 1997), the Anzali Wetland may have the following values.

Item	Annual Value per ha (thousand Rials/ha/year)	Total Value for the Anzali Wetland: 193 km^2 (billion Rials/year)
1) Waste treatment	4,400	84.9
2) Habitat	1,200	23.2
3) Food production	125	13.0*
4) Recreation	1,300	25.1**
5) Cultural	4,500	86.9
Total	11,525	233.1

Note: *- As mentioned in the previous table, present productions of fishery and hunting in the Anzali Wetland are used.

**- As mentioned in the previous table, present income from tourism at around 3 billion Rials/year is smaller than that in this table. However, it is supposed that this value would be increased by promoting tourism in and around the Anzali wetland.

Source: Modified by JICA Study Team referring to "The value of the world's ecosystem services and natural capital", Robert Costanza et al., NATURE, 1997

It is considered that the above values represent the value of the wetland under fair environmental conditions, which require not only the implementation of the proposed WEMP, but also with other proposed management plans in the M/P, such as water quality improvement by the Wastewater Management Plan.

(4) Economic Benefit of the Watershed Management

The proposed watershed management plan (WMP) consists of the following major components: 1) soil erosion control and prevention of land slides, 2) forest and rangeland management, 3) plain area management, 4) livelihood development, 5) environmental monitoring, and 6) institutional arrangement. The economic benefits accrued from these measures are summarized below.

Economic Benefits of the Watershed Management
1) Reduction of sediment load runoff - Reduction of sediment load runoff from the watershed by vegetation recovering and reforestation (reduction 58,700 ton/year) - Reduction of progress of soil erosion as well as an outbreak of flood/debris flow.
2) Mitigation of damages by floods and debris flow - Mitigation of damages by floods and debris flow by structural measures and reforestation
3) Restoration and protection of the fabric of the watershed - Restoration and protection of the fabric of the watershed by conservation of the forests and rangelands
4) Improvement of livelihood of graziers - Improvement of the livelihood of graziers by involving them in forest and rangeland management works
5) Sustainable use of rangeland - Sustainable use of rangeland by applying sustainable stocking capacity (stocking capacity; 3 units/ha, grazing area; about 280 km^2, grazing; about 840,000 units)
6) Recharge of water sources in the watershed - Recharge of water sources by reforestation of the degraded forests (182 km^2).
7) Carbon sequestration - Contribution to improvement of a global environmental issue by increase of carbon storage in the forest
8) Increase of timber production - Increase of timber production by reforestation (Expected production; approximately 4,830 m^3 in about 4,740 ha of forests)

The proposed plan includes erosion control over 77 km^2 of land, reforestation and forest management across 182 $km^2$of land, and rangeland management of 70 km^2 of land. By implementing the proposed measures, the sediment load would be reduced by about 58,700 m^3/year. Since there is no relevant data on the environmental value of the forest in Iran and the forest in the study area is similar to that in Japan, the proposed reforestation area of 182 km^2 may have the following values by applying the "Valuation of Public Benefit Function of Forest in Japan" (Forest Agency of Japan, 2000).

Item	Annual Value per ha (thousand Rials/ha)	Total Value for the Reforestation Area at 182 km^2 (billion Rials)
1) Water reserve	810	14.7
2) Flood prevention	516	9.4
3) Water quality conservation	1,188	21.6
4) Erosion prevention	2,620	47.7
5) Soil erosion prevention	782	14.2
Total	5,917	107.6

Source: Modified by JICA Study Team referring to "Valuation of Public Benefit Function of Forest in Japan, Forest Agency of Japan, 2000"

(5) Economic Benefit of the Wastewater Management

The proposed wastewater management plan consists of the following major components; 1) management of domestic wastewater in urban areas, 2) management of domestic wastewater in rural areas, 3) management of industrial effluent, 4) management of livestock waste, 5) management of pollution from farmland, and 6) environmental monitoring. The economic benefits accrued from these measures are summarized below.

Economic Benefits of the Wastewater Management
1) Improvement of environmental conditions - Improvement of the wetland ecosystem by reduction of pollution load by about 30% (COD: 87,151 ton/year, T-P: 1,120 ton/year, at present) - Improvement of fish habitats in the wetland. - Contribution to control of water pollution in the rivers and the Caspian Sea. - Reduction of the environmental risks from toxic agrochemicals and heavy metals on the wetland, rivers and the sea.
2) Improvement of public health - Reduction of related medical expenses and lost earnings due to illness by reduction of waterborne disease. - Improvement of the public health conditions in the wetland as well as the coastal beaches.
3) Improvement of living environment - Reduction of odor and aesthetic problems downstream of the urban area - Increase of the values of the wetland and the beaches as tourism resources. - Reduction of problems of living environment caused by existence of factories in residential or agricultural areas.
4) Others - Increase of the land values

The economic viability of the sewerage system development projects for Rasht and Anzali Townships are shown in the feasibility studies for both townships. In addition, the proposed Wastewater Management Plan itself was examined with a minimum cost approach comparing with a case of installation of individual sewage treatment systems as a conceivable alternative.

(6) Economic Benefit of the Solid Waste Management

The solid waste management plan consists of the following major components: 1) municipal solid waste management, 2) industrial and medical solid waste management, and 3) environmental monitoring. The economic benefits accrued from these measures are summarized below.

Economic Benefits of the Solid Waste Management
1) Improvement of environmental conditions - Reduction of illegal dumping into rivers, and prevention of pollution of the Wetland and rivers. - Reduction of the risks of accidental ingestion of waste by birds and fishes in the wetland. - Elimination of the problem of groundwater pollution by leachate from landfills - Reduction of the risk of environmental pollution by toxic substances and heavy metals
2) Improvement of the living environment - Reduction of odors and aesthetic problems
3) Public health improvement - Improvement of public health conditions. - Elimination of the risk of the spread of infectious diseases from medical waste.
4) Improvement of efficiencies of material uses - Improvement of the efficiencies of materials use, and reduction of the landfill cost by recycling of the wastes
5) Other - Improvement of the aesthetic value of the wetland - Environmental awareness raising

Solid waste management is an essential public service, and under the new solid waste management law, provision of the service became mandatory in the entire study area. Thus, the economic viability of domestic waste management is evaluated using the least cost approach by a computer simulation. Based on the results, the least cost option for the municipal waste management was selected. Similarly, the measures for industrial and medical waste management can be implemented with minimal investment.

(7) Economic Benefit of the Environmental Education and Institutional Plans

Environmental education, public awareness activities, and institutional arrangements are indispensable to implement the other proposed other sub-plans mentioned before. Therefore, the economic benefits that accrued from the environmental education plan and institutional plan are considered to be included in the assessment of the other sub-plans. Also, their costs are considered justifiable since the proposed measures are selected with the least cost approach.

(8) Economic Evaluation of the Proposed Master Plan

By combining the economic benefit items of the wetland values based on its various functions, forest values based on its various functions, and estimated benefits accrued from the sewerage system development projects, which were valued in the monetary values in

the above, the net present value (NPV), benefit-cost ratio (B/C) and economic internal rate of return (EIRR) were calculated to assess the economic viability of the master plan based on the projected economic cash flow with all economic costs for the master plan. The results of the calculation are shown below. All economic values show that the master plan is economically viable.

Economic Criteria	Results
NPV	216.4 billion Rials
B/C	1.10
EIRR	13.1 %

As another approach to the economic evaluation of the master plan, a sample questionnaire survey was conducted in September 2004 of 1,750 residents in the study area in order to determine their willingness-to-pay (WTP) for the Anzali Wetland conservation. About 1,000 questionnaires were returned (60% collection rate). The results are summarized as below.

Amount to pay (Rials/month/household)	Percent of respondents willing to pay the amount
20,000	42.3%
40,000	36.1%
80,000	33.4%
120,000	27.0%
200,000	22.5%

Source: JICA Study Team

The level of WTP amount to make the proposed master plan economically feasible is estimated at 85,000 Rials/month/household. According to the above result, about 30% of the answers indicate an amount higher than 85,000 Rials/month/household and also 22.5% of the answer indicates the amount of more than 200,000 Rials/month/household. The average WTP amount is calculated at 58,000 Rials/month/household.

Nevertheless, more than 90% of the residents that answered the questionnaire are positive toward conservation of the Anzali Wetland and its watershed. Thus, with some environmental awareness raising, the proposed master plan would become viable.

