ISRAMIC REPUBLIC OF IRAN
DEPARTMENT OF ENVIRONMENT

ISRAMIC REPUBLIC OF IRAN
GILAN PROVINCIAL GOVERNMENT

ANZALI WETLAND ECOLOGICAL MANAGEMENT PROJECT - PHASE II IN THE ISLAMIC REPUBLIC OF IRAN

PROJECT COMPLETION REPORT

MAY 2019

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.

GE
JR
19-025

ISRAMIC REPUBLIC OF IRAN
DEPARTMENT OF ENVIRONMENT

ISRAMIC REPUBLIC OF IRAN
GILAN PROVINCIAL GOVERNMENT

ANZALI WETLAND ECOLOGICAL MANAGEMENT PROJECT - PHASE II IN THE ISLAMIC REPUBLIC OF IRAN

PROJECT COMPLETION REPORT

MAY 2019

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.

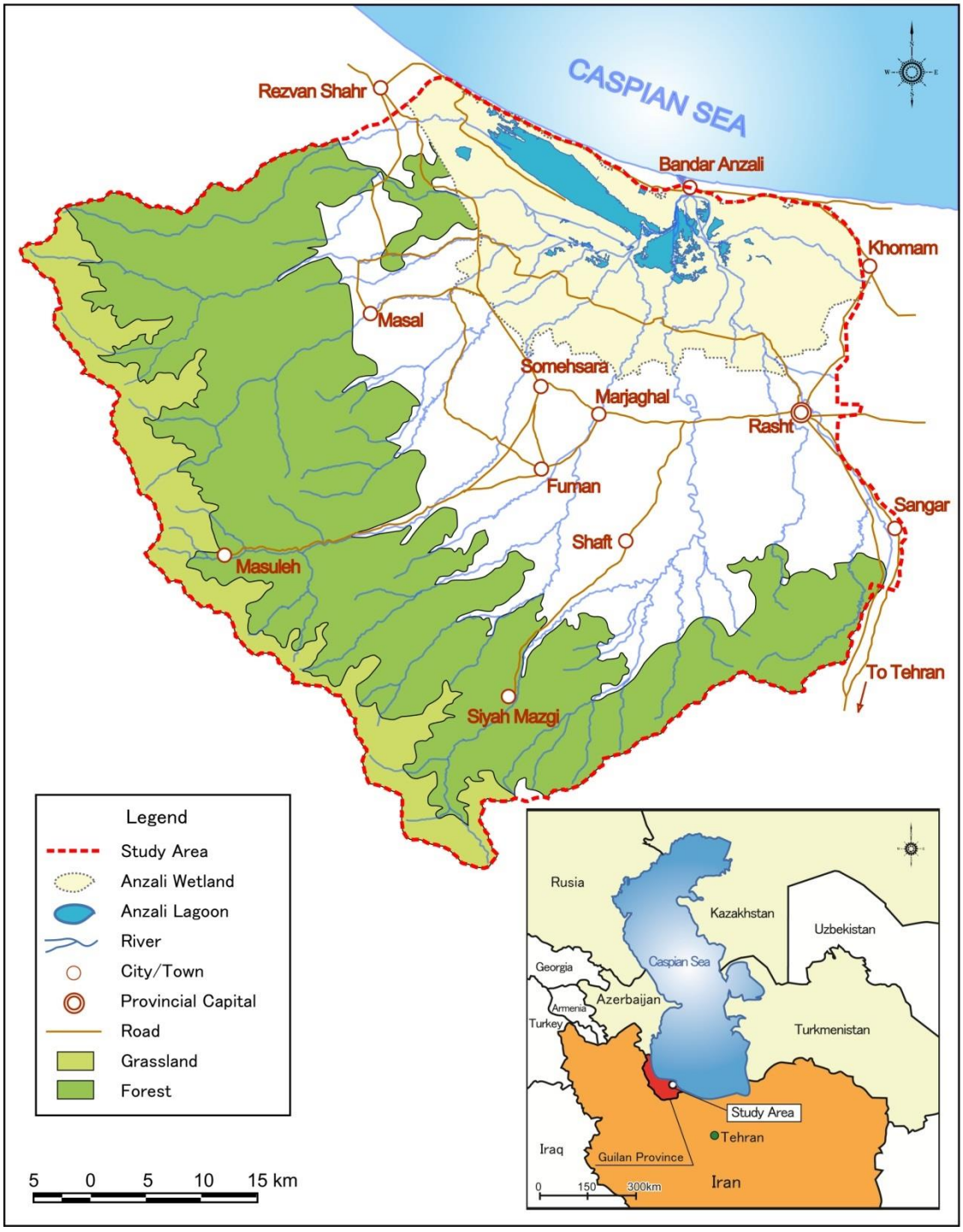
Exchange Rate

JPY 100 = IRR 38,068

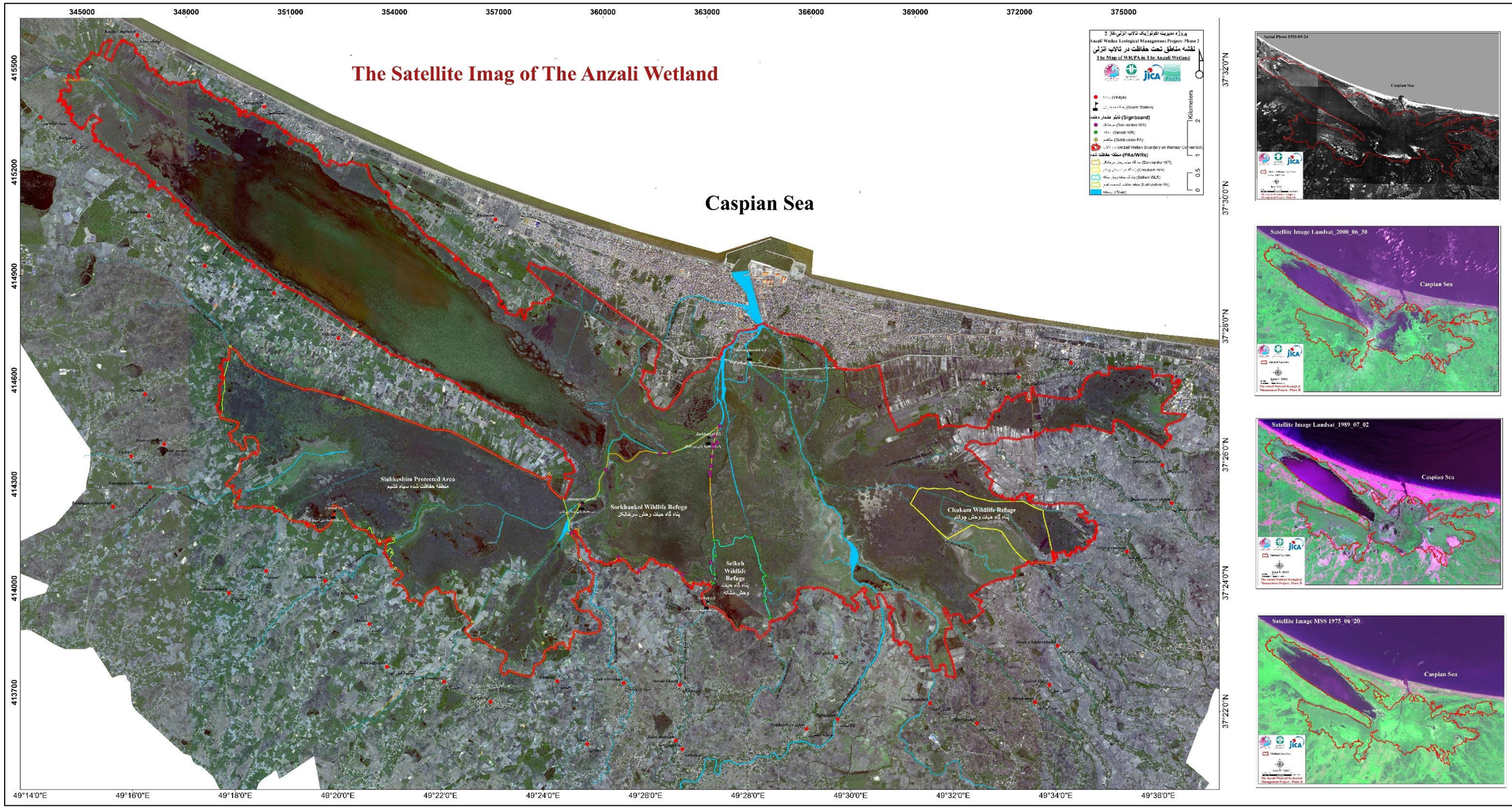
USD 1 = IRR 42,000

(as of 23 May, 2019)

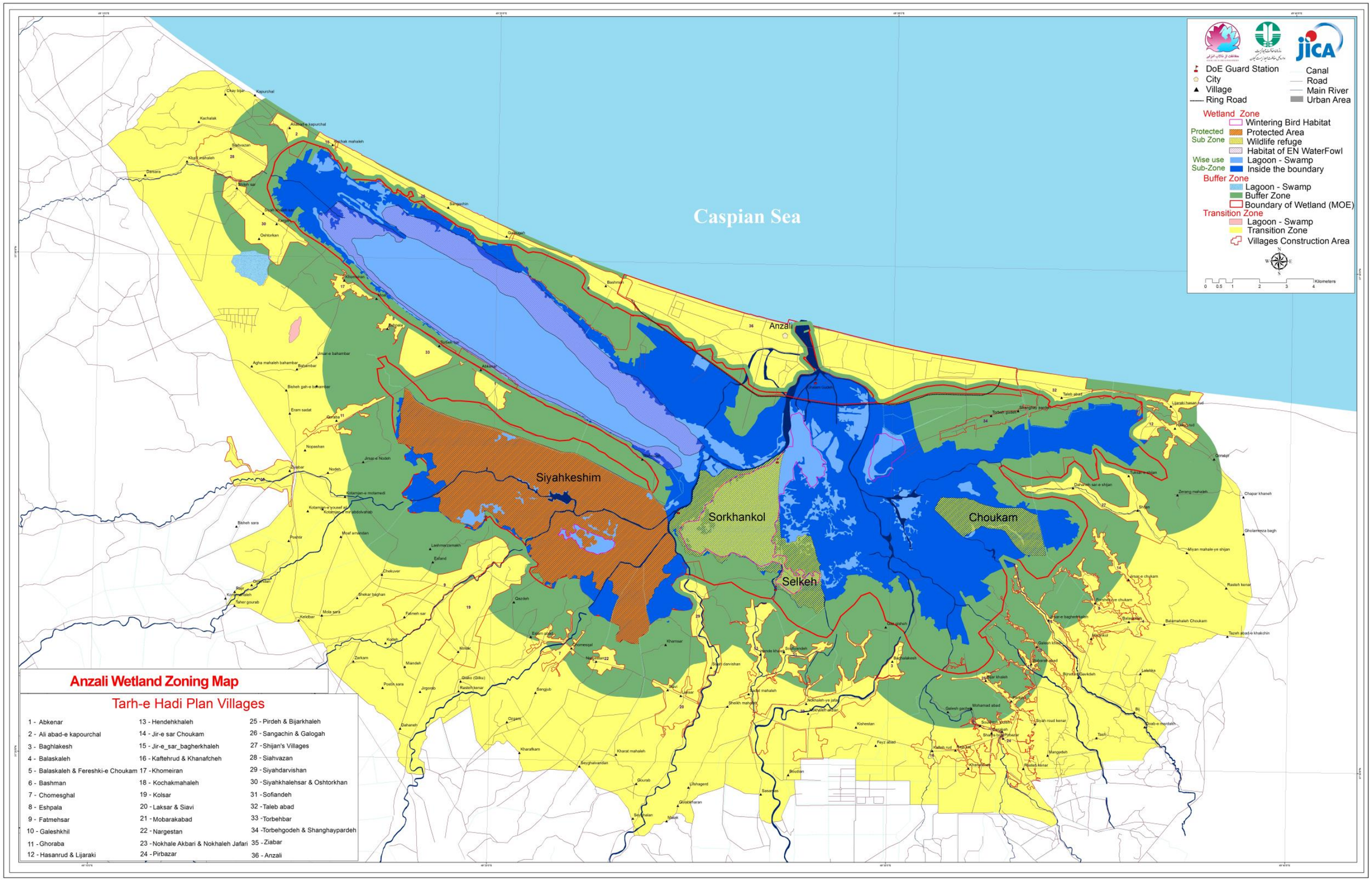
Source: Central Bank of the Islamic Republic of Iran



Project Area



Satellite Image of the Anzali Wetland



Zoning Map of the Anzali Wetland

The Islamic Republic of Iran
Anzali Wetland Ecological Management Project - Phase II

Project Completion Report

CONTENTS

Maps

Attachments

< Wetland Ecosystem Conservation >

Summary of the JPA (1): Comprehensive Ecosystem Survey
Summary of the JPA (2): Monitoring of the natural environment in the Anzali Wetland
Summary of the JPA (3): Wetland Conservation and Restoration
Summary of the JPA (4): Monitoring of Water and Sediment Qualities in the Anzali Wetland and Its Watershed
Summary of the JPA (5): Environmental Zoning and Land Use Management Activity

< Watershed Management >

Summary of the JPA (6): Integrated watershed planning study for erosion and sediment control in Masal River basin
Summary of the JPA (7): Detailed Design (DD) Survey for "Construction Work for Mountainous Erosion Control at Alenze Sub-Basin of Masal River Basin in 2017" (JPA 2017)
Summary of the JPA (8): Construction Work for Mountainous Erosion Control at Alenze Sub-Basin of Masal River Basin in 2017
Summary of the JPA (9): Construction Work for Mountainous Erosion Control at Alenze Sub-Basin of Masal River Basin in 2018 (Iranian fund)
Summary of the JPA (10): Detailed design work at Masule
Summary of the JPA (11): Detailed design survey at Morghak River basin

< Sewage Management >

Summary of the JPA (12): Development Project of On-site Sewage Treatment System in the Anzali Wetland Watershed
Summary of the JPA (13): Development Project of Vacuum Sewerage System in Koliver Area of Anzali City

< Waste Management >

Summary of the JPA (14): Valuable recyclables collection activity
Summary of the JPA (15): Organic waste composting & in-house treatment activity
Summary of the JPA (16): Waste bring-back awareness raising campaign activity
Summary of the JPA (17): River waste collection activity

< Ecotourism >

Summary of the JPA (18): Community-based Ecotourism Development
Summary of the JPA (19): Development of Anzali Wetland Visitor Center

< Environmental Education >

Summary of the JPA (20): Implementation of the EE Program by using the Anzali Wetland Environmental Education Center (AWEEC)
Summary of the JPA (21): Preparation and Implementation of EE Curriculum for School Class and Implementation with Teachers' Training Program
Summary of the JPA (22): Implementation of Broader EE Program
Summary of the JPA (23): Public Relations Activities

(The following attachments are contained in a DVD as attached in this report.)

< Overall >

Attachment 1.2-1 Project Design Matrix Version 2
Attachment 1.2-2 Mid-term Plan for Conservation of the Anzali Wetland for 2020-2030

< Wetland Ecosystem Conservation >

Attachment 3.2-1 Action Plan for Wetland Ecosystem Conservation
Attachment 3.2-2 Comprehensive Ecosystem Survey Report: Mammals
Attachment 3.2-3 Comprehensive Ecosystem Survey Report: Birds
Attachment 3.2-4 Comprehensive Ecosystem Survey Report: Birds Breeding
Attachment 3.2-5 Comprehensive Ecosystem Survey Report: Satellite Tracking of Dalmatian Pelican
Attachment 3.2-6 Comprehensive Ecosystem Survey Report: Reptiles and Amphibians
Attachment 3.2-7 Comprehensive Ecosystem Survey Report: Fish
Attachment 3.2-8 Comprehensive Ecosystem Survey Report: Aquatic Plants of the Selkeh Wildlife Refuge
Attachment 3.2-9 Plan for Control of the Water Hyacinth as Invasive Alien Species
Attachment 3.2-10 Material of Siphon Pipe Type Fishway
Attachment 3.2-11 Ramsar Information Sheet submitted in June 2018
Attachment 3.2-12 Ramsar Boundary, Zoning and Land Use Guideline Concept
Attachment 3.2-13 Material on Boundary Patrol
Attachment 3.2-14 Material on Illegal Hunting Patrol by Using Multi-copter
Attachment 3.2-15 Minute of Meeting on Warning Signboard Installation on the Boundary of Protected Areas

< Watershed Management >

Attachment 3.3-1 Completion Report on Construction Work for Mountainous Erosion Control at Alenze Sub-Basin of Masal River Basin in 2017 Joint Pilot Activity
Attachment 3.3-2 Maintenance Work Report on Construction Work for Mountainous Erosion Control

List of Tables

List of Figures

List of Abbreviations

ALOS	Advanced Land Observing Satellite data
AWEEC	Anzali Wetland Environmental Education Center
AWMC	Anzali Wetland Management Committee
AWMO	Anzali Wetland Monitoring Office
AWNS	Anzali Wetland Nature School
AWVC	Anzali Wetland Visitor Center
BACI	Before-After, Control-Impact (a kind of survey design concept)
BOD	Biochemical Oxygen Demand
CBET	Community Based Ecotourism
CEPA	Communication, Education, Participation and Awareness
COD	Chemical Oxygen Demand
COP	Conference of the Parties
C/P	Counterpart
CSL	Caspian Sea Level
DO	Dissolved Oxygen
DOE	Department of Environment
DSS	Dahanesar Sheijan (name of a village)
EE	Environmental Education
EO	Educational Organization
GCHHTO	Gilan Cultural Heritage, Handicraft and Tourism Organization
GOI	Government of Iran
GRWC	Gilan Regional Water Company
GWEPS	Gilan Women against Environmental Pollution Society
GWWC	Gilan Water and Wastewater Company
GWYES	Gilan Women and Youths Environmentalist Society
HQ	Headquarters
ICHHTO	Iran Cultural Heritage, Handicraft and Tourism Organization
IRR	Iranian Rial
IUCN	International Union for Conservation of Nature
JBK	Jirsar Bagherkhaleh (name of a village)
JCC	Joint Coordinating Committee
JET	JICA Expert Team
JICA	Japan International Cooperation Agency
JPA	Joint Pilot Activity
JPY	Japanese Yen
Kanoon	Farsi name of “Center for the Intellectual Development of Children and Young Adult”
KIWC	Kushiro International Wetland Center
MM	Minutes of Meeting
MOJA	Ministry of Jihad-e-Agriculture
MO	Meteorology Organization
MOE	Ministry of Energy
MPO	Managing and Planning Organization
MPSIAC model	Modified Pacific Southwest Inter-Agency Committee model
MRMO	City Municipalities and Rural Management Organization
NCDC	NOAA's National Climatic Data Center
NGO	Non-governmental Organization
MTP	Mid-term Plan
NIWAI	National Inland Water and Aquaculture Institute
NRWGO	Natural Resources and Watershed Management General Office
NWWC	National Water and Wastewater Company
T-N	Total Nitrogen
T-P	Total Phosphorus
PA	Protected Area
PBO	Planning and Budget Organization

PDM	Project Design Matrix
PMO	Ports and Maritime Organization
PO	Plan of Operation
PTT	Platform Transmitter Terminal
RAM	Ramsar Advisory Mission
R/D	Record of Discussion
RIS	Ramsar Information Sheet
RL	Red List
RWWC	Rural Water and Wastewater Company
SC	Sub-committee
SEI	Sarzamin-e -ideal ma Environmental Institute
STC	Steering Committee
STP	Sewage Treatment Plant
TAA	Tour Agents Association
TBM	Temporary Benchmark
TGA	Tour Guides Association
USD	United States Dollar
WEC	Wetland Ecosystem Conservation
WM	Waste Management
WMC	Waste Management Committee
WMO	Waste Management Organization
WRMC	Water Resource Management Company
WR	Wildlife Refuge
WS	Workshop
WSM	Watershed Management
WWD	World Wetland Day

1. GENERAL

1.1. Introduction

1.1.1. Background of the Project

The Anzali Wetland Complex (approx. 193 km^2) is located near the port city of Bandar Anzali in Gilan Province, north part of Iran along the southern coast of the Caspian Sea. The Anzali Wetland is one of the nearest wetland from Ramsar City which is the origin of the Ramsar Convention. The wetland was designated as a Ramsar site on 23 June, 1975. A large freshwater lagoon, fed by several rivers and separated from the Caspian Sea by a dune system, supports extensive reed bed and abundant submerged and floating vegetation. The permanent wetland is surrounded by seasonally flooded marshes, farmlands (mainly paddy field) and fish ponds. The site is of international importance for breeding, staging and wintering water birds. This site was placed on the Montreux Record in 1993 due to degradations such as change in water level of the Caspian Sea, sedimentation, and water pollution, etc.

