

- 3) Activities in the Wetland
 - a) Commercial and recreational activities including boating, camping, bird watching, fishing, hunting and others
 - b) Introduction of exotic species particularly aquatic animals
- 4) Activities in the surrounding coastal and flat areas
 - a) Waste water (industry and domestic) and solid waste
 - b) Use of chemical substance in agriculture
 - c) Encroachment by farmers
- 5) Activities in the forest and rangelands in the upland area
 - a) Uncontrolled animal husbandry (over grazing)
 - b) Logging
 - c) Encroachment particularly in the areas with steep slopes

2.4 Wetland Ecological Management

2.4.1 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 environment.

2.4.2 Protected Areas

The Environmental Protection and Enhancement Act and the Executive by-law on the Environmental Protection and Enhancement Act define protected areas. In these areas some activities are prohibited or limited.

In addition to these protected areas, DOE declares “No-hunting areas” to provide some areas free from hunting pressure based on the Game and Fish law. These protected areas and prohibited activities are shown in the following table.

Table 2.4.1 Classification of Protected Areas in Iran

Type	Prohibited Activities
National Park	<ul style="list-style-type: none"> • Grazing animals, felling trees, uprooting shrubs, encroachment upon or the destruction of the environment and, in general, any action that causes damage to or destruction of vegetation or leads to any form of alteration of ecosystems • Revision or renewal of permits issued for the exploration or exploitation of mines • Hunting and fishing
National Monument	<ul style="list-style-type: none"> • Grazing animals, felling trees, uprooting shrubs, encroachment upon or the destruction of the environment and, in general, any action that causes damage to or destruction of vegetation or leads to any form of alteration of ecosystems • Revision or renewal of permits issued for the exploration or exploitation of mines • Hunting and fishing
Wildlife Refuge	<ul style="list-style-type: none"> • Felling trees, uprooting shrubs, encroachment upon or the destruction of the living environment, cutting thistles, burning wood into charcoal and, in general, any action that may lead to the eradication of vegetation or alteration of ecosystems • Hunting and fishing
Protected Area	<ul style="list-style-type: none"> • Felling trees, uprooting shrubs, encroachment upon or the destruction of the living environment, cutting thistles, burning wood into charcoal and, in general, any action that may lead to the eradication of vegetation or alteration of ecosystems without acquiring needed permits • Hunting and fishing
No-Hunting area	<ul style="list-style-type: none"> • Hunting and fishing

Source: DOE (2004)

In the Anzali wetland, three reserves the Siakeshim, Selke and Sorkhankol have been established. The south western part of Siakeshim (4,500 ha) was first established as a Protected Area in 1967. The reserve was enlarged to 6,701 ha and upgraded to a Wildlife Refuge in 1971 but reduced to its present size of 4,500 ha and downgraded to a Protected Area in 1975. However, further encroachment has progressed in this area, and DOE Guilan is proposing to adjust the boundary of the Siakeshim for a new size of 4,126 ha.

Selke (360 ha) has been protected as a Wildlife Refuge since 1970. Sorkhankol (477 ha) was designated as a no-hunting area in 1991 and upgraded to a Wildlife Refuge in 2002. DOE Guilan currently plans to expand the size of Sorkhankol to about 1,156 ha.

DOE Guilan has recently submitted a series of proposals to establish no-hunting areas at Chokam (347 ha), Hosseinbekandeh (367 ha) and Ghalm Godeh (119 ha). The Supreme Council for the Environment was reviewing these proposals as of October 2004. The existing and planned protected areas are shown in Figure 2.4.1.

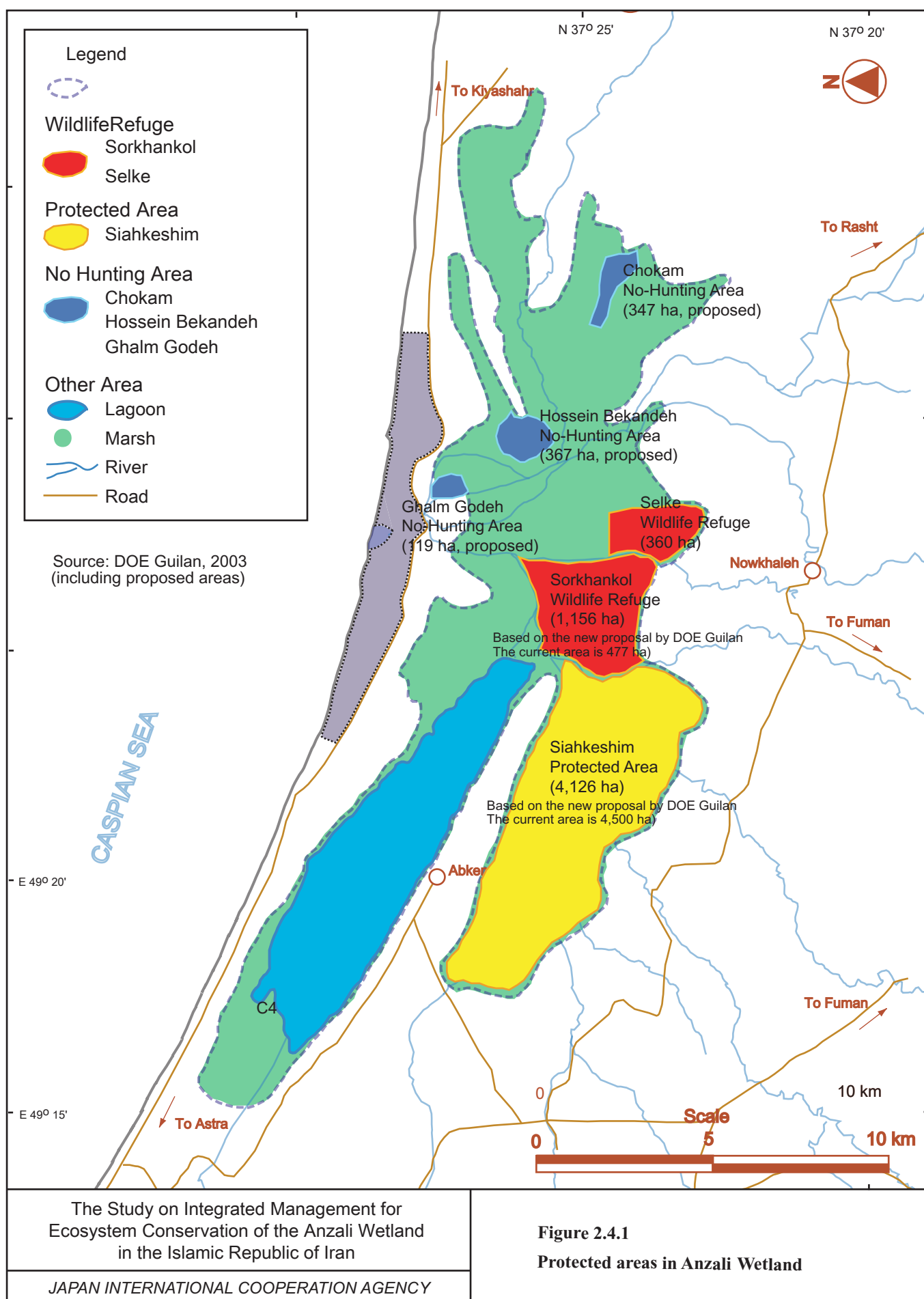
2.4.3 Strategies and Plans for Wetland Conservation

Strategies and plans for the management of the Anzali Wetland are not properly documented by DOE Guilan. One of the main goals of the management by DOE is to control illegal

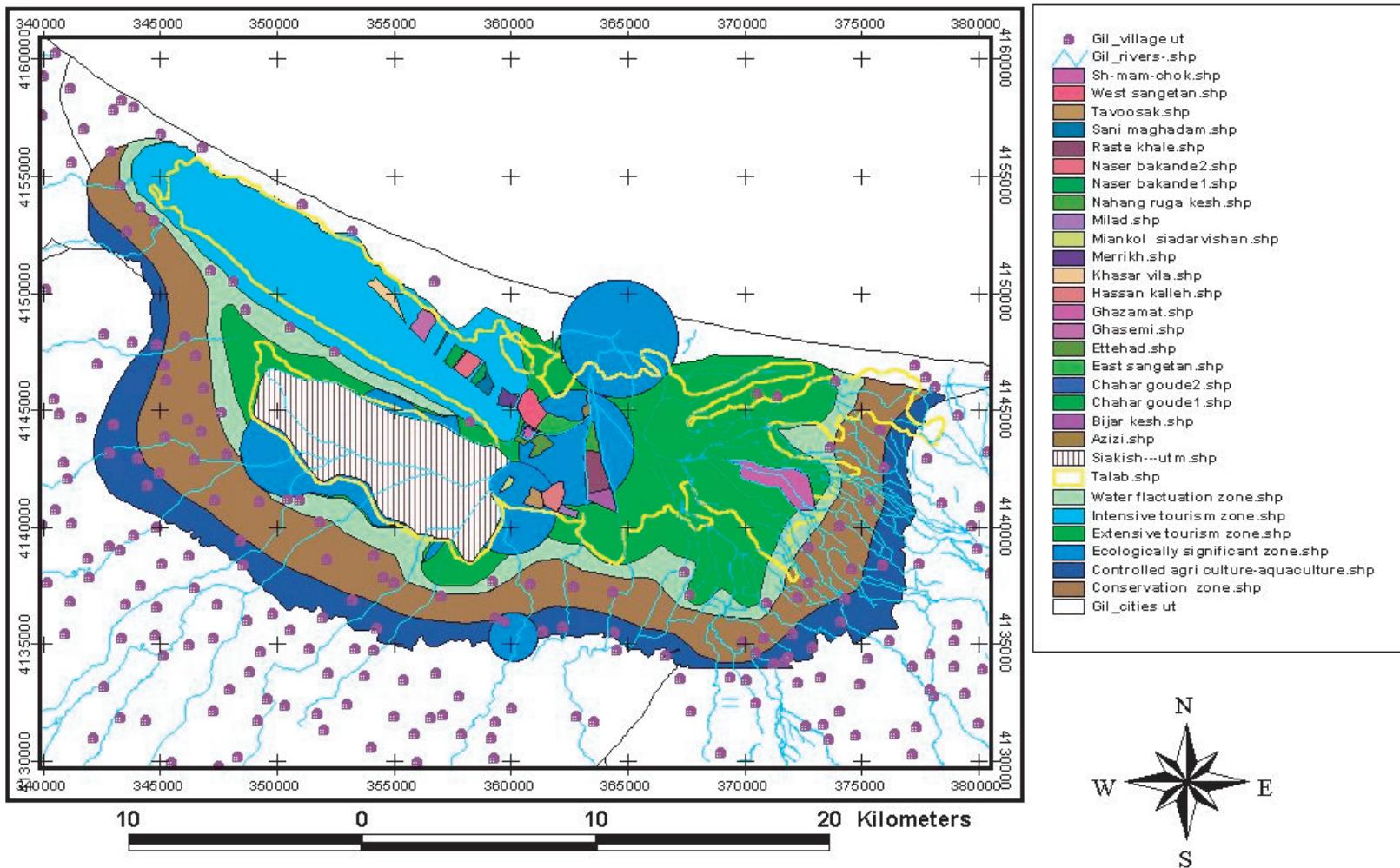
activities in accordance with the Executive by-law on the Environmental Protection and Enhancement Act (1975, amended in 1995). In addition, DOE implements the following management activities for the conservation of the wetland:

- Construction of a ditch around the wetland to clarify the boundary of the wetland,
- Establishment of buffer zone and transition zone (Figure 2.4.2),
- Closure of the hunting season before the spring migration begins,
- Limiting the list of game species for hunting,
- Collection of data on hunting intensity and the number of animals harvested.

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



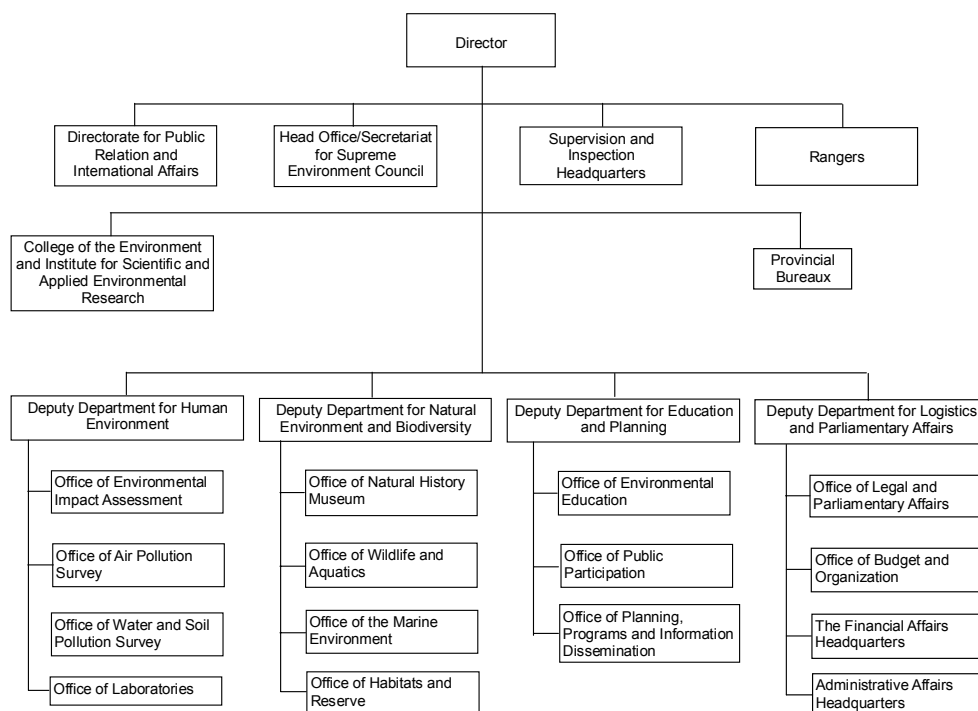
source: Guilan University, 1999



2.4.4 Organization for the Management

(1) DOE Headquarters

Figure 2.4.3 shows the organizational structure of the Department of the Environment (DOE) headquarters in Tehran. The headquarters of DOE is mainly responsible for policy making, development of laws and regulations, management of national projects, budget allocation to provincial bureau and technical support to the provincial bureaus.



Source: DOE, 2002

Figure 2.4.3 Organizational Structure of DOE Headquarters

(2) Provincial DOE

Provincial DOE bureaux are responsible for environmental management at the provincial level. Figure 2.4.3 shows the organizational structure of the DOE Guilan.

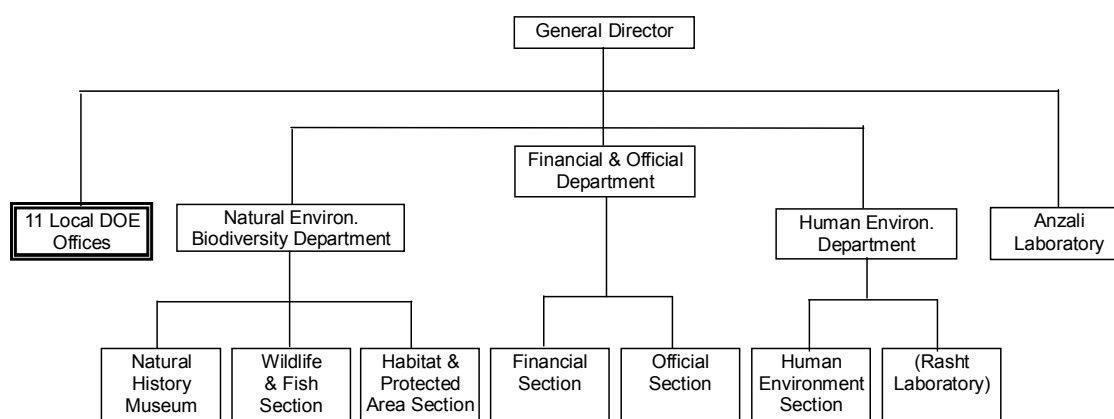


Figure 2.4.4 Organizational Structure of DOE Guilan Bureau

There are approximately 300 staff in DOE Guilan, of which about 80 staff are stationed in the main office in Rasht. DOE Guilan has three major departments, namely, the Natural Environment and Biodiversity Department, Human Environment Department, and Financial and Official Department. Among them, the management of the Anzali Wetland is under the responsibility of the Habitat & Protected Area Section of the Natural Environment Department. The responsibility of the Human Environment Department is to control pollution and other aspects of environment related to human activities.

(3) Local DOEs

The Provincial DOE Bureau has 11 local offices in the following locations: Rodsar, Langrod, Lahijan, Astaneh, Siahkal, Rodbar, Fuman, Somehsara, Talesh, Astara and Anzali¹⁵. The activities related to the protection of the Anzali Wetland are under the jurisdiction of the Anzali and Somehsara DOE offices. A total of 31 rangers are on duty, of which 21 staff are from Anzali and 10 staff from Somehsara.

2.4.5 Present Activities

(1) Environmental Patrols

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 with three stations (Siahdarvishan, Ghalm godeh and Sorkhankol) of the Anzali office and 10 rangers of the Somehsara office with two stations (Selkeh, Esfand). The staff patrol three times a day for 7 days a week (morning, afternoon and night). The staff

¹⁵ The local office in Masal had been established in October 2004.

of DOE can confiscate fishing and hunting gear when they find illegal activities, and they are also authorized to restrain the violators, and send them to the court.



Figure 2.4.5 Control of Illegal Fishing Gear by DOE Ranger

(2) Control of Encroachment

The size of the wetland is shrinking due to encroachment for agricultural purposes, especially for conversion to paddy fields. In the 1970s to 1980s when the level of the Caspian Sea was low, the emergent part of the Anzali Wetland, including the western part of the Siakeshim, was converted to agricultural land. As the water level started to increase in the late 1980s to 1990s, some of the illegal agricultural lands were flooded and abandoned. Nevertheless, due to the ambiguous legal boundary of the wetland, it has been difficult to control the encroachment. More than 100 ha of the wetland have been converted to the paddy fields in the last five years.