10.4 Financial Evaluation

(1) Basic Principles

As many of the proposed measures do not generate any revenues, these measures have to be financed from governmental budgets. There are the following six types of financial sources for implementation of the proposed master plan. The main sources for funding

are thegeneral provincial budget and the national project budget. The sources and their typical uses are listed in the following table.

Financial Source	Typical Use
1) Provincial General Budget	Salary, daily operation costs, other recurrent costs
2) Provincial Development Budget	Medium/small-scale projects to be implemented by executing agencies
3) National Project	Large development projects
4) Purpose Tax	Part of project and O&M cost for specific project/activity
5) User Charges	Operation costs
6) Others	International grants and loans, domestic loans

The present financial evaluation focuses on the following issues:

1) Scale of the proposed measures

The first issue is whether the scales of the proposed measures are reasonable compared to the relevant governmental budgets and the affordability of local residents.

2) Financial responsibility and equity

The second issue is the allocation of financial responsibilities. The potentials of introducing other financial mechanisms are examined based on the Polluter-Pays-Principle and User-Pays-Principle because most measures depend strongly on public financing.

(2) Basic Assumptions for Financial Evaluation

The financial evaluation was conducted under the following basic conditions.

a) All costs in the master plan, i.e., the project (investment) costs and O&M costs during the entire master plan period between 2005 and 2019 are estimated based on June 2004 constant prices in Iranian Rials (IRR).
The exchange rate of USD 1 = IRR 8,652, JPY 100 = IRR 7,955 as of 30 June 2004 is applied. The value added tax (VAT) for all cost components and import tariffs for imported equipment are included in the cost estimation.
b) Based on the average household incomes in the study area, average disposable incomes of the household in urban and rural areas are 20, 275 thousand Rials/year and 15,797 thousand Rials/year, respectively.

(3) Overall Evaluation of the Master Plan

The estimated GRDP in Guilan province and total costs of the M/P during the M/P period are compared as shown below. It is said that public utilities in developing countries cost between 3% and 5% of GRDP in general. The total costs of the M/P will be affordable from the viewpoint of regional economic scale since the annual cost of implementing the

M/P would be between 0.2% and 1.3% of GRDP.

(Unit: billion Rials)

Year	Estimated GRDP	Total Cost of M/P*	% of GRDP
2005	35,793	355	1.0%
2006	37,582	361	1.0%
2007	39,462	492	1.2%
2008	41,435	537	1.3%
2009	43,506	524	1.2%
2010	45,682	262	0.6%
2011	47,966	233	0.5%
2012	50,364	302	0.6%
2013	52,882	308	0.6%
2014	55,526	303	0.5%
2015	58,303	186	0.3%
2016	61,218	171	0.3%
2017	64,279	169	0.3%
2018	67,493	137	0.2%
2019	70,867	136	0.2%

Note: Total cost of the M/P consists of the total project costs and O&M costs.

With reference to the affordability of the governmental budget, the main financial source for the investment cost will be the national project budget. The national project budget will be the main financial source for the investment cost. The average annual investment cost of the proposed master plan is estimated at about 224 billion Rials/year. This is about 0.05% of the national budget to be used by executive bodies for the annual programs and development projects, 436,022 billion Rials in 2003.

As far as the operation and maintenance (O&M) cost is concerned, the required O&M costs are compared with the total provincial budget consisting of current and development budgets, as the main components are salaries and other daily activity costs.

(Unit: million Rials/year)

Main Executing Bodies	Annual Provincial Budget Allocated*	Annual O&M Costs for M/P	Ratio to the Budget
1. MOJA	92,979	330 ~ 2,100	0.4% ~ 2.3%
2. DOE	9,923	2,600 ~ 4,100	26.2% ~41.3%
3. NRGO	33,622	0 ~ 2,790	0.0% ~ 8.3%
4. GWWC	20,071	5,600 ~ 39,000	27.9% ~ 194.3%
5. RWWC	96,843	180 ~ 1,300	0.2% ~ 1.3%
6. Ministry of Education	1,041,599	219 ~ 840	0.0% ~ 0.0%
7. Local governments	32,873	25,500 ~ 41,000	77.6% ~ 124.7%

Source: *- The budget is the total of the current and development expenditures in 2002, Statistical Yearbook of Guilan 2003

As seen in the above table, the O&M costs to be borne by MOJA, NRGO, RWWC, and the Ministry of Education are relatively small. On the other hand, the O&M cost of DOE is relatively large because of various new proposed tasks. The O&M costs for GWWC and local governments exceed their provincial budgets because of the costly sewage and solid waste management services, but a large part of the O&M costs for these services can be collected from the users as mentioned later.

It can be concluded that the proposed master plan is financially viable, since the annual O&M cost for the implementation of the master plan is within the acceptable ratio of the budget, though rearrangement of provincial budgets and financial support by the central government for large investment projects are essential.

(4) Financial Evaluation for the Wetland Ecological Management Plan

The estimated costs of the proposed wetland ecological management plan are shown below.

(Unit: billion Rials)

Components	Project Cost	Total O&M Cost
1. Zoning and Ecological Management	18,175	732
2. Conservation of Wildlife	2,251	682
3. Conservation of Habitat	1,186	3,664
4. Promotion of Wise Use	9,199	3,822
5. Monitoring and Feedback	-	6,356
Total	30,811	15,256
Average Annual	2,054	1,017

Most of the proposed measures in the plan should be implemented by DOE. Therefore, the financial viability of the plan will depend on the budget of DOE. As mentioned before, the provincial budget of DOE Guilan is 10,000 million Rials/year. While, the average annual required O&M budget is estimated at 1,000 million Rials/year. The project cost should be borne by the national budget as much as possible.

(5) Financial Evaluation for the Watershed Management Plan

The estimated costs of the proposed watershed management plan are shown below.

(Unit: billion Rials)

Components	Project Cost	Total O&M Cost
1. Soil Erosion Control	264,965	14,164
2. Forest and Rangeland Management	182,877	23,377
3. Plain Area Management	711	2,163
4. Livelihood Development	3,477	-
5. Environmental Monitoring	-	3,627
6. Institutional Arrangement	1,533	-
7. Livestock Resettlement Program	273,221	-
Total	726,785	43,331
Average Annual	48,452	2,889

The O&M costs for the soil erosion control is 940 million Rials/year and this is acceptably small fraction of the provincial budget of MOJA of about 93,000 million Rials/year. Other O&M costs are about 18,000 million Rials/year and this is roughly a half of the provincial budget of 33,600 million Rials/year. The O&M costs could be secured within the provincial budget. Regarding the large project costs, national budget should be applied.

(6) Financial Evaluation for the Wastewater Management Plan

The estimated costs of the proposed wastewater management plan are shown below.

(Unit: billion Rials)

Components	Project Cost	Total O&M Cost
1. Management of Domestic Wastewater in Urban Areas	2,259,796	400,586
2. Management of Domestic Wastewater in Rural Areas	59,490	8,349
3. Management of Industrial Effluent	128,250	21344
4. Management of Livestock Waste	1,000	560
5. Management of Pollution from Farmland	-	3,960
6. Environmental Monitoring	-	5,250
Total	2,448,865	440,049
Average Annual	163,324	29,337

Under the proposed domestic wastewater management in both urban and rural areas, the average user charges to cover the whole O&M costs are estimated as below.

(Unit: Rials/year/household)

Item	Urban Area (Shahr)	Rural Area (Dehestan)
Estimated user charge for recovery of O&M cost	48,000 ~ 233,000	31,000 ~ 174,000
1% of disposable household income	203,000	158,000
Annual total income (= annual total O&M cost)	5,441~38,522 million Rials	165 ~ 1,089 million Rials

As seen in the above table, the required user charge is in the order of 1% of the disposable household income. Considering future increases in household income, the estimated user charges will be affordable for the users considering the estimated user charges and disposable household income levels for both urban and rural areas. On the other hand, the investment cost for the domestic wastewater management should be covered by the national budget because of the large amounts. The project cost and O&M cost of the industrial effluent management, livestock waste management and management of pollution from farmland should be borne by the polluters in principle.

(7) Financial Evaluation for the Solid Waste Management Plan

The estimated costs of the proposed solid waste management plan are shown below.