Under such situation, in response to a request from the Government of Iran (GOI), the Japan International Cooperation Agency (JICA) has supported to implement the following two projects; the Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland (hereinafter referred to as "M/P Study") and the Anzali Wetland Ecological Management Project (hereinafter referred to as "Phase I Project"). In accordance with the achievement of Phase I Project, the Anzali Wetland Ecological Management Project - Phase II (hereinafter referred to as "Phase II Project" or "the Project") was requested from GOI to the Government of Japan.

1.1.2. Project Area

The project area is the Anzali Wetland and its watershed in Gilan Province of Iran. The watershed stretches as large as 3,610 km^2; it peaks in the mountainous area at 3,105 m above sea level, and its lowest area, the Anzali Wetland (150 km^2) is connected to the Caspian Sea at 25 m below sea level. Land use of the area varies significantly. 42.0% of the watershed is covered by forest and 26.7% is utilized for paddy field and farmland as of 2002. The estimated population in the project area is approximately 1.1 million persons as of 2003, and the provincial capital, Rasht City accommodates 650 thousand people and situated in the middle point of one of the feeder rivers of the wetland. A location map of the watershed of the Anzali Wetland is shown just after the cover page.

1.1.3. Implementation Structure of the Project

A project implementation structure is shown in the following figure and tables. While DOE Headquarters has overall responsibility for the administration and implementation of the project, main member organizations of the Anzali Wetland Management Committee (AWMC) play a role in implementing the project.

Table 1.1-1 Main Responsible Positions for the Project

Position	Name, Title, Affirmation	Responsibility
(1) Project Director	Dr. Ahmad Ali KEIKHA, Deputy head of Natural Environment of DOE / Dr. Farhad Dabiri, Deputy Head of Natural Environment of DOE / Dr. Hamid Zohrabi, Deputy Head of Natural Environment and Biodiversity of DOE	Position to bear overall responsibility for the administration and implementation of the Project
(2) Deputy Project Director	Dr. Hamid Goshtasb, Director General of Habitat and Environmental Affairs, DOE / Dr. Bagherzadeh KARIMI, Manager, Wetland Ecosystem Bureau of DOE	Supporting position for the Project Director who bears the delegated responsibility on the project implementation under the direction of the Project Director.
(3) Project Manager	Mr. Mohammadreza BORJI, Director General of DOE Gilan / Mr. Dr. Ghorbanali Mohammadpour, Director General of DOE Gilan	Responsible for the managerial and technical matters of the Project.

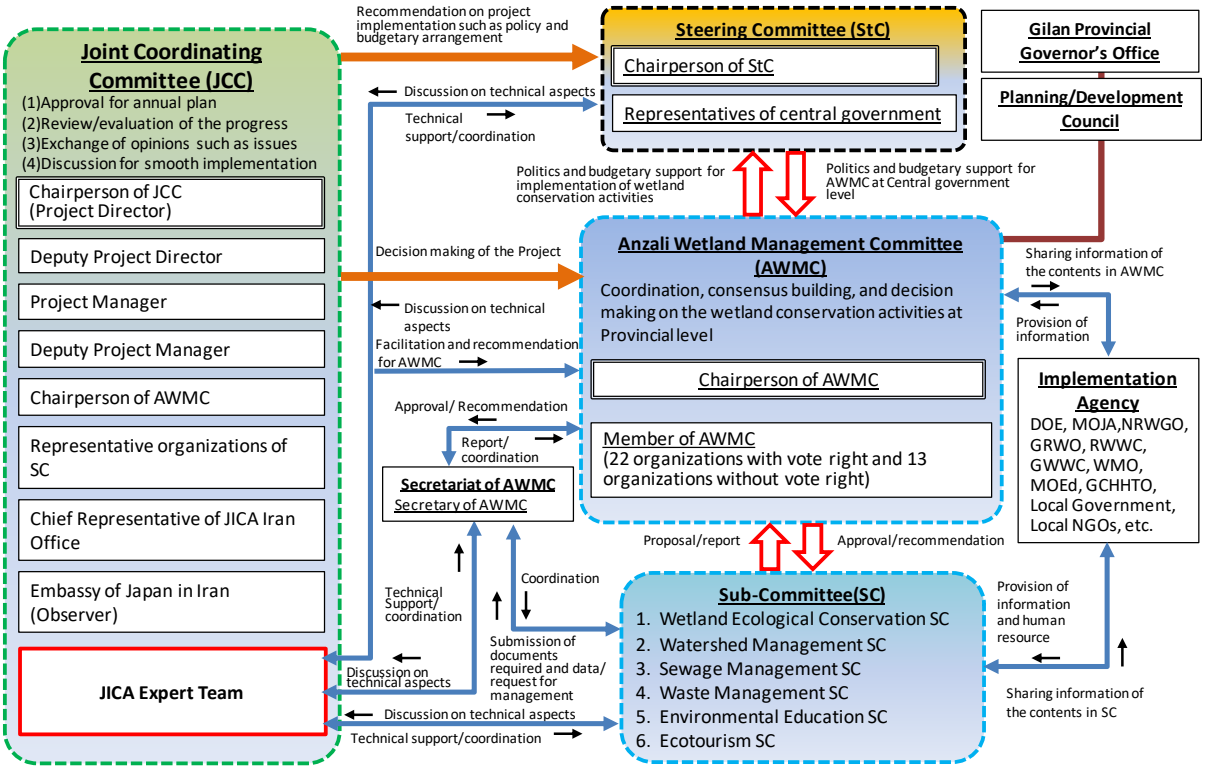
Note: Responsibility for each position is based on the R/D dated 15 December, 2013.

Source: JICA Expert Team

Table 1.1-2 List of Members of JICA Expert Team

Expertise	Name
(1) Chief Advisor / Integrated Wetland Management	Mr. Tomoo AOKI
(2) Deputy Chief Advisor / Wetland Conservation and Monitoring (1)	Dr. Itaru OKUDA
(3) Watershed Management (1)	Mr. Hideki IMAI
(4) Watershed Management (2)	Mr. Tokuaki KAWAGUCHI
(5) Sewage Management (1)	Mr. Takeki KAJIURA
(6) Sewage Management (2)	Mr. Hidehisa TAMURA
(7) Waste Management	Mr. Satoshi HIGASHINAKAGAWA / Mr Tomoyuki HOSONO
(8) Ecotourism	Mr. Masanori SHINTANI
(9) Environmental Education (1)/Wetland Ecosystem/Public Relations	Mr. Hitoshi WATANABE
(10) Wetland Conservation & Monitoring(2)/Environmental Education (2)	Ms. Junko MASAKI
(11) Procurement and Safety Management (Architect)	Mr. Tetsuro NISHIMURA
(12) Fishway Planning	Mr. Yukio OTA
(13) Visitor Center Display Design	Mr. Naoki ONO / Ms. Kaori AKAZAWA
(14) Project Coordinator	Mr. Hiroaki Nakagawara / Mr. Keisuke YANEHASHI

Source: JICA Expert Team



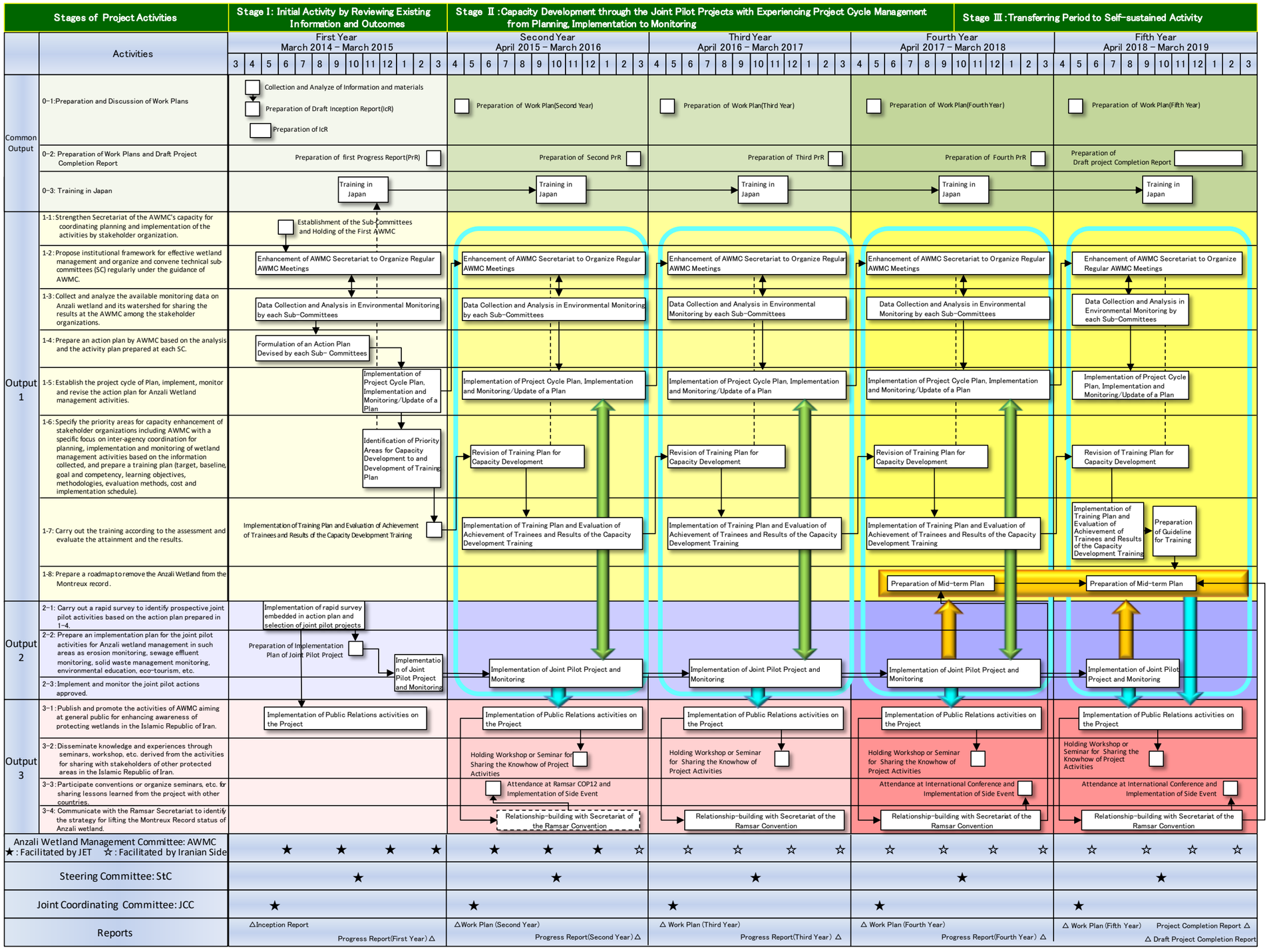
JCC: Joint Coordinating Committee, StC: Steering Committee, AWMC: Anzali Wetland Management Committee, SC: Sub-committee, DOE: Department of Environment, MOJA: Ministry of Jihad-e-Agriculture, NRWGO: Natural Resources and Watershed Management General Office, GWWC: Gilan Water and Wastewater Company, RWWC: Rural Water and Wastewater Company, WMO: Waste Management Organization, GCHHTO: Gilan Cultural Heritage and Handicraft and Tourism Organization, MOEd: Ministry of Education, GRWO: Gilan Regional Water Company

Source: JICA Expert Team

Figure 1.1-1 Implementation Structure of the Project

1.1.4. Overall Work Flowchart

Overall work flowchart of the project is shown below.



Source: JICA Expert Team

Figure 1.1-2 Overall Work Flow of the Project

1.2. Project Design Matrix (PDM) and Plan of Operation (PO)

The project is implemented based on the Record of Discussions (R/D), which was agreed and signed on 15th December 2013 among Gilan Province, DOE, and JICA. The project design matrix (PDM) was revised during the Mid-term Review of the project in June 2016. Based on the revised PDM (PDM version 2.0), the purpose of the Phase II Project is "An integrated and adaptive wetland management system of the Anzali Wetland with effective involvement of all stakeholders and appropriate scientific data and information is established." In order to realize the project purpose, three outputs are set; 1) The Capacity of the Anzali Wetland Management Committee is enhanced, 2) Mechanism to select and implement high priority activities and methodologies for wetland conservation based on biological and fiscal data through Joint Pilot Activities (JPAs) is established, and 3) Knowledge and experience are shared domestically and internationally.

In accordance with the principle on joint implementation of the project, the project purpose is supposed to be achieved with technical support by the JET (JET) to the Iranian counterparts. The goal and purpose of the project, outputs, activities, and monitoring indicators are described in the Project Design Matrix (PDM) as shown below. Project progress and outcomes will be monitored jointly between the Iranian side and the Japanese side by using the PDM.

[Super Goal] Anzali wetland receives clean water to sustain an attractive landscape and supports rich biodiversity where local communities make wise use of its resources as a natural heritage and enhance cooperation among the organizations involve.	<Objectively Verifiable Indicators> Anzali wet land is removed from the Montreaux record of the Ramsar Convention.
[Overall Goal] (1) The conservation activities of Anzali wetland is enhanced by a variety of approaches and methodologies introduced. (2) The integrated Anzali wetland management system under the Anzali Wetland Management Committee (AWMC) is recognized as a conservation model for wetlands in Iran and the Caspian Region.	<Objectively Verifiable Indicators> (1-1) The system which was formulated in the Project such as AWMC and SCs continuously held under the Mid-term Plan. (1-2) Under AWMC and SCs, the conservation and restoration activities are continuously developed and evaluated to reduce the drivers degrading the wetland ecosystem, based on scientific information, such as biological and physical data, from monitoring surveys. (2-1) Policy dialogue meeting regarding to the management of Anzali Wetland Conservation among Central Government, the other Caspian Region, and stakeholders of Anzali wetland is held within one year after the Project. (2-2) At least one wetland in Iran and/or the Caspian Region introduces the integrated Wetland conservation mechanism developed in Anzali Wetland.
[Project Purpose] An integrated and adaptive Wetland management system of Anzali wetland with effective involvement of all stakeholders and appropriate scientific data and information is established.	<Objectively Verifiable Indicators> (1) AWMC is held based on the Anzali Wetland Decree/Declaration and discuss conservation issues raised by Sub-Commitees (SCs), decide necessary actions and allocate budget for the actions. (2) Wetland conservation activities are decided based on appropriate scientific data and information. (3) Annual reports of AWMC are elaborated.

< Output 1 > The Capacity of the Anzali Wetland Management Committee is enhanced.	[Activity-1]: Set agenda and regular meeting schedule for AWMC in accordance with its regulatory frameworks [Activity-2]: Propose institutional framework for effective wetland management and organize and convene sub-committees (SCs) under the guidance of AWMC [Activity-3]: Establish the advisory group of AWMC. [Activity-4]: Monitor SCs' activities at AWMC. [Activity-5]: Establish the integrated and adaptive management cycle of planning, implementation, monitoring and revision of the plans for Anzali Wetland and watershed management activities based on scientific data and information. [Activity-6]: Improve capacity of the secretariat of AWMC.. [Activity-7]: Develop the Mid-term Plan for Anzali Wetland conservation.
< Output 2 > Mechanism to select and implement high priority activities and methodologies for wetland conservation based on biological and fiscal data through Joint Pilot Activities (JPAs) is established.	[Activity-1]: Carry out a rapid survey to identify prospective JPAs for effective watershed management for conservation of Anzali Wetland. [Activity-2]: Short-list prospective JPAs for Anzali Wetland and its watershed in such areas as wetland ecological conservation, watershed management, sewage management, waste management, environmental education, eco-tourism.. [Activity-3]: Implement and monitor the JPAs which AWMC approved. [Activity-4]: Formulate future action plans which are included in the Mid-term Plan based on results of JPAs.
< Output 3 > Knowledge and Experience are shared domestically and internationally.	[Activity-1]: Publish and promote the activities of AWMC aiming at general public for enhancing awareness of protecting wetlands in Iran. [Activity-2]: Disseminate knowledge and experiences through seminars, workshops, etc. derived from the activities for sharing with stakeholders of other wetlands in Iran. [Activity-3]: Participate in conventions or organize seminars, etc. for sharing lessons leaned from the project with other countries. [Activity-4]: Prepare necessary data and information to lift Anzali Wetland from the Montreaux Record in accordance with Resolution VI.1 of Ramsar Convention, and discuss the process with the Secretariat of Ramsar Convention.

Note: Revision of the Project Design Matrix was proposed by the JICA Mid-Term Review Team in June 2016 as PDM Version 2.0 and confirmed by the Iranian side with revision of the Revision of the Record Discussion.

Source: JICA Expert Team

Figure 1.2-1 Outline of the Project Design Matrix (Version 2.0)

1.3. Evaluation of the Project

1.3.1. Mid-term Evaluation

The Mid-term Review for the Project was conducted by a JICA Mid-term Review Team between 19 May and 6 June, 2016 in the project area. Results of the Mid-term Review and implementation plan in further stage of the Project are summarized below.

(1) Objectives of the Mid-term Review

The Mid-term Review was conducted to discuss about necessary items for further stage of the Project by reviewing the latest progress of the project activities in the mid-term period of the Project. Concrete objectives of the Mid-term Review are shown as follows.

1) To review inputs, activities, and outputs of the Project to date and assess the likelihood of achieving the Project Purpose as well as the Overall Goal in due course;

2) To analyze the progress and achievements in reference to the Project Design Matrix (PDM) and the five criteria for evaluation (relevance, effectiveness, efficiency, impact, and sustainability); and
3) To discuss measures to be taken for the Project's further improvement and to prepare the Joint Mid-term Review report.

(2) Summary of the Review Results and Conclusion

Review Results and Conclusion of the Mid-term Review are summarized in the following list.

Table 1.3-1 Review Results and Conclusion of the Mid-term Review

Output 1: The capacity of the Anzali Wetland Management Committee enhanced. The achievement level of Output 1 has been deemed moderate. Each SC has worked enthusiastically to develop JPA plans, and the AWMC has approved them. The AWMC and the committee of the Anzali Wetland Restoration Program had been integrated, the meeting has been held. However, some improvement such as management of secretariat is needed.
Output 2: Joint pilot activities identified and implemented. The achievement of Output 2 is considered as moderate at the time of the mid-term review. In terms of joint pilot activity identification and implementation, they are progressing based on action plans. The JPAs have been selected through SC meetings based on action plans which were formulated based on basic surveys, considering the priorities and the each organization's plan which is related to wetland conservation. When each SC selected the JPAs, they also properly examined negative impacts to the wetland. After getting approval of AWMC, JPAs have been implemented. The process of survey, planning and implementation through SCs are properly done. Some JPAs implementation is delayed due to budget distribution and some procedure or permission issues. It is expected that the proper portion of the budget shall be allocated in a timely manner and related procedures should be done under the collaboration with relevant organizations. In addition, it should be mentioned that several achievements have been confirmed even there are not set for as target in the indicators, such as increased number of species of birds (246 species) including newly detected have been confirmed through the monitoring of JPA, removing water hyacinth activities which originally was not planned as a JPA was added as a new JPA in order to deal with the newly appearing problem, and increased beneficiaries' number of environmental education. The Review team also recognized the increase of interests and motivation of local people through ecotourism JPAs. Some SC members and Gilan provincial government official showed dissatisfaction with JPAs because some of them were too small or did not use new technologies and insisted that the Project should focused on activities which would have more impacts. As a matter of course, JPAs should be effective ones, and some of them should be integrated. However, it should be recognized that the main objective of JPAs is to strengthen management mechanism in which relevant organizations cooperate together and plan and implement proper actions based on basic surveys. The current PDM and indicators cannot show this point properly. So, they should be changed to clarify the objectives of the Output and to measure the achievement and impacts of the Output properly.
Output 3: Knowledge and Experience are shared domestically and internationally. The achievement level of Output 3 has been deemed moderate. The Project has been disseminating the knowledge and experience obtained through the JPAs to the public at the time of the mid-term review. The Project plans to convene joint seminars/workshops with stakeholders in the third year of the Project. Furthermore, the Project plans to participate in side events of related international convention COPs In addition, the Project aims at removing the Anzali Wetland from the Montreux Record. Regarding the Montreux Record, the Project obtained the necessary documents in February 2016 from the Ramsar secretariat office. Accordingly, the Project will take action to implement the requirements in the Project activities. It should be mentioned that current indicators can only show what activities are done and do not properly indicate the achievement and impacts of the Outputs. Proper indicators are needed to evaluate the results appropriately.
Project Purpose: To establish an integrated wetland management of Anzali wetland with effective involvement of all stakeholders.