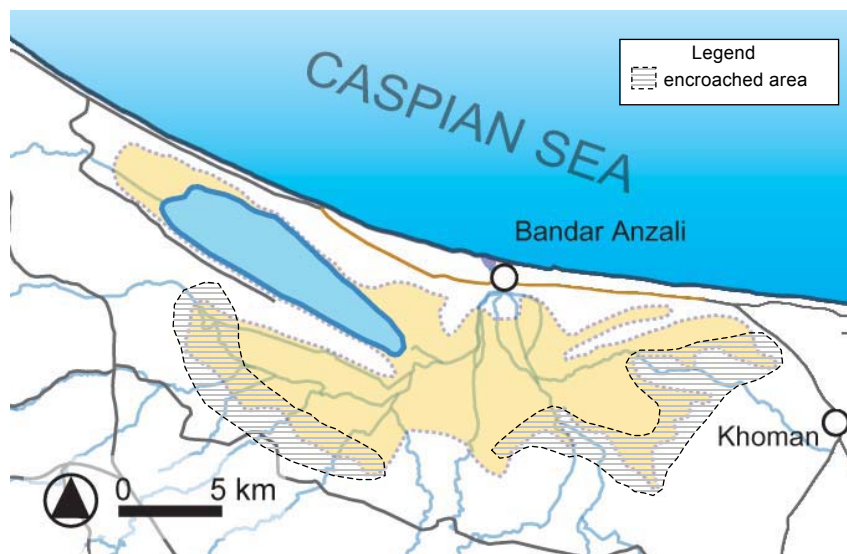


Figure 2.4.6 Areas with Encroachment Problems

The rangers of DOE are engaged in control of encroachment. This is initiated by reporting from local people or regular patrol activities of the DOE rangers. When encroachment is detected, the ranger reports it to the legal officer of the local DOE office. If the encroachment is located in a protected area or wildlife refuge, the case is taken to the court directly. If the encroachment is located outside a protected area or wildlife refuge, it is dealt with by NRGGO.

(3) Environmental Education

Educational and public awareness activities are carried out by the staff of the Natural Environment and Biodiversity section and by public relation experts of DOE. DOE prints and distributes bulletins and brochures about the protection of wetlands. Many students visit the wetland from schools and universities every year. In the year of 2001 the “Migrant Bird Welcome Festival” was organized, and many people participated in this educational event.

(4) Water Quality Monitoring

Monthly sampling and analysis of waters in the wetland and rivers (estuaries) such as the river of Goharroud (two sites), Zarjoub (two sites) and Pirbazar river (one site) have been conducted by the Laboratory of DOE Guilan.

(5) Annual Bird Census

An annual bird census of migratory and resident species is carried out in January by the experts of the Natural Environment and Biodiversity section in accordance with the methods of the International Waterfowl and Wetland Research Bureau (IWRB). In the wetland, the census is carried out in Eastern area, Western area, Central area, Sorkhankol, Selkeh, Siakeshim, Hossein Bakandeh 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. Banding for chicks is implemented.

(6) Issuance of Licenses for Hunting and Fishing

Table 2.4.3 shows the number of hunting and fishing licenses issued in the last three years.

Table 2.4.2 Number of Licenses Issued in the Last Three Years

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
Fishing license	3,186	2,902	2,577

Source: DOE (2003)

Permitted hunting days with a weapon are 3 days in a week, Wednesday, Thursday and Friday. The bag limit with a weapon is 6 game birds per day and 20 individuals per day in “abandan¹⁶”. The bag limit with a trap is 10 game birds per day. Regarding a fishing license, only angling is permitted.

2.4.6 Major Issues

(1) Regulatory Status of the Wetland Areas

A large part of the Wetland is owned by NRGO (legal land owner), but its management is entrusted to DOE. According to the current regulatory framework, legal protection covers mainly protected areas, wildlife refuges and no-hunting areas. Main issues with respect to rules and regulations for management purposes are:

- Determination of clear area boundaries for legal protection.
- Regulation of encroachment into the wetland area.
- Law enforcement.
- Flexible adjustment of regulations to meet the specific management requirements in a given time.

(2) Conflicts with Development Plans

DOE has been involved in the development process of a number of key urban development master plans such as the urban development plans for Anzali, Rasht and Somehsara. It is possible that some of the existing development plans significantly affect this JICA master plan.

¹⁶ Abundan is defined as an area that is rented out for private use including hunting and fishing particularly in the winter.

However, any conflict between those plans should be avoided and the major issues on this aspect include:

- Status and progress in the construction of the Anzali Ring Road should be closely monitored and technical recommendations should be made.
- Ensure an environmental impact assessment for major development projects based on Note 105 of the Law of the Third Development Plan (1994), Decree 138 of the Environmental Protection High Council (1994) and the Code of Practice of the Environmental Protection High Council (1997).

(3) Lack of a Management Policy

The current management of the Anzali Wetland is mainly based on the Executive by-law on the Environmental Protection and Enhancement Act (1995) and Game and Fish law (1996). However, management policy specifically indicating general directions in the management of the Anzali Wetland is not clearly defined so that the main issues in this area are as follows:

- Determine a clear policy over the Anzali Wetland: Application of adaptive management and wise use of natural resources should be considered.
- Proper documentation and authorization of the policy.

(4) Lack of Wetland Management Plan

Current management of the wetland is carried out under the direction of the General Director of the DOE based on recommendations by experts and review of previous research data including the study carried out by the Guilan University in 1995-99. However, existing management plans are not practical enough for imminent implementation. Specific issues in planning are as follows:

- Preparation of a practical management plan for imminent implementation
- Collection of systematic data that can generate a basis for planning (monitoring)
- Wetland ecosystem is dynamic so that plans should be holistic and integrated

(5) Establishment and strengthening Institutional Framework

Management decision-making process for the Anzali Wetland should be flexible since the wetland ecosystem is highly dynamic. However, current institutional set up of DOE does not meet the requirement to implement systematic decision-making based on scientifically sound data. Furthermore, there seems to be a lack of knowledge on wetland ecology and management among many of the staff at DOE so that capacity building is also a key factor to be considered in planning. Main issues in this area are:

- Establishment/strengthening institutional set up to implement integrated management actions

- Capacity building with respect to the implementation of management plans by the DOE staff

(6) Shortage of Budget

DOE is suffering from a chronic shortage of funds for environmental management activities. The Anzali Wetland has the potential to generate sufficient revenue for management from ecotourism, handicraft industry, tourism tax, fishery tax, hunting and fishing licenses, etc. The revenues from such local sources can be used locally for the management of the wetland in light of the User-Pay-Principle so that the main issues of securing budget are as follows:

- Secure enough allocation from the national budget
- Self sustainable budget generation for the implementation of wetland management
- Seeking alternative sources of budget (i.e. international funding agency)

2.5 Watershed Management

In the watershed, the management issue most relevant to the conservation of the wetland is the control of sediment from the watershed, especially the degraded forests and rangelands. This section describes the present situation of soil erosion and land degradation, institutional framework, present management activities, and management issues of watershed management.

2.5.1 Situation of Soil Erosion

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.



Figure 2.5.1 Situation of Soil Erosion

(1) Estimated Release of Sediment from the Watershed

To estimate the sediment yields from the upper watershed¹⁷, two empirical models, namely, the Erosion Potential Method (EPM) and Pacific Southwest Inter-agency Committee Method (PSIAC), were used. The estimation reveals that about 326,000 tons/year of sediment are released from the upper watershed.

Table 2.5.1 Estimate of Annual Sediment Yield from Mountains

Sediment Yield	Forest	Grassland	Bare land	Total
Annual sediment (m ³ /yr)	96,500	16,000	136,500	250,000
Annual sediment (ton/yr) ^{*1}	125,500	20,800	177,500	326,000

Note: ^{*1}: Assuming soil bulk density of 1.3 ton/m³

Source: JICA Study Team (Supporting Report Part 2 “Hydrology”)

Sediment is also released from the plain areas, such as paddy fields, other farm and pasturelands, riverbanks and urban areas. In total, the sediment release from the plain area is estimated at 74,000 ton/year. Details are given in the Supporting Report Part 2 “Hydrology”.

Table 2.5.2 Estimate of Annual Sediment Yield from Plain Area

No	Source	Quantity	Rate	Total (ton/yr)	Percent
1	Rice Paddy	1280km ²	30 ton/km ² /yr	38,400	52%
2	Farm and pasture land	240km ²	100 ton/km ² /yr	24,000	32%
3	River bank	111,300m	0.05m ³ /m/yr	5,600	8%
4	Urban runoff	60km ²	100ton/km ² /yr	6,000	8%
	Total	-	-	74,000	100%

Source: JICA Study Team

(2) Sediment Transport and Deposition Mechanisms

The amount of sediment reaching the wetland was estimated by using the HEC-6 computer software, which has the capability to simulate transport and deposition of the sediment along the rivers. Figure 2.5.2 summarizes the quantity of the mountain-derived sediment, plain-derived sediment, and sediment transport in the watershed. The resulting inflow of the sediment to the wetland is approximately 400,000 tons/year.

¹⁷ “The Upper Watershed” refers to the portion of the watershed which is higher than EL. 100m. The total area of the upper area is approximately 1,840 km².

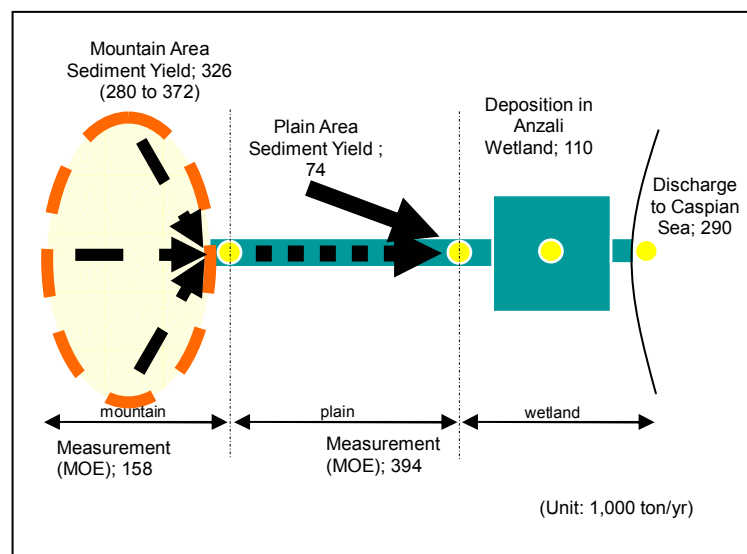


Figure 2.5.2 Sediment Budget in the Watershed

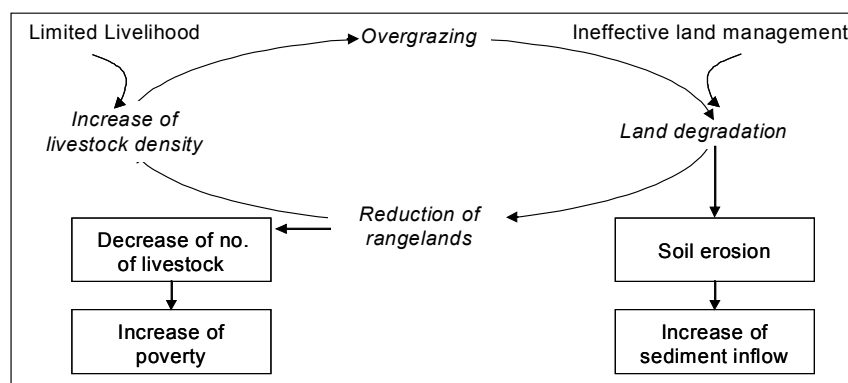
(3) Landslides

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.

2.5.2 Situation of Rangeland and Forest Degradation

(1) Causes of Rangeland Degradation

Overgrazing is closely related to the socio-economic situation of graziers. Since the people are economically disadvantaged and less educated, their sources of income are very limited and livestock grazing is the sole livelihood in many cases.



Source: JICA Study Team

Figure 2.5.3 A Vicious Cycle of Overgrazing and Land Degradation

An inventory survey conducted by Natural Resources General Office (NRGO) in 1984 shows about 3,900 families of graziers and 430,930 units¹⁸ of livestock resided in the forests and used the rangelands for grazing. No inventory survey about the number of graziers and livestock in the area has been carried out since then. According to the staff of NRGO Guilan, they, who reside in forests, are 80~90 % of total registered graziers in the watershed. Consequently, the total numbers of graziers and livestock in the upper watershed are estimated to be about 4,600 and 507,000, respectively¹⁹.

According to the Rangeland Management Department of NRGO, the total number of permitted livestock in the watershed is 162,152 units, which is far below the estimated livestock (506,980 units). Assuming the number of livestock has not changed since 1984, the stocking density of livestock in the study area is estimated at 11.5 units/ha, while that permitted is estimated at 3.7 units/ha. The data support the existence of an overgrazing issue in the rangeland.

Table 2.5.3 Estimated Stocking Density of Livestock

Grassland (ha) *1, *2	Estimated Livestock (unit)	Permitted Livestock (unit) *1	Stocking Density (units/ha)	
			Actual	Permitted
44,126	506,976	162,152	11.5	3.7

Note: *1 – Data are obtained from the Rangeland Management Department of NRGO, Guilan.

*2 – Grassland consists of the rangeland and grasslands in the forest.

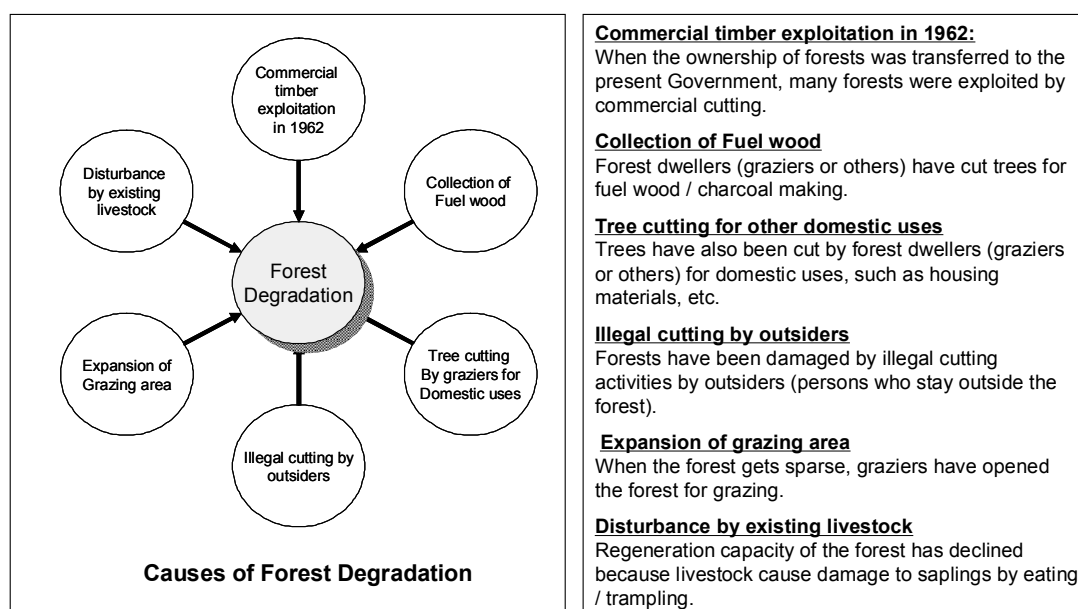
Source: NRGO, Guilan and Estimation of JICA Study Team

¹⁸ NRGO uses the “unit” for indicating the density of livestock instead of using “number” or “head”. In its presentation, one head of sheep / goat (small animals) is counted as 1 unit while cattle / house (large animal) is counted as 5 units.

¹⁹ The total numbers of graziers and livestock are estimated by JICA Study Team assuming 85 % of registered graziers and livestock reside in the forest.

(2) Causes of Forest Degradation

As a whole, the condition of forests in the upper watershed is relatively good, although parts of the forests have degraded since the 1960s. Causes of forest degradation are enumerated in Figure 2.5.4.



Source: JICA Study Team

Figure 2.5.4 Causes of Forest Degradation

(3) Identified Degraded Areas

The LANDSAT image analysis made by the JICA Study Team revealed that about 77 km² of rangelands and 70 km² of forests were in degraded condition. Another study²⁰ comparing the present land use with that in 1960' showed that about 112 km² of grasslands along boundaries between rangelands and forests (grasslands in margin areas) have degraded from forests to grasslands since the 1960s. Consequently, the total degraded forest amounts to approximately 182 km² as shown in Table 2.5.4. The locations of degraded rangelands and forests are given in the Supporting Report Part 4 "Watershed Management".

²⁰ The study was undertaken by JICA Study Team together with NRGO in 2004.

Table 2.5.4 Degraded Area of Rangelands and Forests

Sub-watershed	Degraded Rangeland between EL 1500-2000m		Degraded Forests below EL. 1500 m		Grasslands above 1500 m (former forests in 60s)	
	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)
1)Chafroud	324	3	1,443	12	1,650	14
2)Bahambar	0	0	0	0	0	0
3)Morghak	2,017	8	1,094	4	2,510	10
4)Khalkai	1,566	7	1,268	5	2,900	12
5)Plangvar	0	0	194	2	210	2
6)Masulehroud Khan	1,328	4	1,664	5	1,040	3
7)Shakhras	196	1	46	0	1,950	8
8)Pasikhan	2,235	6	932	2	970	2
9)Siahroud	0	0	337	4	0	0
Total area	7,666	4	6,978	4	11,230	6

Note: Shares are ratios to the respective watershed areas.

Source: JICA Study Team (Supporting Report Part 4 “Watershed Management”)

2.5.3 Laws and Organizations for Erosion Control

(1) Laws and Regulations

As stated in the aforementioned section, the mountain areas/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 erosion. There are many laws and regulations related to the management of rangelands and forests in Iran. The most relevant are the following two laws and based on these laws, MOJA and NRGGO have issued numerous internal regulations.

- Law of Land Affairs (1962),
- Law on Exploitation and Protection of Forests and Rangelands (1967, amended in 1997).