(Unit: billion Rials)

Components	Project Cost	Total O&M Cost
1. Provision of Efficient Waste Collection Services	121,651	345,761
2. Composting	17,083	178,557
3. Sanitary Landfill	6,906	12,265
4. Proper Treatment of Hazardous Industrial Waste	600	8,252
5. Environmental Monitoring	-	3,494
Total	146,239	548,329
Average Annual	9,749	36,555

It is desirable to fully-recover the cost of solid waste management by local governmental tax or user charges. The user charges for full cost recovery are estimated as below.

(Unit: Rials/year/household)

Item	Urban Area (Shahr)	Rural Area (Dehestan)
Estimated user charge for full cost recovery	163,000	311,000
2% of disposable household income	406,000	316,000
Annual total income (= annual total cost)	35,000 ~ 49,000 million Rials	1,850 ~ 13,700 million Rials

As seen in the above table, the estimated user charges can be covered by 2% of the disposable household income and its rate will be affordable for the residents. The cost of the industrial and medical solid waste management should be borne by the polluters based on the polluters-pays-principle. The cost for the environmental monitoring should be covered by the provincial budget of DOE Guilan as regular work.

(8) Price Contingency

While the economic and financial evaluation were conducted by using the constant prices of June 2004, examples of the total cost of the M/P at current price are shown assuming

future price escalations at several levels. Based on national statistics for Iran, average annual price escalation based on the consumer price index (CPI) for the past 5 years is very high at around 18.7%/year, though this high level of the inflation is not a realistic figure to assume future price escalations. As shown in the following table, an annual price escalation of only 3% causes about a 20% of increase in the total cost of the M/P.

(Unit: billion Rials)

Annual Price Escalation	Total Cost of M/P at 2004 Constant Price	Total Price Contingency in 2019/20	% of Total Cost of M/P
3%/year Case	4,478	903	20.2%
5%/year Case		1,633	36.5%
10%/year Case		4,050	90.4%

(9) Suggested Preparations

Because significant funds are required for the implementation of the master plan, and as it is essential that the proposed measures are implemented in a coordinated manner, the relevant organizations are urged to take coordinated actions to secure necessary budget.

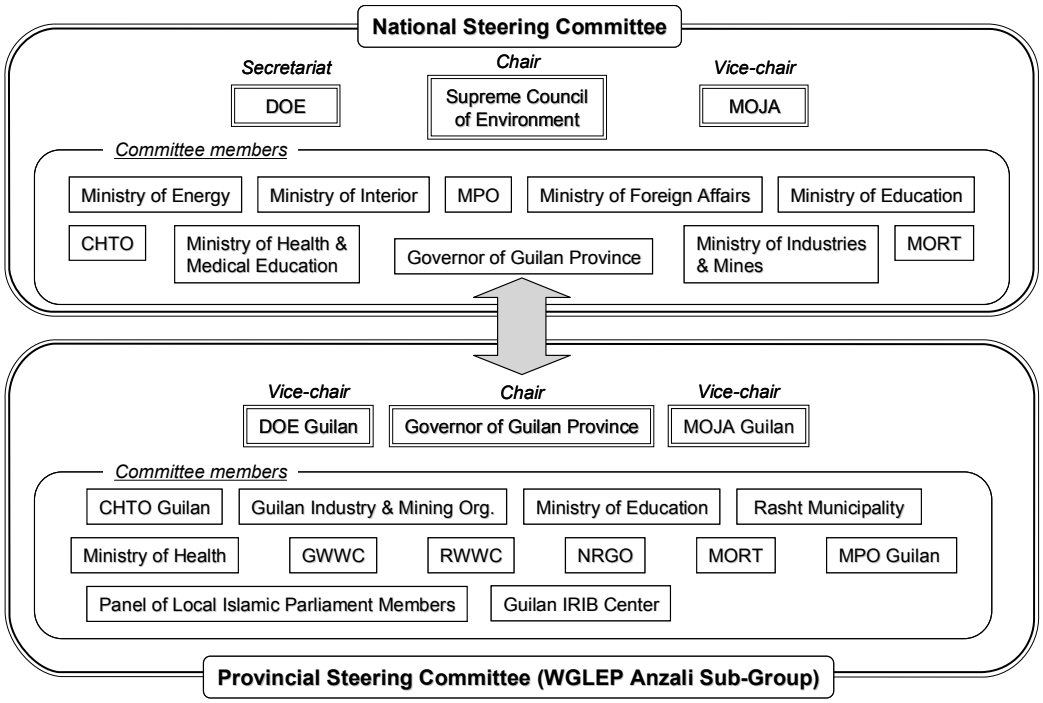
1) Application for the National Five-Year Development Plan

As a first step to secure the required budget for the proposed master plan, it is recommended to include the master plan in the national 5-year development plans, from the 4th national 5-year development plan (2005 - 2009) if possible.

2) Organizing Special Committees at National and Provincial Levels

The proposed master plan includes broad fields and therefore it should be implemented efficiently and effectively through coordination of the relevant organizations.

To secure the required budget effectively and efficiently, it is suggested to form special committees consisting of relevant organizations at both national and provincial levels. The special committee at the national level has to play an important role in creating a channel to the national budget based on the information from the special committee at the provincial level. The special committee at the provincial level would monitor the progress of implementation of the master plan. The organizational charts of these special committees would be as shown below.



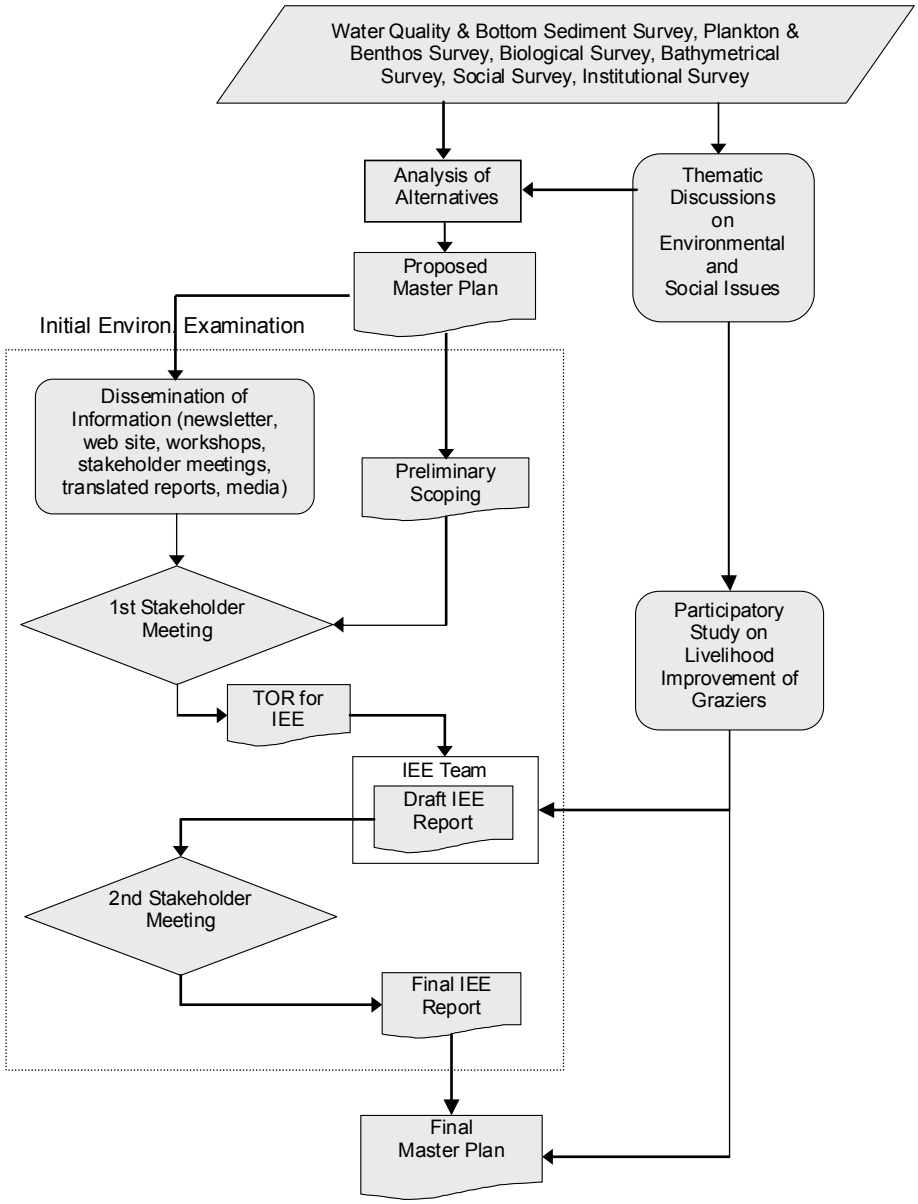
Note: MPO- Management & Planning Organization, GWWC- Guilan Water and Wastewater Company, RWWC- Rural Water and Wastewater Company, NRGO- Natural Resources General Office, MORT- Ministry of Road and Transport, IRIB- The Islamic Republic of Iran Broadcasting

10.5 Environmental and Social Evaluation

Among the six sub plans included in the proposed master plan, the following four sub plans are subject to environmental and social evaluation.