AWMC meetings are held frequently after the committee of Anzali Wetland Restoration Project was integrated and related organizations discuss wetland conservation measures. This is a great progress. However, there are some points that should be improved in order to achieve the project purpose.
(1) Agenda and related materials of the meetings should be distributed with enough time. .
(2) AWMC should discuss based on SCs' information and proposals, and the decision of the AWMC should be noticed to SCs.
(3) The budget shall be allocated adequately and in a timely manner.

Overall Goal: The conservation activities of Anzali wetland is enhanced by a variety of approaches and methodologies introduced.
The integrated Anzali wetland management system under the Anzali Wetland Management Committee (AWMC) is recognized as a conservation model for wetlands in Iranian and the Caspian Region.
Judging from the current achievement degree towards the Project's purpose, it has been deemed premature to predict the achievement of the overall goal at the time of the mid-term review. If the Project improves the degree of achievement towards the target and secures sustainability, the prospect of achieving the overall goal will increase.

Implementation Process of the Project
(1) Contributing factors for Project implementation
1) Convening relevant organizations as SC member by Gilan Province
The Governor of Gilan Province, signer of the R/D, has convened all organizations relevant to the Project as SC members. Due to this collaboration, SCs have been established from the beginning of the Project, and activities have been continuing smoothly.
2) Participation of MPO
MPO has convened a meeting in order to implement and monitor the Project appropriately. Their participation has sparked discussion about project management and budget matters among Gilan Province, the MPO of Gilan, the DOE Gilan, and the Project itself.
3) Relevance and appropriateness of JPA selection process
The process of JPA selection was appropriate because the following procedure has been through. The AWMC formulated six SCs. Then the each SC had conducted survey in order to elaborate action plans. Once the action plans had been prepared, the each SC has discussed and selected JPA plans. Six prioritized plans described in the Master Plan for Anzali Wetland have been considered for elaboration of action plans and JPAs. They are as follows; 1)Wetland ecological conservation, 2)Environmental education, 3)Institutional management, 4)Watershed management, 5)Wastewater Management and 6)Waste
Management. Action plans were submitted to AWMC, and the AWMC has approved the submitted plans.
Through this process, practical and prioritized activities were selected as JPAs.
(2) Hindering factors of the Project implementation
1) Delay of budget allocation and disbursement and necessary permissions and procedures for JPAs
The Project has agreed to allocate the necessary portion of the budget for each JPA through SC discussion. However, budget allocation and disbursement were sometimes delayed. In addition, necessary permissions and procedures also took time. As a result, some JPAs implementation was delayed.
2) Insufficient information sharing among SCs and AWMC
Each SC has frequent and enthusiastic meetings. On the other hand, information of the SC activities and explanation from JET were not fully shared with leaders of SC members' organizations. As a result, some misunderstanding was observed among some organizations' leaders, and necessary information was not necessarily provided to the AWMC.
3) Absence of JET members from AWMC meetings
The AWMC has been established by Gilan Province decree as the highest and most integrated committee working toward Anzali Wetland conservation. Gilan Provincial Office has integrated the AWMC and the committee of the Anzali Wetland Restoration Project. However, JET members had not been informed the integration nor invited to some of the AWMC meetings. If JET members were regularly invited to the meetings, they could give technical advices to the Committee.
4) Limited dispatch of Japanese experts
Due to the limitation of JICA's budget, Japanese expert assignment period is limited. In some cases, the C/Ps have faced inconvenience to implement the activities during their absence. In order to minimize the inconvenience, JET and their C/Ps need to coordinate well enough of its dispatch period and measures during their absence in Iran.

(2) Result of the Review based on 5 criteria
1) Relevance: High The Relevance of the Project is assessed as high due to observed consistency between the needs of the DOE, the development policy of the Iranian government, the Japanese assistance policy to Iran and the comparative technical advantages of Japan.
2) Effectiveness： Moderate All activities and Outputs are fully linked to the Project Purpose. To achieve the Project Purpose by the end of the Project's duration, some improvement is needed.
3) Efficiency: Moderate The inputs such as experts and equipment have been implemented and contributed to generate expected Outputs at the time of the mid-term review. Furthermore, the assignment of C/Ps from the DOE Gilan and other relevant organizations also has been conducted properly. However, delay of budget disbursement and necessary permissions and procedures for some JPAs has decreased the efficiency of the Project. Meanwhile, several SCs have been working enthusiastically in spite of difficulty such as budget issue. It has contributed to increase efficiency.
4) Impact: Medium Several spillover effects have been confirmed in some JPAs. On the other hand, the Important Assumption of the Overall Goal must be fulfilled to achieve the Goal.
5) Sustainability: Relatively low The Sustainability of the Project has been deemed relatively low at the time of the mid-term review. While the political aspect is expected to be stable, the institutional, financial, and technical aspects are expected to be improved.
< Conclusion > The recommendations from the preparatory study and terminal evaluation of Phase 1 of the Project have been reflected in the project design. Fortunately, factors that were hindering progress have drastically improved, as of the mid-term review. Based on field observations and interviews of stakeholders, the Review Team recognized some points to be improved as mentioned at "7. Recommendations". These issues are expected to be addressed by relevant organizations and stakeholders under the leadership of the Gilan Provincial Office and DOE Headquarter.

Source: Mid-term Review Report of the Anzali Wetland Ecological Management Project Phase II, Mid-Term Review Team of the Project for The Anzali Wetland Ecological Management Project II organized by Anzali Wetland Management Committee (AWMC) and Japan International Cooperation Agency (JICA), 6 June, 2016

(3) Recommendations and Further Implementation of the Project

Based on the above analysis of the Project, the Review Team put forth the recommendations for the improvement of the Project. Recommendations by the Review Team and actions to be taken in the further stage of the Project are summarised in the following table. The recommendations and those actions to be taken will be confirmed in the JCC meeting in early third year of the Project. Moreover, concrete issues and measures were discussed for each subject by each sub-committee.

Table 1.3-2 Recommendations by Mid-term Review

Recommendations by Mid-term Review
1) Reconfirmation of objectives and significance of the Project Problems related to wetland conservation are continuously changing. Therefore, it is necessary for removal of Anzali wetland from Montreux Record to establish and continuously implement the adaptive management cycle, namely "①checking the current situation,②planning,③ implementing,④monitoring,⑤revising the plan", under the active cooperation among relevant organizations. This is the only way for improvement of nature environment. The objective of the project is to strengthen the capacity of related organizations and establish a continuous management mechanism for wetland conservation through project activities such as JPAs. It should be

Recommendations by Mid-term Review
mentioned that JPAs are just parts of necessary activities, and it doesn't mean that JPAs will solve all the problems of wetland conservation. On the other hand, some stakeholders seemed to misunderstand that the Project objective is to apply Japanese advanced technology, equipment and system into Anzali Wetland and it will solve problems. It is very important to grasp the current natural environment condition and identify critical factors which significantly affect on ecosystem. Based on it, relevant organizations need to make feasible plans and carry out activities, and monitor its result. The Review Team recommend that participants of the Project understand this point and establish the basis of the mechanism for wetland conservation.
2) Strengthening Structure and Function of AWMC i) Leadership of Gilan Governorate and Cooperation of MPO Since active cooperation among relevant organizations is necessary for wetland conservation, leadership of Gilan Provincial Office is significantly important as the chairperson of AWMC. Cooperation by MPO, the organization which is responsible for budget allocation, is also significantly important. Under the further leadership of Gilan Provincial Office and cooperation by MPO, AWMC can consult measures to address issues for the wetland conservation and restoration, and allocate appropriate budget to each activity.
ii) Establishment of Advisory Group In a wetland ecosystem conservation and restoration, it is necessary to take adaptive management which analyzes the current environmental situation of the wetland and effectiveness of the measures based on scientific data, and takes prompt and appropriate measures according to situation changes. Therefore, the Review Team recommends to establish an Advisory Group to analyze scientific data such as monitoring data in an integrated manner and provide appropriate advice to AWMC for its supervision and decision-making. Advisory Group is established in Japanese wetland as well, and DOE Headquarter also mentions the importance of such group. As national focal point of the Ramsar Convention, it is desirable that DOE Headquarter would involve into the group and give AWMC technical advice.
iii) Utilization and Improvement of Technical SCs To make AWMC work effectively, SCs should be established based on issues to be tackled with, under AWMC. The organization which has mandate and expertise should lead each SC, consider countermeasures against issues and implement in cooperation with other SC members. The leading organization of each SC should organize SC meetings and provide a venue for the meetings. In AWMC, it is required to appraise the proposal raised by each SC and allocate proper budget. When the proposal is approved by AWMC, each SC implements projects accordingly. Thorough this process, irrelevant or low prioritized proposal would not be approved. When new issues appear, relevant SC should be established accordingly. On the other hand, SCs which solve the issues can be dissolved. The current SCs should be facilitated in the same manner as above. AWMC has a role to decide SC's establishment and dissolution, and to decide the leading organization for each SC. DOE Gilan shall arrange AWMC as the secretariat and lead a SC which covers issues DOE Gilan is in charge of, however, DOE Gilan doesn't necessarily have to be involved into all of SCs.
iv) Strengthening of Administrative function AWMC which is composed by various related organizations need to be managed effectively. For this purpose, it is required for DOE Gilan to arrange schedules of meetings, prepare the agenda, documents, record the meeting and report timely to relevant organizations. JET should support DOE Gilan accordingly during the Project period.
v) Integration, reconsideration and Promoting Implementation of JPA It is founded that some JPAs is too small. For example, some JPAs seems each step of a series of one activity. It is recommended to sort and integrate JPAs by its objectives so that the result of JPAs would be clearer and it will be made use for further plan. To proceed JPA and see the development effect, both Iranian side and Japanese side make their best effort for allocation and expenditure of budget and proceeding procedures of approval for implementing JPAs.
vi) Promotion of information sharing among SCs and relevant organizations In the mid-term review, some members of Iranian side mentioned about the lack of information sharing between SCs. For promoting information sharing and active communication between SCs, it is required for relevant staff of each organization to attend periodical inter-SC meeting. Each organization is required to share information more actively and timely.

Recommendations by Mid-term Review

3) Appropriate Indicator and Monitoring for Evaluation of Wetland Conservation and Restoration

Anzali Wetland was registered the List of Wetlands of International Importance of Ramsar Convention based on the following criteria, 1) wintering and breeding site for threatened species such as the Pigmy Cormorant *Phalacrocorax pygmaeus*, Dalmatian Pelican *Pelecanus crispus*, 2) rich biodiversity in wetland fauna and flora, 3) supporting breeding colonies of herons and Whiskered Tern *Chlydonias hybrida*, 4) Habitat of more than 50,000 of waterfauls, 5) supporting over 0.5% of total breeding population of water birds in Middle-East region such as Whiskered Tern *Chlydonias hybrida*, Pigmy Cormorant *Phalacrocorax pygmaeus*. On the other hand Anzali wetland is registered as Montreaux Record as well. It means that Anzali wetland has difficulties to meet the criteria of Ramsar Convention.

According to the Resolution VI.1 of Ramsar Convention on guidelines for operation of the Montreux Record, it is recommended in its "2. Guidelines for describing and maintaining the ecological character of the listed sites" that the evaluation should be conducted based on relevant data and information on the criteria fulfilled by the site at the time of designation for the Ramsar list. However, it also recommends that other relevant information be examined for the evaluation, since significant degradation of wetland ecosystem might occur without any of the designated criteria.

Data and information on the criteria registered to the Ramsar list and other relevant data related to the wetland ecosystem should be set as indicators to evaluate achievement of the Project. These data and information as indicators should be monitored by DOE Gilan and relevant organizations. If the monitoring data don't meet the criteria or indicate the degradation of the wetland ecosystem, it is required for Iranian side to analyze obstacles, and consider and implement effective and feasible countermeasures. JET should help the monitoring surveys and their analysis and consideration and implementation of the measures.

4) Prompt Formulation of Mid-Term Plan (Road-Map)

Iranian side requires JICA to formulate a Mid-Term Plan as soon as possible to promote wetland restoration since the limitation of budget towards wetland restoration will be reduced thanks to removal of economic sanction.

The Review Team recommends to formulate the Mid-Term plan (Road Map) as soon as possible in the project. SC members and JET will discuss policy and outline of the Mid-Term Plan and propose it to AWMC as soon as possible.

5) Introduction of Japanese Technology and Experience, and Promote Partnership with Japanese Companies

Iranian side explained their needs for Japanese knowledge and experience. It is difficult to increase numbers of JPAs and Japanese experts due to budget limitation of both sides. In order to scale up project activities, the Review Team recommends JET to provide and share more Japanese knowledge and experience which are beneficial to wetland conservation and restoration. In addition, JET and JICA shall help Iranian side to meet Japanese related companies based on the request.

Dissemination of Project Outcome

In the Mid-term Review, many of Iranian counterpart organizations mentioned that they cannot recognize the project outcomes. On the other hand, the project is making progress as planned and the project outcomes are observed as well. To solve this gap, dissemination of project outcomes is significantly important. The Review Team recommends to summarize outcomes in accordance with the purpose and target groups, and try to disseminate the Project outcomes in more effective way.

Target	Items to be summarized	Method of Dissemination
DOE Gilan, Relevant Organizations of AWMC	Current situation of wetland, related data, Reports of activities and results, plans/recommendations	Reports, DB, Newsletter, Plans and Proposals
	*summarizing the outcomes by considering interests, strategies and plans of relevant organizations.	
DOE Headquarters, Other organizations related to wetland conservation	Model of Wetland Management, Process and Lesson learnt	Seminars, Brochures, Reports, Web Sites, Newsletter etc.
Secretariats of International Conventions such as Secretariat of Ramsar	Summarizing project outcomes based on the resolutions of each convention, National Report, Ramsar Information	COP Side Events, Regional seminars of Ramsar Convention, International

Recommendations by Mid-term Review		
Convention	Sheet	seminars, Web sites, Reports to Secretariats of Conventions
Academia	Academic knowledge on wetland management and outcomes such as ecological data	Thesis, Presentation in Academic conferences
Local communities, Children	Relationship between wetland and livelihoods	Media, Events, School Education (Curriculum, teaching materials), Brochures
Tourists	Importance of wetland, Places or points to see	Brochures, Tour guides, Signboards, Exhibition and explanation in the visitor center, Web sites,
Media (Iranian and Japanese TV, Magazines etc.)	Attractive information of the wetland	TV, Newspapers, Magazines

Source: The recommendations in the above table are referred from "Mid-term Review Report of the Anzali Wetland Ecological Management Project Phase II, Mid-Term Review Team of the Project for The Anzali Wetland Ecological Management Project II organized by Anzali Wetland Management Committee (AWMC) and Japan International Cooperation Agency (JICA), 6 June, 2016"

(4) Revision of PDM

In order to reflecting the recommendations in the project framework and to make evaluation indices of the accomplishment of project purposes and outputs tangible, JICA Mid-term Review team prepared a revised PDM. Revised PDM (version 2.0). After the revised PDM was confirmed jointly between Iranian side and JET and was agreed in the JCC meeting, a minutes of meeting on the revision of PDM was concluded.

1.3.2. Terminal Evaluation

The Terminal Evaluation for the Project was conducted by a Joint Terminal Evaluation Team between 17 November and 3 December, 2018 in the project area. Results of the Terminal Evaluation are summarized below.

(1) Objectives of the Terminal Evaluation

The objectives of the Terminal Evaluation are listed as follows:

1) To confirm the achievement levels of Outputs and the prospect for achieving the Project Purpose by the end of the project period, and the Overall Goals within three to five years after the project completion, based on the Project Design Matrix (PDM);
2) To identify factors or issues that have promoted or hindered the implementation of the Project activities;

3) To conduct a comprehensive evaluation from the viewpoints of five evaluation criteria; Relevance, Effectiveness, Efficiency, Impact and Sustainability
4) To draw recommendations specifying measures to be taken for achieving the Project Purpose and securing sustainability of the Project, and draw the lessons learned from the evaluation results.

(2) Conclusion of the Evaluation

Conclusion of the Terminal Evaluation are shown in the following list.

Table 1.3-3 Conclusion of the Terminal Evaluation

The Team concluded that an integrated and adaptive wetland management system of Anzali Wetland with effective involvement of all stakeholders and appropriate scientific data and information will be established to some extent. The AWMC's meeting is, now, organized almost every two weeks chaired by Development Deputy Provincial Governor and serves as a place for interagency coordination and discussion of Anzali Wetland conservation activities. Furthermore, good effects have been observed on wetland conservation activities through JPAs as stated in 3-2. Achievement of Outputs." On the other hand, it was found that the AWMC's management still needs to be improved and the environmental monitoring, which is required for adaptive wetland management system, needs to be put into practice at DOE Gilan.
The Project highly met the needs of Iranian target groups and aligned with the policies of the Governments of Islamic Republic of Iran and Japan. Therefore, the project relevance was assessed as high. The Project was effective to some extent in establishing an integrated and adaptive wetland management system, involving all relevant stakeholders and based on the scientific data as the Project Purpose is likely to be partially achieved by May 2019. All outputs are logically leading to fulfillment of the Project Purpose and any external factors affecting the Project Purpose were observed to date. The efficiency is found as moderate since several factors influencing the project progress were identified and those have affected the achievement level of the project outputs. The impact was assessed as moderate. The Team found possibility to generate project impact if some measures are taken by Iranian side. To assure the project impact, the Mid-term Plan needs to be certainly implemented with appropriate and timely budget allocation and disbursement, and the AWMC keeps functioning well. Whether the wetland management system like the AWMC will be established highly depends on future actions of DOE HQs, which currently shows the intention to establish a wetland management committee in all province in the future. The policy and intuitional sustainability are likely to be ensured. However, the Team found several issues and concerns to ensure the sustainability of organizational, financial and technical perspectives.

Source: The recommendations in the above table are referred from "Joint Terminal Evaluation Report for Anzali Wetland Ecological Management Project – Phase II in the Islamic Republic of Iran, Joint Evaluation Team, December 2018"

(3) Recommendations and Further Implementation of the Project

Based on the above analysis of the Project, the Evaluation Team put forth the recommendations for the improvement of the Project. Recommendations by the Evaluation Team and actions to be taken in the further stage of the Project are summarised in the following table.