(2) Organization

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

2.5.4 Present Management Activities for Erosion Control

(1) Soil Erosion Control

MOJA Guilan tries to control erosion by applying several kinds of measures, such as, i) gabion check dams; ii) wooden dams; iii) stone masonry walls; iv) vegetation works/biological works; v) introduction of protection area, etc. Table 2.5.5 presents the sediment and erosion control works that MOJA Guilan has conducted in the study area from 1998 to 2002.

Table 2.5.5 Erosion Control Works Implemented by MOJA Guilan

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

Source: MOJA Guilan Provincial Office

Although MOJA has made an effort to control soil erosion, most of the areas with gully and rill erosion still remain untreated, especially in the degraded rangelands. If these areas are left without any countermeasures, the erosion process would progress and slope failures could cause serious problems such as debris flow and floods. In the past, floods caused severe damage to social infrastructure (roads, irrigation facilities, etc.), personal assets (houses, farmlands, animals, etc.), natural resources and, if worst comes to worst, human lives in the study area. Table 2.5.6 shows the past record of outbreaks of floods in the upper watershed

Table 2.5.6 Past Record of Outbreaks of Floods in the Study Area

Sub-watershed	Past records
Masulehroudokhan	8 times (1951, 1986, 1997, 1998, 2001, 2002, 2003 and 2004)
Pasikhan	4 times (1998, 1999, 2000 and 2001)
Siahroud	3 times (1951, 1952, and 1957)
Shakhraz	2 times (1991 and 1996)
Morghak	Once (2002)
Khalkai	Once (2001)
Plangvar	Once (1926)
Chafroud and Bahamber	None

Source: WMD, MOJA

The floods might have been prevented from causing any casualties if a warning system had been installed in place. In a sense, the installation of a warning system should be considered as one of the urgent measures that the Government should take to protect the area from any damage by flood.

(2) Prevention of Land Slides

In the upper watershed, cut slopes for the roads are not protected properly and therefore landslides and large-scale slope failures have often occurred. In the areas where a slope collapse or landslides have occurred, no countermeasure is taken due to lack of technique and budget. Landslides and slope collapse eventually result in blocking road sections in the upper watershed.

2.5.5 Present Forest and Rangeland Management Activities

Forest and rangeland management is under the responsibility of NRGGO. In the study area, a total of 215,000 ha, which consists of 161,300 ha of forest, 27,100 ha of rangelands and 26,900 ha of farmlands, are under the jurisdiction of NRGGO Guilan. These areas are managed by six NRGGO local offices, namely, Rezvanshahr, Shaft, Masal, Fuman, Rasht and Somehsara. The number of staff and the respective responsible areas of NRGGO local offices are presented in the Supporting Report Part 4 “Watershed Management”. It seems that the number of staff, especially forest rangers, is not sufficient to manage all the responsible areas.

(1) Forest Management

The forests in the watershed are relatively good condition, though about 182 km² of forests have degraded as shown in Table 2.5.4. The main aim of NRGGO in forest management is to restore the forests to the conditions they were in during the 1960s. To this end, NRGGO Guilan has carried out i) livestock resettlement; ii) reforestation; iii) conservation of protected areas; iv) forest management by entrusting private firms, and v) development of eco-tourism plans.

In August 2003, the Iranian Government approved the “Presidential Decree of the Council of Ministers of MOJA-DOE-MPO on the Management of the Northern Forest (No. 26239/16276)²¹” to facilitate conservation of the Northern Forest. The decree stipulates that MOJA and DOE shall establish a committee and take necessary actions to conserve forests in the northern region, which include i) implementation of the livestock resettlement program; ii) reforestation; iii) conservation of forests; iv) promotion of sustainable forest management; and

²¹ The Northern Forest is the forest on the northern slopes of the Alborz Mountains in Guilan, Mazandaran and Golestan Provinces.

v) monitoring and evaluation of conservation activities. In 2003, NRGU Guilan established a forest conservation committee at the provincial level along with the decree. The organizational chart of the committee is presented in the Supporting Report Part 4 “Watershed Management”.

1) Livestock Resettlement Program

NRGO has implemented resettlement activities to reduce the number of livestock and negative impacts on the forest since the 1990s. The progress and results of the activity in the past was not as satisfactory as expected, since its compensation scheme was inflexible and there were few considerations of socio-economic aspects. In line with the aforementioned presidential decree, the NRGU elaborated a livestock resettlement program with its implementation guideline. The outline of the program is described in the Supporting Report Part 4. According to the guideline, the program targets the following rural residents who reside in the forest.

- a. Graziers who raise more than 30 head of livestock in the forest
- b. All families who reside in villages with less than 20 households
- c. Families who reside in sensitive/critical areas

There is no precise information about the number of graziers/rural residents who presently stay in the forest since no inventory survey has been carried out yet. According to NRGU Guilan, about 80~90 % of total registered graziers or about 3,930 families reside in the forest and will be compensated by the program. The affected graziers are composed of the following two (2) types:

Table 2.5.7 Numbers and Types of Affected Graziers

Graziers to be relocated (Resettlers)	Graziers to quit grazing (Retired graziers)	Total affected graziers	Total livestock units to be resettled (units)
1,774	2,154	3,928	430,930

Source: NRGU Chalues

As a result of the resettlement program, the numbers of graziers and livestock are expected to be reduced to 693 families ($4,621 - 3,928 = 693$) and 76,046 units ($506,976 - 430,930 = 76,046$), respectively. By 2002, a total of 337 graziers or 52,170 units of livestock had been relocated. Consequently, 3,591 families and 378,760 units of livestock will be affected over the next six years. According to NRGU Chalues, about 70 % of the estimated budget for the livestock resettlement program was already programmed in the Fourth Five-year National Development Plan (2005-2009).

The existing guideline for the program has no description of a consultation process nor assistance in livelihood recovery for affected families, although it gives the

definition of target families, scope of compensation, and agreement forms to be used. A participatory study carried out by an NGO under contract with the JICA Study Team also reported that the consultation and explanation to affected families were very limited in the implementation of the resettlement program at the field level.

2) Conservation of Protected Forests and Genetic Flora

A total of 3,250 ha or 29 protected areas are located in the watershed area. To conserve forests 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. There are also 25 biosphere reservation areas that have genetically important flora. The biosphere reservation areas range from several hectares to several tens of hectares in general.

Besides, a vast area of forests, called Shaft-Siahmezgi forest (39,511 ha), was designated by DOE Guilan as a protected area. Although NRGO Guilan and DOE Guilan agreed that the jurisdiction over the area would be transferred to DOE, the final designation of the Shaft-Siahmezgi protected forest still awaits approval by the parliament. The Shaft-Siahmezgi forest covers half of Ghalaroudkhan sub-watershed and almost all the Siahmazgiroud sub-watershed as shown in Figure 2.5.5.

3) Forest Management under the Forestry Plan

Out of nine (9) sub-watersheds, four (4) sub-watersheds, namely, Chafroud, Morghak, Pasikhan and Siahroud, are presently used as forestry areas (production forests) under the management of local private firms. NRGO made 10-year contracts with private firms and entrusted to them the management of the sub-watersheds in accordance with forestry plans prepared by NRGO Guilan. The contract can be renewed in the last year of the contract if the performance of the firm is satisfactory. The locations of the four (4) sub-watersheds are presented in Figure 2.5.5. The main activities planned for the four (4) sub-watersheds are summarized as follows:

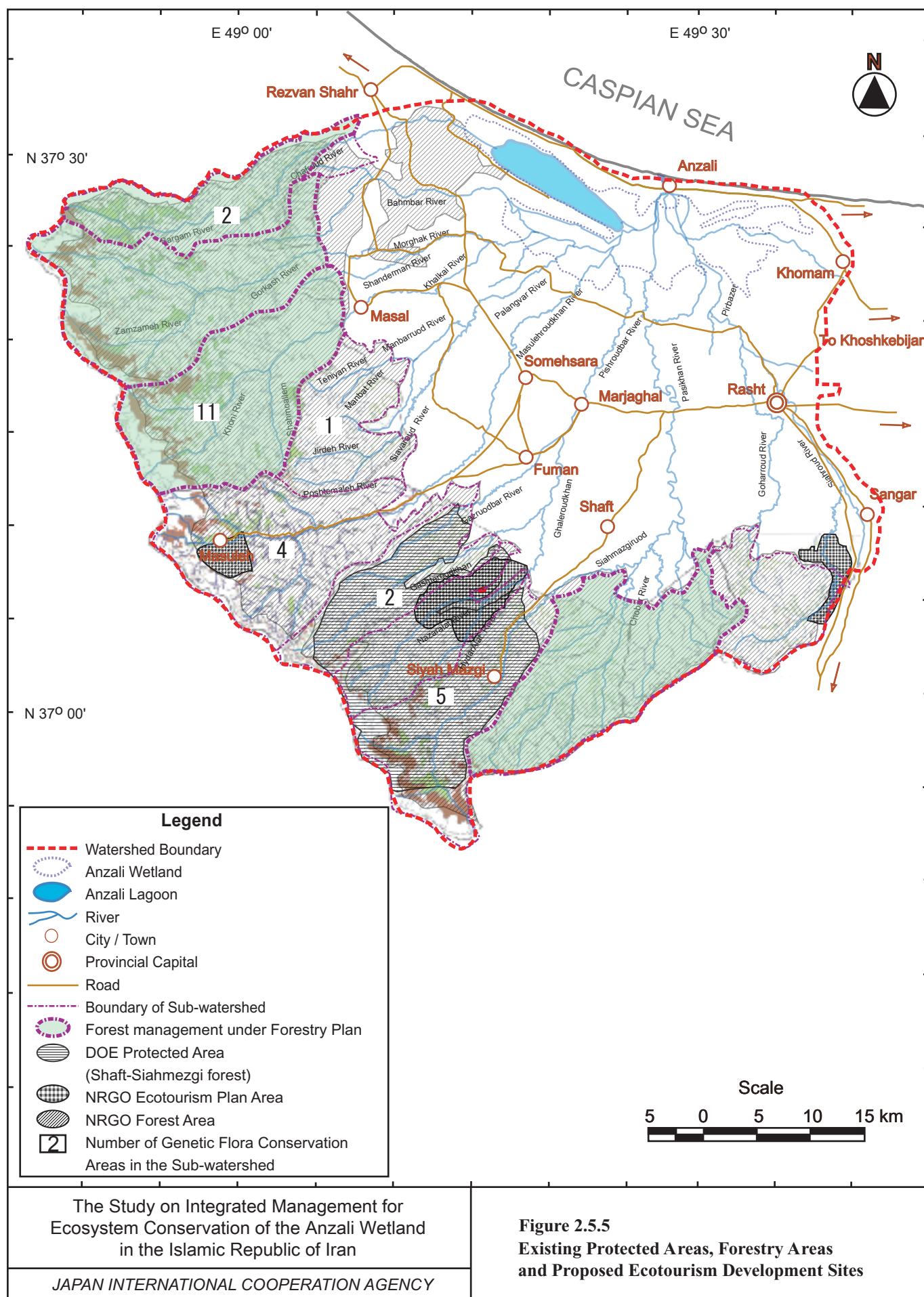
Table 2.5.8 Outlines of Forestry Activities in the Four Sub-Watersheds

Sub-watershed	No. of Series (nos)	Total Area (ha)	Production Forest (ha)	Annual Exploitation (m3/yr)	Exploitation Rate (m3/ha/yr)	Road Construction (km)
Chafroud	7	16,917	8,085	7,200	0.89	34.1
Morghak	10	40,334	9,186	9,000	0.98	14.9
Pasikhan	9	26,222	6,557	8,000	1.22	23.0
Siahroud	3	23,802	6,018	6,000	1.00	2.6
Total	29	107,275	29,846	30,200	1.02	74.6

Source: NRGO Guilan

The forestry plan also specifies that contractors shall adopt the following sustainable forestry practices to maintain and improve the quality of forests.

- a. Forests should be maintained as mixed-aged forests. In other words, the age composition of forests should be maintained as complex as possible.
- b. Contractors should i) protect forests from illegal activities and fires, ii) protect reforested areas by fencing and other measures, and iii) designate special protected areas for ecological protection.
- c. Selective cutting should be adopted. (Clear cutting is not allowed.)
- d. In selection of trees and exploitation, contractors should comply with the regulation of NRGGO, which includes:
 - Exploitation should be adjusted based on the existing volume of wood.
 - The volume of cutting should be reduced in sensitive / critical areas.
 - No cutting should be allowed in steep valleys.
 - Rare species should be protected from cutting.
 - Adequate number of productive trees should be left for regeneration.
 - Light conditions of the understory should be taken into account in selection of trees.
- e. Forest roads should be constructed in accordance with the design of NRGGO.
- f. Grazing activities should be controlled in the area.
- g. 70 % of the sales income should be spent on forest conservation.



4) Reforestation Plan

Between 1981 and 2002, total of 31,500 ha have been reforested by NRGU Guilan. Table 2.5.9 shows the accomplishments by sub-watershed for the last five years.

Table 2.5.9 Reforestation for the Last Five Years

(Unit: ha)

Area	1999	2000	2001	2002	2003
Reforested area	150	443	484	489	869

Source: NRGU Guilan

As shown in Table 2.5.10, reforestation has not been extensively undertaken over the last 5 years. While NRGU aims to restore the vegetation conditions of the watershed to the level in the 1960s, there is no long-term reforestation plan prepared by NRGU at present. For 2004, the office plans to reforest about 600 ha, mainly in Khalkai/Morghak and Masulehroudokhan sub-watersheds.

5) Eco-tourism Development Plan

The eco-tourism plan aims to promote tourism through developing forest parks in the mountain areas. NRGU plans to establish forest parks in three sub-watersheds, namely, Masulehroudokhan (Masuleh town), Shakhraz (Ghalerudokhan Castle), and Siahroud (Salawan Park). The locations of the proposed eco-tourism sites are shown in Figure 2.5.5 and the outlines of the plan are summarized as follows:

Table 2.5.10 Eco-tourism Development Plan

Sub-watershed	Area	Tree planting	Electricity ^{*1}	Camping site	Others
Masuleh	2,401 ha	615 ha	926 ha	168 ha	Ropeway:2,200m
Shakhraz	1,878 ha	-	220 ha	780 ha	-
Siahroud	1,487 ha	15 ha	1,200 ha	1,300 ha	-

Note: ^{*1} Figures indicate the areas where electricity facility will be distributed.

Source: NRGU Guilan

6) Others

In addition to the forest protection activities, NRGU Guilan has studied livelihood development potentials in the watershed and promoted several livelihood options, such as, horticulture, cold-water fish culture, production of medicinal plants, mushroom production, handicraft making, etc., as part of forest management.

(2) Rangeland Management

1) Balancing the Number of Livestock

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 only

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.

2) Planning of the Rangeland Management Plan

The Rangeland Management Department (RMD) of NRGO Guilan has prepared approximately 40 rangeland management plans dividing the rangeland into 156 areas. The rangeland management plans give the existing livestock units, stocking potential of the area, recommended management practices, etc., but have no scheme to reduce the number of livestock. So far, no rangeland management plan has been implemented, since RMD realized that the overgrazing problem could not be solved without reducing the number of livestock as well as graziers. At present, RMD has no clear program for managing rangelands and just waits for the implementation of the resettlement program expecting it to reduce the number of livestock and change the situation drastically. After the resettlement program, RMD plans to revise the management plans based on the situation. Accordingly, the management plan will include the following activities.

- a) to have discussions with remaining graziers who have a limited number of livestock in order to persuade them to move out of grazing activities
- b) at the same time, to request graziers who will quit grazing to sell some of their livestock to graziers who have a large number of livestock
- c) After reducing the number of livestock, to train the remaining graziers on proper rangeland management procedures
- d) to rehabilitate and fence degraded rangelands

3) Estimation of Carrying Capacity of Rangeland

NRGO is also carrying out a detailed survey to determine the carrying capacity of the rangelands. Some 150 km² have been surveyed so far, and the rangelands were classified into four (4) levels (Level 1: 4 units/ha; Level 2: 3 units/ha; Level 3: 2 units/ha and Level 4: 1 unit/ha) according to the estimated carrying capacity. NRGO Guilan has yet to reach its final conclusion on appropriate carrying capacity in the watershed. Hence, NRGO tentatively estimates the average carrying capacity of the rangeland at about 3 units/ha based on the estimated stocking density.

2.5.6 Present Plain Area Management Activities

The management of the vast agricultural 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.

2.5.7 Major Issues

(1) Soil Erosion Control

1) Issues and Limitations

a. Lack of active management to prevent progression of erosion

Erosion has to be controlled when it is minor. Otherwise, it will rapidly progress and become difficult to control. However, the efforts to control erosion seem limited, and many sites are left unattended. In order to implement effective erosion control measures with limited budget, the area needs active management programs with emphasis on preventive measures, such as fencing of sensitive areas, control of early stages of erosion, and education of graziers in erosion control measures.

b. Poor construction methods of roads in mountains

Some areas of the watershed are geologically susceptible to landslides and slope collapses. However, many roads have been constructed in such areas without any countermeasures. Thus, the design and methods of road construction in the mountain areas should be improved. This problem is also related to the capability of NRGGO to monitor and supervise the construction work of contractors.