1) Wetland Ecological Management Plan
2) Watershed Management Plan
3) Wastewater Management Plan
4) Solid Waste Management Plan

The environmental education plan and institutional plan for implementation are not subject to evaluation as they do not involve any physical projects and their environmental and social impacts are deemed small. According to the JICA Guidelines for Environmental and Social Considerations (2004) as well as considering the relevant laws, regulations and guidelines in Iran, an Initial Environmental Examination (IEE) was executed in the Study. Figure below shows the steps of environmental and social considerations in this study including the IEE.



The project information was disseminated using 3 newsletters (total 3,000 copies), a web site (English/Farsi), 4 workshops and 2 seminars, translated reports (total 220 copies), etc. Then, 2 stakeholder meetings were organized in August, 2004 and October, 2004, to discuss specific environmental and social issues. In total 49 participants, including members from 5 local environmental NGOs participated in the stakeholder meetings.

	Name	Organization/Department
Participants to the First Stakeholder Meeting		
1	Mr. Rasoul Mohammadi	MOJA
2	Mr. Mohammad Nejati	MOJA
3	Mr. Alireza Saeedi	Environmental Health Expert of Physician Science University
4	Mr. Sadegh Islami	Environmental Health Expert of Guilan Physician Science University
5	Mr. Adel Kazemi	NRGO
6	Mr. Ismail Javadi	Mine & Industry Organization in Guilan
7	Mr. Naser Toutchi	Ports and Shipping Organization – Port of Anzali
8	Mr. Alireza N. Sanati	Guilan Fishery Bureau
9	Mr. Mohsen Urumieh	Watershed Management Deputy
10	Mr. Farhad Momenpour	GWWC
11	Mr. Rahim Khorasani	MOE
12	Mr. Alireza Mirzajani	Caspian Bony Fishery Research Center, in Anzali
13	Mr. Nooroddin Azimi	Guilan University
14	Mr. Shahrouz Mallah	NGO, Nejatesabz Committee
15	Mr. Mohamoud Nikouyeh	NGO, Guilan Jamieate Sabz
16	Mr. Roohollah Vahidi	NGO, Sabz Aien
17	Ms. Mayam Panahandeh	NGO, Sabz Aien
18	Ms. Shirin Parsi	NGO, Women Association Against the Environmental Pollution
19	Ms. Nasim Tavafzadeh	NGO, Guilan Sabzkaran
20	Mr. Abbas Safakar	Guilan DOE
21	Mr. Asan Bagharzadeh	Guilan DOE
22	Mr. Hossein Ali Mohammadi	Watershed Management Deputy
23	Dr. Moslem Akbarinia	JICA Study Team
24	Dr. Itaru Okuda	JICA Study Team
25	Mr. Masayuki Fujii	JICA Study Team
Participants to Second Steering Committee Meeting		
1	Mr. Seyednourodin Hosseinpour	Anzali Bony Fishes Research Center
2	Mr. Seyedhojjat Khodaparast	Anzali Fishery General Department
3	Mr. Naser Toutchi	Anzali Ports and Navigation Organization
4	Mr. Alireza Nejatsanati	Guilan NRGO
5	Mr. Mohammad Cheraghcheshm	MOJA
6	Mr. Mohammadbagher Rafati	WMD
7	Mr. Reza Mahdavi	MPO
8	Mr. Hossein Amini	ITTO
9	Mr. Mohsen Oroumieh	Watershed Evaluation study Office
10	Mr. Mohammad Heidarzadeh	HUDO
11	Mr. Esmaill Tahsini	HUDO
12	Mr. Azadeh Amed	Women ‘s NGO
13	Mr. Adel Kazemi	NRGO
14	Mr. Mahyar Sakari	DOE
15	Mr. Asan Bagharzadeh	DOE
16	Mr. Rahim Khorasani	RWO
17	Mr. Hossein Ali Mohammadi	MOJA
18	Mr. Eghdami	MPO
19	Mr. Hirofumi Sadamura	JICA Study Team
20	Dr. Itaru Okuda	JICA Study Team
21	Mr. Shin-ichiro Tanimoto	JICA Study Team
22	Mr. Yoji Mizuguchi	JICA Study Team
23	Mr. Tomoo Aoki	JICA Study Team
24	Dr. Paul Driver	JICA Study Team

The IEE documents were drafted by the IEE team consisting of 6 experts on environmental and social issues. From these discussions, the environmental and social impact by the above plans were evaluated, and mitigation measures were proposed. The expected adverse environmental and social impacts and mitigation measures are summarized below. Because the master plan was designed to improve the environmental conditions of the wetland and its watershed, the environmental impacts of the master plan are considered to be limited, though the social aspects of the master plan, in particular the livestock resettlement program, need due attention.

1) Wetland Ecological Management Plan

Proposed Measures	Environmental and Social Impacts	Proposed Mitigation Measures
Rehabilitation and Maintenance of Habitat	Pollution and secondary environmental problem by dredging and disposal	Small-scale pilot project, Environmental monitoring
Establishment of Environmental Zoning	Influence by introduction of buffer zone and transition zone	Stakeholder meeting
Sustainable Use of Natural Resources	Influence to professional hunters and fishermen by strict license control	Stakeholder meeting, Development of alternative livelihood, monitoring

2) Evaluation of Watershed Management Plan

Proposed Measures	Environmental and Social Impacts	Proposed Mitigation Measures
Soil Erosion Control	Destruction of natural environment around construction site Release of wastewater from construction site	Preparation of guidelines, Instruction to contractors
Prevention of Landslides	Further landslides and slope collapses due to civil works in a landslide area	Technical support by the MOJA head office
Improvement of Livestock Resettlement Program	Lack of social safety net for the people to be resettled and those to remain in the mountains	Stakeholder participation, Development of livelihood improvement plan

3) Evaluation of Wastewater Management Plan

Proposed Measures	Environmental and Social Impacts	Proposed Mitigation Measures
Sewerage Development	Disposal of sludge generated from treatment facilities Pollution by treated wastewater	Disposal to the designated site Tertiary treatment

4) Evaluation of Solid Waste Management Plan

Proposed Measures	Environmental and Social Impacts	Proposed Mitigation Measures
Proper Disposal of Municipal Solid Waste	Odor, increased traffic and other nuisance to the neighboring residents	Feasibility study Good management
Provision of Efficient Municipal Waste Collection Service to the Whole Area	Claim for reduction of collection frequency and points	Environmental awareness raising

10.6 Technical Evaluation

The proposed master plan includes construction and operation of facilities such as concrete

erosion control facilities, wastewater treatment facilities, sanitary landfills, etc. The proposed master plan is evaluated from the technical aspect.

(1) Wetland Ecological Management Plan

This plan includes construction of facilities for environmental education and ecotourism. However, no special technology is needed for construction of those facilities.

(2) Watershed Management Plan

The major facilities included in the plan are concrete check dams, gabion check dams, wooden dams, sediment traps, slope protection walls and restraint work for landslides. Among them, concrete check dams and restraint work for landslides are new technologies for MOJA Guilan, Watershed Management Department (WMD). Technical assistance by MOJA head office or experts to WMD will be necessary.

(3) Wastewater Management Plan

Several kinds of wastewater treatment systems are proposed in the wastewater management plan. These technologies have already been applied in Iran, however, the executing organizations, such as GWWC, RWWC and MOIM in Guilan do not have experience to operate them. According to the contract agreement with the contractors for construction of WWTP in Anzali and Rasht, the contractors shall provide one year training programs for operation of WWTP after completion of the construction. These training programs are expected to solve technical weakness of the execution organizations for the operations.