Table 1.3-4 Recommendations by Mid-term Review

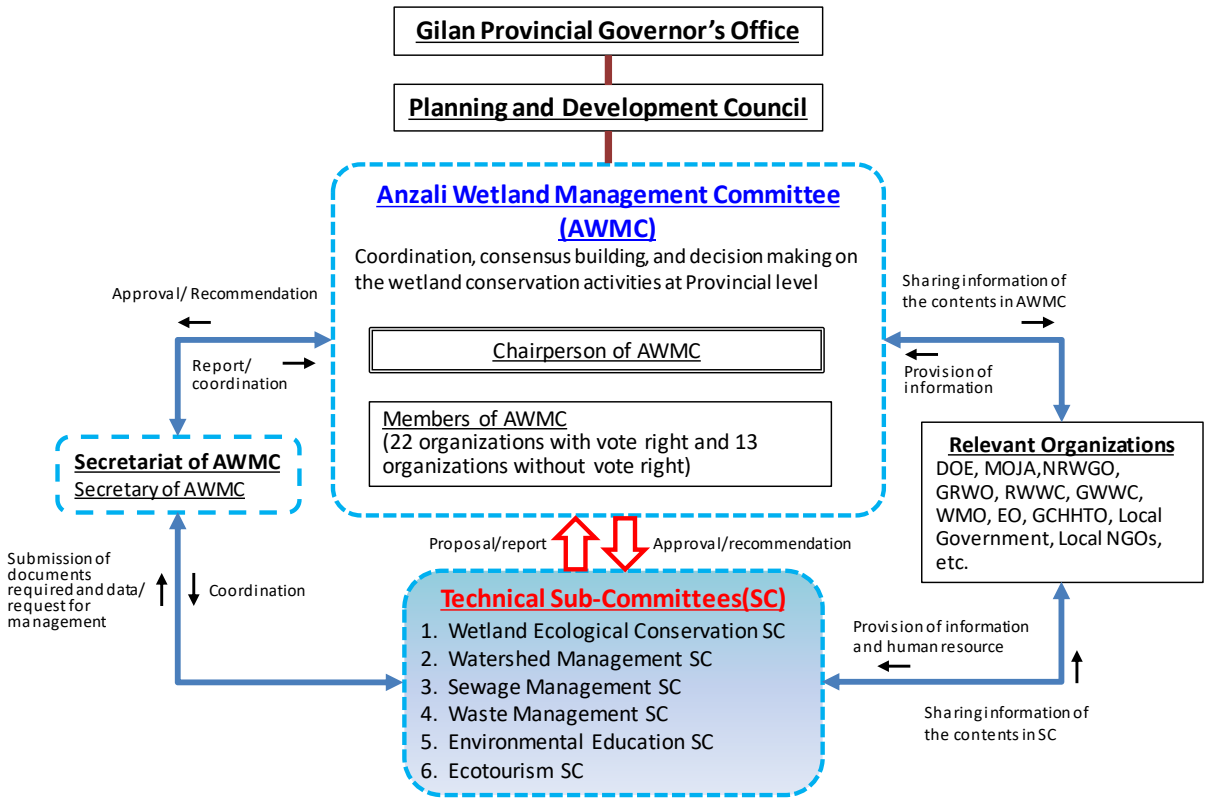
Recommendations by Mid-term Review
(1) Continuation of activities for AWMC Activities of AWMC are crucial to manage Anzali Wetland comprehensively; therefore, the counterparts of Iranian side have to continue the activities not only during project implementation but also after the end of project. As the Project is developing instruction for effective management of AWMC, which will be included in the Mid-term Plan, the AWMC will be managed by utilizing this instruction in the future. The current Decree of Establishment of AWMC was approved in 2011; however, some descriptions such as role and responsibility of the SCs in the Decree seems undefined clearly. In this respect, JET has already started to analyze the current Decree, to renew it, and will propose the revised version of Decree including reorganization of each SC before the end of project. It is recommended that the DOE HQs, DOE Gilan and Provincial Governor's Office finalize the approval process for the revised Decree before end of project.
(2) Finalization and approval of Mid-term Plan Currently, each SC is developing the Mid-term Plan. JET will finalize it after reflecting the comments from DOE HQs and the AWMC members before closing the project. The Team recommends that all Iranian stakeholders relevant to the Project closely work together with JET to finalize it, by responsibly following the schedule and steps for approval of the Mid-term Plan as shown in Annex 10. The appropriate involvement and following the schedule will strengthen ownership of Iranian side to implement the planned activities in next ten years, namely, between 2020 and 2030. Furthermore, the budget allocation and disbursement should be ensured to implement the planned activities in the Mid-term Plan. For this, the Team recommends that both provincial budge and budget allocated from the national level to each sectoral department/organization at Gilan Province be certainly secured taking the necessary budgeting process.
(3) Follow up of Joint Pilot Activities (JPAs) by Iranian Side The JPA site is useful as a good model for not only Ramsar Convention on Wetlands in Iran but also for wetlands conservation activities on seacoast Caspian. JET and counterparts conducted various activities in the pilot sites; however, delays in some activities such as construction of visitor center and some monitoring surveys for Wetland Ecosystem Conservation occurred due to various issues. The list on Annex 11 expresses activities that need for follow-up by Iranian side after closing the project. The list also describes the plans for respective SC's (or responsible organizations') activities before terminating the project. JET and counterparts should work together to complete all activities on the list until the end of project. In addition, the Team strongly requests that Iranian side conduct the follow up activities including maintenance works, sharing experiences and extension of activities to other sites under their responsibilities after the end of project.
(4) Importance of monitoring activities The monitoring data accumulation is an essential action to maintain the Anzali Wetland in good condition; however, it has been difficult for the Project to conduct this activity as planned due to lack of budget allocation from Iranian side. It should be noted that one of the Indicators for the Project's Overall Goal is that "Under AWMC and SCs, the conservation and restoration activities are continuously developed and evaluated to reduce the drivers degrading the wetland ecosystem, based on scientific information, such as biological and physical data from monitoring surveys". To achieve this target, the Iranian side, by themselves, has to implement monitoring activities without JICA's support. Since JICA will confirm the achievement level of the Overall Goal three years later through ex-post evaluation, the Team strongly requests that the Iranian side seriously work on the monitoring surveys to complete project activities during the project and make efforts to achieve Overall Goal after closing the Project.
(5) Extension of the Wetland Management Committee to other provinces and other countries around Caspian Region During the study of Terminal Evaluation, DOE HQs expressed the intention to extend the Wetland Management Committee to all provinces in Iran and establish regional network with countries around Caspian Region in the future. Introduction of the integrated wetland conservation mechanism developed in Anzali Wetland to other provinces in Iran and the Caspian Region is also one of the Overall Goals of the Project. The Team strongly encourages DOE's intention and expects that this system will be effectively introduced in the future.

Source: The recommendations in the above table are referred from "Joint Terminal Evaluation Report for Anzali Wetland Ecological Management Project – Phase II in the Islamic Republic of Iran, Joint Evaluation Team, December 2018"

2. ACTIVITIES OF OUTPUT 1

2.1. Outline of Activities

To enhance the capacity of the AWMC, JET have supported DOE Gilan as secretariat of the AWMC, mainly in holding the AWMC meeting. In addition, since enhancement of the capacity of the AWMC also requires enhancement of the capacity of the technical sub-committees (SC), who are supposed to examined all the issues, subjects ,and activities related to the Anzali Wetland to be made final decision in the AWMC meeting, JET supports six SCs through preparation of the Action Plan and plan and implementation of the Joint Pilot Activities during the project. Structure of the AWMC is shown in Figure 2.1-1.



Source: JICA Expert Team

Figure 2.1-1 Structure of the AWMC

2.2. Activities

Meetings of the AWMC, held during the project period, are summarized below.

(1) AWMC Meetings in the 1st Year of the Project

1) Establishment of the Technical Sub-committees

Six technical sub-committee under the AWMC (SCs) were established between May and June 2014 to discuss technical issues and measures on six main subject areas on conservation of the Anzali Wetland; 1) Wetland ecosystem conservation, 2) Watershed management, 3) Sewage management, 4) Waste management, 5) Ecotourism, and 6) Environmental education. SC member organizations were officially designated by the Gilan Provincial Governor's Office as shown in Table 2.2-1. One or two personnel was/were appointed from the SC member organizations.

Under the Wetland Ecosystem Conservation SC, three working groups (WGs) were established since different organizations are involved in three major subjects in the SC; 1) Wetland Conservation and Restoration WG, 2) Monitoring WG, and 3) Environmental Zoning and Land Use Management WG as shown in Table 2.2-2.

Table 2.2-1 Member Organizations of the Technical Sub-committees

Name of SC	Member Organization
(1) Wetland Ecosystem Conservation SC	1) DOE Gilan, 2) MOJA Gilan, 3) Shilat (Fishery Organization), 4) National Inland Water and Aquaculture Institute (NIWAI), 5) Port and Maritime Organizations (PMO), 6) Gilan Regional Water Corporation (GRWC), 7) Gilan Water and Wastewater Corporation (GWWC), 8) Rural Water and Wastewater Corporation (RWWC), 9) Natural Resources and Watershed Management Office (NRWGO), 10) Housing Foundation, 11) Documents and Property Registry Office, 12) Road and Urban Planning Organization, 13) Gilan Cultural Heritage, Handicraft, and Tourism Organization (GCHHTO), 14) Municipalities, 15) Ab-bandan Owners Union, 16) Scientist related to wetland ecosystem, 17) NGOs
(2) Watershed Management SC	1) DOE Gilan, 2) NRWGO, 3) GRWC, 4) MOJA Gilan, 5) Metrological Organization (MO)
(3) Sewage Management SC	1) DOE Gilan, 2) GWWC, 3) RWWC
(4) Solid Waste Management SC	1) DOE Gilan, 2) Gilan WMO, 3) Rural Affairs Office
(5) Ecotourism SC	1) DOE Gilan, 2) GCHHTO
(6) Environmental Education SC	1) DOE Gilan, 2) Gilan Educational Organization (EO Gilan)

Note: Underlined organizations are responsible organizations for each SC.

Source: JICA Expert Team

Table 2.2-2 Working Group under the Wetland Ecosystem Conservation SC

Working Groups	1) Wetland Conservation and Restoration WG	2) Monitoring WG (Water and Ecological Management)	3) Environmental Zoning and Land Use Management WG
(1) DOE Gilan	✔	✔	✔
(2) MOJA Gilan	✔	-	✔
(3) Shilat (Fishery Organization)	✔	-	✔
(4) NIWAI	✔	-	-
(5) PMO	-	✔	
(6) GRWC	-	✔	✔
(7) GWWC	-	✔	-
(8) RWWC	-	✔	-
(9) NRWGO	-	-	✔
(10) Housing foundation	-	-	✔
(11) Documents and Property Registry Office	-	-	✔
(12) Road and Urban Planning Organization	-	-	✔
(13) GCHHTO	-	-	✔
(14) Municipalities	-	-	✔
(15) Ab-bandan Owners Union	-	-	✔
(16) Scientist related to wetland ecosystem	✔	✔	✔
(17) NGOs	✔	-	-

Source: JICA Expert Team

2) 1st Meeting of the Anzali Wetland Management Committee under the Project

First meeting of the Anzali Wetland Management Committee (AWMC) under the project was held on 25 Sept 2014 at the DOE Gilan office, attended by Deputy Provincial Governor for Development and representatives of the member organizations of the AWMC. While the representative of each SC presented the outline of the project progress and JET explained the roles of AWMC and SC as it was the first meeting, the participants pointed out the necessity of more discussion on specific issues and decision making in the next AWMC meeting.

Table 2.2-3 Agenda of the 1st Meeting of AWMC under the Project

Program		Name
1.	Koran and National Anthem	-
2.	Opening Remarks and Explanation on Agenda	Mr. Mohammad Reza Borji Secretariat of the AWMC Director General, Gilan Provincial Directorate, Department of Environment (DOE Gilan)
3.	Organizing Technical Sub-committees and Activities under the Phase II Project	Mr. Tomoo Aoki Chief Advisor, JICA Expert Team (JET)
4.	Activity Plan and Current Progress of SC (1): Wetland Ecosystem Conservation SC	Mr. Hitoshi Watanabe Wetland ecosystem/EE expert, JET
5.	Activity Plan and Current Progress of SC (2): Watershed Management SC	Mr. Hideki Imai Watershed management expert, JET
6.	Activity Plan and Current Progress of SC (3): Wastewater Management SC	Mr. Takeki Kajiura Wastewater management expert, JET
7.	Activity Plan and Current Progress of SC (4): Waste Management SC	Mr. Satoshi Higashinakagawa Waste management expert, JET
8.	Activity Plan and Current Progress of SC (5): Ecotourism SC	Mr. Farzad Rashidi Ecotourism expert and tour observer, GCHHTO
9.	Activity Plan and Current Progress of SC (6): Environmental Education SC	Mr. Nourollah Akbari Secretary of Gilan Province Education Council, Education Council, Gilan Office, Ministry of Education
10.	Questions and comments from the participants	(chairperson): Mr. Mohammad Reza Borji
11.	Summary and Conclusion	Mr. Mohammad Reza Borji
12.	Closing Remarks	Mr. Mohammad Reza Borji

Source: JET

(2) AWMC Meetings in the 2nd Year of the Project

1) Joint meeting of the AWMC and JCC on 8 March, 2015

Joint meeting of the Anzali Wetland Management Committee (AWMC) and Joint Coordination Committee (JCC) for the project was held on March 8, 2015. Due to lack of the coordination by DOE Gilan, chairpersons for both JCC and AWMC, project manager and their deputies did not attend the meeting. In the meeting, progress of the project activities were presented by representatives of six SCs. Agenda of the meeting is shown in the following table.

Table 2.2-4 Agenda of the Joint Meeting of the AWMC and JCC on 8 March, 2015

No.	Program	Name
1.	Koran and national anthem	-
2.	Opening remarks and explanation on agenda	Mr. Mahmoud Farajpour Secretary of Research Council and Expert of Legal Dept, Guilan Provincial Directorates, DOE,.
3.	Outline of the project activities in the 1st year of the project.	Mr. Hossein Shokri Technical Deputy, DOE Gilan
4.	Presentation on draft action plan and proposed Joint Pilot Activities (JPAs) by SC	
(1)	Wetland Ecosystem Conservation SC	Mr. Fallah Firouzikouhi Seyed Farshid Expert of Monitoring , Maritime Environment, DOE Gilan
(2)	Watershed Management SC	Mr. Bagherzadeh Asan Director, Environment and Water Quality Section, GRWC

No.	Program	Name
(3)	Sewage Management SC	Mr. Lotfi, General Director, GWWC Mr. Mohammadali Fareamini, General Director, RWWC
(4)	Waste Management SC	Mr. Abdol Azim Ahadifar Human Environment, DOE Gilan
(5)	Ecotourism SC	Mr. Farzad Rashidi Specialist in charge of Monitoring Gilan Tour Agencies and Tour Guides, GCHHTO
(6)	Environmental Education SC	Mr. Mohammadreza Goli Deputy of Primary Education, Gilan EO
5.	Necessary arrangement and actions for the implementation in further stage of the project	Mr. Tomoo Aoki Chief Advisor, JICA Expert Team (JET)
7.	Remarks by JICA	Mr. Kohei Sato, Chief Representative of JICA Iran Office

Source: JET

2) Joint meeting of the AWMC and JCC on 20 May, 2015

Since the previous meeting was held inappropriate manner without chairpersons for both JCC and AWMC and project manager, joint meeting of the Anzali Wetland Management Committee (AWMC) and Joint Coordination Committee (JCC) for the project was held on 20 May, 2015, chaired by Dr. Mohammad Ali Najafi, Governor of Gilan Province. In the meeting, action plans and proposed plans of JPAs, which were prepared by six SCs in the 1st year of the project, were approved for their implementation. Agenda of the meeting is shown in the following table. Due to lack of the coordination by DOE and DOE Gilan, the minutes of the meeting has not been signed yet.

Table 2.2-5 Agenda of the Joint Meeting of the AWMC and JCC on 20 May, 2015

No.	Program	Name
1.	Koran and national anthem	-
2.	Opening remarks	Mr. Mohammad Reza Borji, Secretary of the AWMC and Project Manager of the JICA Project, Director General, DOE Gilan
3.	Necessary arrangement, actions, and work plan in further stage of the project	Mr. Tomoo Aoki Chief Advisor, JICA Expert Team (JET)
4.	Presentation on draft action plan and proposed Joint Pilot Activities (JPAs) by SC	
(1)	Wetland Ecosystem Conservation SC	Mr. Fallah Firouzikouhi Seyed Farshid Expert of Monitoring , Maritime Environment, DOE Gilan
(2)	Watershed Management SC	Dr. Mohen Yousefpour Deputy of Watershed Management Dept., NRWGO
(3)	Sewage Management SC	Mr. Hadi Neizebaz, Deputy Manager of Engineering & Development Dept, GWWC Mr. Farre Aminy, Managing Director, RWWC
(4)	Waste Management SC	Mr. Abdol Azim Ahadifar Human Environment, DOE Gilan
(5)	Ecotourism SC	Mr. Farzad Rashidi Specialist in charge of Monitoring Gilan Tour Agencies and Tour Guides, GCHHTO
(6)	Environmental Education SC	Mr. Nourolah Akbari Executive Advisor of Director General, Gilan EO
5.	Questions and comments from the participants, and conclusion	(chairperson): Mr. Mohammad Reza Borji
6.	Remarks by JICA	Mr. Kohei Sato Chief Representative of JICA Iran Office
7.	Remarks by chairperson of JCC	Dr. Hamid Gashtasb Director General of Habitats and protected Area, DOE
8.	Remarks by chairperson of AWMC	Dr. Mohammad Ali Najafi Governor of Gilan Province
9.	Signing ceremony for the M/M of the meeting	(postponed)

Source: JET

(3) AWMC Meetings in the 3rd Year of the Project

Anzali Wetland Management Committee (AWMC) Meetings have been held at the deputy provincial governor's office, headed by Mr. Shabanpour, Development Deputy Provincial Governor, as chairperson, on 14 August, 7 and 29 September, 10 November, 31 December in 2016, 26 January, 23 February, 6 April, and 25 May in 2017 in the 3rd year of the project. As result, the AWMC meetings have been held once a month periodically on average.

Thanks to instruction by Mr. Shabanpour that any items related to the Anzali Wetland conservation shall be examined and discussed under the respective technical sub-committees of the AWMC (SCs), this rule is gradually being permeated among the member organizations of the SCs. DOE Gilan has followed the instruction and facilitated intentionally to coordinate the SC meetings.

(4) AWMC Meetings in the 4th Year of the Project

Anzali Wetland Management Committee (AWMC) Meetings have been held at the deputy provincial governor's office, headed by Mr. Shabanpour, Development Deputy Provincial Governor, as chairperson, on 22 July, 7 September 8 and 26 October, 7 December in 2017, 28 February, and 5 April in 2018 in the 4th year of the project. As result, the AWMC meetings have been held once two months periodically on average.

Thanks to instruction by Mr. Shabanpour that any items related to the Anzali Wetland conservation shall be examined and discussed under the respective technical sub-committees of the AWMC (SCs), this rule is gradually being permeated among the member organizations of the SCs. DOE Gilan has followed the instruction and facilitated intentionally to coordinate the SC meetings.

(5) AWMC Meetings in the 5th Year of the Project

In the 5th year of the project, the AWMC meeting was held only one time on 6th October 2018 under new acting Deputy Provincial Governor after the former Deputy Provincial Governor retired.

2.3. Achievements

The AWMC meetings were held at certain extent with attendance of various member organizations, chaired by the Deputy Provincial Governor. One of the outstanding of the achievement in the project was that the SC meetings and its activities provided opportunities of inter-organization activities with attendance of various governmental organizations, which have never been practiced not only in the wetland conservation, but also other topics under the vertical governmental organizations and systems.

On the other, though there were some plans to improve the operation of AWMC such as review and revision of the Provincial Decree on the AWMC through discussion in AWMC and with DOE HQ and DOE Gilan, those have not been done due to some reasons such as less intention by relevant officers in the end.

2.4. Recommendations

(1) Establishment of New Section or Appointment of Staff in charge of the Wetland Conservation under the DOE Gilan

Currently, there is no specific section and/or personnel in charge of the wetland conservation, including that for the Anzali Wetland, under DOE Gilan office, though it was continuously suggested by the JICA Expert Team during the project. Therefore, each issue on the wetland has individually been tackled on a day-to-day basis ununiformly without coordination and

accumulation of the knowledge and experience. Under such situation, the AWMC meeting is usually arranged several days before, even one day of the meeting by DOE Gilan as secretariat of the AWMC, without any systematic way.

Thus, there is no institutional structure to implement the comprehensive wetland conservation. Under such situation, Establishment of a specific section for the wetland conservation in DOE Gilan should be discussed between DOE HQ and DOE Gilan office, including preparation of legal document which appoint and define mandate of such wetland conservation section and/or personnel in charge of the wetland conservation with securing necessary budget for operation.

Technical support and instruction from the Wetland Ecosystem Office of DOE HQ to DOE Gilan is required.

(2) Systematic Arrangement of the AWMC Meeting by Secretariat of AWMC

In addition to the institutional issue above on the DOE Gilan as AWMC Secretariat, there is no systematic procedure to hold the AWMC meeting. It is recommended to introduce some templates which can be utilised not only the secretariat of the AWMC, but also member organizations of the AWMC. Some example of the templates to be utilised are shown below.