2) Prospective Situation

The watershed as well as wetland environment would get worse if the management issues enumerated above are left as they are. The prospective adverse impacts are:

- Increase of sediment load (Deterioration of wetland environment)
- Increase of floods/debris flow (Negative social impact)
- Rangeland degradation (Reduction of grazing lands)

(2) Forest and Rangeland Management

1) Issues / Limitations

a. Lack of long-term vision for sustainable resource management

The livestock resettlement program would be effective in protecting the forests and rangelands from further destruction in the short run. However, driving graziers from forests is not always effective since overexploitation is closely related to their socio-economic conditions (limited livelihoods). Therefore, its long term effect is uncertain and there is a high probability that affected families would return to grazing/exploitation activities unless they can establish an alternative livelihood after the program. It also seems to be difficult for NRGO to control the inflow of new migrants into all the sub-watersheds considering the present capability of the local offices.

b. Lack of participation of local people in forest and rangeland management

Present management style of NRGO is still “government-centered” or “regulatory-based”, and therefore, a sense of responsibility over resources have not been created in local people’s mind. Presently, local people are considered as a main cause of forest and rangeland degradation and, what is worse, incapable to manage their natural resources. The more local people are involved in resource management, the more they are responsible for their resources. Therefore, a “participatory management” approach should be introduced, in which local people will be allowed to manage natural resources in a sustainable manner so as to develop their sense of responsibility to become real managers.

c. Lack of consideration of socio-economic improvement

Socio-economic information regarding graziers/forest dwellers is not properly considered in forest and rangeland management. For example, NRGO Guilan collected the socio-economic data of local people in planning but the data are basically used for estimation of the number of affected families and required cost for resettlement. Livelihood improvement of local people is the key to sustainable management and protection of natural resources in the upper watershed. However, there is no substantial scheme for that purpose at present.

d. Lack of Coordination in Forest and Rangeland Management

There is little coordination between NRGO, DOE and WMD regarding forest and rangeland management or conservation. For example, both NRGO and DOE designate protected forests, but the areas are overlapping and they are not consistent with one another.

2) Prospective Situation of Forests and Rangelands

Under the circumstances, it would be difficult for NRGO to sustainably manage and protect forests and rangelands due to:

- Inflow of migrants/graziers in forests and rangelands; and
- Conflicts with graziers/forest dwellers on resource uses.

(3) Livestock Resettlement Program

1) Issues Limitations

a. Lack of precise information about the families and livestock in the area

The resettlement plan was prepared based on the data gathered in 1984. There is no precise data/information about the number of families / livestock staying in the forest at present.

b. Insufficient consultation in the resettlement process

Adequate consultations and discussions, especially on livelihood recovery, should be conducted in the course of the program since the subject people have little knowledge of livelihood options that they can engage in outside the forest. However, this kind of support is very limited at present and the implementation guideline for the program pays little attention to that matter as pointed out in section 2.5.2.

c. Lack of coordination among related organizations

Integrated support is indispensable for livelihood recovery of resettlers. At present, several organizations (NRGO, MOJA, Housing and Urban Development Organization, Rural Water and Wastewater Company, Agricultural bank, etc.) are involved in the resettlement program. However, the coordination between/among the organizations is not adequate and poor coordination often causes ineffective assistance.

d. Inactive/Insufficient assistance in livelihood development

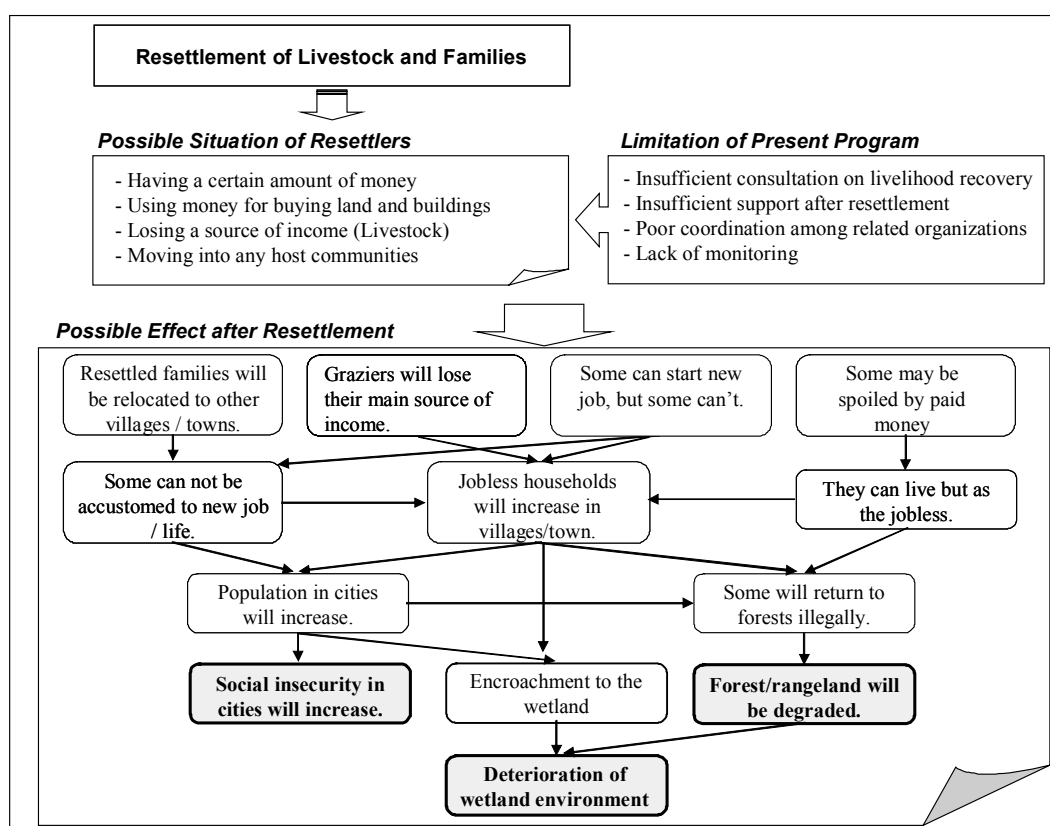
The stance of NRGO on livelihood assistance seems to be “inactive”, since it has no responsibility for livelihood support after relocation. What the NRGO staff has often stated is “the government can provide several types of assistance to affected families when they ask the government for support”. Since most of the affected people have no idea of what kind of governmental support they can access, NRGO in coordination with other relevant organizations should be involved and provide necessary support for livelihood recovery in the consultation process.

e. Lack of monitoring

There is no monitoring activity undertaken on resettled families after relocation. NREGO should periodically monitor the situation of resettled families together with relevant organizations and provide assistance if necessary.

2) Prospective Situation

If the livestock resettlement program were pursued with the limitations as enumerated above, it would possibly cause negative impact on the wetland as well as the upper watershed as illustrated in Figure 2.5.6.



Source: JICA Study Team

Figure 2.5.6 Prospective Situation of the Resettlement Program

2.6 Wastewater Management

2.6.1 Pollution Sources and Pollution Loads to the Anzali Wetland

(1) Characteristics of Pollution Sources

The wastewaters discharged to the wetland are generated in the basin of the wetland. The water environment in the wetland has been degraded by continuous wastewater inflow from

human activities, such as domestic, industrial and agricultural activities. Major water pollution sources are the urban population (743,000 residents), rural population (395,000 residents), industrial factories, livestock (860,000 head), and farmland (99,000 ha). In addition, the natural environment such as forest/grassland (198,000 ha) also generates water pollution. The composition of water pollution sources are as shown below.

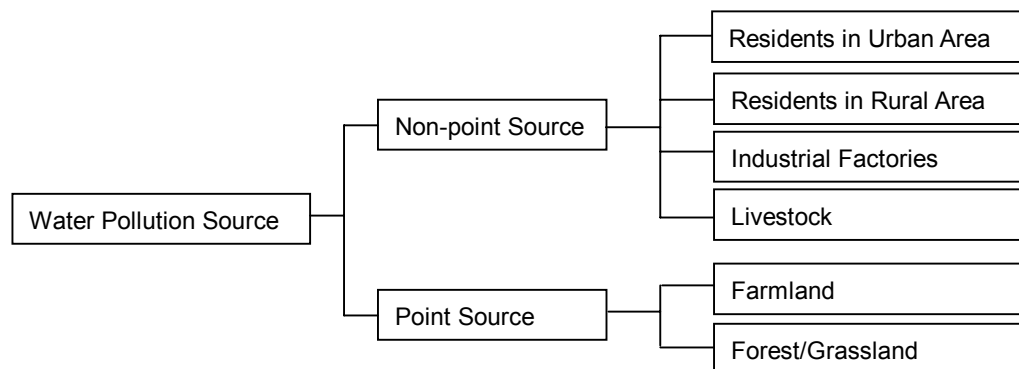


Figure 2.6.1 Composition of Pollution Sources in the Anzali Wetland Watershed

(2) Water Flows in the Anzali Wetland

Pollution from the basin is discharged into the wetland through the nine rivers and drains. For the study on pollution load analysis, the basin of the wetland is divided into the five sub-basins shown in Figure 2.6.2. The mechanism of water flow in the wetland was modeled as shown in Figure 2.6.3.

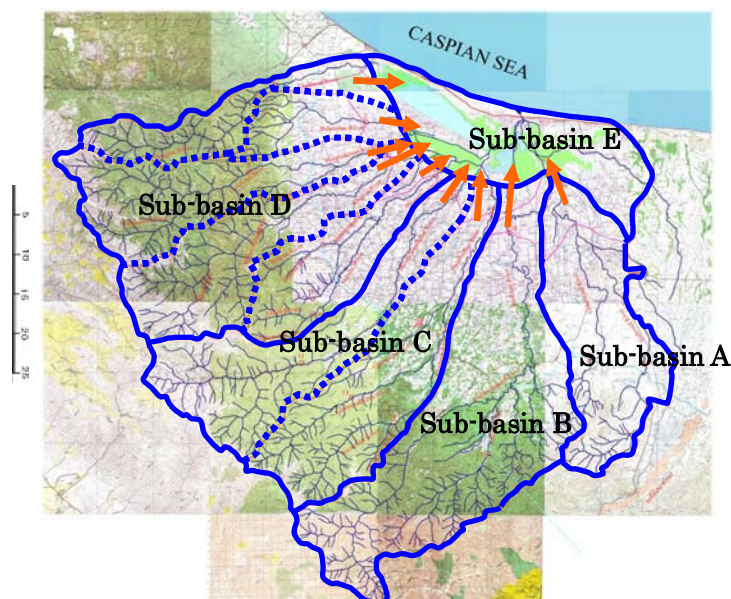


Figure 2.6.2 Sub-Basins for the Study

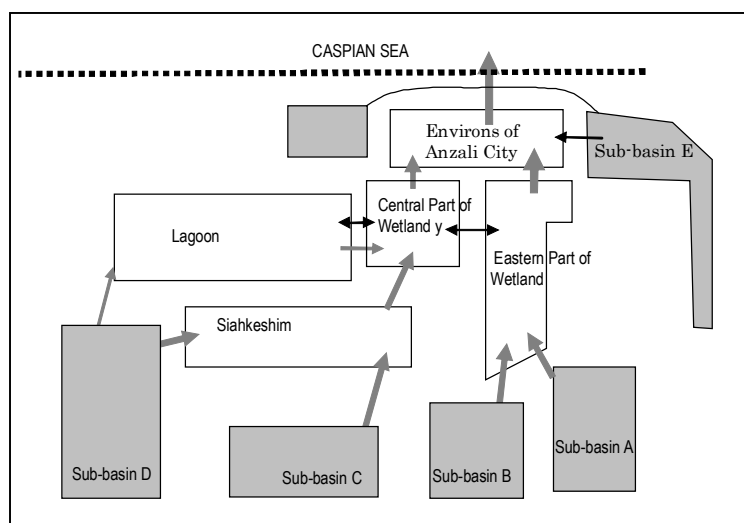


Figure 2.6.3 Pollution Load Discharge Mechanism in the Anzali Wetland

(3) Evaluation of Pollution Load Generation and Discharge

The amount of pollution load into the wetland is calculated based on estimates of condition of pollution sources, unit pollution load generations and discharged rates. Tables 2.6.2 and 2.6.3 show results of pollution load discharged into the wetland on COD, T-N and T-P, respectively.

Table 2.6.1 Calculated COD Load Discharge

(Unit: ton/year)

COD Load	Unit Pollution Load		Sub-Basin					Total
			A	B	C	D	E	
Population (Urban)	g/p/day	130	24,437	364	3,900	858	5,688	35,247
Population (Rural)	g/p/day	40	971	1,387	1,626	1,079	694	5,757
Industrial Activities	mg/L	50	110	0	0	0	0	110
Live Stock(Cows & Buffalo)	g/p/day	26	382	599	1,022	980	100	3,083
Live Stock (Sheep & Goats)	g/p/day	6.5	1	239	455	577	2	1,275
Farmland	kg/ha/year	107	2,126	1,925	3,450	2,507	555	10,562
Forest & Pasturage	kg/ha/year	47	1,396	2,978	2,047	2,792	93	9,306
Total			29,422	7,492	12,500	8,792	7,131	65,338

Source: JICA Study Team

Table 2.6.2 Calculated T-N Load Discharge

(Unit: ton/year)

COD Load	Unit Pollution Load		Sub-Basin					Total
			A	B	C	D	E	
Population (Urban)	g/p/day	11.0	2,068	31	330	73	481	2,982
Population (Rural)	g/p/day	3.3	80	114	134	89	57	475
Industrial Activities	mg/L	30.0	66	0	0	0	0	66
Live Stock (Cow & Buffalo)	g/p/day	2.90	43	67	114	109	11	344
Live Stock (Sheep & Goats)	g/p/day	0.73	0	27	51	64	0	142
Farmland	kg/ha/year	14.3	284	257	461	335	74	1,412
Forest & Pasturage	kg/ha/year	7.6	226	482	331	451	15	1,505
Total			2,766	978	1,421	1,122	639	6,925

Source: JICA Study Team

Table 2.6.3 Calculated T-P Load Discharge

(Unit: ton/year)

T-P Load	Unit Pollution Load		Sub-Basin					Total
			A	B	C	D	E	
Population (Urban)	g/p/day	1.8	338.4	5.0	54.0	11.9	78.8	488.0
Population (Rural)	g/p/day	0.5	13.1	18.7	22.0	14.6	9.4	77.7
Industrial Activities	mg/L	6.0	13.1	0.0	0.0	0.0	0.0	13.1
Live Stock (Cow & Buffalo)	g/p/day	0.50	7.3	11.5	19.7	18.8	1.9	59.3
Live Stock (Sheep & Goats)	g/p/day	0.125	0.0	4.6	8.8	11.1	0.0	24.5
Farmland	kg/ha/year	0.98	19.5	17.6	31.6	23.0	5.1	96.7
Forest & Pasturage	kg/ha/year	0.3	8.9	19.0	13.1	17.8	0.6	59.4
Total			400.4	76.5	149.0	97.2	95.8	818.8

Source: JICA Study Team

2.6.2 Responsible Organizations for Wastewater Management

(1) Relevant Laws

The Regulation and Standard of Environment, 1999 describes the effluent standard. According to the standard, all of domestic and industrial wastewater shall be treated properly before discharging to surface water or absorption well. However, it will take a long time for all polluters to follow the standard. DOE conducts control of industrial effluent even by 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. To follow the standard, the treatment level is required Secondary Treatment Level.

Table 2.6.4 Summary of Effluent Standard

Items	Discharge to Surface Water	Discharge to Absorbent Well (Ground)	Using for Agriculture and Irrigation
BOD	30	30	100
COD	60	60	200
Ammonia (NH ₄)	2.5	1	-
Nitrite (NO ₂)	10	10	-
Nitrate (NO ₃)	50	10	-
Total Phosphorous	6	6	-

Source: Regulation and Standard of Environment, 1999

(2) Responsible Organization

The various authorities such as DOE, MOJA, GWWC and RWWC take responsibility for management of wastewater and pollution from different pollution sources, though a large part of the wastewater is still discharged without any treatment.

Table 2.6.5 shows the responsible organizations for management of each pollution source.

Table 2.6.5 Task of Organizations Responsible for Wastewater Management

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

Source: JICA Study Team

2.6.3 Domestic Wastewater Management in Urban Areas

(1) Present Situation

GWWC is responsible for the management of domestic wastewater in the urban areas. At present about 762,000 people live in the urban areas of the basin and most of them are connected to traditional sewerage systems. These systems consist only of combined sewers for storm water and wastewater collection, without any treatment. There are about 200 outlets from existing sewers along the rivers in Rasht, and about 100 outlets in Anzali.

Effluent water quality from these outlets is completely out of compliance with the effluent standard, because of the lack of any treatment. Some parts of the urban area are not connected to the existing sewerage systems. The households in these areas discharge wastewater directly to rivers, absorption wells, or surface drains along the streets.

(2) Sewerage Development Plan of GWWC

GWWC has a general long-term goal to develop sewerage systems that meet DOE discharge standards in all urban areas. Figure 2.6.5 shows the location and the status of sewerage development projects in the cities for which GWWC is responsible. The service populations and the project costs for the projects are described in Table 2.6.6. The implementation of sewerage projects depends upon national investment managed by MPO. Although these projects have been started, the financial sources for many of them have not been decided. MPO is still negotiating loan arrangements for implementation of Rasht and Anzali sewerage projects with the World Bank.