(4) Solid Waste Management Plan

The only major facility to be constructed is only a sanitary landfill. In the plan, the Fukuoka Method is proposed. This method has already been applied in the Rostamabad sanitary landfill near the study area, so that no technical constraint is found.

(5) Environmental Education Plan

The major facility to be constructed is wetland education center. Hence, there is no technical constraint found.

CHAPTER 11 IMPLEMENTATION PROGRAM BY ORGANIZATION

11.1 Introduction

The proposed master plan consists of six sub-plans; the Wetland Ecological Management Plan, Watershed Management Plan, Wastewater Management Plan, Solid Waste Management Plan, Environmental Education Plan and Institutional Plan for Implementation. They are to be carried out by various organizations, such as DOE, MOJA, Local Governments, GWWC, RWWC, etc. In this section, the implementation programs proposed in the previous chapters are rearranged by executing organization. This section describes the following.

1) Implementation schedule of the proposed projects to be carried out by each organization
2) Investment cost and operation and maintenance (O&M) cost for implementation of the proposed projects to be provided by each organization
3) Outline of priority projects to be carried out by each organization

Demarcation of responsibility by organization for implementation of the proposed master plan is shown below.

Sub-Plan	DOE	MOJA	Local Gov.	GWWC/ RWWC	Others
1) Wetland Ecological Management	○	-	-	-	-
2) Watershed Management	△	○	-	-	-
3) Wastewater Management	○	○	-	○	○
4) Solid Waste Management	○	-	○	-	○
5) Environmental Education	○	○	△	-	○
6) Institutional Plan	○	○	○	△	○

Note: ○ Direct responsibility
△ Assistance
Source: JICA Study Team

11.2 Implementation Program for Each Organization

(1) DOE

The implementation schedule of the proposed projects to be carried out by DOE is shown in Figure 11.2.1. The project cost and annual operation and maintenance (O&M) cost are also shown in Table 11.2.1. The total project cost is 44,270 million Rials and annual O&M cost ranges between 3,100 million Rials/year and 4,700 million Rials/year.

Table 11.2.1 Proposed Implementation Schedule for DOE (1/2)

Proposed Measures		Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WETLAND ECOLOGICAL MANAGEMENT PLAN																
1. Environmental Zoning																
(1)	Establishment of Environmental Zones															
(2)	Enforcement of Zoning															
2. Conservation of Wildlife																
(1)	Conservation of the Threatened Species															
(2)	Control of Alien Species															
3. Conservation of Habitat																
(1)	Strengthen of the Regulation															
1)	Construction of Guard Station															
2)	Capacity Development of Rangers															
3)	Regulation of Motorboats															
(2)	Rehabilitation and Maintenance of Habitat															
1)	Rehabilitation of Habitat															
2)	Measure for Solid Waste Inflow															
4. Promotion of Wise Use																
(1)	Development of Ecotourism															
	1) Structuring of Ecotourism Network															
	2) Nature Interpreter Training															
	3) Preparation of Infrastructure															
	4) Implementation of Ecotour			Trial Activity						Full Activity						
(2)	Sustainable Use of Natural Resources															
5. Monitoring and Feedback																
(1)	Environmental Monitoring for Adaptive Management															
(2)	Environmental Research															
WASTEWATER MANAGEMENT PLAN																
1. Management of Domestic Wastewater in Urban Area																
(4)	Promotion of Individual Wastewater Treatment															
(5)	Promotion of Low Phosphorous Detergent															
2. Management of Domestic Wastewater in Rural Area																
(1)	Community Wastewater Treatment System Development															
1)	First Stage (Seven Villages)															
2)	Second Stage & Third Stage															
3. Management of Industrial Effluent																
(1)	Centralization of Industrial Factories															
(3)	Strengthening of Monitoring Activities by DOE															
4. Management of Livestock Waste																
(1)	Treatment of Livestock Waste from Industrial Animal Husbandry															
(2)	Control of Livestock Waste in Grazing Lands in the Plain Area															
SOLID WASTE MANAGEMENT PLAN																
2. Industrial and Medical Solid Waste Management																
(2) Non-hazardous industrial solid waste management																
2)	Establishment of Reduction/Recycling System of Industrial Solid Waste															

Source: JICA Study Team

Table 11.2.1 Proposed Implementation Schedule for DOE (2/2)

Proposed Measures		Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period					
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ENVIRONMENTAL EDUCATION PLAN																	
2. Public Awareness Raising and Participation																	
(1)	Decision Makers - Sub-measures 1) - 4)																
(3)	Business and Industry - Sub-measures 1)																
	Business and Industry - Sub-measures 2) - 4)																
(5)	General Public and Tourists - Sub-measures 2) - 4)																
	General Public and Tourists - Sub-measures 1) and 5) - 7)																
INSTITUTIONAL DEVELOPMENT PLAN																	
1. Establishment of Anzali Wetland Conservancy																	
(1)	Establishment of Anzali Wetland Department																
(3)	Annual Anzali Forum																
2. Capacity Development																	
(1)	In-country cross-sectoral training																
(2)	DOE "apprenticeship" training																
(3)	Overseas exchange visits																
DISBURSEMENT SCHEDULE		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
	1) Project Cost	1,639	730	3,799	1,012	4,460	7,283	5,868	5,146	4,410	4,410	1,070	1,070	1,233	1,070	1,070	44,270
	2) O&M Cost	3,112	3,477	3,731	3,752	3,832	4,125	4,333	4,670	4,480	4,480	4,459	4,389	4,639	4,479	4,399	62,357

Source: JICA Study Team

The priority projects to be implemented by DOE are listed as below.

1) Environmental zoning (Wetland ecological management plan)
2) Development of ecotourism (Wetland ecological management plan)
3) Establishment of adaptive management system (Wetland ecological management plan)
4) Strengthening of monitoring for industrial effluent by DOE (Solid waste management plan)
5) Public awareness raising and participation for decision makers (Environmental education plan)
6) Establishment of Anzali Wetland Department in DOE Guilan (Institutional plan)

(2) MOJA

The implementation schedule of the proposed projects to be carried out by MOJA is shown in Table 11.2.2. The project cost and annual operation and maintenance (O&M) cost are also shown in Figure 11.2.2. The total project cost is 726,800 million Rials and annual O&M cost ranges between 845 million Rials/year and 5,700 million Rials/year.

Table 11.2.2 Proposed Implementation Schedule for MOJA

Proposed Measures		Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WATERSHED MANAGEMENT PLAN																
1. Soil Erosion Control and Prevention of Land Slides																
(1)	Soil erosion control															
1)	Vegetative meausres															
2)	Structure measures															
(2)	Prevention of land slides															
2. Forest and Rangeland Management																
(1)	Pilot activity of participatory resource management															
(2)	Reforestation of degraded forests															
(3)	Reforestation of the margin areas															
(4)	Forest management under forestry plan															
(5)	Conservation of protected forests															
(6)	Rangeland management by graziers															
(7)	Development of regulations necessary for participatory resource management															
(8)	Improvement of livestock resettlement program															
3. Plain Area Management																
(1)	Source-level control of sediment runoff in plain area															
(2)	Measure to control inflow of sediment into the wetland															
(3)	River management for extreme conditions															
4. Livelihood Development																
(1)	Capacity development of NRGO Provincial and Local Offices															
(2)	Livelihood improvement of local people in forest and rangeland management															
5. Environmental Monitoring Plan																
(1)	Monitoring of soil erosion controls															
(2)	Monitoring of land use / vegetation cover															
(3)	Monitoring of rangeland management															
(4)	Monitoring of forest management															
(5)	Monitoring of livestock resettlement program															
5. Institutional Arrangement																
(1)	Coordination among relevant organizations															
(2)	Capacity development for sustainable watershed management															
Livestock Resettlement Program (done by Iranian Government)																
WASTEWATER MANAGEMENT PLAN																
5. Management of Pollution from Farmland																
(1)	Promotion of Low External Input Farming															
1)	Expansion of use of compost such as livestock manure and/or Azolla															
2)	Expansion of integrated pest management through farmer field school															
3)	Promotion of proper farming practice															
ENVIRONMENTAL EDUCATION PLAN																
(4)	Farmers and Rural Communities - Sub-measures 1) - 5)															
	Farmers and Rural Communities - Sub-measures 6)															

DISBURSEMENT SCHEDULE		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
	1) Project Cost	98,847	48,669	132,625	109,458	97,686	44,711	48,010	45,251	33,255	28,652	19,655	8,484	5,790	3,204	2,487	726,785
	2) O&M Cost	845	1,005	1,795	3,305	4,265	5,684	5,560	4,909	4,660	4,272	4,286	4,145	4,117	4,074	4,085	57,006

Source: JICA Study Team

The priority projects to be implemented by MOJA are listed as below.