Table 2.4-1 Suggested Template (1) for Mandate of the Technical Sub-committee

Anzali Wetland Management Committee

Form No. XX: Budget Request for Sub-committee

Role and Responsibility for Sub-committee

Date	
Name of Sub-committee	
Main role of the SC	
Responsibility of the SC	
Activities under the SC	
Core members	
Role and responsibility of the SC members	(1) Member 1 (2) Member 2 (3) Member 3

Source: JICA Expert Team

Table 2.4-2 Suggested Template (2) for Proposal on Conservation Activity of the Anzali Wetland

Anzali Wetland Management Committee

Form No. XX: Proposal by Sub-committee

Proposal by Sub-committee

Date of the proposal	
Name of Sub-committee	
Title of the proposal	
Objective of the proposal	
Summary of the proposal	
Location	(map to be attached)
Timeframe	
Cost	Total (Breakdown of the cost shall be attached.)
Possible source of budget	
Responsible body	
Implementation body	
Effect to Anzali Wetland conservation	
Environmental impact	
Economic impact	

Source: JICA Expert Team

Table 2.4-3 Suggested Template (3) for Budget Request Application for Sub-Committee

Anzali Wetland Management Committee

Form No. XX: Budget Request for Sub-committee

Budget Request Application for Sub-committee

Date	
Name of Sub-committee	
Name of Proposed Activity	
Outline of Implementation Plan	
Breakdown of Annual Expences	

Source: JICA Expert Team

3. ACTIVITIES OF OUTPUT 2

3.1. Introduction

In this chapter, implementation of the wetland conservation activities for different subjects under the six technical sub-committees of the Anzali Wetland Management Committee, participated by personnel from the member organizations as counterpart of the project, is explained. One main activities of the project were the Joint Pilot Activities (JPAs), which were based on the Action Plan, prepared by each SC in the first year of the project and implemented between 2nd year and 5th year of the project. In addition to detailed explanation of the JPAs in the following sections, Summary Sheets of the JPA were prepared for all the JPA and are attached in the end of this report.

3.2. Wetland Ecosystem Conservation

3.2.1. SC Meetings

The activities for wetland ecosystem conservation were implemented by three working groups (WGs) under Wetland Ecosystem Conservation SC (WEC SC).

Official meetings of the WG meetings were held in 26 times for five years as shown in the following table.

Table 3.2-1 Working Group Meetings under the Wetland Ecosystem SC

No	Date	Discussion
(1) Wetland Conservation and Restoration WG		
1	20 Sep 2014	• Introducing members and appoint of secretariat Wetland Ecosystem Conservation Sub-Committee • Project and the Purpose of Ecosystem Conservation and Restoration Sub Committee including three Working Group • Environmental Zoning Plan in phase 1 project • Monitoring Activities and Monitoring Manual in phase 1 project
2	23 Dec 2016	Symposium: Report of the Mammal and Bird survey in the Anzali Wetland - How to Monitor and Conserve the Anzali Wetland Ecosystem - • Result of Mammal Survey • Result of Bird Survey • Result of Pelican Satellite Tracking Survey • Progress of Fish Survey • Discussion on comprehensive scientific inventory survey and Monitoring
3	5 Feb 2017	2nd symposium in Anzali Wetland EE center in Selkeh • Result of Mammal Survey • Result of Bird Survey • Result of Pelican Satellite Tracking Survey • Progress of Fish Survey • Importance of ecosystem monitoring and monitoring plan • Discussion on comprehensive scientific inventory survey and Monitoring

No	Date	Discussion
(1) Wetland Conservation and Restoration WG		
4	22 Feb 2017	• Plan of Comprehensive Ecosystem Survey(JPA-1) • Plan of Restoration and Conservation Activity (JPA-2) • Plan of Ecosystem Monitoring(JPA-4) • Further Plan of the Anzali Wetland Restoration • Current situation of Water Hyacinth Removal.
5	23 Dec 2017	Symposium: Report of the Mammal and Bird survey in the Anzali Wetland - How to Monitor and Conserve the Anzali Wetland Ecosystem - • Result of Mammal Survey • Result of Bird Survey • Result of Pelican Satellite Tracking Survey • Progress of Fish Survey • Discussion on comprehensive scientific inventory survey and Monitoring
6	5 Feb 2018	2nd symposium in Anzali Wetland EE center in Selkeh • Result of Mammal Survey • Result of Bird Survey • Result of Pelican Satellite Tracking Survey • Progress of Fish Survey • Importance of ecosystem monitoring and monitoring plan • Discussion on comprehensive scientific inventory survey and Monitoring
7	7 Mar 2018	Fishway Workshop (Joint SC workshop with WSM SC) • The necessity of Fishway Installation to restore the Ecosystem Network of Anzali Wetland Watershed • Design of Siphon System Pipe-Type Fishway and Its Influence in Indonesia and Japan • Discussion
8	18 Apr. 2018	• Plan of Dredging Work in the Anzali Wetland
9	21 May 2018	• Applicability of Bioremediation
10	3 Oct 2018	• Result of reptile and amphibian survey
(2) Monitoring for Adaptive Management WG		
11	29 Oct 2014	• Water quality and sediment quality of the Anzali Wetland and its tributaries by DOE • Monitoring of pollution sources in the watershed by DOE • Monitoring of plankton and benthos in the Anzali Wetland and its tributaries by NIWAI • Monitoring of sediment transport in the tributaries of the Anzali Wetland by GRWC
12	22 Nov 2014	• Preliminary estimation of pollution load to the Anzali Wetland in 2004 and 2011 • Proposed activities in the first year until May 2015
13	22 Oct 2015	• Quality control in environmental monitoring • Proposed monitoring of Anzali Wetland and rivers in October 2015 • Water quality management in Japan
14	26 Apr. 2016	• Results of water quality analysis in Japan • Revision of JPA on water quality monitoring
15	4 Mar 2017	• Results of regular water quality monitoring in Sept. 2016, January – February 2017 • Iranian budget for water quality monitoring • Plan for comparative analysis in Europe
16	15 Aug 2017	• Quality management of water and sediment quality analysis
17	1 Dec 2018	• Conclusion of the monitoring activities under the project • Mid-term plan

No	Date	Discussion
(1) Wetland Conservation and Restoration WG		
(3) Environmental Zoning and Land Use Management WG		
18	15 Nov 2014	• The Purpose of Environmental Zoning Working Group and Policy of the Zoning Plan • How to Control Land Uses and Activities in/around the Anzali Wetland • How to identify the boundary of wetland and update zoning map • Who is land owner in/around the wetland • How to identify illegal land use and activities • How to determine a procedure to permit in each zone • How to make a land use guideline based on updated zoning plan
19	23 May 2016	• JPA Environmental Zoning and Land Use Management Activity • Preparation on Land Use Guideline based on the Zoning Plan • Signboard Installation Plan • Discussion on the management of the Land-use in/around the Wetland)
20	15 Feb 2017	• The boundary of wetland based on MOE on the law. • Land Use Management Plan
21	31 May 2017	• Activities of Zoning and Land Use Management WG under AWMC • Result of Boundary Patrolling and Future Plan • Current Situation and Future Plan of Signboard installation • Proposal for starting round table meeting with village council(s) and pilot village selection • Discussion: How to control illegal land use
22	2 Sep 2017	• Current situation of illegal LUs in PAs as the result of Boundary Patrol • Round-table meeting with Local councils • Current Situation of "Boundary of Wetland" by MOE • Land Use Guideline based on the Zoning Plan with Legal Justification • Current situation of signboard installation and future plan • How to manage the Land-use and Activities in/around the Wetland)
23	4 Feb 2018	• Control of illegal fishing, hunting, and possessions in/around/in the Anzali Wetland • The current condition of wetland protection
24	13 Mar 2018	Joint meeting with Legal SC • Land use management
25	4 Feb 2019	• Zoning in the mid-term plan (MTP) • Wetland ecosystem in the MTP • Issuance of Hunting and fishing licenses in the MTP
26	12 Feb 2019	• Zoning in the mid-term plan (MTP) • Wetland ecosystem in the MTP • Dredging in the MTP • Issuance of Hunting and fishing licenses in the MTP

Source: JICA Expert Team

3.2.2. Meetings between Relevant Organizations and JET

Between relevant organizations and JET held meetings in addition to the WG and SC meetings as shown in the following table. The meetings were held in 152 times for the project as of March, 2019.

Table 3.2-2 Summary of the Preliminary Meetings between Relevant Organizations and JET (June 2017 to May 2018)

No.	Date	Participated Organizations	Main Discussions
Wetland Conservation and restoration WG			
1	6 Jun 2014	MOJA Gilan JET	• Introduction of the project - Phase II • Current activities in the Anzali Wetland by MOJA
2	7 Jun 2014	Shilat JET	• Introduction of the project - Phase II • Current activities in the Anzali Wetland by Shilat • Request for selection of personnel in the SC
3	8 Jun 2014	PMO JET	• Introduction of the project - Phase II • Request for the EIA report of wave breaker at the mouth of the Anzali Wetland
4	10 Jun 2014	GRWC JET	• Introduction of the project - Phase II • Current activities in the Anzali Wetland by GRWC
5	1 Jul 2014	NIWAI JET	• Introduction of the project - Phase II • Current activities in the Anzali Wetland by NIWAI
6	13 Nov 2014	Lahijan Azad University, JET	• Aquatic plant in the Anzali Wetland
7	22 Nov 2014	NIWAI, JET	• Fish survey in/around the Anzali Wetland
8	2 Dec 2014	Gilan University, JET	• Field survey of mammal in the Anzali Wetland
9	6 Dec 2014	MOJA, JET	• Farmland in/around the Anzali Wetland
10	23 Dec 2014	Gilan University, JET	• Field survey of mammal in the Anzali Wetland
11	25 Feb 2015	PMO, JET	• Management of waterway in the Anzali Wetland • EIA of wave breaker at the mouth of the Anzali Wetland • The water level of the Caspian Sea
12	25 Feb 2015	Gilan University JET	• Field survey of mammal in the Anzali Wetland • Method of the survey by using camera traps
13	3 Apr 2015	Gilan University JET	• Mammal Survey
14	6 Jul 2015	GRWC, DOE Gilan, JET	• Joint Field Visit to Pasikhan dam about the installation of the fish ladder and maintenance flow
15	22 Sep 2015	DOE Gilan, JET	• Joint Filed Survey of Water Hyacinth
16	19 Oct 2015	DOE Gilan, JET	• Joint Filed Survey of Water Hyacinth
17	25 Oct 2015	DOE Gilan, JET	• Joint Filed Survey of Water Hyacinth
18	15 Nov 2015	DOE Gilan, JET	• Water Hyacinth Removal Activity
19	25 Nov 2015	DOE Gilan, JET	• Joint Filed Survey of Water Hyacinth
20	8 Dec 2015	DOE Gilan, JET	• Joint Filed Survey of Water Hyacinth
21	15 Dec 2015	Gilan University, JET	• Final Report of Mammal Survey
22	17 Feb 2016	GRWC, JET	• Water gate construction in the mouth of Anzali Wetland
23	20 Oct 2016	DOE Gilan, JET	Joint Filed Survey of Water Hyacinth
24	12 Nov 2016	DOE Gilan, JET	DOE activities related to WEC, JPAs
25	24 Nov, 2016	DOE Gilan, JET	Arrangement of Symposium
26	5 Dec 2016	DOE, NIWAI	Joint Field Survey of Fish in Pasikhan River
27	4 Feb, 2017	DOE Gilan, JET	Arrangement of Symposium
28	8 Feb 2017	DOE Gilan, JET	Comprehensive Ecosystem Survey
29	19 Feb 2017	DOE Gilan, JET	Budget Allocation of Comprehensive Ecosystem Survey
30	26 April, 2017	DOE Gilan, JET	Comprehensive Ecosystem Survey
31	27 April 2017	NIWAI, JET	Fish Survey on Comprehensive Ecosystem Survey
32	2 May 2017	NIWAI, JET	Joint Field Survey of Fish on Khalkaee River
33	16 May 2017	NIWAI, JET	Joint Field Survey of Fish on Siahkeshim PA
34	20 Nov, 2017	DOE Gilan, JET	Water Hyacinth and Azolla

No.	Date	Participated Organizations	Main Discussions
35	26 Nov 2017	DOE Gilan, JET	Reptiles and Amphibian survey
36	12 Dec 2017	DOE Gilan, JET, NIWAI, PBO	Water Hyacinth Committee
37	20 Dec 2017	DOE Gilan, JET	Fishway Installation
38	12 Feb 2018	DOE Gilan, JET	Illegal hunting in protected areas
39	24 Feb 2018	DOE Gilan, JET	Illegal hunting in protected areas
40	24 Feb 2018	DOE Gilan, JET	Illegal hunting in protected areas
41	26 Feb 2018	DOE Gilan, JET	Fishway installation arrangement, Satellite tracking
42	27 Feb 2018	DOE Gilan, JET	Fishway installation arrangement,
43	5 Mar 2018	DOE Gilan, JET	Patrol by using hexacopter, Fishway workshop
44	15 Mar, 2018	DOE HQ, JET	Ramsar Information Sheet
45	17 Mar 2018	DOE Gilan, JET	Satellite tracking (Pelican capturing)
46	16 May 2018	Rahjan University	Reptile and amphibian survey
47	18 May 2018	Rahjan University, Aria Herpetological Institute	Reptile and amphibian field survey
48	11 Aug 2018	Rahjan University, JET	Reptile and amphibian survey
49	14 Aug 2018	Rahjan University, JET	Reptile and amphibian survey
50	17 Aug 2018	Rahjan University, Aria Herpetological Institute, JET	Reptile and amphibian field survey
51	18 Aug 2018	DOE Gilan, , JET	Water Hyacinth removal, Ecosystem survey
52	25 Aug 2018	DOE Gilan, JET	Dredging plan of Sekeh WR
53	28 Aug 2018	DOE Gilan, JET	Water Hyacinth removal, Ecosystem survey, Bird monitoring
54	26 Sep 2018	Rahjan University, JET	Report of Reptile and amphibian survey
55	2 Oct 2018	DOE Gilan, JET	Arrangement of WG of the report of reptiles and amphibian survey
56	4 Oct 2018	NIWAI, JET	Guidebook of fishes in Anzali Wetland
57	28 Jan 2019	DOE Gilan, JET	Mid-term plan
58	5 Feb 2019	DOE Gilan, JET	Satellite tracking of Pelican
59	16 Feb 2019	DOE Gilan, JET	Satellite tracking of Pelican
60	17 Feb 2019	DOE Gilan, JET	Satellite tracking of Pelican
61	5 Mar 2019	DOE Gilan, JET	Satellite tracking of Pelican
62	9 Mar 2019	DOE Gilan, JET	Satellite tracking of Pelican
Monitoring for Adaptive Management WG			
63	13 May 2015	DOE Gilan, JET	• Preparation for water sampling
64	18 May 2015	DOE Gilan, GWWC, RWWC, GRWC, NIWAI, JET	• Water sampling and comparative analysis of samples from Anzali Wetland, Pirbazar River, sewage outfall
65	8 Sep. 2015	DOE Gilan, JET	• Discussion on results of comparative analysis
66	21-23 Sep 2015	DOE Gilan, GWWC, RWWC, GRWC, NIWAI, JET	• Quality control
67	3 Oct. 2015	DOE Gilan, GWWC, RWWC, GRWC, NIWAI, JET	• Distribution of reference samples for comparative analysis
68	7 Nov 2015	DOE Gilan, JET	• Water sampling in Anzali Wetland
69	21 Jan 2016	DOE Gilan, JET	• Discussion on the design of water quality monitoring plan
70	9 Feb 2016	DOE Gilan, JET	• Discussion on revision of JPA
71	8 Mar 2016	DOE Gilan, JET	• Water sampling in the wetland and a river
72	19 Apr 2016	DOE Gilan, JET	• Discussion on quality control
73	27 Apr. 2016	DOE HQ, JET	• Discussion on water quality monitoring, quality control
74	25 Aug 2016	DOE, JET	Meeting on regular monitoring
75	1 Sept 2016	DOE, JET	Meeting on regular monitoring
76	4 Sept 2016	DOE, JET	Regular monitoring

No.	Date	Participated Organizations	Main Discussions
77	14 Sept 2016	DOE, JET	Salinity monitoring
78	11 Nov 2016	DOE, JET	Meeting on regular monitoring
79	27 Feb 2017	DOE, JET	Meeting on results of DOE's sediment monitoring
80	7 Mar 2017	DOE HQ, JET	Discussion on DOE Gilan's responsibilities
81	8 Mar 2017	DOE, JET	Monitoring for international comparative analysis
82	2 Aug, 2017	DOE Gilan, JET	Monitoring
83	21 Aug 2017	DOE HQ, JET	Current situation of monitoring in Iran
84	29 Nov, 2017	DOE Gilan, JET	Monitoring
85	5 Dec 2017	DOE HQ, JET	Monitoring
86	16 Jan 2018	DOE Gilan, JET	Monitoring
87	28 Jan 2018	DOE Gilan, Anzali Monitoring office	Monitoring by Anzali Monitoring office
88	12 Ap 2018	DOE Gilan, JET	Monitoring by Anzali Monitoring office
89	17 Apr 2018	DOE Gilan, JET	Result of sediment quality monitoring
90	20 Aug 2019	DOE Gilan, JET	Mid-term plan
91	27 Nov 2019	DOE AWMO, JET	Result of monitoring
Zoning and Land Use Management WG			
92	21 Jun 2014	GRWC, JET	• Boundary of Wetland
93	22 Jun 2014	GRWC, JET	• Boundary of Wetland
94	12 Jul 2014	Road and Urban Planning Organization, JET	• Introduction of the project - Phase II • Anzali city urban plan • Boundary of Wetland
95	9 Sep 2014	Road and Urban Planning Organization, JET	• Anzali city urban plan • Boundary of wetland
96	25 Nov 2014	NRWGO, JET	• Landownership in the Anzali Wetland
97	19 May 2015	DPRO, DOE Gilan, JET	• Cadaster Map in/around the Wetland
98	30 June 2015	DPRO, DOE Gilan, JET	• Cadaster Map in/around the Wetland
99	13 Mar 2016	DOE Gilan, JET	• Field Survey of Illegal Land Use in Anzali Area
100	15 Mar 2016	DOE Somesara, DOE Gilan, JET	• Signboard Installation of Siahkeshim Protected Area
101	24 Apr 2016	GRWC, JET	• The boundary of Anzali Wetland by the Ministry of Energy
102	10 May 2016	DOE Anzali, DOE Gilan, JET	• Signboard Installation of Sorkhankol Wildlife Refuge
103	18 May 2016	WRMC, DOE HQ, DOE Gilan, JET	• The boundary of the Anzali Wetland based on "Law on Equitable Distribution of Water."
104	5 Oct 2016	DOE Gilan, JET, Subcontractor	Field survey for Signboard Installation Place
105	6 Oct 2016	DOE Gilan, JET, Subcontractor	Signboard Installation
106	8 Oct 2016	DOE Gilan, JET, Subcontractor	Inspection of Signboard
107	9 Oct 2016	DOE Gilan, JET, Subcontractor	Meeting about further signboard installation
108	30 Oct 2016	DOE Gilan, JET, Subcontractor	Field survey for Signboard Installation Place
109	8 Nov 2016	DOE Somesara, JET	Inspection of Signboard
110	9 Nov 2016	DOE Somesara, JET	Inspection of Signboard
111	13 Nov 2016	DOE Gilan, JET, Subcontractor	Field survey for Signboard Installation Place
112	4 Dec 2016	DOE Somesara, JET	Field survey for Signboard Installation Place
113	7 Dec, 2016	DOE Gilan, JET,	Zoning Plan
114	6 Feb 2017	Provincial Governors' Office, JET	Land Use Guide Line The boundary of Wetland by MOE
115	26 Feb 2017	DOE Gilan, JET	Signboard Installation
116	4 Mar, 2017	DOE Gilan, JET	Data Collection for Zoning Plan
117	29 Apr, 2017	DOE Gilan, JET	Boundary Patrol