Table 2.6.6 List of Planned Projects of Sewerage System Development

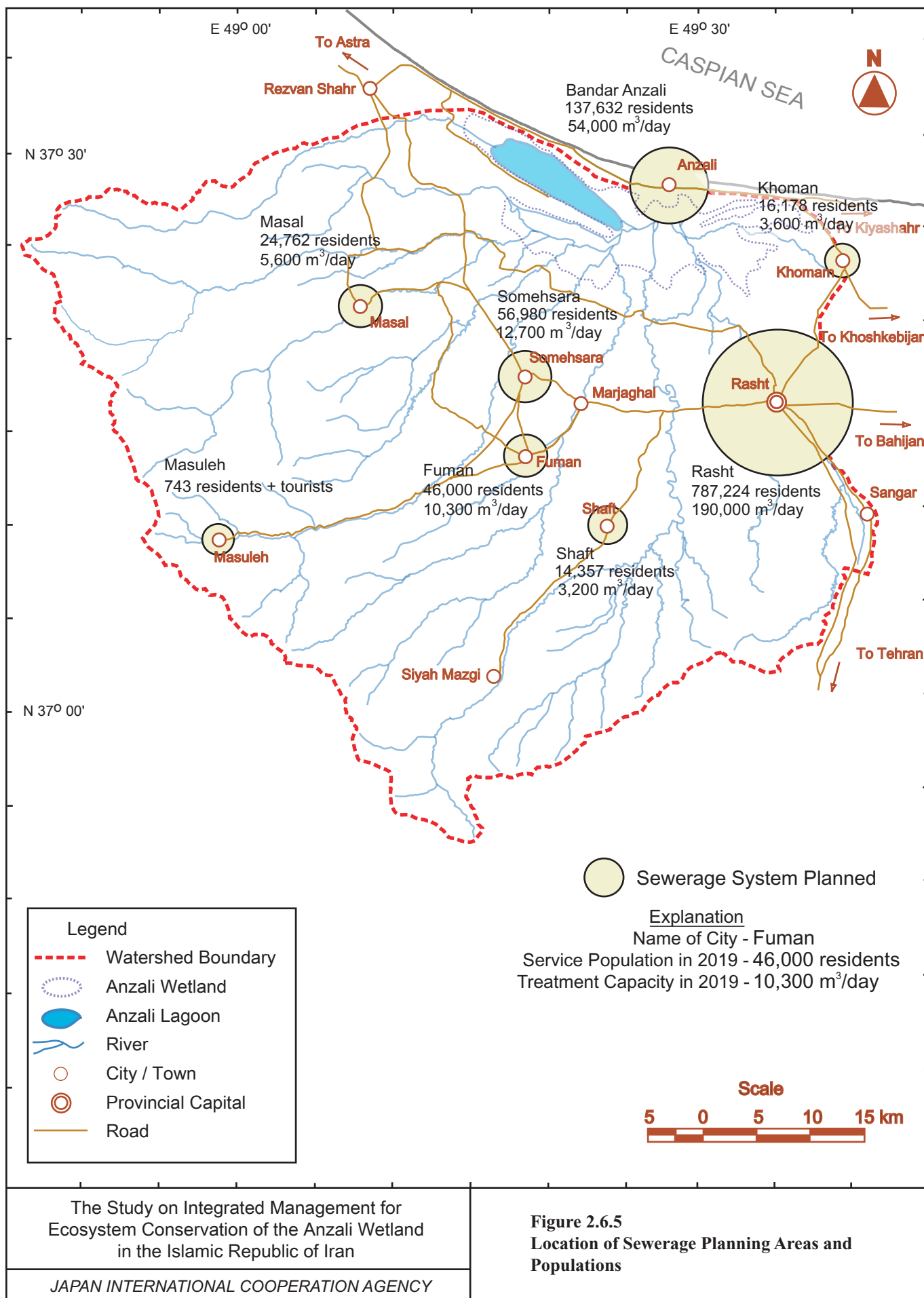
Basin	Sewerage Projects	Service Population	Project Cost (million Rial)	Progress
Eastern Part	Rasht (Phase 1)	253,816	478,880	Construction
	Rasht (Phase 2)	378,284	471,494	Basic Design
	Rasht (Phase 3)	93,600	285,874	Basic Design
	Anzali (Phase 1)	77,920	357,187	Construction
	Anzali (Phase 2)	51,000	101,130	Basic Design
	Anzali (Phase 3)	8,712	18,803	Basic Design
	Khomam	16,095	52,000	Basic Study
	Shaft	14,357	46,000	Basic Design
	Total	893,784	1,811,368	
Western Part	Somehsara	56,980	184,000	Construction
	Fuman	46,000	149,000	Basic Design
	Masal	24,762	80,000	Basic Study
	Total	127,742	413,000	

Source: JICA Study Team

The construction of sewerage systems with secondary treatment (activated sludge process) in Rasht, Anzali and Somehsara has already commenced. Figure 2.6.4 shows pictures of the construction sites.



Figure 2.6.4 Construction Sites of Sewerage Systems in Rasht and Anzali



2.6.4 Domestic Wastewater Management in Rural Areas

(1) Present Situation

About 394,000 people live in the rural areas. The Rural Water and Wastewater Company, Guilan (RWWC) is responsible for water supply and domestic wastewater management in the rural areas of Guilan. However, RWWC has not conducted any work on wastewater treatment, except for the planning of wastewater treatment systems, because of financial constraints. Most of the houses in rural areas have absorption wells, into which wastewater is discharged directly. These wells, which are constructed by the residents themselves, are the traditional wastewater treatment facilities in Iran. Domestic wastewater from the absorption tank infiltrates the surrounding ground.

(2) Development Plan for Community Wastewater Treatment System proposed by RWWC

According to RWWC Guilan, the target of wastewater management in rural areas up to 2022 is to provide wastewater treatment systems consisting of “septic tanks and a secondary treatment process” for 40% of villages that have more than 20 families. The main purpose of rural wastewater treatment is to improve sanitary conditions for residents and it will also contribute to the reduction of pollution load on the wetland. This system will enable low-cost treatment of wastewater from rural communities, with ease of operation.

RWWC has prepared detailed designs for rural wastewater treatment systems for sixteen villages, which include seven villages; Atashgah, Kheshtnasjed, Gasht, Loleman, Norgeston, Sheikhneshin and Aliabad are in the Anzali Wetland basin. The total service population in the seven villages is expected to be 18,325 residents. These projects were planned to be implemented for the Third Five-Year Plan (2000-2004), but the construction works has not commenced because no budget for the projects has been prepared by the central government.

2.6.5 Management of Industrial Effluent

(1) Present Situation

According to DOE, Guilan, the amount of industrial effluent from major industries in 2002 is estimated as below.

Table 2.6.7 Water Consumption and Wastewater Discharges from Industrial Factories(unit: m³/day)

Items	Number of Factories	Water Consumption	Wastewater from human activity	Wastewater from Processes
Textile	11	3,757	555	2,852
Foods	15	2,836	87	1,389
Electrical Products	3	1,270	123	605
Ceramics	6	673	127	256
Metals and Machines	5	478	107	297
Chemical	1	320	17	200
Total	41	9,334	1,016	5,599
				6,615

Source: DOE

Owners of the factories have a responsibility to treat industrial effluent to meet the effluent standard and DOE has responsibility for monitoring the effluent from the factories. The industrial factories are located in various places. It is therefore difficult for DOE staff to carry out effective monitoring of the effluent from all of the industrial factories.

As shown in Table 2.6.3, the total amount of industrial effluent discharged in the basin is roughly estimated to be less than 7,000 m³/day. This is estimated to be about 3% of the total wastewater discharge by volume. The pollution load to the wetland from industrial activities, therefore, does not seem to be serious with respect to organics and nutrients. However, the industries may be the important sources of heavy metals and other toxic materials.

(2) Industrial City Development Plan

There are five existing industrial cities, and one planned in the basin. The management of industrial cities is described as below.

Table 2.6.8 Management of Industrial Cities in the Study Area

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

Such centralization of industrial factories in certain places is useful for effective control of the industrial effluent. The Ministry of Industries and Mining is trying to transfer existing large-scale industrial factories and new industrial factories to these industrial cities. At present, there are no wastewater treatment systems in the industrial cities, though as a first step, a small-scale wastewater treatment system is under construction in Anzali Industrial City.

2.6.6 Management of Livestock Waste

About 862,000 livestock are living in the basin. The livestock include about 309,000 cows, 417,000 sheep, 120,000 goats, 17,000 water buffalo and 47,000 horses and donkeys. The livestock are divided into the following three types of livestock.

(1) Livestock fed by Individual Farmers

Out of 268,000 head of cows and buffalos in the basin, about 200,000 head of them are fed by individual farmers in the plain area. Usually one family feed two to ten cows or buffalo near their house or on their farmland. The farmers use livestock waste as manure on their farmland. The effective usage of the fertilizer for the farmland is the only measure for control of pollution, and a large number of the farmers have already carried out the manure use.

(2) Livestock in Rangelands in Mountain Area

Out of about 537,000 heads of sheep and goats in the basin, most of the sheep and goats stay in 441 km² of rangelands in the mountain area. Waste from the sheep and goats are spreading in a wide area, because they are moving from place to place. A large parts of the pollution load is decomposed in the soil, and only a small amount of pollution load is discharged to the rivers. Under the rangeland management program by NRGGO, about 250,000 head of livestock in the rangeland are planned to be removed. This will contribute to reduction of pollution load to the wetland. Livestock waste in the rangelands in the mountain area is not a serious problem to the wetland because the rangelands are far from the wetland.

(3) Livestock in Rangelands near the Wetland

About 20,000 head of cows and buffalos are fed in pastures near the wetland. Wastes from these livestock are spread in the pastures, 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.

(4) Livestock in Industrial Animal Husbandries

There are about 17 industrial animal husbandries in the basin, where more than 20 head of cows are kept. Dung from the cows is used as fertilizer in the farmland or for feed in fishponds. Liquid wastes are discharged to absorption tanks or ponds, and are not treated properly. DOE requested industrial animal husbandry to have suitable waste treatment facilities to meet the effluent standard. Before authorizing construction of a new animal husbandry building, DOE should evaluate whether it has a suitable waste management system. For waste management, the building is required to have a storage facility for livestock manure, and a wastewater treatment facility. However, there is no standard design for the waste management system for animal husbandry at present.

2.6.7 Management of Pollution from Farmland

In the Anzali Wetland basin, there are 98,700 ha of farmlands, which consist of 81,200 ha of paddy fields and 17,500 ha of other farmlands. A portion of the fertilizers, pesticides and manure used in the farmland is discharged to rivers, and eventually to the wetland as pollution load.

MOJA has an important role in guiding farmers on the control of pollution from agricultural activities. For the control of consumption of fertilizers, pesticides and herbicides, MOJA gives advice to farmers through the Agricultural Service Centers and Township Cooperative Offices as shown in Figure 2.6.6.

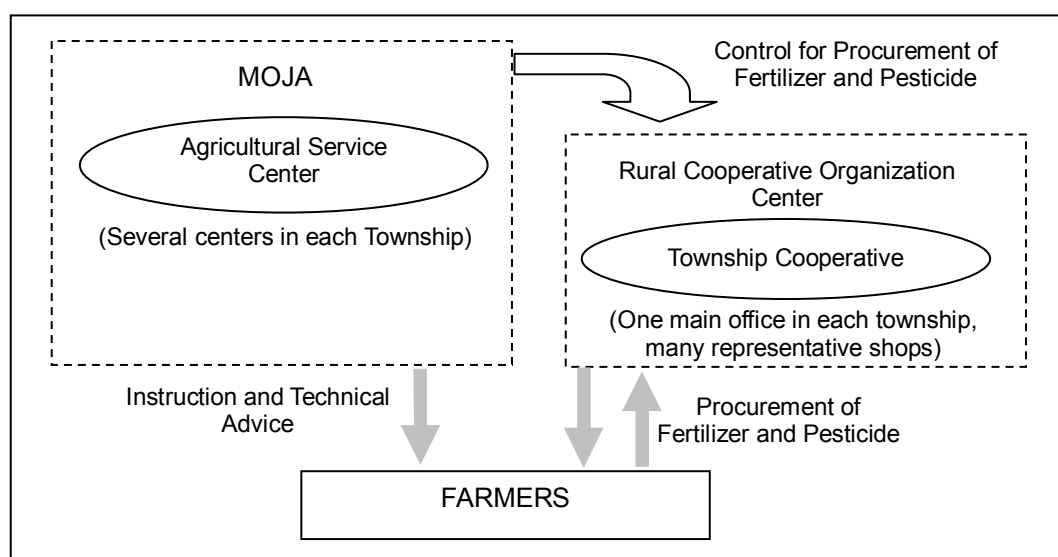


Figure 2.6.6 Organization for Control of Consumption of Fertilizer and Pesticide

(1) Chemical Fertilizer

On average, 75 kg of nitrogen, 4 kg of phosphorous and 26 kg of potassium were applied for one hectare of paddy fields in 2002 based on the data given by MOJA. The dosages for nitrogen and phosphorous are more or less equal with those recommended by MOJA, while that for potassium is quite lower than the MOJA's recommendation²². The yield of rice has increased owing to stable application of fertilizer and improvement of rice varieties. At present, fertilizers are subsidized by the Government and provided to farmers through

²² Recommended dosage per hectare for traditional rice is 55 kg of Nitrogen (N), 0 kg of Phosphate (P) and 60 kg of Potassium (K), while the one for improved variety is 83 kg (N), 0 kg (P), and 120 kg (K).

present, fertilizers are subsidized by the Government and provided to farmers through cooperatives. It is speculated that large quantities of fertilizers could be applied by farmers unless the agricultural extension work of MOJA would function well.

The soil laboratory of MOJA conducts soil analyses every year to determine the optimal dosage of fertilizers based on the soil analysis and give farmers recommendations on appropriate dosage to reduce the quantities. Through these activities, MOJA has been successfully reducing average phosphorous consumption, 36 kg/ha/year in 1992 to 4 kg/ha/year in 2002.

(2) Agricultural Chemical (Pesticide and Herbicide)

The kinds and the amount of the main agricultural chemicals used for rice farming in the study area are summarized in the following table. 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.

Table 2.6.9 Main Agricultural Chemicals in the Paddy Field, 2002

Township	Cultivated area (ha)	Insecticide			Fungicide		Herbicide (kg)
		Diazinon (kg)	Rident (kg)	Padan (kg)	Hinozan (liter)	Beem (kg)	
Anzali	4,200	10,000	10,450	2,200	450	50	10,500
Rasht *	15,500	67,500	20,000	17,500	1,875	500	38,750
Shaft	14,330	10,409	29,650	-	1,000	1,000	35,800
Fuman	13,870	38,325	3,825	12,150	500	500	34,400
Somehsara	27,150	86,369	29,004	12,430	1,500	1,500	67,800
Masal	6,150	15,000	2,000	-	300	500	15,300
Total	81,200	227,603	94,929	44,280	5,625	4,050	202,550

Source: Horticulture and Agriculture Organization in Guilan, MOJA (Data of Chemical Consumption), JICA Study Team, based on the data from the Statistic Data Book in Guilan Province, 1997 (Data of farmland area)

Remarks: The value shown in the cell "Rasht" is the chemical consumption in the part of Rasht, that is in the basin of the wetland. It is assumed that 25 % of the chemical amount in Rasht is used in the basin of the wetland.

The agricultural minister directed to reduce the quantity of agricultural chemical use in 1994. Accordingly, MOJA has instructed farmers through cooperatives to reduce the frequency of chemical application and implemented the IPM (Integrated Pest Management) program to enable farmers to minimize their chemical use. In fact, the consumption of chemicals has decreased to one third for the last decade at the national level. Biological control, which is an insect control technology that uses the natural enemy of insects, such as the egg parasitism bee, was introduced about 20 years ago in the country. MOJA has also promoted the biological control since 1994 when the minister directed curtailment of agricultural chemicals. Thanks to the effort of MOJA, it has been spreading quickly in recent years and produced a certain effect to reduce the agricultural chemical use, though further reduction is desirable.

2.6.8 Major Issues

(1) Lack of Wastewater Treatment Systems in Urban Area

There is no wastewater treatment system for residents in urban area at present. About 762,000 people live in the urban areas of the basin, and most of them are connected to the combined sewer pipe system without any treatment. Some parts of the urban area are not connected to the sewer pipe system, and the households in these areas discharge wastewater directly to rivers, absorption wells, or surface drains along the streets. The construction of two wastewater treatment plants with secondary treatment (activated sludge) has just commenced in Rasht and Anzali.

(2) Unsuitable wastewater treatment in Rural Area

There is no sewerage system in the rural area and a large percentage of residents in the rural area have absorption tanks for wastewater treatment. The absorption tanks cause groundwater pollution around the tanks and wastewater sometimes overflows from the tanks in cause of high groundwater level. 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. However, RWWC has not commenced any construction work on the wastewater treatment in the rural areas because of financial constraints.

(3) Prospective Rapid Development of Industrial Activities

The pollution load from industrial activities does not seem to be serious at present. However, industrial activity is expected to develop much more in the future and will become a major sources that will include heavy metals and other toxic materials. Although all of the industrial factories are required to follow the effluent standard, the monitoring system is still not enough. There are four industrial cities in the basin. However, there is as yet no wastewater treatment facility in the industrial cities so far, although a small-scale wastewater treatment facility is under construction in Anzali industrial city.

(4) Large number of Livestock

There are about 862,000 head of livestock in the basin. Most of the waste of the livestock is spread in the rangeland or farmland, and some of it may be discharged into rivers. Industrial animal husbandries, which feed more than 20 heads of cows, a supposed to follow the effluent standard. However, there is no wastewater treatment facility in any industrial animal husbandry at present.

(5) Large amount of consumption of Chemical Fertilizers and Agricultural Chemicals

Chemical fertilizers and agricultural chemicals are main pollution loads from farmlands. As a whole, large quantities of chemical fertilizers and agricultural chemicals are applied in the

entire farmlands of 98,700 ha in the study area, while the application rate per unit area is not quite large as described above. Although there is no clear data to prove that farm inputs (fertilizers and agricultural chemicals) applied would contribute to water pollution in the wetland, some of the applied inputs seem to be discharged into the wetland. It would be difficult to reduce fertilizers and agrochemicals consumption drastically since the present application level is more or less similar with the recommended and reducing application may affect crop productivity.

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/day of waste generated in the urban areas, the municipalities collect the largest 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. The amount of waste illegally dumped into rivers is difficult to estimate, but according to a questionnaire survey conducted by the team as a part of a pilot activity, it is estimated that as much as 66 tons/day of waste is dumped into rivers, of which 34 tons/day is from the urban and 32 tons/day from the rural areas. The waste generated in villages, 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.