1) Vegetative erosion control measures (Watershed management plan)
2) Structural erosion control measures (Watershed management plan)
3) Pilot activity of participatory resource management (Watershed management plan)
4) Reforestation of the degraded forest of 70 km^2 (Watershed management plan)
5) Rangeland management by graziers (Watershed management plan)
6) Livelihood development (Watershed management plan)
7) Public awareness raising and participation for farmers and communities (Environmental education plan)

(3) GWWC and RWWC

The implementation schedule of the proposed projects to be carried out by GWWC and RWWC is shown in Table 11.2.3. The project cost and annual operation and maintenance (O&M) cost are also shown in Figure 11.2.3. The total project cost is about 2,319,000 million Rials and annual O&M cost ranges between 5,400 million Rials/year and 39,600 million Rials/year.

Table 11.2.3 Proposed Implementation Schedule for GWWC and RWWC

Proposed Measures	Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WASTEWATER MANAGEMENT PLAN															
1. Management of Domestic Wastewater in Urban Area															
(1) Rasht Sewerage System Development Project															
1) Rasht Sewerage (Phase 1)															
2) Rasht Sewerage (Phase 2)															
(2) Anzali Sewerage System Development Project															
1) Anzali Sewerage (Phase 1)															
2) Anzali Sewerage (Phase 2)															
(3) Somehsara Sewerage System Development Project															
2. Management of Domestic Wastewater in Rural Area															
(1) Community Wastewater Treatment System Development															
1) First Stage (Seven Villages)															
2) Second Stage & Third Stage															

DISBURSEMENT SCHEDULE	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1. GWWC																
1) Project Cost	185,178	254,294	292,775	320,315	319,303	100,508	74,979	159,489	167,589	170,559	55,384	55,384	54,454	24,793	24,793	2,259,796
2) O&M Cost	5,441	8,360	11,280	14,199	17,119	22,799	26,396	29,993	33,590	38,522	38,522	38,522	38,522	38,522	38,522	400,303
2. RWWC																
1) Project Cost	0	4,860	4,860	4,860	5,250	3,915	3,915	3,915	3,915	4,170	3,915	3,915	3,915	3,915	4,170	59,490
2) O&M Cost	0	165	165	165	363	528	528	528	528	726	891	891	891	891	1,089	8,349

Source: JICA Study Team

The priority projects to be implemented by GWWC and RWWC are listed as below.

1) Rasht sewerage system development project Phase 1 (Wastewater management plan, GWWC)
2) Anzali sewerage system development project Phase 1 (Wastewater management plan, GWWC)

(4) Municipalities

The implementation schedule of the proposed projects to be carried out by Municipalities is shown in Table 11.2.4. The project cost and annual operation and maintenance (O&M) cost are also shown in Table 11.2.4. The total project cost is 146,000 million Rials and annual O&M cost ranges between 26,000 million Rials/year and 42,000 million Rials/year.

Table 11.2.4 Proposed Implementation Schedule for Local Governments

Proposed Measures	Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SOLID WASTE MANAGEMENT PLAN															
1. Municipal Solid Waste Management															
(1) Environmental Awareness Rising															
1) Participatory Recycling Activity															
a) Pilot Activities by Volantary Groups															
b) Extention of Target Groups															
c) Full Activity															
(2) Provision of efficient municipal waste collection service to the whole area															
1) Provision of waste collection to villages															
a) Phase 1 (Villages along the rivers)															
b) Phase 2 (Villages near the Anzali wetland)															
c) Phase 3 (Villages away from the Anzali wetland)															
2) Change of collection frequency and collection point in urban areas															
1) Trial Operation in selected cities															
2) Extension of Target cities															
3) Full Operation in selected cities															
(3) Proper disposal of municipal solid waste															
1) Composting of municipal solid waste															
2) Sanitary landfill construction															
1) Rasht															
2) Anzali															
3) Closure of present open dumping sites															
INSTITUTIONAL DEVELOPMENT PLAN															
1. Establishment of Anzali Wetland Conservancy															
(2) Formation of Anzali Sub-Group of WGLEP															

DISBURSEMENT SCHEDULE	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1. Provincial Government																
1) Project Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2) O&M Cost	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	870
2. Municipalities																
1) Project Cost	32,478	6,764	7,334	7,524	6,384	16,454	5,624	7,904	15,000	6,194	9,804	5,624	6,764	6,764	5,624	146,239
2) O&M Cost	26,007	31,287	31,542	32,698	33,411	36,969	37,508	38,565	38,218	38,840	39,393	39,850	40,630	41,417	41,994	548,329

Source: JICA Study Team

The priority projects to be implemented by Municipalities are listed as below.

1) Participatory recycling activity for municipal waste (Solid waste management plan)
2) Provision of waste collection services to villages (Solid waste management plan)
3) Construction of composting plant in Anzali (Solid waste management plan)
4) Formation of Anzali sub-group in the provincial thematic working group on land use, environment and population (WGLEP), to be coordinated by the Provincial Governor.

(5) Other organizations

The implementation schedules of the proposed projects to be carried out by other organizations are shown in Table 11.2.5. The project cost and annual operation and maintenance (O&M) cost are also shown in Table 11.2.5. The total project cost is 131,000 million Rials and annual O&M cost ranges between 1,300 million Rials/year and 2,900 million Rials/year.

Table 11.2.5 Proposed Implementation Schedule for Others

Proposed Measures	Fourth 5-year Plan Period					Fifth 5-year Plan Period					Sixth 5-year Plan Period				
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WASTEWATER MANAGEMENT PLAN															
3. Management of Industrial Effluent															
(1) Centralization of Industrial Factories															
(2) Construction of Centralized Wastewater Treatment System															
1) Anzali															
2) Rasht															
3) Others															
SOLID WASTE MANAGEMENT PLAN															
2. Industrial and Medical Solid Waste Management															
(1) Proper treatment of hazardous solid waste															
1) Consyruction of pretreatment facility for solid waste containing heavy metals															
2) Establishment of separation and collection system for infectious waste															
(2) Non-hazardous industrial solid waste management															
1) Promotion of reduction and recycling of industrial solid waste															
ENVIRONMENTAL EDUCATION PLAN															
1. Environmental Education															
(1) Environmental Education in Schools - Sub-measures 1) - 5)															
Environmental Education in Schools - Sub-measures 6) - 7)															
(2) Environmental Education in Higher Education. - Sub-measures 1) - 3)															
Environmental Education in Higher Education - Sub-measures 4)															
Environmental Education in Higher Education - Sub-measures 5)															
2. Public Awareness Raising and Participation															
(2) Religious Leaders - Sub-measures 1)															
Religious Leaders - Sub-measures 2) and 3)															
(6) NGOs and Journalists - Sub-measures 1) - 4)															

DISBURSEMENT SCHEDULE	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1) Project Cost	266	266	266	37,766	30,266	16,587	17,750	0	0	0	5,987	5,400	5,400	5,400	5,400	130,755
2) O&M Cost	1,329	1,379	1,414	2,258	2,358	2,280	2,752	2,129	2,607	2,285	2,431	3,174	2,756	2,698	2,861	34,708

Source: JICA Study Team

The priority projects to be implemented by other organizations are listed as below.