No.	Date	Participated Organizations	Main Discussions
118	6 May 2017	DOE Gilan, JET	Inspection of Signboard
119	20 May 2017	DOE Gilan, JET, Subcontractor	Signboard Installation
120	14 Jun, 2017	DOE Gilan, JET	Illegal land use in Anzali Wetland
121	20 Aug 2017	DOE Gilan, JET	Arrangement of Zoning WG meeting
122	22 Aug, 2017	DOE Gilan, JET	Land use management
123	28 Aug 2017	DOE Gilan, JET	Arrangement of Zoning WG meeting
124	28 Nov 2017	DOE Gilan, JET	Arrangement of joint SC with legal SC
125	29 Nov 2017	DOE Gilan, JET	Zoning matters
126	17 Dec 2017	DOE Gilan, JET	Boundary patrol of Chokum Wildlife Refuge
127	10 Mar 2018	DOE Gilan, JET	Joint SC with legal SC about Land use management
128	21 Aug 2018	DOE Rasht JET	Signboard Installation of Chokum WR
129	26 Aug 2018	DOE Rasht JET	Field survey of Chokum WR
130	28 Aug 2018	DOE Gilan, JET	Signboard Installation of Chokum WR, zoning
131	6 Sep 2018	DOE Gilan, Khoman District Office, Villages, JET	Signboard Installation of Chokum WR
132	10 Sep 2018	DOE Gilan, JET	Signboard Installation of Chokum WR
133	13 Sep 2018	DOE Rasht JET	Field survey of signboard Installation of Chokum WR
134	26 Sep 2018	DOE Gilan, JET	Zoning of protected areas
135	31 Oct 2018	DOE Gilan, JET	Hunting license and illegal hunting
136	3 Nov 2018	DOE Gilan, JET	Arrangement of illegal hunting patrol by using drone
137	5 Nov 2018	DOE Gilan, JET	Arrangement of illegal hunting patrol by using drone
138	11 Nov 2018	DOE Gilan, JET	Illegal hunting patrol by using a drone in the field
139	12 Nov 2018	DOE Gilan, JET	Result of illegal hunting patrol by using drone
140	13 Nov 2018	DOE Gilan, JET	Illegal hunting patrol by using a drone in the field
141	16 Nov 2018	DOE Gilan, JET	Illegal hunting patrol by using a drone in the field
142	17 Nov 2018	DOE Gilan, JET	Illegal hunting patrol by using a drone in the field
143	2 Dec 2018	DOE Gilan, JET	Preliminary meeting for WRML meeting
144	5 Dec 2018	WRMC, GRWC, Gilan Provincial Governor Office, Housing foundation, DOE HQ, DOE Gilan, JET	Criteria of Ramsar boundary of the Anzali Wetland The boundary of wetland by MOE Zoning and land use guideline
145	8 Dec 2018	DOE Gilan, JET	Zoning, Drone training, Illegal hunting patrol by using drone
146	11 Dec 2018	DOE Gilan, JET	Zoning Plan, dredging plan, satellite tracking of Pelican
147	15 Dec 2018	DOE Gilan, JET	Arrangement of meetings
148	16 Dec 2018	DOE Gilan, JET	Training of equipment for DOE Guard stations, Enhancement of DOE GS function
149	18 Dec 2018	NIWAI, JET	Guidebook and poster of fishes
150	25 Jan 2019	DOE Gilan, JET	Illegal hunting patrol by using a drone in the field
151	1 Feb 2019	DOE Gilan, JET	Illegal hunting patrol by using a drone in the field
152	15 Feb 2019	DOE Gilan, JET	Illegal hunting patrol by using a drone in the field

Source: JICA Expert Team

3.2.3. Preparation and Implementation of the Action Plans

(1) Outline of the Action Plan

The member of Wetland Ecosystem Conservation(WEC) SC discussed and studied the current activities of WEC, and prepared an Action Plan and JPAs in 2015 to be implemented from the second(2015) to the fifth year(2018) of the project.

1) Overall strategy

The Action Plan for Wetland Ecosystem Conservation has been proposed based on the following strategies:

- To survey the current conditions of the wetland ecosystem correctly, and to conserve and restore the wetland ecosystem actively from the standpoint of ecological management;
- To regularly monitor environmental conditions in and around the wetland for adaptive management of the wetland; and
- To minimize land users' conflicts by introducing the zoning map and the guideline for land use as administrative tools to separate potentially conflicting activities depending on the current situation of the ecosystem and land use in/around the wetland.

2) Action Plan for Wetland Conservation and Restoration WG

a) Implementation of comprehensive ecosystem survey and monitoring

The data of comprehensive ecosystem are essential baseline information for planning wetland conservation and restoration activities and to remove the Anzali Wetland from the Montreux Record on the Ramsar Convention.

The comprehensive ecosystem survey under the Wetland Conservation and Restoration WG consists of the macrophyte and vegetation survey, phytoplankton survey, mammal survey, bird survey, reptile and amphibian survey, fish survey, benthos, and evaluation of ecosystem which will be implemented by DOE Gilan in cooperation with NIWAI and other scientists.

b) Monitoring of the natural environment in the Anzali Wetland

This activity is to introduce regular monitoring of the natural environment in order to implement adaptive management of the wetland. The JPA consists of a review of related data and information on the natural environment, implementation of a tentative monitoring program, review of the monitoring data and preparation of monitoring reports, revision of the monitoring program and implementation of the revised monitoring program which will be implemented by DOE Gilan in cooperation with Shilat and NIWAI. The monitoring plan should be considered adequately based on the results of the comprehensive ecosystem survey.

c) Wetland conservation and restoration activities

This activity is implemented in order to secure the balance of the Anzali Wetland ecosystem by solving many issues based on the result of the comprehensive ecosystem survey.

The wetland conservation and restoration activities under the Wetland Conservation and Restoration WG consists of the restoration of open water in drying area, management of vegetation succession, control of alien species, construction of fish ladder and monitoring of the activities which will be implemented by DOE Gilan in cooperation with MOJA Gilan, Shilat,

NIWAI, and GRWC. The plan for each activity should be considered adequately based on the results of the comprehensive ecosystem survey.

3) Action Plan for Monitoring for Adaptive Management WG

This activity is to introduce regular monitoring of water and sediment qualities in the wetland and its watershed in order to implement adaptive management of the wetland. The monitoring of water and sediment qualities in the Anzali Wetland and its watershed under the Monitoring for Adaptive Management WG consists of review of related data and information, implementation of a tentative monitoring program, review of the monitoring data and a preparation of monitoring reports, revision of the monitoring program and implementation of the revised monitoring program which will be implemented by DOE Gilan in cooperation with NIWAI, GRWC, GWWC, and RWWC.

4) Action plan for Environmental Zoning and Land Use Management WG

An appropriate land use management should be started based on the updated zoning plan adapted to the current condition of the wetland and the land use guideline. The Action Plan of the Environmental Zoning and Land Use Management WG consists of data collection and field surveys, updating of the zoning plan, preparation of a land use guideline in each zone, installation of signboards on the boundaries of each zone, promotion of sustainable use of the wetland, wetland patrol by DOE guards and monitoring of the activities which will be implemented by DOE Gilan in cooperation with MOJA Gilan, Shilat, PMO, GRWC, NRWGO, Housing Foundation, Document and Property Office, Road and Urban Planning Organization, GCHHTO, Municipalities, and Union of Ab-Bandan Dar.

(2) Outline of the Proposed Joint Pilot Activities

1) Strategies for prioritization and selection of Joint Pilot Activities

Among the activities outlined in the Action Plan, the WEC SC will implement selected activities with JET as JPAs. The selection was made based on the following criteria for prioritization:

- Activities that are necessary to get baseline information of ecosystem condition;
- Activities that are effective to conserve or restore the ecosystem;
- Activities that minimize conflicts among users of wetland resources; and
- Activities that are not implemented regularly by the member organization of the SC

2) Items of Proposed Joint Pilot Activities (JPAs)

- JPA-1: Comprehensive Ecosystem Survey
- JPA-2: Monitoring of the natural environment in the Anzali Wetland
- JPA-3: Wetland Conservation and Restoration Activity

- JPA-4: Monitoring of Water and Sediment Qualities in the Anzali Wetland and its Watershed
- JPA-5 Environmental Zoning and Land Use Management Activity

(3) Result of the Implementation of the Action Plan

1) General Achievement

Before the project, there was very few scientific surveys and monitoring of the wetland ecosystem. Many JPAs have been implemented under the project mainly using JICA budget. Many reliable scientific data such as mammal, bird, reptile and amphibian, fish, water and sediment qualities, etc. was obtained. These data can be used as the reference data for short and long-term wetland management of the Anzali Wetland. However, DOE Gilan did not understand the importance of these ecosystem survey and monitoring. Several Iranian parts of the JPAs could not be completed ,unfortunately.

Control of Water Hyacinth as invasive alien species was successfully implemented by DOE Gilan in cooperation with relevant organizations and JET as of now.

2) Achievement of Action Plan for each Member of SC

In the WEC SC including three WGs, the whole WEC action plan is almost same as plans of JPAs except wetland conservation and restoration activities by DOE Gilan. Therefore, the achievement of Action Plan is described in chapter 3.2.4 and 3.2.5.

Regarding the wetland conservation and restoration activities by DOE Gilan. All activities of DOE Gilan including many dredging works are not clear because of non-disclosure. Thus, the achievement cannot be evaluated. As a sample, dredging work to restore the water body in Selkeh WR was partially succeeded. Dried up area became the shallow water body by dredging and pump up and many waterbirds came back in winter. However, any monitoring work and adaptive management based on the result of monitoring were not implemented. Thus, the outcome could not be maximized of the activities.

3.2.4. Implementation of the Joint Pilot Activities

(1) JPA-1: Comprehensive Ecosystem Survey

The data of comprehensive ecosystem are essential baseline information for planning wetland conservation and restoration activities. Also, DOE should submit the latest data of the ecological character of the wetland as the Ramsar Information Sheet (RIS) to the Ramsar Convention every six years. Furthermore, at least the latest RIS is required to remove the Anzali Wetland from the Montreux Record on the Ramsar Convention.

However, DOE Gilan did not understand the importance of the comprehensive ecosystem survey as baseline information, and the obligation of the DOE to Ramsar Convention very much.

According to the action plan at the beginning of the project, only mammal and bird survey would be implemented by using JET budget. The other items of the comprehensive ecosystem survey should be implemented by using the Iranian budget. The only fish survey has been implemented by the Iranian budget. JET recognized the importance of them, the reptiles and amphibian survey have been implemented by JET. Limited aquatic plant (macrophyte) survey was implemented at the last moment of the project by JET. Unfortunately, insect, planktons and benthos survey have not been implemented. JET supported to make the RIS of the Anzali Wetland based on the uncompleted the comprehensive ecosystem survey.

Table 3.2-3 Implementation Schedule of JPA-1 (Comprehensive Ecosystem Survey)

Activities		2015		2016		2017		2018		2019	Remarks
		1394		*1395*		*1396*		*1397*			
		2nd Year		**3rd Year**		**4th year**		**5th year**			
		Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	
Preparation of survey plan	Plan																Done by 1st year
	Actual																
Mammal	Plan																Done by JET budget.
	Actual																
Bird	Plan																Done by JET budget.
	Actual																
Bird Satellite Tracking	Plan																Done by JET budget.
	Actual																
Reptile and Amphibian	Plan																It should be done by Iarnian budget. However, done by JET budget.
	Actual																
Fish	Plan																Done by NIWAI and DOE Gilan
	Actual																
Insect	Plan																It should be done by Iarnian budget. Not implemented.
	Actual																
Benthos and Zooplankton	Plan																It should be done by Iarnian budget. Not implemented.
	Actual																
Macrophyte (plant)	Plan																It should be done by Iarnian budget.Only Selkeh WR was surveyed by JET budget.
	Actual																
Phytoplankton	Plan																It should be done by Iarnian budget. Not implemented.
	Actual																
Evaluation of ecosystem	Plan																Evaluated based on the incomplete information
	Actual																

Source: JICA Expert Team

1) Mammal survey

Different areas in and around the Anzali Wetland were surveyed and monitored for four seasons for one year from January 2015 to January 2016 by a survey team including Dr. Mirzajani,

NIWAI expert, Mr. Hadipour, DOE expert, lead by Dr. Naderi, a professor in Gilan University as a joint pilot activity under the Project.

The survey methodologies were field sign survey, camera-trap, trapping, sand-box (footprint trap) methods, and netting method for bat.

As a result, 21 mammal species have been recorded in and around the Anzali Wetland. Mammal Checklist in and around the Anzali Wetland is shown in the following table.

Distribution maps were also prepared. A map of Common Otter distribution is shown in the following figure as representative and endangered species.

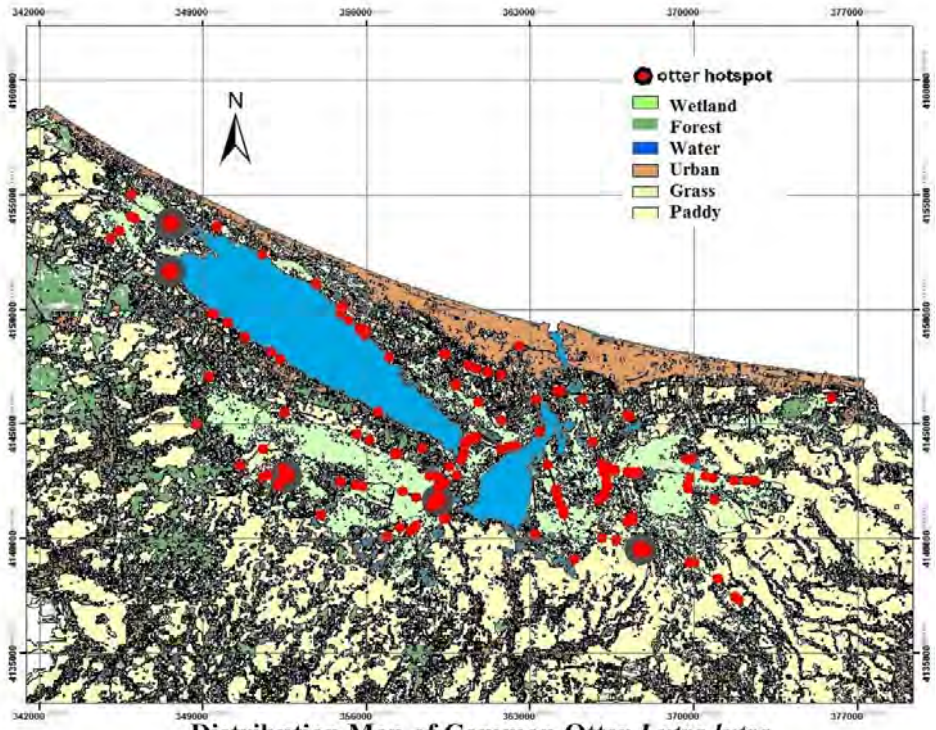
Table 3.2-4 Mammal Checklist in/around Anzali Wetland in 2015-16

No.	Order	Family	English name	Species
1	Erinaceomorpha	Erinaceidae	Southern White-breasted Hedgehog	*Erinaceus concolor*
2	Soricomorpha	Talpidae	Blind Mole	*Talpa sp.*
3		Soricidae	Shrew	*Crocidura sp.*
4	Chiroptera	Rhinolophidae	Horseshoe Bat	*Rhinolophus hipposideros*
5		Vespertilionidae	Common Pipistrelle	*Pipistrellus pipistrellus*
6			Nathusius' Pipistrelle	*Pipistrellus nathusii*
7			A kind of Pipistrelle 1.	*Pipistrellus* sp.1
8			A kind of Pipistrelle 2.	*Pipistrellus* sp.2
9	Rodentia	Gliridae	Fat Dormouse	*Glis glis*
10		Cricetidae	Eurasian water vole	*Arvicola amphibious*
11		Muridae	Brown rat	*Rattus norvegicus*
12			Roof Rat	*Rattus rattus*
13			House Mouse	*Mus musculus*
14		Hystricidae	Indian Crested Porcupine	*Hystrix indica*
15	Carnivora	Canidae	Golden jackal	*Canis aureus*
16		Mustelidae	Least Weasel	*Mustela nivalis*
17			Common Badger	*Meles meles*
18			Common Otter	*Lutra lutra*
19		Felidae	Asiatic Wildcat	*Felis silvestris ornata*
20			Jungle Cat	*Felis chaus*
21	Artiodactyla	Suidae	Wild Boar	*Sus scropha*

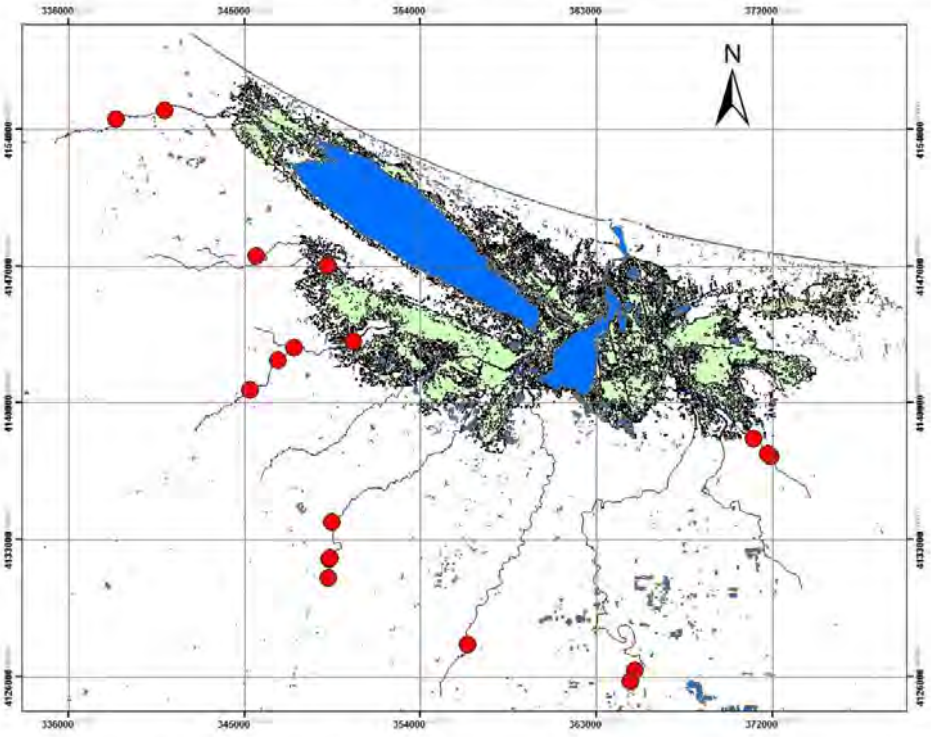
Source: Updated by JET from Mammal Survey, Dr. Naderi et al., 2015 (Subcontracted by JET)

Source: JICA Expert Team

Figure 3.2-1 Typical Mammals in the Anzali Wetland



Distribution Map of Common Otter *Lutra lutra*
in/around Anzali Wetland



Distribution Map of Common Otter *Lutra lutra*
in Distributaries of Anzali Wetland

Source: Mammal Survey, Dr. Naderi, et al., 2015 (Subcontracted by JET)

Figure 3.2-2 Distribution Maps of Common Otter in Anzali Wetland and Its Distributaries

2) Bird fauna survey

Different areas in/around the Anzali wetland were surveyed for one year (twelve months), from January to December 2015 by a survey team led by Dr. Moradi, a professor in Gorgan University in cooperation with Mr. Ashoori, DOE expert

In order to identify and estimate the bird's population, the binocular and telescope have been used. A digital camera with tele lens was used to take photos and short films of birds and their habitats. In order to identify the coordinates of endangered species, GPS receiver was used

Considering different types of habitat, Anzali Wetland Complex was divided into eight areas, which are Selke Wildlife Refuge, Sorkhankol Wildlife Refuge, Center, Chokum, East, Northeast, West, and Siahkeshim as shown in Figure 3.1-16, and those areas were surveyed for four days per month. Terrestrial areas around the Anzali Wetland have also been surveyed in a day per month. In total, the bird survey in the Anzali Wetland has been carried out in total five days in a month. This survey has been conducted from January 2015 to December 2015 (12 months).

After the field survey, new information from monitoring activities and the other related survey was obtained.