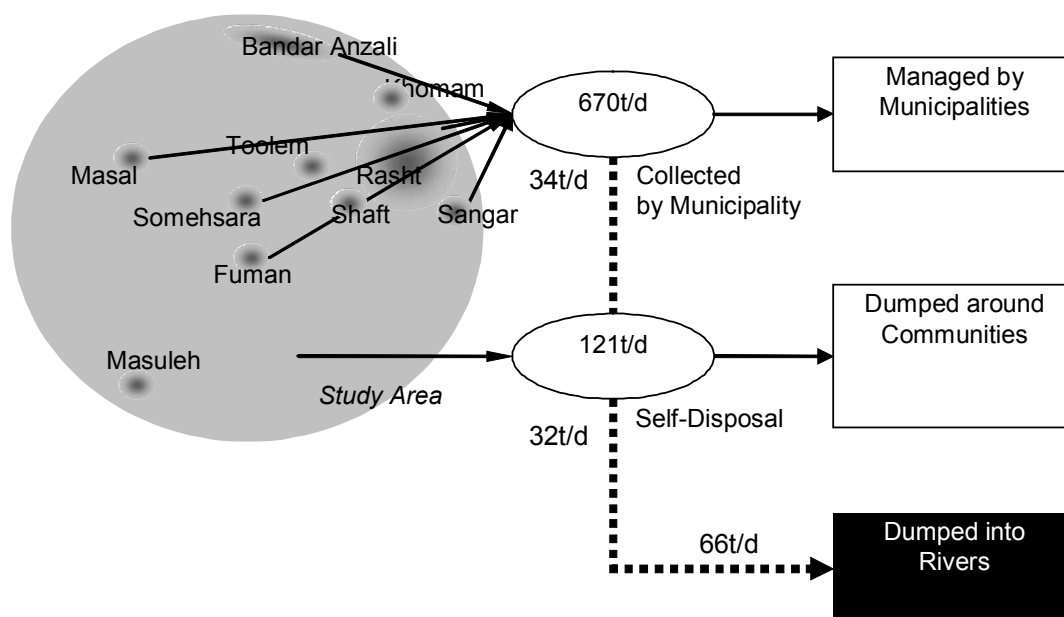


Figure 2.7.1 Amount of Waste Dumped into Rivers

Furthermore, none of the dumping sites in the study area had proper leachate control and pollution of the surrounding environment is a concern. This includes the dumping site in Anzali that is located right next to the wetland. Although 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 Laws and Organizations

(1) Laws

The Waste Management Law was enacted in June of 2004. This comprehensive law covers all wastes, including municipal, industrial, hazardous, and infectious wastes. The major contents are:

- The role of the Ministry of Interior to establish an ordinance to set strategies
- The role of DOE to establish regulations to put the law into practice
- SWM fee charge to cover the total cost as much as possible
- A strict penalty system

In addition, DOE has 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, Paragraph (C) of Article 104 of the Law of the 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 municipalities (Shahrs) and counties (Dehestans), as regulated by the Municipal Law. Waste in ten municipalities in the study area has been managed by the 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 responsibility of factories and hospitals/clinics.

2.7.3 Municipal Solid Waste

(1) Municipal Solid Waste Management

Figure 2.7.3 shows the stream of municipal waste in the study area. 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.

1) Waste Management in Urban Areas

In the urban areas, 670 tons of waste is generated by 744 thousand persons at an average rate of about 900 g/person/day. The waste collection service is provided 6-7 days a week for every house in the municipalities. However, even at this level of collection service, 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 the urban areas.

Almost all waste collected from the municipalities is taken to the Sarawan dumping site, which is a large dumping site located in Rasht Township. This has been used without any liner or leachate treatment for many years.



Figure 2.7.2 Panoramic View of Dumping Site at Sarawan

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 operation 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.

2) Waste Management in Villages

The 121 tons of waste generated in the villages, the “Dehestans”, is not collected, and they are disposed of informally around the communities.

(2) Solid Waste Management Fee

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 or 30,000 Rials to 100,000 Rials per year per household. There is no direct charge system for only SWM service.

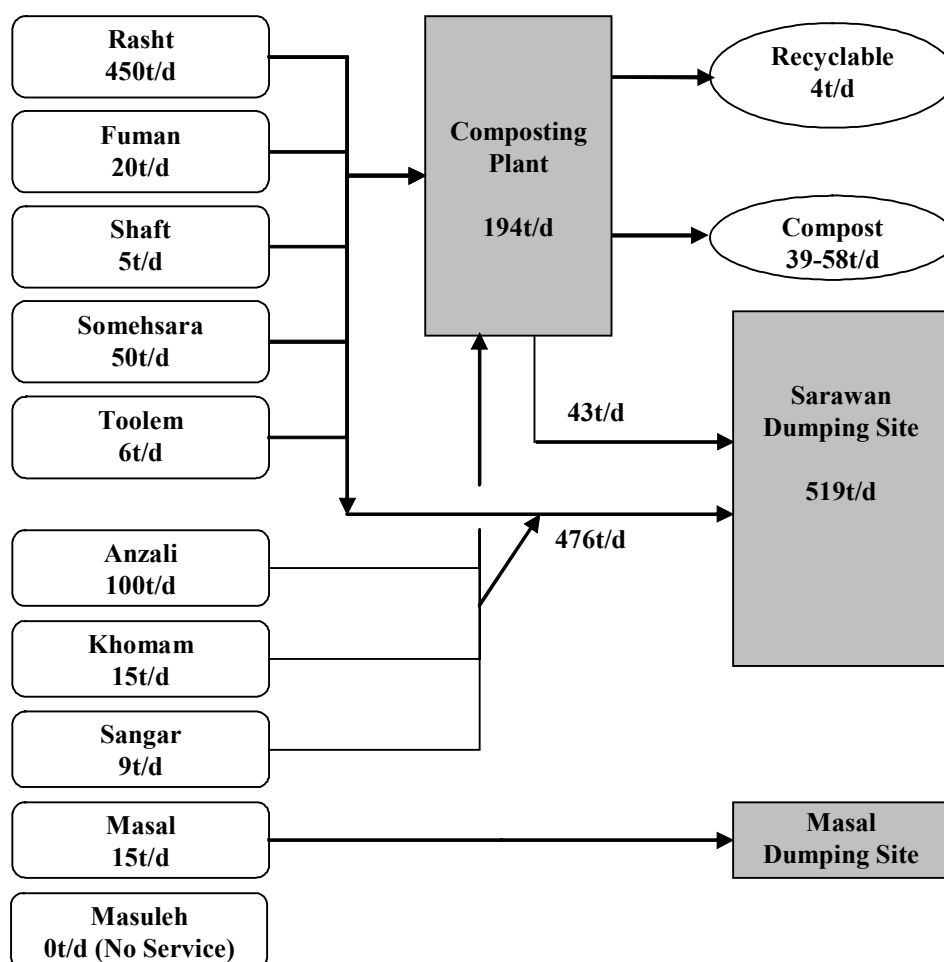


Figure 2.7.3 Waste Flow in the Study Area

2.7.4 Industrial and Medical Solid Waste

There is no written law/regulation on management of industrial waste, but DOE controls factories so that 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 by 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 to be burned. Rasht municipality is constructing a new incinerator for infectious wastes. This plant will cover all hospitals and the private clinics can also use this incinerator.

2.7.5 Major Issues

Based on the analysis in the previous sections, the present issues related to solid waste management can be described as below.

1) Low Level of Environmental Awareness

Scenes of waste dumping into rivers are often seen, even if residents in municipalities have a regular collection service. This behavior is rooted in the long-term habit of throwing waste anywhere, and the priority is to raise public environmental awareness by environmental education of householders.

2) Low Rate of Collection Coverage in Rural Areas

No collection service is provided in villages at present. This causes waste dumping into rivers. It is necessary to provide waste collection service to the villages.

3) Inefficient Waste Collection in Urban Areas

Wastes are collected 6 times or 7 times a week in urban areas. The residents just put their wastes in front of their houses. Residents can discharge their waste at any time to any place. This convenient waste discharge leads, not only to low environmental consciousness, but also inefficient collection service. If residents are obliged to

discharge their wastes in designated places on designated days under a certain waste discharge rule, it will raise the environmental awareness and can reduce the collection cost.

4) Limited Recycling by Residents

At present, waste reduction activities such as recycling still remain at a low level. Only some NGOs are active in promoting recycling activities. Waste reduction, especially recycling, is very important and effective to extend the lifetime of landfill sites. It is also very effective to educate people.

5) Unsanitary Disposal of Municipal Solid Waste

Currently, the collected wastes are dumped in dumping sites in an unsanitary way. Leachate from open dumping places is one of the pollution sources. This situation should be changed urgently by constructing some sanitary landfill sites. Among them, the Anzali dumping site needs urgent measures to conserve the Wetland, because it is located adjacent to the Wetland.

6) Insufficient Capacity of Composting Plant

There is one composting plant in the study area, whose capacity is 250t/d of waste. 200t/d of wastes are carried 6 days a week at present. In order to use the landfills as long as possible, composting is one of the possible technologies to reduce the amount of waste to be managed. It might be necessary to construct another composting plant.

7) Anticipated Increase in Non-hazardous Industrial Solid Waste

There is no serious problem related to non-hazardous ISW at present, mainly because industrial activities in the area are still limited. But in the future, the amount of waste will increase according to the growth of industrial activity. This will result in a lack of landfills and the reduction of non-hazardous ISW will be important as MSW. This is a potential problem at present.

8) Weak Management of Hazardous Industrial Solid Waste and Infectious Solid Waste

The quantity of HISW is very small at present. Though it is very small, to manage HISW is very important to conserve the environment. In terms of control of HISW, DOE is quite positive to monitor the factories. However, this activity is not being done systematically. Furthermore, there is no disposal plant for HISW. Similarly, the management of infectious waste needs improvement. This is particularly true for small clinics that may not be able to bring infectious waste to incinerators.

2.8 Environmental Education

2.8.1 Introduction

This section describes the current situation of (i) environmental education, (ii) awareness raising, and (iii) public participation. 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. Various efforts are being made by DOE, Ministry of Education, MOJA, NGOs and other stakeholders with respect to these definitions of terms. 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 of environmental education, awareness raising and public participation in the study area, and it is important to build much structured and coordinated approaches encompassing broader perspectives into daily activities of the stakeholders.

2.8.2 Relevant Laws and Organizations

(1) Relevant Laws and Regulations

The requirement for Environmental Education and Public Participation are included in major legislative documents as summarized in Table 2.8.1.

Table 2.8.1 Requirements for Environmental Education and Public Participation

Name of Legislative Document	Requirements stipulated in the documents
Constitution	Article 50 of the Constitution of the Islamic Republic of Iran states that "It shall be considered a public duty in the Islamic Republic to protect the natural environment in which the present as well as the future generations shall have a developing social life. Therefore economic activities or otherwise which cause pollution or irreparable damage to environment shall be prohibited".
Environmental Protection and Enhancement Act (1999)	Section 6 d of the Environmental Protection and Enhancement Act of the Environmental Code of the Islamic Republic of Iran (1999) states that one of the responsibilities of the Department of Environment in Iran is to "Develop and implement training and educational programs for purposes of public enlightenment in connection with the protection and enhancement of the environment". Chapter 5 of the Executive By-Law on the Environmental Protection and Enhancement Act, specify the regulations on Education Programmes for Environmental Protection and Enhancement. There are 5 articles that cover; (i) public awareness programs, (ii) inclusion of environmental education in school curricula, (iii) establishment of special institutions for learning in environmental protection, (iv) development of education programs for other organizations, and (v) provision of scholarships for study in other countries.
Third Socio Economic and Cultural Development Plan of the Islamic Republic of Iran	Chapter Twelve of this plan covers Environmental Policies. Paragraph A states that certain programs have to be implemented to provide for the sustainable exploitation of natural resources. One of these programs is entitled the "Institutionalisation of Public Participation in Planning, Decision-Making and Plan Implementation". Little progress appears to have been made on this program to date, though it is anticipated that it legislation will have been proposed before the end of plan date of 2004.

Other major international and national strategic documents related to the environment include:

- The Ramsar Convention signed by IR Iran in 1971
- Caspian Environment Convention, signed by IR Iran in November 2003, and to be ratified in the near future
- Strategic Action Plan for the Caspian Sea developed as part of the Caspian Environment Program
- The National Caspian Sea Action Plan
- The National Biodiversity Action Plan

(2) Organizations

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

2.8.3 Environmental Education for Children and Young People

(1) Environmental Education in Formal Education Sector

There is no formal system as such for environmental education in Iran. Although the Department of the Environment 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. The curriculum is divided into subjects that take a traditional approach both in terms of content and teaching style. Some environmental content appears in subjects such as science and geography but not in any coherent fashion and the focus is on knowledge about the natural environment rather and in some cases broader environmental issues.

There are however a number of positive signs. These include the work of joint Committee of the Ministry of Education and Department of Environment that meets to strengthen Environmental Education. The immediate goals for this Committee include integrating more Environmental Education into the school text books that are currently being revised; to develop a greater environmental education component in teacher training and to promote environmental education in Kindergarten schools. And yet another encouraging sign was the first ever National Conference on Environmental Education held in December 2003. Hosted by the Ministry of Education, over forty papers were presented covering topics from curriculum development, the role of women in environmental education, the use of media and evaluation.

(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 environmental activities. This is largely because of the huge pressure on timetables as a result of the large numbers of children and the two shift system. The Department of the Environment through its public relations department occasionally provides lecturers to visit 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. An interesting development in Rasht is the construction of a Natural History Museum in the Department of Environment in Rasht that will be opened at the end of 2004.

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 the Universities have Faculties of Science and teach environmentally related subjects such as Biology and Ecology. In the University of Guilan there is also a Natural Resources faculty that has Masters courses in Forestry and Fishing and within the faculty there is an Environmental Department that will start Masters courses within the next few years. Guilan University has recently started a course on Urban Development, and the Azad University on Rural Development and another on Tourism. A number of Universities in Tehran also have Environmental Faculties. These focus mainly on ecology and environmental science.

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 available of qualified and experienced lecturers.

(2) Higher Education in Department of the Environment

Nationally, the Department of the Environment has established a College of the Environment and The Institute for Scientific and Applied Environmental Research both to train Department staff. The Department of the Environment in Tehran issues a program of training each year that includes a variety of courses ranging comprehensive courses on Natural Park management to specific courses on public participation, ISO 14000 and species identification. These are mostly short courses lasting from about 30 hours upwards.

At a regional level, professional development opportunities for those working in wetlands has recently taken a step forward with the establishment of the Ramsar Education and Training Centre, in Ramsar itself. This has been established by the the Ministry of Foreign Affairs and funded by Department of the Environment, 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 Department including the Adult Education Department of the Ministry of Education, the PR Section of the DOE and the Education and Extension Departments of both MOJA and NRGO. The Ministry of Education has a number of responsibilities including literacy education (in which they have

been very successful raising adult literacy rates from 50% to over 85%), life skills and vocational education. One mechanism for delivering this education is through a growing network of Community Learning Centers (CLCs), which has priorities focused on rural communities and women. A number of the CLC courses have a content that includes environmental topics such as energy, waste, caring for the environment in the home and so on.

(2) Education for Farmers and Fishermen

Education and awareness raising for farmers is the responsibility of appropriate departments of the MOJA through their Extension Departments. MOJA is responsible for training three groups of people. Firstly, decision makers at all levels; those who are called the beneficiaries, or managers of different programs and projects, and then people who live and work in rural communities. For the first two groups, the training is focused on specific technical needs, and subjects for training are selected through an annual needs analysis. For the third group, MOJA decides priorities for information and awareness raising. 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 Centre 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, supporting 16 offices in townships in Guilan. 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) The Work of the DOE in Raising Public Awareness

The Department of the Environment in Tehran and each of the provincial offices engage in a wide variety of activities designed to raise 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 Department of Environment consists of a team of three people. Activities include organizing specific events and producing specific information materials such as posters and leaflets for

the seven of so 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. The DOE also regularly contributes to local television and radio programs.

(2) Role of NGOs

The number of NGOs in the region has grown over the last few years, and in Guilan Province there is an active network of around 40 NGOs many of whom are members of the Green Network. The NGOs have benefited from activities associated with the Caspian Environment Programme (CEP) and have been given training in Project Preparation provided by the World Bank. As a result their capacities are slowly developing. In Rash, for example, 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 the Department of the Environment on specific projects.

(3) Environmental Awareness Raising for Tourists

The Gilan office of the newly established Cultural Heritage and Tourism Organization (CHTO), which replaces the Iran Tourism and Travel Office (ITTO), provides glossy high quality information leaflets about the province which describes the wetlands and other environmental and cultural sites and also run an excellent and informative web site. There is however, little information about the need for environmental protection or the problems the Wetland is facing and little encouragement for visitors to behave in a particular way, such as the Country Code in the UK. However, the CHTO works closely with the Municipalities and produces other simpler materials that it distributes to visitors during the high seasons and a number of these stress the importance of caring for the wetland, not dropping litter and so on. They are distributed through the Municipality Tourist Offices open in the summer and New Year and by the Red Cross Tent volunteers. 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. These were established in 1998 and represent a major step forward for the development of civil society. Currently, they undertake very little environmental awareness raising, but they have great potential for being a focus for public participation. The Mosques also provide opportunities for environmental awareness raising. Islamic beliefs, traditions and the writings of the Koran, have much to say about keeping a clean environment, and especially keeping water

clean. There is currently little overt environmental message in the teaching of the Mosques but like the Islamic Councils, there is great potential.

2.8.7 Public Participation

(1) Public Participation in the Structure 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 given to the public about the plan.

(2) Public Participation and Environmental Impact Assessment

Environmental Impact Assessments are required for specified large scale projects including petrochemical plants, power plants, steel industries, composting plants other centers for recycling and large scale forestry 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 exist, as it was the case for the controversial Anzali Ring Road project.

(3) Public Participation in Rural Development

Public participation is not yet common in Rural Development projects in Iran, but the use of techniques such as Participatory Rural Appraisal (PRA) through projects funded by UNDP and others, is 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 (University of Tehran Journal of Environmental Studies, Vol. 28, March 2003) highlights the gaps between communities and other stakeholders and stresses the need for great participation in rural planning.