1) Centralized wastewater treatment in Rasht industrial city (Wastewater management plan, Private companies)
2) Environmental education in Schools (Environmental education plan, Ministry of Education)

3) Pre-treatment facility for hazardous industrial waste containing heavy metal (Solid waste management plan, Private companies)
4) Establishment of separation and collection system for infectious waste (Solid waste management plan, Hospitals)

CHAPTER 12 CAPACITY DEVELOPMENT

12.1 Introduction

Capacity development of stakeholders was one of the main objectives of this study, and various capacity development activities were implemented throughout the course of the study. The goals of the capacity development activities were to:

1) facilitate coordination among the stakeholders,
2) develop capacities to develop management plans,
3) implement activities that lead to local initiatives for environmental conservation,
4) develop capacities for environmental management based on monitoring data, and
5) develop mechanisms to disseminate environmental information

12.2 Daily Activities

Many capacity development activities were carried out daily through various joint activities, such as field surveys, data analysis, meetings and joint development of the master plan. They are summarily explained as follows:

Activities	Content of Activities
Development of Coordination Mechanisms	1) National steering committee meetings 2) Local steering committee meetings 3) Technical steering committee meetings 4) Meetings on implementation of the proposed M/P
Involvement of Local Stakeholders	1) Stakeholder meetings 2) Questionnaire survey 3) Workshops
Participatory Study on Livelihood Improvement of Graziers	1) Participatory rural appraisal (PRA) sessions for graziers
Environmental Surveys	1) Water & Bottom Sediment Survey 2) Plankton and Benthos Survey 3) Biological Survey 4) Bathymetrical Survey 5) Social Survey 6) Institutional Survey
Analysis of Degradation Mechanisms of the Anzali Wetland and Its Watershed	1) Pollution load 2) Sediment yield and deposition 3) Landslide mechanisms
Joint Development of Master Plan	1) Thematic meetings 2) Coordinated meetings

12.3 Pilot Activities

(1) Objectives

During the initial phase of the Study, the JICA Study Team reviewed the current environmental management activities in Guilan, and identified a number of promising environmental measures that could be implemented with the current capacities of the local organizations. Some of such promising environmental measures were implemented as pilot activities in order to:

1) evaluate the effectiveness of promising environmental measures through trial implementations,
2) gain real-life experience required to upscale such activities in the future,
3) promote environmental education and public awareness of the Anzali Wetland conservation
4) promote public participation in the conservation of the Anzali Wetland,
5) promote coordination among various stakeholders, and
6) incorporate the experiences of the pilot activities into the environmental master plan, and improve the effectiveness of the master plan.

(2) Pilot Activities Implemented

In order to design effective pilot activities, many discussions with local stakeholders were carried out in June-August 2003, and the following 11 activities were selected and implemented.

Activities	Evaluation
1) Eco-tourism	Participants gave a positive impression, but attractive facilities and programs are essential for economic feasibility.
2) Wetland Education Program	Participants gave positive feedback. High sustainability can be expected. Management of Center and program will be key point.
3) Beneficial Use of *Azolla* as Fertilizer	Potential was confirmed. Sustainability will depend on establishment of efficient collection system.
4) Erosion Control in Masuleh	Recovery of vegetation was confirmed, but effectiveness should be monitored for the long term.
5) Community Wastewater Treatment System Development in Masal	Technical effectiveness was confirmed. Promotion should be made.
6) Research on Water Purification Capacity of Reed Bed in Selke	Evaluation has not been completed. Environmental education effect is also expected.
7) Livestock Wastewater Treatment Facility Development in Rasht	Expansion of knowledge of livestock waste treatment. Effectiveness is under monitoring by Iranian side.
8) Waste Drop-off centers in Fuman and Masal	Generally welcomed by residents. Selection of location is key point for success.
9) Community-based Recycling in Masal and Somehsara	This activity is for the progress of raising environmental awareness. Sustainability of the activity depends on sufficient participants and incentives to the participants.
10) Environmental Report	Highly praised by stakeholders. Sustainability of the activity depends on editors.
11) Website Development	Very useful. Updating is key point.

12.4 Environmental Monitoring Activities

DOE, MOJA, MOE and various other organizations have environmental monitoring programs. However, many of them are not co-ordinated, and the results of such monitoring activities have not been used to improve the environment of the study area. Thus, the study supported environmental activities of these organizations with the objectives to:

1) develop a basic system of environmental monitoring through structured activities of collecting, analyzing, disseminating, and reflecting the results of the environmental monitoring back to the management activities, and
2) foster active cooperation and sharing of information among the stakeholders.

The monitoring indicators were selected based on the concept of the "Pressure-State-Response" relationship of environmental issues, considering the capacities of relevant Iranian organizations to implement them within the existing technical and financial resources. The following environmental items were selected for the activities.

Category	Monitoring Items
Wetland Management	- Birds, macrophytes and fish in the Anzali Wetland - Water and Sediment Quality in the Anzali Wetland - Review of Case Studies of Wetland Management in Iran - Information on Protected Areas and Foundation of a GIS Map - List of Resource Persons for Wetland Management - Monitoring of Fluctuation of Water Level
Watershed Management	- Inventory of GIS Database - Forest Management Activity - Rangeland Management Activity - Erosion Control Measures - Educational Activity for Promotion of Sustainable Agriculture - Use of Chemical Fertilizers and Pesticides
Wastewater Management	- Water and Sediment Quality in Rivers - Expansion of Sewer Network - Activities implemented by RWWC - Human Resources for Industrial Pollution Control - Domestic and Industrial Wastewater Characteristics
Solid Waste Management	- Maps of Areas Polluted by Solid Waste - Solid Waste Management Activities by Municipalities - Educational Activities for Improvement of Solid Waste Management - Amount of Solid Waste Dumped at Anzali Landfill Site

Overall good efforts have been made to collect information, and the participation of relevant organizations was reasonable. Nevertheless, there seem to be two major issues that hinder the effective environmental management based on monitoring data:

1) Lack of a system of environmental management based on monitoring data
2) Lack of information sharing

12.5 Workshops and Seminars

(1) Workshops

In total seven workshops were held during the course of the study as below in order to exchange opinions among the stakeholders of the Anzali Wetland conservation.

No.	Date	Contents	Total Participants
Workshop No.1	June 16, 2003	1) Overall scope and schedule of the study 2) Examples of similar studies in Latvia and Kenya.	72
Workshop No.2	July 27, 2003	1) Iran's wetland management 2) Sustainable management plan for soil and water resources in Hablehroud basin 3) How environmental education and public participation contribute to wetland conservation 4) Participatory wetland management in Asia Anzali international wetland, the problems and solutions	100

No.	Date	Contents	Total Participants
Workshop No.3	Sept. 23, 28, 29, Oct. 4, 2003	1) Landslides and countermeasures 2) Anzali Wetland Conservancy	83
Workshop No.4	Nov. 30, 2003	1) Progress of the Study 2) Evaluation of present water quality condition in the wetland 3) Evaluation of pollution load into the wetland 4) Evaluation of soil erosion and sedimentation in the wetland	58
Workshop No.5	June 23, 2004	Anzali Wetland Conservancy (at the Provincial Thematic Working Group on Land Use, Environment and Population)	30
Workshop No.6	August 1, 2, 4, 11, 15, 2004	5 thematic sessions were held on wetland ecology, water quality management, buffer zone management, and solid waste management.	58
Workshop No.7	Sept. 25, 2004	Proposed Wetland Ecological Management Plan (Stakeholder meeting)	26

(2) Seminars

Seminars were organized three times in order to disseminate the information about the study.

No.	Date	Contents	Total Participants
Seminar No.1	Feb. 19, 22 2004	1) Our challenge for comprehensive conservation of Lake Biwa 2) Interim results of the Study 3) Solid waste management 4) Watershed management	89
Seminar No.2	Dec. 19, 23 2004	1) Outline of the study 2) Adaptive management for wetlands 3) Introduction of advanced treatment processes to wastewater treatment plant 4) Watershed management in northern provinces 5) Participatory management of environmental resources in watershed of Anzali Wetland	-
Special Seminar (JICA Training)	Sept. 16, 2004	1) Watershed management on the Fuji mountain slope 2) Biwa and Kasmigavra wetland condition 3) Watershed management on Non Tan San mountain slope 4) Watershed management around Biwa Lake.	62

12.6 Newsletters and Postcards

Newsletters in English/Farsi were issued five times in the course of the study, and distributed in total 5,000 copies, or 1,000 copies each, to stakeholders. The newsletters were very useful to disseminate information about the outline of the study and present the findings and environmental issues in the Anzali Wetland and its basin. The postcards were issued three times, and distributed in total 7,500 copies, or 2,500 copies each, to local stakeholders, tourists, donors, and others for environmental awareness raising.