Totally 243 birds species including 112 water birds and 131 terrestrial birds have been identified in Anzali Wetland from January 2015 to December 2015. These numbers belonged to 17 orders and 57 families. The highest number of birds was observed in April 2015 in the Anzali Wetland with 139 species, and the lowest numbers were observed in June 2015 in Anzali Wetland. The highest number of water birds species was identified in September 2015 with 67 species, and the lowest numbers were found in May 2015 with 36 species. The highest number of individuals was observed in January 2015 with 134,167 birds, and the lowest number was observed in May 2015 with 6,979 birds in Anzali Wetland.

The checklist was updated based on the literature and the monitoring activities as shown in the following table. Based on the table, 254 bird species were recorded in and around the Anzali Wetland until now.

Table 3.2-5(1) Bird Checklist in/around Anzali Wetland in 2015

No	English name	Scientific name	Habitat	Bird Survey (JPA) 2015	Ramsar Information Sheet 1985	Paper Sethieh and Expand 1999-2000	MP Study by JICA 2003-2004	Waterbird Census by DOE 2006	Waterbird Census by DOE 2007	Waterbird Census by DOE 2009	Waterbird Census by DOE 2010	Waterbird Census by DOE 2011	Waterbird Census by DOE 2012	Waterbird Census by DOE 2013	Waterbird Census by DOE 2014	Waterbird Census by DOE 2016	Waterbird Census by DOE 2017	Monitoring by JET 2016	Monitoring by JET as of 15 May 2017	Migration Status	Conservation Status
1	Little Grebe	*Tachybaptus ruficollis*	W	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	-
2	Great Crested Grebe	*Podiceps cristatus*	W	✔	✔		✔	✔	✔	✔			✔	✔	✔	✔	✔	✔		R	-
3	Red-necked Grebe	*Podiceps grisegena*	W	✔			✔							✔	✔					WM	-
4	Black-necked Grebe	*Podiceps nigricollis*	W	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	WM	-
5	Slavonian Grebe	*Podiceps auritus*	W	✔	✔				✔					✔	✔	✔		✔		WM	-
6	Great White Pelican	*Pelecanus onocrotalus*	W	✔	✔	✔	✔	✔			✔			✔		✔	✔	✔	✔	WM	P
7	Dalmatian Pelican	*Pelecanus crispus*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	VU
8	Great Cormorant	*Phalacrocorax carbo*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	-
9	Pygmy Cormorant	*Phalacrocorax pygmeus*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	P
10	Grey Heron	*Ardea cinerea*	W	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	P
11	Purple Heron	*Ardea purpurea*	W	✔	✔	✔	✔											✔	✔	BM	P
12	Great White Egret	*Casmerodius albus*	W	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	RM	P
13	Little Egret	*Egretta garzetta*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	P
14	Cattle Egret	*Bubulcus ibis*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔				✔	✔	✔	R	P
15	Squacco Heron	*Ardeola ralloides*	W	✔	✔	✔	✔			✔								✔	✔	BM	P
16	Night Heron	*Nycticorax nycticorax*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	P
17	Little Bittern	*Ixobrychus minutus*	W	✔		✔	✔											✔		BM	E
18	Eurasian Bittern	*Botaurus stellaris*	W	✔		✔	✔	✔		✔						✔		✔	✔	WM	P
19	White Stork	*Ciconia ciconia*	W	✔																PM	P
20	Black Stork	*Ciconia nigra*	W	✔																PM	P
21	Glossy Ibis	*Plegadis falcinellus*	W	✔		✔	✔					✔					✔		✔	PM	-
22	Spoonbill	*Platalea leucorodia*	W	✔		✔														PM	-
23	Greater Flamingo	*Phoenicopterus roseus*	W	✔	✔	✔	✔										✔	✔	✔	WM	P
24	Mute Swan	*Cygnus olor*	W	✔	✔	✔	✔		✔	✔	✔		✔	✔	✔		✔	✔	✔	WM	P
25	Whooper Swan	*Cygnus cygnus*	W	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	WM	P
26	Bewick's Swan	*Cygnus columbianus*	W		✔															WM	P
27	White-fronted Goose	*Anser albifrons*	W		✔		✔							✔			✔			WM	P
28	Lesser White-fronted Goose	*Anser erythropus*	W		✔															WM	VU
29	Graylag Goose	*Anser anser*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
30	Ruddy Shelduck	*Tadorna ferruginea*	W	✔		✔	✔		✔						✔	✔	✔		✔	WM	-
31	Shelduck	*Tadorna tadorna*	W	✔		✔	✔	✔	✔						✔	✔	✔	✔	✔	WM	-
32	Wigeon	*Anas penelope*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	WM	-
33	Gadwall	*Anas strepera*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
34	Teal	*Anas crecca*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
35	Mallard	*Anas platyrhynchos*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	-
36	Northern Pintail	*Anas acuta*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
37	Garganey	*Anas querquedula*	W	✔	✔	✔	✔												✔	WM	-
38	Shoveler	*Anas clypeata*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
39	Marbled Teal	*Marmaronetta angustirostris*	W				✔													WM	VU
40	Red-crested Pochard	*Netta rufina*	W	✔	✔		✔	✔	✔			✔	✔	✔			✔	✔	✔	WM	P
41	Pochard	*Aythya ferina*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	VU
42	Ferruginous Duck	*Aythya nyroca*	W	✔		✔	✔	✔	✔			✔	✔	✔	✔	✔	✔	✔		R	NT
43	Tufted Duck	*Aythya fuligula*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
44	Scaup	*Aythya marila*	W	✔		✔	✔													WM	-
45	Goldeneye	*Bucephala clangula*	W	✔	✔		✔			✔					✔		✔	✔	✔	WM	-
46	Smew	*Mergus albellus*	W	✔	✔		✔	✔	✔	✔		✔	✔	✔	✔	✔	✔		✔	WM	P
47	Goosander	*Mergus merganser*	W	✔																WM	P
48	White-headed Duck	*Oxyura leucocephala*	W	✔	✔									✔						WM	EN
49	Osprey	*Pandion haliaetus*	T	✔			✔													PM	P
50	Red Kite	*Milvus milvus*	T	✔			✔													PM	NT
51	Black Kite	*Milvus migrans*	T	✔			✔											✔	✔	WM	P
52	White-tailed Eagle	*Haliaeetus albicilla*	T	✔			✔											✔	✔	R	NT
53	Short-toed Eagle	*Circaetus gallicus*	T	✔																PM	P
54	Common Buzzard	*Buteo Buteo*	T	✔														✔		WM	P
55	Long-legged Buzzard	*Buteo rufinus*	T	✔																FM*	P
56	Hen Harrier	*Circus cyaneus*	T	✔														✔	✔	WM	P
57	Pallid Harrier	*Circus macrourus*	T	✔														✔		PM	NT
58	Montagu's Harrier	*Circus pygargus*	T	✔			✔													PM	P
59	Marsh Harrier	*Circus aeruginosus*	T	✔			✔											✔	✔	R	P
60	Sparrowhawk	*Accipiter nisus*	T	✔			✔											✔		R	P
61	Goshawk	*Accipiter gentilis*	T	✔														✔	✔	WM	P
62	Greater Spotted Eagle	*Aquila clanga*	T	✔			✔											✔	✔	WM	VU
63	Lesser Spotted Eagle	*Aquila pomarina*	T	✔																SM	P
64	Steppe Eagle	*Aquila nipalensis*	T	✔																WM	P
65	Imperial Eagle	*Aquila heliaca*	T	✔																WM	VU
66	Lesser Kestrel	*Falco naumanni*	T	✔			✔													SM	P
67	Kestrel	*Falco tinnunculus*	T	✔			✔													*FM	P
68	Merlin	*Falco columbarius*	T	✔														✔	✔	WM	P
69	Hobby	*Falco subbuteo*	T	✔														✔	✔	BM	P
70	Saker Falcon	*Falco cherrug*	T	✔																PM	EN
71	Peregrine Falcon	*Falco peregrinus*	T	✔			✔													WM	E
72	Barbary Falcon	*Falco pelegrinoides*	T	✔			✔													PM	P
73	Pheasant	*Phasianus colchicus*	T	✔															✔	R	P
74	Quail	*Coturnix coturnix*	T	✔																PM	-
75	Common Crane	*Grus grus*	W	✔																PM	E
76	Water Rail	*Rallus aquaticus*	W	✔		✔	✔	✔	✔	✔			✔	✔	✔	✔	✔	✔	✔	R	-
77	Corncrake	*Crex crex*	W	✔																PM	-
78	Little Crake	*Porzana parva*	W	✔																BM	-
79	Spotted Crake	*Porzana porzana*	W	✔		✔														PM*	-
80	Moorhen	*Gallinula chloropus*	W	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	-
81	Purple Gallinule	*Porphyrio porphyrio*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	P
82	Coot	*Fulica atra*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R	-
83	Little Bustard	*Tetrax Tetrax*	W	✔																WM	NT
84	Oystercatcher	*Haematopus ostralegius*	W	✔															✔	PM	-
85	Black-winged Stilt	*Himantopus himantopus*	W	✔		✔	✔		✔									✔	✔	SM*	-
86	Pied Avocet	*Recurvirostra avosetta*	W	✔		✔	✔	✔	✔			✔		✔		✔	✔	✔	✔	WM	-
87	Stone Curlew	*Burhinus oedicnemus*	W	✔																PM	-
88	Collared Pratincole	*Glareola pratincola*	W	✔														✔	✔	BM	-
89	Black-winged Pratincole	*Glareola nordmanni*	W	✔																PM	NT
90	Northern Lapwing	*Vanellus vanellus*	W	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	R *	-
91	White-tailed Plover	*Vanellus leucurus*	W	✔														✔	✔	PM *	-
92	Sociable Lapwing	*Vanellus gregarius*	W	✔																PM	CR
93	European Golden Plover	*Pluvialis apricaria*	W	✔	✔			✔			✔					✔	✔		✔	WM	-
94	Grey Plover	*Pluvialis squatarola*	W	✔									✔	✔		✔	✔	✔		WM	-
95	Ringed Plover	*Charadrius hiaticula*	W	✔	✔	✔			✔		✔	✔				✔	✔	✔	✔	WM	-
96	Little Ringed Plover	*Charadrius dubius*	W	✔														✔	✔	BM	-
97	Kentish Plover	*Charadrius alexandrinus*	W	✔			✔								✔			✔		WM	-
98	Greater Sand Plover	*Charadrius leschenaultii*	W	✔																PM	-
99	Caspian Plover	*Charadrius asiaticus*	W		✔															PM	-
100	Black-tailed Godwit	*Limosa limosa*	W	✔	✔		✔		✔	✔	✔			✔	✔	✔	✔	✔	✔	WM	NT
101	Bar- tailed Godwit	*Limosa lapponica*	W	✔																PM	-
102	Whimbrel	*Numenius phaeopus*	W	✔																PM	-
103	Eurasian Curlew	*Numenius arquata*	W	✔			✔			✔				✔				✔		PM*	-
104	Spotted Redshank	*Tringa erythropus*	W	✔	✔						✔			✔	✔	✔		✔	✔	WM	-
105	Redshank	*Tringa totanus*	W	✔		✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	WM	-
106	Marsh Sandpiper	*Tringa stagnatilis*	W	✔		✔	✔							✔	✔	✔		✔		PM*	-
107	Greenshank	*Tringa nebularia*	W	✔				✔	✔						✔	✔	✔	✔	✔	WM*	-
108	Green Sandpiper	*Tringa ochropus*	W	✔						✔	✔	✔		✔	✔			✔		SM*	-
109	Wood Sandpiper	*Tringa glareola*	W	✔					✔				✔			✔		✔	✔	PM	-
110	Terek Sandpiper	*Xenus cinereus*	W	✔														✔		PM	-
111	Common Sandpiper	*Actitis hypoleucos*	W	✔									✔						✔	SM*	-
112	Ruddy Turnstone	*Arenaria interpres*	W	✔															✔	PM	-
113	Red-necked Phalarope	*Phalaropus lobatus*	W	✔															✔	PM	-
114	Woodcock	*Scolopax rusticola*	W	✔								✔		✔		✔				WM	-
115	Great Snipe	*Gallinago media*	W	✔																PM	NT
116	Common Snipe	*Gallinago gallinago*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	FM*	-
117	Jack Snipe	*Lymnocryptes minimus*	W	✔			✔	✔	✔					✔						WM	-
118	Sanderling	*Calidris alba*	W	✔																WM	-
119	Little Stint	*Calidris minuta*	W	✔				✔						✔				✔	✔	WM	-
120	Temminck's Stint	*Calidris temminckii*	W	✔			✔											✔		PM	-
121	Dunlin	*Calidris alpina*	W	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
122	Curlew Sandpiper	*Calidris ferruginea*	W	✔																PM	-
123	Broad-billed Sandpiper	*Limicola falcinellus*	W	✔																PM	-
124	Ruff	*Philomachus pugnax*	W	✔		✔						✔					✔	✔	✔	PM	-
125	Pomarine Skua	*Stercorarius pomarinus*	W	✔																PM	-
126	Common Gull	*Larus canus*	W	✔	✔			✔	✔	✔	✔	✔		✔			✔	✔		WM	-
127	Herring Gull	*Larus argentatus*	W				✔												✔	WM	-
128	Lesser Black-backed Gull	*Larus fuscus*	W	✔			✔													PM	-
129	Armenian Gull	*Larus armenicus*	W	✔							✔									WM*	-
130	Caspian Gull	*Larus cachinnans*	W	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
131	Siberian Gull	*Larus heuglini*	W	✔																PM	-
132	Great Black-headed Gull	*Larus ichthyaetus*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
133	Black-headed Gull	*Larus ridibundus*	W	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	WM	-
134	Mediterranean Gull	*Larus melanocephalus*	W	✔					✔						✔					WM	-
135	Slender-billed Gull	*Larus genei*	W	✔																PM*	-
136	Little Gull	*Larus minutus*	W	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		WM	-
137	Whiskered Tern	*Chlidonias hybridus*	W	✔	✔	✔	✔				✔	✔	✔	✔	✔		✔	✔	✔	BM	-
138	White-winged Black Tern	*Chlidonias leucopterus*	W	✔	✔	✔											✔	✔	✔	SM*	-
139	Black Tern	*Chlidonias niger*	W	✔	✔												✔	✔	✔	PM	-
140	Gull-billed Tern	*Sterna nilotica*	W	✔																PM	-
141	Caspian Tern	*Sterna caspia*	W	✔		✔												✔		PM	-
142	Common Tern	*Sterna hirundo*	W	✔	✔													✔		BM	-
143	White-cheeked Tern	*Sterna repressa*					✔													PM	-

Source: JICA Expert Team

Table 3.2-5(2) Bird Checklist in/around Anzali Wetland in 2015

No	English name	Scientific name	Habitat	Bird Survey (JPA) 2015	Ramsar Information Sheet 1995	Paper Selken and Espand 1999-2000	M/P Study by JICA 2003-2004	Waterbird Census by DOE 2006	Waterbird Census by DOE 2007	Waterbird Census by DOE 2009	Waterbird Census by DOE 2010	Waterbird Census by DOE 2011	Waterbird Census by DOE 2012	Waterbird Census by DOE 2013	Waterbird Census by DOE 2014	Waterbird Census by DOE 2016	Waterbird Census by DOE 2017	Monitoring by JET 2016	Monitoring by JET as of 15 May 2017	Migration Status	Conservation Status
144	Little Tern	*Sterna albifrons*	W	✔	✔															BM	-
145	Sandwich Tern	*Sterna sandvicensis*	W	✔																PM*	-
146	Rock Dove	*Columba livia*	T	✔																R	-
147	Wood Pigeon	*Columba palumbus*	T	✔															✔	WM	-
148	Turtle Dove	*Streptopelia turtur*	T	✔																PM	-
149	Laughing Dove	*Streptopelia senegalensis*	T	✔														✔	✔	R	-
150	Collared Dove	*Streptopelia decaocto*	T	✔														✔	✔	R	-
151	Ring-necked Parakeet	*Psittacula krameri*	T	✔																PM	-
152	Common Cuckoo	*Cuculus canorus*	T	✔			✔											✔	✔	BM	-
153	Short-eared Owl	*Asio flammeus*	T				✔													WM	-
154	Barn Owl	*Tyto alba*	T	✔																PM*	p
155	Scops Owl	*Otus scops*	T	✔																SM*	p
156	Tawny Owl	*Strix aluco*	T	✔																WM	p
157	European Nightjar	*Caprimulgus europaeus*	T	✔																PM	-
158	Common Swift	*Apus apus*	T	✔			✔											✔	✔	SM*	-
159	Common Kingfisher	*Alcedo atthis*	T	✔			✔											✔	✔	R	-
160	Persian Bee-eater	*Merops persicus*	T	✔														✔	✔	BM	-
161	European Bee-eater	*Merops apiaster*	T	✔			✔											✔	✔	BM	-
162	Hoopoe	*Upupa epops*	T	✔			✔											✔	✔	BM	-
163	European Roller	*Coracias garrulus*	T	✔																PM	NT
164	Wryneck	*Jynx torquilla*	T	✔																PM	-
165	Calandra Lark	*Melanocorypha calandra*	T	✔														✔	✔	WM	-
166	White - winged Lark	*Melanocorypha leucoptera*	T	✔																WM	-
167	Greater short-toed Lark	*Calandrella brachydactyla*	T	✔																PM	-
168	Lesser Short-toed Lark	*Calandrella rufescens*	T	✔																WM	-
169	Woodlark	*Lullula arborea*	T	✔																PM	-
170	Crested Lark	*Galerida cristata*	T	✔																PM	-
171	Eurasian Skylark	*Alauda arvensis*	T	✔														✔	✔	WM	-
172	Sand Martin	*Riparia riparia*	T	✔														✔	✔	BM	-
173	Barn Swallow	*Hirundo rustica*	T	✔														✔	✔	BM	p
174	House Martin	*Delichon urbicum*	T	✔																SM*	-
175	Yellow Wagtail	*Motacilla flava*	T	✔														✔	✔	BM	-
176	Citrine Wagtail	*Motacilla citreola*	T	✔														✔	✔	WM*	-
177	Grey Wagtail	*Motacilla cinerea*	T	✔															✔	PM*	-
178	White Wagtail	*Motacilla alba*	T	✔			✔											✔	✔	R	-
179	Meadow Pipit	*Anthus pratensis*	T	✔															✔	WM	-
180	Water Pipit	*Anthus spinoletta*	T	✔																WM	-
181	Red-backed Shrike	*Lanius collurio*	T	✔															✔	PM	-
182	Isabelline Shrike	*Lanius isabellinus*	T	✔																PM	-
183	Woodchat Shrike	*Lanius senator*	T	✔																PM	-
184	Lesser Grey Shrike	*Lanius minor*	T	✔														✔	✔	PM	-
185	Wren	*Troglodytes troglodytes*	T	✔														✔		WM	-
186	Dunnock	*Prunella modularis*	T	✔																WM	-
187	European Robin	*Erithacus rubecula*	T	✔														✔	✔	WM	-
188	Thrush Nightingale	*Luscinia luscinia*	T	✔																PM	-
189	Common Nightingale	*Luscinia Megarhynchos*	T	✔																BM	p
190	Bluethroat	*Luscinia svecica*	T	✔														✔	✔	WM	-
191	Common Redstart	*Phoenicurus phoenicurus*	T	✔															✔	PM	-
192	Black Redstart	*Phoenicurus ochruros*	T	✔																PM	-
193	Whinchat	*Saxicola rubetra*	T	✔														✔	✔	PM	-
194	Common Stonechat	*Saxicola torquatus*	T	✔																PM	-
195	Pied Wheatear	*Oenanthe pleschanka*	T	✔																PM	-
196	Northern Wheatear	*Oenanthe oenanthe*	T	✔														✔	✔	PM	-
197	Desert Wheatear	*Oenanthe deserti*	T	✔																PM	-
198	Blackbird	*Turdus merula*	T	✔														✔	✔	WM	-
199	Song Thrush	*Turdus philomelos*	T	✔																WM	-
200	Mistle Thrush	*Turdus viscivorus*	T	✔																WM	-
201	Redwing	*Turdus iliacus*	T																✔	PM	-
202	Fieldfare	*Turdus pilaris*	T																✔	PM	-
203	Cetti's Warbler	*Cettia cetti*	T	✔														✔	✔	R	-
204	Grasshopper Warbler	*Locustella naevia*	T	✔																PM	-
205	Savi's Warbler	*Locustella luscinioides*	T	✔																BM	-
206	Moustached Warbler	*Acrocephalus melanopogan*	T	✔														✔		BM	-
207	Sedge Warbler	*Acrocephalus schoenobaenus*	T	✔																BM*	-
208	European Reed Warbler	*Acrocephalus scirpaceus*	T	✔			✔													BM	-
209	Marsh Warbler	*Acrocephalus palustris*	T	✔																BM*	-
210	Great Reed Warbler	*Acrocephalus arundinaceus*	T	✔														✔	✔	BM	-
211	Icterine Warbler	*Hippolais icterina*	T	✔																PM	-
212	Eastern Olivaceous Warbler	*Iduna pallida*	T															✔	✔	PM*	-
213	Sykes's Warbler	*Iduna rama*	T	✔																PM	-
214	Green Warbler	*Phylloscopus nitidus*	T	✔																PM	-
215	Common Chiffchaff	*Phylloscopus collybita*	T	✔														✔	✔	WM	-
216	Willow Warbler	*Phylloscopus trochilus*	T	✔														✔		PM	-
217	Blackcap	*Sylvia atricapilla*	T	✔																PM	-
218	Garden Warbler	*Sylvia borin*	T	✔																PM	-
219	Common Whitethroat	*Sylvia communis*	T	✔																PM	-
220	Lesser Whitethroat	*Sylvia curruca*	T	✔																PM	-
221	Menetries's Warbler	*Sylvia mystacea*	T	✔																PM*	-
222	Goldcrest	*Regulus regulus*	T	✔																WM	-
223	Spotted Flycatcher	*Muscicapa striata*	T	✔														✔		PM	-
224	Red-breasted Flycatcher	*Ficedula parva*	T	✔														✔		PM	-
225	Semi-collared Flycatcher	*Ficedula semitorquata*	T	✔																PM	NT
226	Long-tailed Tit	*Aegithalos caudatus*	T	✔														✔	✔	R *	-
227	Eurasian Penduline Tit	*Remiz pendulinus*	T	✔														✔		R *	-
228	Bearded Tit	*Panurus biarmicus*	T	✔																PM	-
229	Coal Tit	*Parus ater*	T	✔																WM	-
230	Great Tit	*Parus major*	T	✔														✔	✔	R	-
231	Blue Tit	*Parus caeruleus*	T	✔														✔	✔	WM	-
232	Chaffinch	*Fringilla coelebs*	T	✔														✔	✔	WM	-
233	Brambling	*Fringilla montifringilla*	T	✔																WM	-
234	Greenfinch	*Carduelis chloris*	T	✔																FM*	-
235	Siskin	*Carduelis spinus*	T	✔																WM	-
236	Goldfinch	*Carduelis carduelis*	T	✔																WM	-
237	Common Rosefinch	*Carpodacus erythrinus*	T	✔																PM	-
238	Hawfinch	*Coccothraustes*	T	✔																PM	-
239	Corn Bunting	*Emberiza calandra*	T	✔																PM	-
240	Yellow hammer	*Emberiza citrinella*	T	✔																WM	-
241	Pine Bunting	*Emberiza leucocephalos*	T	✔																WM	-
242	Ortolan Bunting	*Emberiza hortulana*	T	✔														✔		PM	-
243	Black-headed Bunting	*Emberiza melanocephala*	T	✔																PM	-
244	Reed Bunting	*Emberiza schoenichus*	T	✔														✔	✔	WM	-
245	House Sparrow	*Passer domesticus*	T	✔														✔	✔	R	-
246	Spanish Sparrow	*Passer hispaniolensis*	T	✔														✔		WM*	-
247	Tree Sparrow	*Passer montanus*	T	✔														✔		R	-
248	Pale Rock Sparrow	*Petronia brachydactyla*	T	✔																PM	-
249	Rose-coloured Starling	*Sturnus roseus*	T	✔															✔	PM	p
250	Starling	*Sturnus vulgaris*	T	✔			✔											✔	✔	R	-
251	Golden Oriole	*Oriolus oriolus*	T	✔																BM*	-
252	Magpie	*Pica pica*	T	✔			✔											✔	✔	R	-
253	Rook	*Corvus frugilegus*	T	✔			✔											✔	✔	WM	-
254	Hooded Crow	*Corvus corone cornix*	T	✔			✔											✔	✔	R	-
Total Number of Species				**243**	**48**	**55**	**86**	**43**	**49**	**45**	**43**	**42**	**39**	**55**	**47**	**58**	**51**	**126**	**116**	**254**	