Although this might be the current situation in Guilan, public participation is slowly becoming more main stream to the work of the MOJA and DOE, as exemplified by a participatory approach taken in the Hableh Rood Watershed Management Project and a recent GEF project on Integrated Pest Management in Guilan. These projects can all form good models for the extension of public participation

(4) Promotion of Public Participation

The DOE is encouraging the spread of public participation methodologies. The Bureau of Public Participation was established in 1998 and has the goal of “raising participation impediments (sic), obtaining suitable opportunities for participation and empowering formations and volunteer peoples in the context of environmental protection” and since its

formation the Bureau has prepared - an educational kit to encourage women's participation, a kit about participatory appraisal, and is preparing a booklet about participation for NGOs. In 2002/3 the Bureau ran 20 days of training for different groups. The Bureau is also responsible for the development of NGOs and is active in this field (see above)

MOJA has a Department of Extension and Participation and has a well structured approach to 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. At present they manage around 6 million hectares but still only a small proportion of land is under cooperative management - less than 10% in the case of forests.

A number of NGOs are well known in the area of participatory rural appraisal, 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) A lack of understanding of some of the key concepts of environmental education, awareness and participation, in particular amongst those responsible for their delivery at a provincial level.
- 2) A lack of systems to ensure that education, awareness and participation are delivered in a strategic and consistent way.
- 3) A lack of capacity to deliver education, awareness and participation - and especially a lack of knowledge and experience about effective methods of delivery
- 4) A lack of tools to do work effectively including publications and other resources
- 5) A lack of partnership between national and provincial government Ministries and Department themselves and between decision makers and other stakeholders including business and NGOs.
- 6) A lack of motivation and interest on the part of both decision makers and other stakeholders. Other pressures take priority
- 7) A lack of evaluation taking place to assess whether what is being done is working
- 8) A 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 problem in the Anzali Wetland and its catchment, 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 (some of which take place a long way from the wetland itself), 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 environment. Better management and improved integration are institutional challenges - such issues are often more difficult to address than purely technical issues.

2.9.2 Institutional Structure of Government

(1) National

The Islamic Republic of Iran has a centralised form of government, administered by the 19 Ministries (plus the Office of the President and the Judiciary Power) headquartered in Tehran. The Department of the Environment (DOE) falls under the Office of the President, and the Head of DOE is a Vice President. Each ministry and department has a staff structure in each of the Ostans (=provinces).

Three national level inter-sectoral oversight bodies are also of relevance. The Supreme Council for the Environment is chaired by the President and includes, inter alia, the Ministers of Jihad e Agriculture, Construction Industries, Interior, Housing & Urban Development, Health & Medical Education, along with the Director of the Management and Planning Organization (MPO) and the Director of DOE who serves as the secretary to the Council. 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. This is of great importance with reference to any new legislation that might be needed to establish a new body for the management of Anzali Wetland and its catchment (see 4.4.1 below concerning the proposed establishment of the Anzali Conservancy).

DOE also acts as the Secretariat of the Ramsar Sub-Committee of the National Council for Sustainable Development (NCSA), which reports directly to the Council.

The Water High Council is chaired by the President and includes the Ministers of Energy, Jihad e Agriculture and Interior and the Directors of MPO and DOE. 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. A large proportion of provincial income, both taxes and government fees, is paid to central government, which then distributes a large proportion of the total back to the Ostans for development. These proportions vary geographically, to provide financial support for the poorer Ostans. The proportions have also been changing over time to give an increasingly greater provincial control over expenditure. All expenditure is budgeted and controlled, both centrally and provincially by MPO.

The Ostans are divided into Shahrestans (=sub-provinces), which are usually centered on a large town or city. Gilan province has 16 Shahrestans, six of which cover the study area, and two cover the Anzali Wetland, Bandar-e-Anzali and Somehsara. The municipal authorities in the Shahrestans are responsible for public services, development control, and development planning in liaison with the Housing and Urban Development Organization. Water supply and sewage treatment are provided by nominally independent water companies at Shahrestan level, with separate companies for the urban and rural areas (GWWC and RWWC of Guilan respectively).

2.9.3 Anzali Stakeholder Organizations

Numerous institutions have some responsibility for, or interest in, environmental management of the Anzali Wetland and its watershed. For the purposes of this study, we have concentrated on those institutions which were the subject of the institutional questionnaire survey, i.e. the following:

- Department of the Environment (DOE), Headquarters in Tehran
- Department of the Environment, Provincial Directorate in Guilan
- Department of the Environment, Water Quality Laboratory in Anzali
- Ministry of Jihad-e-Agriculture (MOJA), Headquarters in Tehran
- Ministry of Jihad-e-Agriculture, Provincial Directorate in Guilan
- Ministry of Jihad-e-Agriculture, Watershed Management Bureau²³ in Guilan

²³ Note that responsibilities for watershed management are now being combined with forest and rangeland management under FRO.

- Ministry of Jihad-e-Agriculture, Forestry and Rangeland Organization (FRO), Guilan.
- Ministry of Jihad-e-Agriculture, Fisheries (Shilat) General Directorate of Guilan
- Ministry of Industries and Mines (MOIM), Provincial Organization in Guilan
- Management and Planning Organization (MPO), Provincial Directorate in Guilan
- Ministry of Energy (MOE), Guilan Regional Water Company
- Guilan Water and Wastewater Company (GWWC) – urban systems.
- Rural Water and Wastewater Company of Guilan
- Ministry of Roads and Transportation (MORT), Provincial Directorate in Guilan
- Ports and Shipping Organization (PSO), Bandar e Anzali
- Government of Guilan Province
- Rasht Municipality
- Anzali Municipality
- Somehsara Municipality
- Iranian Travel and Tourism Organization (ITTO)²⁴, Guilan Provincial Office
- Guilan University, Rasht Guilan Green NGOs Network

The scarcity of civil society organizations should be noted. The NGOs in the above-mentioned network 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 Co-ordinating Body

Poor co-ordination has been identified as the principal constraint to good environmental management of Anzali Wetland and its catchment. There has therefore been a strong imperative within the institutional development study to improve co-ordination and integration. If possible, 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), for which MPO provides the secretariat. The membership of this Working Group is as follows:

²⁴ Note that the tourism responsibilities of ITTO have now been combined with those for culture and heritage within the new Culture, Heritage and Tourism Organization (CHTO).

Table 2.9.1 Membership of the Land use & Environment (and Population) Working Group

1	The Governor (Chairman)
2	Head of Provincial Management & Planning Organization (Secretary)
3	Head of Provincial Housing & Urban Planning Organization
4	Head of Provincial Roads & Transportation Organization
5	Head of Provincial Department of Environment
6	Head of Provincial Jihad & Agriculture Organization
7	Representative of Ministry of Defense (Designated by the Minister)
8	Managing Director of the Regional Water Company
9	Head of Provincial Mine & Industries Organization
10	Head of the Islamic Housing Foundation of the province
11	General Director of the Provincial Cultural Heritage Organization
12	Head of the Provincial Tourism Organization
13	General Director of the Provincial Natural Resources Organization
14	General Director of Provincial Tribal Affairs Bureau
15	Director of the Provincial Education and Training Organization
16	Managing Director of the Provincial Water & Wastewater Company
17	General Director of the Technical Office of the Provincial Government
18	Managing Director of the Industrial Areas of the Province
19	Director of the Economic Planning Office of the Provincial Government
20	Director General of the Provincial Social Affairs Organization
21	Director General of the Provincial Intelligence Bureau
22	Official representative of Provincial NGO Network (Without Vote)
23	Other co-opted non-voting members (Mayors, University Professors, Head of Provincial Islamic Council)

The Land use & Environment (and Population) Working Group is one of the Thematic Working Groups under the Provincial Council for Planning and Development (chaired by the Governor), which are listed in Table 2.9.2 below, each of which also has technical Working Groups. The Thematic Working Group on Water, Agriculture and Natural Resources, is also of relevance to Anzali Wetland.

Table 2.9.2 Thematic Working Groups of the Provincial Council for Planning & Development

1	Administration Promotion Planning
2	* Infra-structure & Development
3	* Water, Agriculture and Natural Resources
4	* Industry & Mine
5	* Fuel Wise Use
6	* Urban Development & Architecture
7	* Land Use & Environment (and Population)
8	* Tourism & Cultural Heritage
9	* Employment & Investment
10	Export Development
11	* Research, Statistics & IT Technology
12	Education & Training
13	* Social Affairs
14	* Hygiene, Health Care & Social Security
15	Culture, Arts & Physical Education
16	Women & Youth

Notes: The Director General of Guilan Province DOE is a member of the Thematic Working Groups (WG) asterisked * above.

Decisions of Thematic Working Groups are implemented if approved by the Council. Such decisions must be sent to the Council's Secretariat within one week. The Secretariat of each WG resides within the organization of which its Secretary is a member. It could be argued that the Provincial Working Group on Land use, Environment and Population is the right forum for integration between Anzali stakeholders. However, the Working Group has shortcomings in this respect as follows:

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

The latter point is the most relevant, in that it is a working group in name alone. It therefore does not currently provide an adequate co-ordinating mechanism to address the principal institutional problem identified above.

2.9.5 Institutional Problems of Environmental Management

Legislation is available to address most of the physical problems of the wetland and its catchment, and whilst each of the organizations takes action to fulfill its own duties, they are undertaken sectorally. 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 problems of management of the Anzali Wetland and its catchment are therefore largely organizational and institutional in origin, and can be summarized as follows.

1) Poor Inter-organization Co-ordination

Most of the responsible bodies feel that they are addressing the problems correctly in their own domains, but there is an almost universal recognition that the primary problem is inadequate communication and co-ordination between the various responsible bodies²⁵.

2) Poor Intra-organization Co-ordination

In fact, the lack of integration seems to be more serious than is recognized, because it applies within the major organizations as well as between them. For example, the MOJA Watershed Management Bureau has not had close relations with the MOJA Forestry and Range Organization (FRO). This is despite the fact that forestry is one

²⁵ This could be partly addressed by the proposed merger of NRG, DOE and the Water Department of MOE, which has been approved by Government, but so far has been rejected by the Majlis (this may change over time).

of the most effective means of protecting watersheds²⁶. Similarly, the overall relationship between agricultural development and watershed management is not well appreciated.

3) Unclear Responsibilities

It seems that the responsibilities of different government institutions are often either unclear or overlap. This is partly due to changes in the structure of government, which have not been followed up with amendment of management responsibilities and clear instructions for implementation (e.g. the merger of the Ministries of Jihad and Agriculture) or where the implications of structural change have not been anticipated at the time of re-organization. Of course, this contributes to the inadequate co-ordination between and within organizations mentioned above.

4) Inadequate Budget

Most organizations believe that they could do a better job if they had a larger budget. For many this is undoubtedly true, given the historical lack of investment (and lack of expectation) in public services such as waste disposal and sewage treatment. The recent rapid growth in population means that the capacity of public services and infrastructure has been overwhelmed, and will not be able to cope unless there is significant new investment. However, in many cases, performance could be improved with better organization and management.

5) Need for Ecosystem Approach

There is not a good appreciation of the need for an ecosystem approach to management of the wetland and its watershed. For example, the Watershed Management Bureau states that it does not have any environmental specialists on its staff, yet its whole *raison d'être* must actually be environmental management of watersheds²⁷.

6) Inadequate Planning

Another indication of this lack of a broad integrated management approach, is the fact that the main institutions do not have a plan or Master Plan for the Anzali catchment (with the exception of the "Comprehensive Land Management Plan" of the FRO, which has not yet been published). Whilst many "good works" are

²⁶ This is currently being addressed by moving watershed management responsibilities to fall under the FRO, but it is symptomatic of a more general problem.

²⁷ The recent establishment of an Office for Environment and Sustainable Agricultural Development in MOJA's HQ, and its eventual replication in the provinces, is a very welcome development in the right direction. It is to be hoped that this will be able to introduce a cross-cutting ecological approach to agriculture, rather than simply adding yet another "silo" to the MOJA organization.

undertaken by the individual organizations, there seems to be an ad hoc approach to the selection of their activities.

7) Lack of Pro-active Management in the Wetland

DOE Guilan diligently carries out its statutory duties in the enforcement of regulations (fishing and hunting) and the protection of gazetted protected areas. However, it has not undertaken much other pro-active management of the wetland. This is beginning to change as funding is put into physical works e.g. restoration of the channel around Selke. However, such works should be planned as part of an overall long-term plan for management of the wetland.

8) Lack of Implementation

It is clear that Anzali Wetland and its catchment have been the subject of numerous studies over the years, including the 1989-1991 FAO study and the comprehensive study conducted by Guilan University during 1995-1999, with similar objectives and methods to the present study. These studies have resulted in relatively little action. There appear to be two reasons for this. Firstly, there is a general institutional inertia, which prevents any new work or direction (other than reorganizations). Secondly, given that there is no single body responsible for the wetland (and its watershed), everyone assumes that it is the responsibility of someone else to initiate action.

9) Lack of Motivation

Virtually all government officers undertake private work in the afternoons, which is often more profitable than their government salary. This means that they may lack motivation to undertake their official duties, and may even be diverted from their duties by the greater interest in their private work. It also means that they may look for opportunities to “privatize” parts of their official duties. This is a problem that occurs in all countries which pay unreasonably low salaries to government officers. Elsewhere, this has been addressed by reducing the number of government officers whilst increasing their pay (part of “Structural Adjustment”). This national problem cannot be addressed in the present study.

CHAPTER 3 FRAMEWORK OF MASTER PLAN

3.1 Introduction

This chapter presents the general framework of the Master Plan (M/P) including the overall goal, main approaches, structure, prioritization and evaluation criteria, and the socio-economic framework.

(1) Deterioration of the Environmental Conditions of the Anzali Wetland

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 agriculture into the wetland, 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.

(2) Conservation of the Anzali Wetland as Societal Choice

With the degradation of the environmental conditions, people started to realize the important functions and values of the wetland. The Anzali Wetland still provides habitat for many threatened species (e.g., 8 bird species and 16 fish species) and wintering grounds for as many as 150,000-400,000 migratory birds that visit the wetland every year. The natural resources in the wetland, such as fish, are important assets to the local economy and provide a livelihood for many people. The wetland is also one of the prime destinations for tourists from all over Iran. Over 90% of the people in the area¹ are now in favor of conservation of this beautiful wetland – the conservation of the Anzali Wetland is a societal choice.

(3) Factors Affecting Effective Wetland Conservation

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 (see Chapter 2), and it was realized that the following factors are particularly pertinent to effective conservation of the wetland.

1) Ecological Balance

The wetland ecosystem is maintained by a dynamic and delicate balance of various biological, physical and chemical factors. Thus, the master plan should take into account all major human activities and natural phenomena that affect such ecological balance.

¹ Based on a questionnaire survey conducted by the JICA Study Team in September, 2004. The number of respondents to the survey was about 1,200.

2) Inherent Vulnerability of the Wetland to Environmental Pressures

The wetland is located at the bottom of the watershed, and is inherently sensitive to environmental pressures from the watershed. Even relatively diffuse problems at their sources could get concentrated in the wetland, as exemplified by the problems of water pollution caused by inflow of untreated sewage and illegally dumped waste and sedimentation caused by erosion from the watershed.

3) Support of Stakeholders and Local Socio-economic Issues

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.

4) Coordination among Relevant Organizations

The conservation of the wetland and its watershed involve various cross-sectoral issues, such as land use management, water management, etc., and concerted efforts of stakeholders are essential. The general lack of coordination among relevant organizations, especially across the boundaries of ministries, is one of the weakest point of environmental management in the area.

3.2 Goal and Approaches

3.2.1 Goal

The Anzali Wetland is a significant natural as well as economic asset, and the functions and values of the wetland should be maintained in harmony with the long-term needs and welfare of the people in the area. The goal of the master plan is, thus:

“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

To achieve its goal, the master plan will take the following general approaches, taking the Ramsar guidelines², Ecosystem Approach by Convention of Biodiversity³, the JICA Guidelines for Environmental and Social Considerations (JICA, 2004), and various suggestions from local stakeholders and international experts into consideration.

² The Ramsar Convention has a number of guidelines, such as “New Guidelines for management planning for Ramsar sites and other wetlands” (2002), “Program on communication, education and public awareness (CEPA)” (2002), and “Guidelines for integrating wetland conservation and wise use into river basin management” (1999).