12.7 Overseas Training

In total, nine experts of DOE and MOJA participated in the 1-month JICA counterpart training courses in Japan specifically designed for the study. They studied the wetland conservation activities, watershed management activities, etc. in Japan. Also, three experts of DOE and NGO were invited to the UK by the British Council and inspected the wetland management in the UK.

12.8 Overall Evaluations

(1) Achievements of Capacity Development Activities

Significant achievements were made during the course of the study in Iran, which lasted 18 months. There are a number of important points to be highlighted:

First, the study was implemented by coordinated efforts of many local organizations, NGOs and other stakeholders, and this by itself is a major achievement given the highly centralized administrative systems in Iran. In particular, the joint development of the master plan should be highlighted as a major accomplishment of such coordinated efforts; the developed master plan is one of its first kind that unites views of many organizations into a common goal to achieve conservation of the Anzali Wetland and its basin.

The study initiated various environmental activities, including 11 pilot activities with vibrant participations of many local residents, NGOs and government offices in the fields of solid waste management, environmental education and awareness building, wastewater management, eco-tourism, etc. These were major endeavors, and took a lot of time and efforts. Nevertheless, the practical experiences gained through these activities were irreplaceable to build action-oriented environmental management with participation of stakeholders. These activities also provided good opportunities to build environmental awareness among stakeholders.

The study also emphasized the importance of environmental monitoring and dissemination

of information, and the Environmental Report for the area in Farsi was drafted, compiled, designed and issued by the efforts of stakeholders.

(2) Recommendations on Capacity Development

Despite these achievements made in such a short period, it was felt that the capacities of the local stakeholders could not be developed to the level that allow a higher level of environmental governance by the stakeholders. As the results, it is possible that the momentum built during the course of the study is lost once the study is terminated. There are a number of reasons for this, such as (i) most stakeholders are bound to the vertical organizational structures, and cannot coordinate across the boundaries of ministries like the international experts of the study team, (ii) there are very few capable managers/technocrats who can control budgets and also understand how the environmental systems work, and they are extremely busy, (iii) the mechanisms to support activities of NGOs and CBOs are not well-developed, and opportunities for NGOs and CBOs to participate in environmental management activities are limited, and (iv) not all stakeholders are motivated to get involved in capacity development activities. Thus, the following recommendations are given on capacity development.

1) Support by Decision Makers

In order to continue capacity development activities, understanding and support of decision makers, in particular general mangers of provincial offices, is important. For regional/local issues and cross-sectoral coordination, the role of the provincial governor and the governors of Shahrestants (townships) and Bakshes (districts) are also significant.

2) Support by International Donors

International donors do not belong to any domestic hierarchy, and they can facilitate activities that involve many organizations. Because capacity development takes long-time, the donors should coordinate and provide long-term supports for environmental management activities.

3) Development of a Network of Key People

There are many enthusiastic community leaders, active NGOs, talented people in private sectors, and motivated government officials. The capacity development should first focus on these key people, and then spread to others by developing a network of key people.

CHAPTER 13 CONCLUSIONS AND RECOMMENDATIONS

13.1 Conclusions

The master plan was evaluated with respect to economic, financial, environmental, social and technical aspects (see Chapter 10). Though quantitative analyses of economic and financial aspects of the master plan were limited due to lack of information, the overall results indicated that the master plan is economically justifiable, financially feasible, and there are no major technical issues that would prevent its successful implementation. Because the master plan was designed to improve the environmental conditions of the wetland and its watershed, negative environmental impacts of the master plan are considered to be limited, though the social impacts, in particular relating to the livestock resettlement plan, need due attention as explained in the Initial Environmental Examination. In conclusion, the master plan is worth implementing, and relevant organizations are urged to take necessary actions to initiate the implementation of the master plan.

The six component plans in the master plan, i.e., the Wetland Ecological Management Plan, Watershed Management Plan, Wastewater Management Plan, Solid Waste Management Plan, Environmental Education Plan, and the Institutional Plan for Coordination, are evaluated as follows:

(1) Wetland Ecological Management Plan

This plan consists of environmental zoning, conservation of wildlife, conservation of habitats, promotion of wise use, and monitoring and feedback. The combination of the environmental zoning and conservation of wildlife and habitats enable effective management of the ecosystem, while the wise use of natural resources is also essential to gain wider support from the stakeholders.

(2) Watershed Management Plan

The inflow of sediment into the wetland would gradually make the wetland shallower, and affect the ecological character of the wetland. It is not possible nor desirable to completely stop the release of sediment from the watershed, though the management of the watershed, especially the upper-watershed is important to prevent further deterioration of the wetland by sedimentation.

(3) Wastewater Management

One of the most serious environmental problems in the wetland is the water pollution

caused by the inflow of wastewater from the watershed. Domestic wastewater treatment in Rash (population 650,000) and Anzali (population 130,000) has high priority to improve the water quality in the wetland. In addition, careful management of other pollution sources, such as domestic wastewater in rural areas, industrial wastewater, livestock wastewater, and wastewater from agricultural fields, are also essential.

(4) Solid Waste Management Plan

Inflow of waste into the wetland is caused by illegal waste dumping by local residents. In order to minimize this problem, provision of waste collection services in rural areas is important as currently there is no such services in the rural areas. In addition, environmental awareness of both urban and rural populations should be raised.

(5) Environmental Education Plan

Environmental education is essential for sustainable conservation of the Anzali Wetland and its watershed. However, the present level of environmental education in Iran is still relatively low, and further efforts in the areas of environmental education in the formal education sector, creation of networks of stakeholders, awareness raising for residents, establishment of public participation mechanisms, etc., are required.

(6) Institutional Plan for Implementation

The master plan involves many organizations from various sectors; establishment of a coordination mechanism is crucial for smooth implementation of the master plan. Thus, to unite the activities of these organizations, the proposed Anzali Wetland Conservancy or a similar organization should be established.

13.2 Recommendations

The following actions are recommended for the implementation of the master plan.

(1) Early Establishment of Coordination Mechanism

The master plan proposed the establishment of the Anzali Wetland Conservancy as a mechanism to coordinate effective and sustainable actions. However, establishment of a new organization takes time. Therefore, as a preparatory step, the proposed Anzali subgroup of the Provincial Working Group on Land use, Environment and Population should be established as suggested in the Institutional Plan.

(2) Securing the Budget

In Iran, major public investment projects are implemented by the state budgets, and the provincial development budget, which is currently around 500 billion Rials/year, is not sufficient to cover the required investment cost of implementing the master plan of about 3,350 billion Rials[3] in 15 years. Obviously the master plan cannot be implemented without financial support from the central government. In order to secure the budget both at the central and the provincial levels, the following actions are recommended:

1) Add the components of the master plan to the fourth 5-year development plan at the national and provincial levels
2) Establish special committees at the central and the provincial levels to coordinate actions to secure the budgets.
3) Consider international loans and other financial sources for implementation of large projects, such as the construction of the sewerage systems.

(3) Capacity Development of Provincial Offices

Many projects implemented in the study area have been lead by the central government, and the capacities of the provincial offices to develop plans/programs, manage projects, and coordinate with other organizations have not been fully developed. This is a major concern for the implementation of the master plan to be implemented mainly at the provincial level. Thus, the relevant ministries and departments are urged to develop capacity at the provincial level by dispatching competent specialists and managers from the central offices, and also by providing internal and cross-sectoral training.

(4) Promotion of the Participation of Stakeholders

The majority of local stakeholders are enthusiastic about conserving the wetland and its watershed. However, there are few opportunities for these stakeholders to participate in environmental conservation activities or to have their voices heard. Because the support of stakeholders is essential for successful implementation of the master plan, it is important to create opportunities for stakeholders to participate in the implementation of the master plan. The 11 pilot activities, 7 workshops, 3 seminars, and other activities carried out during the course of the study were very useful in promoting public participation, and such activities should be continued in the future.

(5) Improvement of the Livestock Resettlement Plan

The successful implementation of the livestock resettlement program by NRGO is essential for forest and rangeland management. However, the current program does not have a

[3] The cost was estimated based on June 2004 price without price escalation.

social safety net, and forces the affected people to look for new livelihood by themselves after receiving compensation, even though finding livelihood is expected to be difficult. In order to minimize social impacts and to support the affected people, the program should be improved by incorporating a consultation process and long-term support mechanisms.

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