³ Decisions adopted by the conference of the parties to the convention on biological diversity at its fifth meeting, UNEP/CBD/5/23, 2000

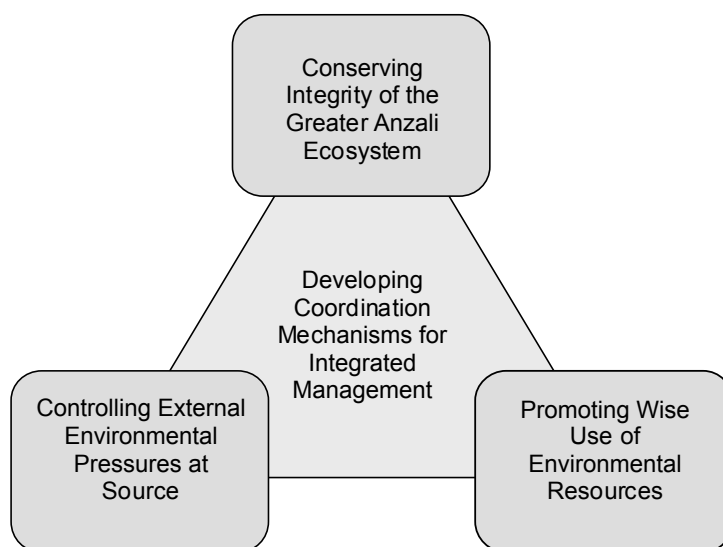
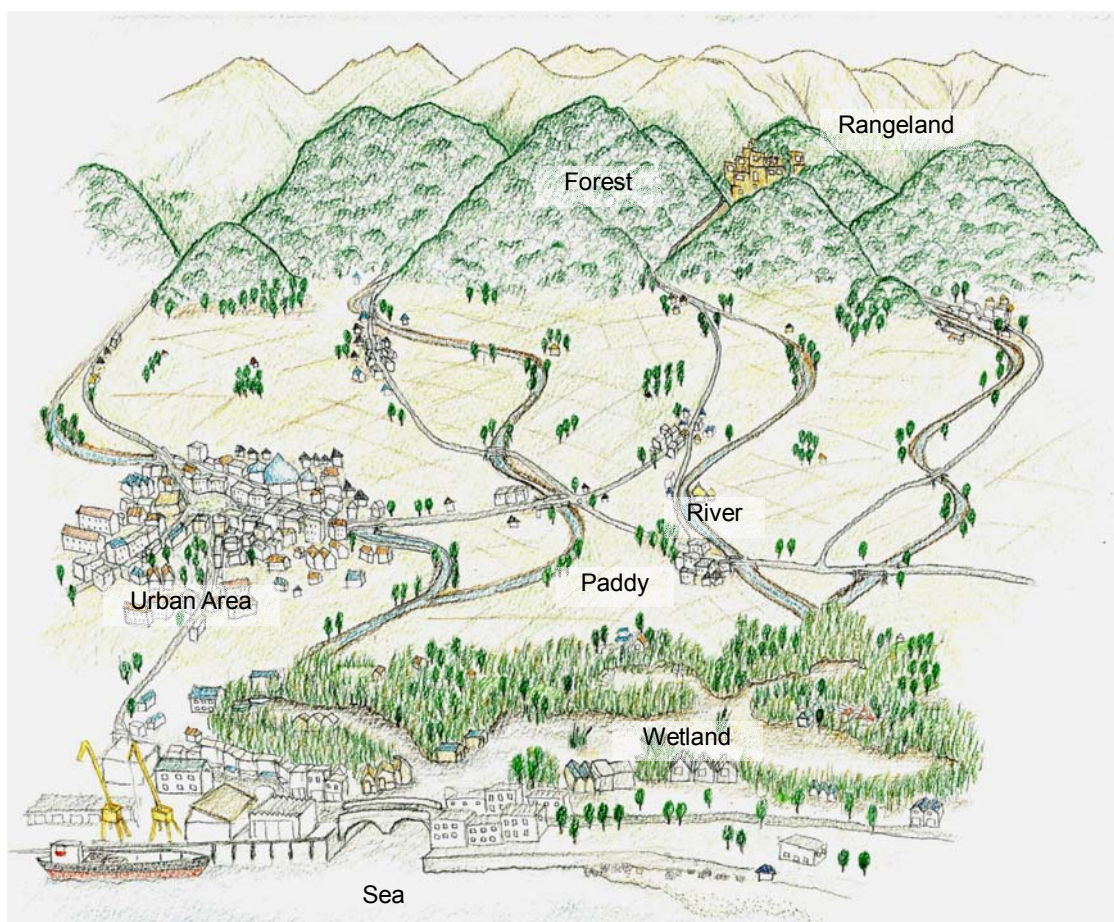


Figure 3.2.1 General Approaches of the Master Plan

(2) Conserving Integrity of the Greater Anzali Ecosystem

There is a misconception among some stakeholders that the conservation of the Anzali Wetland is the responsibility of DOE, and the wetland can be conserved if DOE carries out adequate management in the wetland. Such an idea is far from adequate if we think about how nature works.

Figure 3.2.2 below shows the Anzali Wetland and surrounding area. As is evident from this figure, the ecosystem of the Anzali Wetland is not an isolated system, but is a part of the large, complex ecosystems in the region. The watershed of the 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 provide 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 conserve 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. Anybody who has a stake in the integrity of the Greater Anzali Ecosystem is a stakeholder in this master plan.



Source: JICA Study Team

Figure 3.2.2 Pictorial Representation of the Anzali Wetland and its Watershed

(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 that live in clean water; and many people are looking for quick solutions to such problems. However, 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, over-fishing, 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, before they start to affect the ecosystems in the watershed downward, and consequently, the Anzali Wetland. Among the main approaches to control external environmental pressures are:

- Reducing pollution loads to the wetland
- Reducing the inflow of solid waste to the wetland
- Reducing the sediment load to the wetland
- Reducing illegal encroachment/reclamation
- Reducing illegal hunting and fishing

Once these external environmental pressures are controlled, the natural capacity of the wetland would bring the ecosystem back to a healthy state.

(4) Promoting Wise Use of Environmental Resources

Many environmental measures introduced in the wetland and its watershed, such as licensing for fishing, hunting and grazing, or control of industrial pollution by surveillance, belong to a class of measures known as ‘regulatory’ measures, because these measures try to restrict or regulate human activities by imposing punitive measures against violators. Such measures constitute an essential part of environmental regulations in any country including Iran. 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, such as overexploitation of fishery resources in the wetland, overgrazing of rangelands, and deforestation in the watershed.

As an alternative approach, the master plan promotes ‘wise use’⁴ 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 environment. The concept of ‘wise use’ is tailored into the master plan through the following mechanisms:

1) Recognizing the benefits of the wise-use approach

Local environmental administrators, such as officers of DOE and NREGO, are trained so that they are able to understand and promote the wise use approach. The area needs a policy mix of regulatory measures and wise use approaches.

2) Developing economic opportunities to benefit from protection of the environment while internalizing the environmental costs

Local economic opportunities that benefit local stakeholders when they protect the environment must be developed. Eco-tourism, sports fishing, forest management, participation in erosion control works, etc., are among the ideas suggested in the master plan.

3) Involving local stakeholders

Many local stakeholders who rely on environmental resources, such as fishermen, hunters, graziers and farmers, are serious advocates of environmental protection, and have good knowledge about the local environmental systems. Their participation in environmental management from the planning stage is essential to develop sustainable, locally-based environmental conservation activities that really work.

⁴ The very concept of ‘wise use’ has been promoted by the Ramsar Convention, and is also recommended in the Ecosystem Approach of the Convention of Biodiversity, which seeks integrated management of land, water and living resources through conservation and sustainable use in an equitable way.

4) Emphasizing long-term sustainability of measures

These measures should be long-lasting, evolving processes, rather than one time projects. Allocation of continuous flows of funding, continuous improvement of activities, and capacity building are the keys for long-term sustainability.

(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, such as control of ambient water quality, erosion control and land use management⁵. 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 National Development Plan (Iranian Year 1384-1388), Period II (2010-2014) corresponding to the Fifth National Development Plan (Iranian Year 1389-1393), and Period III (2015-2019) corresponding to the Sixth National Development Plan (Iranian Year 1394-1398). At the end 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.

⁵ For example, control of ambient water quality involves GWWC and RWWC (domestic wastewater management), MOJA (control agricultural wastewater), and IMO (industry pollution control) and DOE (monitoring and law enforcement). Erosion control involves NRGO (management of rangeland and forest), WMD of MOJA (construction of erosion control facilities) and RWO (management of rivers). Land use management involves HUDO (urban planning), Governor's Engineering Office (general planning), municipalities, and various other parties. See Section 2.9.

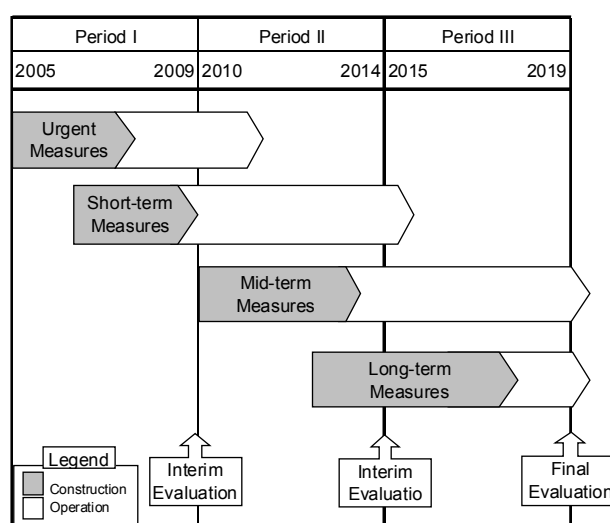


Figure 3.3.1 Phasing of the Master Plan

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 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 were proposed under the general framework of the master plan as shown in Figure 3.4.1.

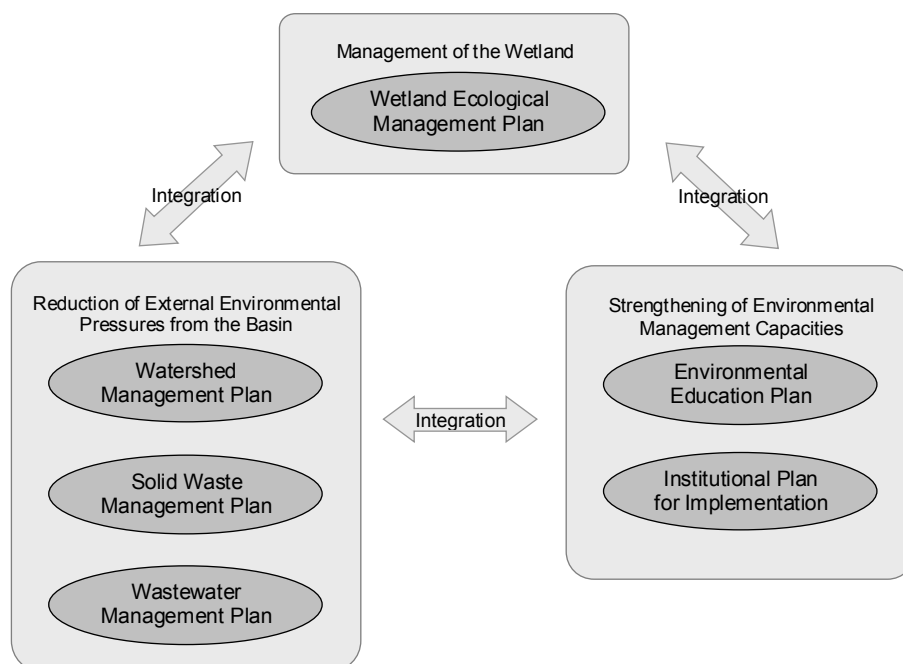


Figure 3.4.1 Overall Structure of the Master Plan

The six sub-plans consist of a plan for management of the wetland itself (wetland ecological management plan), three plans to control environmental pressures from the basin (watershed management plan, wastewater management plan, solid waste management plan), and two plans that integrate other plans (environmental education plan and institutional plan for implementation).

1) Wetland Ecological Management Plan (Chapter 4)

The wetland ecological management plan deals with management of the wetland itself. The main objective of the plan are “to secure the ecological balance to maintain the natural properties of the Anzali Wetland for future generations”. To achieve these objectives, environmental zoning is introduced, and areas to be protected, areas to be used for limited purposes, and buffer areas are designated according to ecological requirements and potential for sustainable use. Then, a series of plans for conservation of wildlife and habitat, sustainable use of the wetland, and monitoring and feedback are proposed.

2) Watershed Management Plan (Chapter 5)

The ecosystem of the Anzali Wetland is sustained by about 10 rivers originating from the forests and rangelands of the mountain areas. However, the environmental conditions of the watershed have deteriorated due to overgrazing in the rangeland, forest exploitation, landslides, and slope collapses due to the problem of road construction methods in the mountains, and other reasons. These issues are covered in the watershed management plan.

3) Wastewater Management Plan (Chapter 6)

Water pollution is one of the most serious environmental problems in the Anzali Wetland, and a separate plan for wastewater management has been developed. The objective of the wastewater management plan is to improve and maintain the water quality of the Anzali Wetland to a level suitable for the wetland ecosystem. Based on an analysis of pollution loads from various sources, measures to control domestic, industrial and non-point pollution sources, as well as institutional and organizational measures, are discussed.

4) Solid Waste Management Plan (Chapter 7)

Lack of environmental awareness of the residents and inefficient waste management are the major causes of the solid waste problems, such as indiscriminately and illegally dumping waste, polluting and unsanitary dumping sites, and lack of disposal facilities for industrial wastes. Thus, a series of measures related to the following areas are considered: (i) environmental awareness raising, (ii) provision of efficient collection systems to the whole area, (iii) proper disposal of municipal solid wastes, and (iv) safe disposal of hazardous and infectious solid waste.

5) Environmental Education Plan (Chapter 8)

The environmental education plan envisions “to increase the level of environmental awareness and understanding through effective provision of information and life-long learning”, and “to increase the level of all stakeholders’ participation in decision-making about their local environment”. Environmental education is a main cross-sectoral endeavor, and environmental education of young generations in schools is one of the main emphases in this study. The plan also includes plans for public involvement of decision-makers, religious leaders, business and industry, farmers and communities, the general public, NGOs and other groups involved in environmental management.

6) Institutional Plan for Implementation (Chapter 9)

The institutional plan examines institutional and organizational development for efficient and effective implementation of the master plan. Improvement of inter- and intra-organizational coordination is central to the plan because weak coordination is probably the most serious problem of the current administrative system, which is highly centralized and vertical. Inadequate planning and review of activities, unclear responsibilities, and lack of pro-active management are among the other issues considered in the institutional plan. This plan plays the key role in the master plan as it unites all components of the master plan.

3.5 Socio-Economic Framework

3.5.1 Introduction

A socio-economic framework is outlined in this section to indicate the likely future directions of socio-economic changes in the study area. The socio-economic framework is of interest to the study because it has great impact 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 pollution loads related to domestic wastewater and amount of solid waste generated. To develop plans to manage wastewater and solid waste, information on future population is therefore essential. Similarly, growth of the regional economy, such as agriculture and industry, and major development projects in the basin, are important factors affecting the environmental impact on the wetland.

3.5.2 Population of the Study Area

The 2004 population of the study area is estimated at about 1.16 million, nearly 50% of which lives in Rasht City. The future population of the area is estimated at 1.17 million in 2005 and 1.52 million in 2019, with an average increase rate of 1.8%/year, and a 30% growth of the population in the 15-year Master Plan period as shown below. While the total population of

the urban area will increase by around 44% in 15 years, the total population in the rural area is predicted to decrease slightly at 0.3%.

Table 3.5.1 Population Forecast in the Study Area from 2005 to 2019

(Unit: thousand persons)

Year	Anzali	Rasht	Shaft	Somehsara	Fuman	Masal	Total	Urban *1	Rural *2
2004	132.3	647.5	75.5	138.7	110.6	52.1	1,157	763	394
2005	133.9	662.8	76.3	139.3	111.6	52.9	1,177	783	394
2006	135.5	678.6	77.1	140.1	112.5	53.6	1,197	804	394
2007	137.0	694.8	77.7	140.9	113.5	54.3	1,218	825	394
2008	138.5	711.4	78.3	141.8	114.6	55.1	1,240	846	393
2009	140.1	728.6	78.9	142.8	115.6	55.9	1,262	869	393
2010	141.6	746.2	79.5	143.9	116.6	56.6	1,284	891	393
2011	143.2	764.2	80.2	145.1	117.7	57.4	1,308	915	393
2012	144.9	782.8	80.8	146.4	118.8	58.2	1,332	939	393
2013	146.5	801.9	81.5	147.9	119.8	59.0	1,357	964	393
2014	148.2	821.5	82.2	149.5	120.9	59.8	1,382	989	393
2015	149.9	841.7	82.9	151.2	122.0	60.7	1,408	1,016	393
2016	151.7	862.3	83.6	153.0	123.2	61.5	1,435	1,043	393
2017	153.1	883.5	84.4	155.0	124.3	62.4	1,463	1,070	393
2018	154.5	905.3	85.1	157.1	125.4	63.3	1,491	1,098	393
2019	155.9	927.7	85.9	159.4	126.5	64.2	1,520	1,127	393

Note: *1 - Total population of urban area covers cities ("Shahr" in Farsi).

*2 - Total population of rural area covers rural districts ("Dehestan" in Farsi).

Source: The above figures are estimated based on preliminary estimate by the Statistics Unit of MPO Guilan only taking account of the past 20-year trend of the census data from 1976 to 1996 and without consideration of other factors such as fertility, mortality and net migration.

3.5.3 Future Economic Forecast

The general revenue of the Guilan provincial government for the past five years is shown below. The average increase in total revenue estimated using 2002 currency values from 1998/99 to 2002 is 5.8%/year. This annual increase rate would be an index for the future economic growth of Guilan province. By applying this annual increase rate, the total revenue of Guilan province is estimated at about 567 billion Rials in 2005 and 1,250 billion Rials in 2019.

Table 3.5.2 General Revenue of the Provincial Budget

(Unit: million Rials)

Parameters	1998	1999	2000	2001	2002
Total revenue at actual current prices*1	199,890	283,850	380,358	436,531	479,056
Estimated at constant price of 2001*2	382,549	438,661	506,795	514,269	479,056
Increase rate (%)	-7%	15%	16%	1%	-7%

Note: *1- The provincial revenue consists of taxes, government monopoly and ownership, merchandise sales and services, insurance premiums and other revenue.

*2- Estimated by JICA Study Team by applying average national consumer price index in urban and rural areas.

Source: Guilan Statistical Yearbook, 2003

In this context, assuming an annual economic growth rate of 5%, the GRDP of Guilan province is estimated at 20,882 billion Rials in 2005 and 41,345 billion Rials in 2019.

Table 3.5.3 Forecast of GRDP in Guilan Province

(Unit: billion Rials)	
Year	GRDP
2000*1	16,362
2005*2	20,882
2019*2	41,345

Note: Estimated at constant prices of 2001

Source: ¹⁾ GRDP in 2000 was obtained from MPO Guilan

²⁾ GRDPs between 2005 and 2019 were estimated by JICA Study Team

3.6 Basic Conditions for Cost Estimate

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 price 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 (refer to Attachment-1)

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

3.7.1 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.

Table 3.7.1 Criteria for Prioritization of Proposed Measures

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 for a measure is reasonable
Capacity of Executing Organization	Whether the capacities of the executing organization are sufficient to implement the measure 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 beyond 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 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”. Some activities, especially environmental monitoring, are to be implemented within the regular activities of each organization, and their priorities are not evaluated using the criteria mentioned above.

3.7.2 Evaluation of Proposed Measures

To ensure the proposed measures are sustainable and viable, they are evaluated with respect criteria related to environmental, economic, and technical aspects.

Table 3.7.2 Criteria for Evaluation of the Proposed Master Plan Components

Name	Evaluation Criteria
Environmental and Social Aspects	Whether the proposed measures do not 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, they are 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.