Habitat type/ W:Water Bird T:Terrestrial Bird
Migration Status/ R: Resident, BM:Breeding Migrant, SM:Summer Migrant, WM:Winter Migrant, PM:Passing Migrant, FM:Four Seasons Migrant
Star Mark (*) in migration status indicates the ucertinity of the present situation of birds in Chokam Wildlife Refuge. More research is needed in the region in the future.
Conservation Status/ CR:Critically Endangered ,EN:Endangered ,VN:Vulnerable ,NT:Near Threatened,p:Protected, -:unprotected

Source: JICA Expert Team

Source: JICA Expert Team

Figure 3.2-3 Typical Birds in the Anzali Wetland

4) Breeding bird survey

There are many breeding bird species in the Anzali Wetland. Each bird species selects specific habitat as its breeding site. In order to conserve birds in the Anzali Wetland as a component of the wetland ecosystem, the survey of birds breeding situation is an effective and important method. The Anzali Wetland ecosystem generally consists of open water, aquatic plant community, reed bed, rangeland, and forest. Therefore, typical breeding bird species of each habitat were selected as indicator species. Four bird species were selected as indicator species of the Anzali Wetland as shown in the following table.

Table 3.2-6 Indicator Bird Species of Breeding Survey

No	English Name of Species	Scientific name	Breeding Habitat in Anzali Wetland
1	Whiskered Tern	*Chlidonias hybrida*	Aquatic plant on the shallow water surface
2	Common Tern	*Sterna hirundo*	A small island on the water surface
3	Purple Heron	*Ardea purpurea*	Reed bed
4	Great Reed Warbler	*Acrocephalus arundinaceus*	Reed bed

Source: JICA Expert Team

a) Whiskered Tern *Chlidonias hybrid*

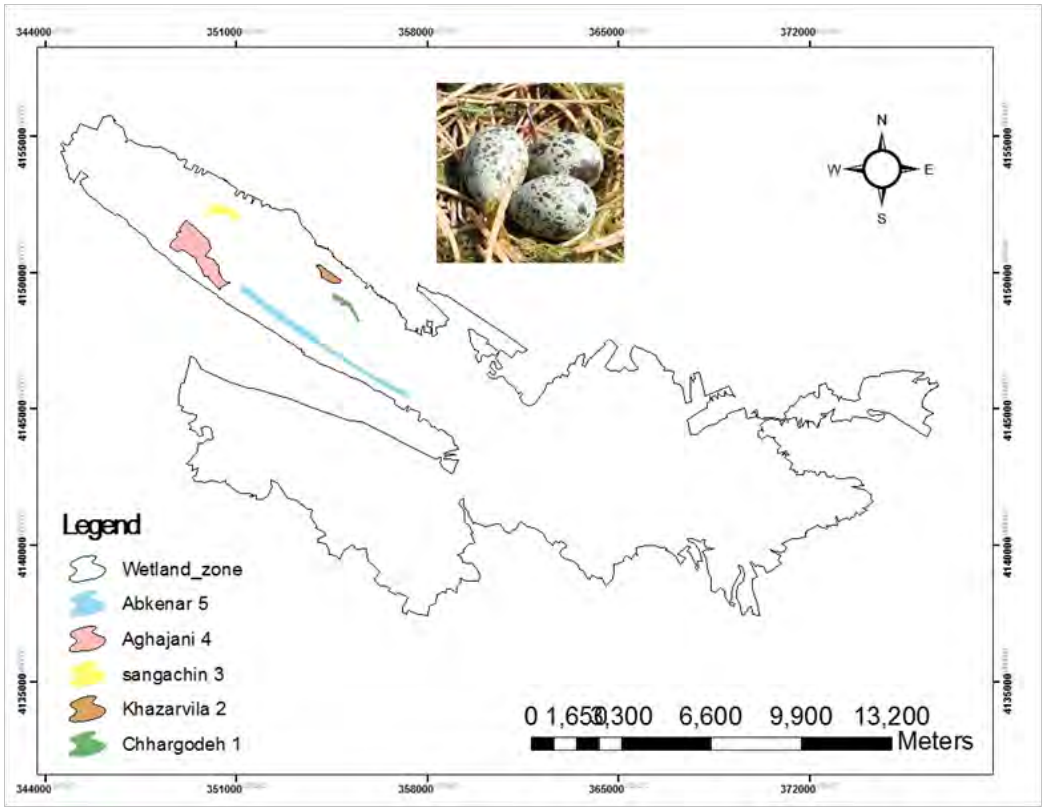
The survey counted 2,725 Whiskered Tern nests in an area of 418 ha in the western part of the Anzali Wetland. However, over 1% of the global population of this species was counted in the Anzali Wetland in this survey, which indicates the importance of Anzali Wetland in supporting this species generation.

The habitat condition has changed every year. After the survey in 2015, the breeding habitat was increased. The vast West Lagoon and Siahkeshim WR were suitable for the breeding of Whiskered Tern in 2016-2018.

Table 3.2-7 Nest Number of Whiskered Tern in 2015

Different parts of Anzali Wetland	Numbers of colony	Areas of the colony (ha)	Number of nests	Number of nest/ha
West of Anzali Wetland	Chahargoodeh (1)	16	172	10.75
	Khazarvila (2)	24	160	6.6
	Sangachin (3)	38	490	12.9
	Aghajani (4)	184	1006	5.5
	Abkenar (5)	156	897	5.75
East of Anzali Wetland	0	0	0	0
Center of Anzali Wetland	0	0	0	0
Siahkeshim	0	0	0	0
Total	**5**	**418**	**2725**	**6.5**

Source: Bird Survey, Dr. Moradi, et al., 2015 (Subcontracted by JET)

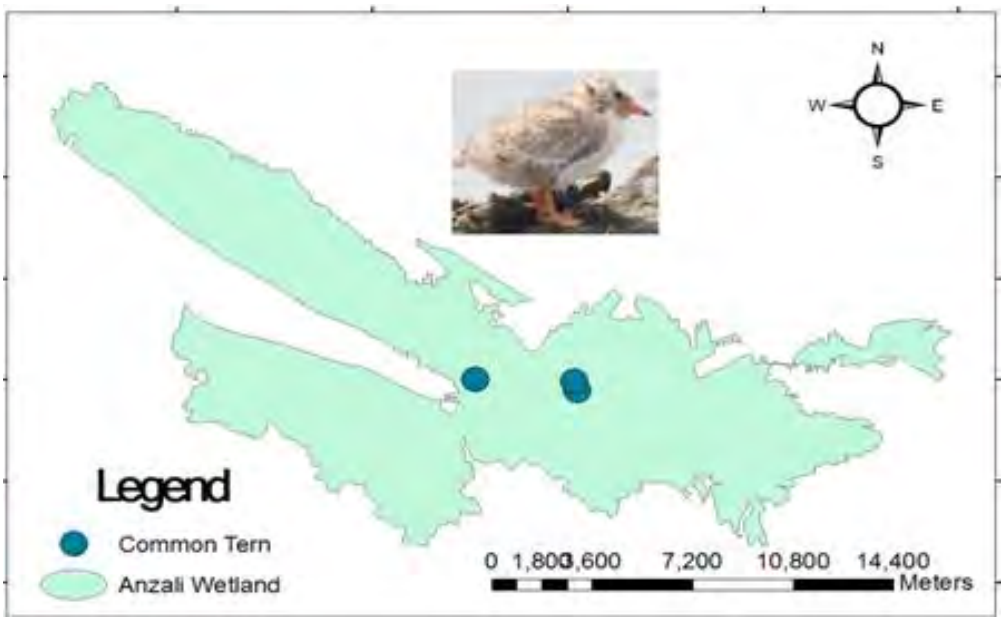


Source: Bird Survey, Dr. Moradi, et al., 2015 (Subcontracted by JET)

Figure 3.2-4 Distribution of Colony of Whiskered Tern

b) Common Tern

Totally five nests of Common Terns have been identified between spring and summer 2015. Two nests had been made on the floating reed mass with root in the central part of the Anzali Wetland, and three nests had been made at the edge of the western part of the Anzali Wetland in the sandy island. This sandy island was created due to the dredging of Mahroozeh entrance channel to the west lagoon in 2015.

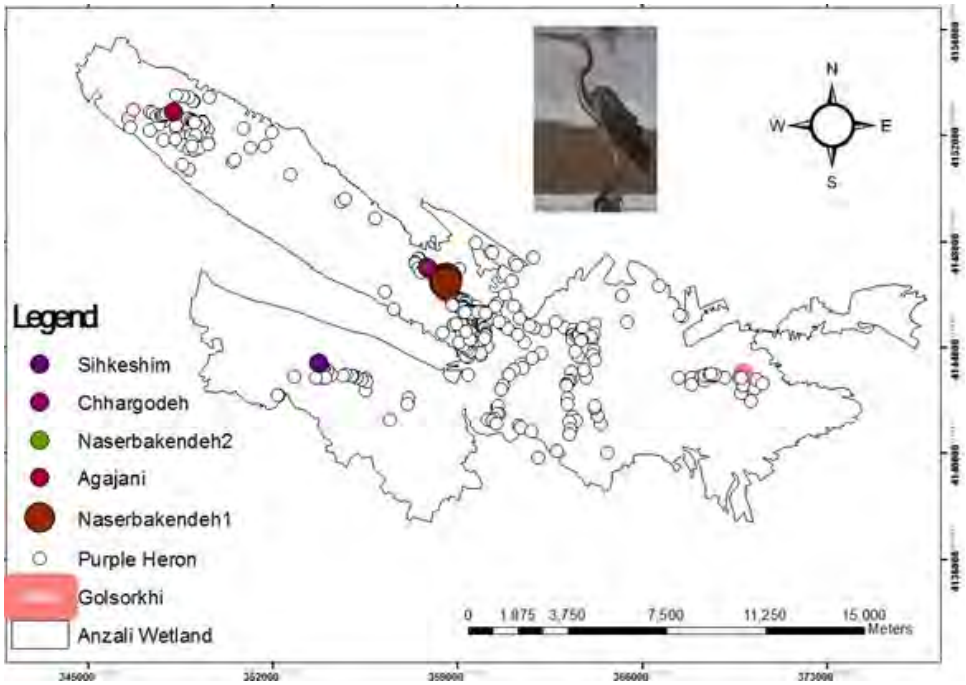


Source: Bird Survey, Dr. Moradi, et al., 2015 (Subcontracted by JET)

Figure 3.2-5 Distribution of Nest of Common Tern

c) Purple Heron

Six breeding colonies have been identified in three parts including western part of the wetland (4 colonies), the most point of eastern part (1 colony) and in Siahkeshim Protected Area in Abkenar (1 colony).

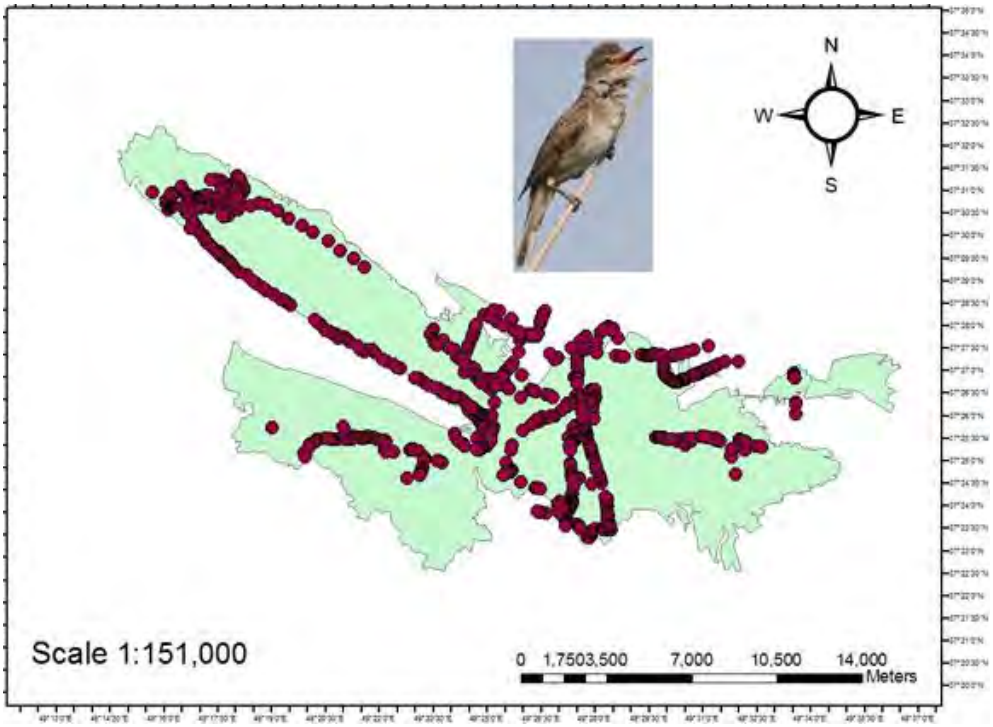


Source: Bird Survey, Dr. Moradi, et al., 2015 (Subcontracted by JET)

Figure 3.2-6 Distribution of Purple Heron and Its Nests

d) Great Reed Warbler

The survey counted 1,146 nests of Great Reed Warbler in the Anzali Wetland. It meant there were 2,292 pairs of Great Reed Warbler.



Source: Bird Survey, Dr. Moradi, et al., 2015 (Subcontracted by JET)

Figure 3.2-7 Distribution of Great Reed Warbler Nest

5) Satellite tracking of migratory birds

a) Objective

The Anzali Wetland is a very important habitat of migratory birds. Many birds are migrating to the other wetlands in the other countries. It is necessary to cooperate internationally. However, there is less information about the migration of birds. The migratory route of important birds should be identified.

b) Methodology

ARGOS system is a global satellite-based location and data collection system from Platform Terminal Transmitters (PTTs), PTTs dedicated to studying and protecting the planet's environment. The satellite catches radio wave from the PTTs and informs the coordinates of PTTs to users. Survey team tried a local method with the foot net which is used to catch the birds.

PTTs of ATX-1, which were produced by Nomad Science Inc. in Japan, and rings were attached to the captured birds which were released. And then the survey team received the coordinates of the tagged birds through the ARGOS website.

A satellite bird tracking survey of four Dalmatian Pelicans (*Pelecanus crispus*) as typical wintering waterbird in the Anzali Wetland was finished in May 2016. Additional Dalmatian Pelicans(DPs) survey was planned in 2017. However, the capturing of Pelicans was postponed due to an epidemic of avian influenza in 2017 and security matter in 2018 even though eight PTTs were produced. Only one immature Dalmatian Pelican was captured and tagged in 14th Mar 2019 because of the difficulty of capturing.

On the other hand, Purple Heron (*Ardea purpurea*) as a typical species of summering migrant breeding bird in the Anzali Wetland was selected as second target species. Purple Heron breeds in reed bed of the Anzali Wetland. It generally breeds in Iran including coast area of the Caspian Sea and winters in southern countries. It is very important to identify the wintering site and migration route of Purple Heron. The survey was implemented in 2017.

c) Result of the Dalmatian Pelicans Tracking

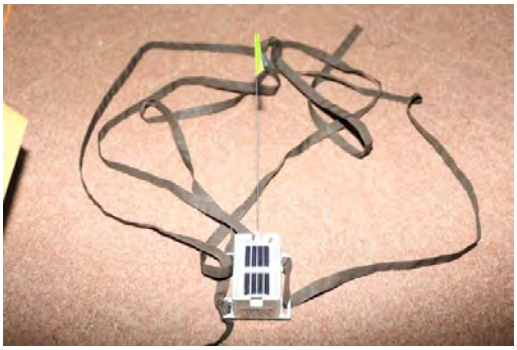
Three of DPs with their PTTs left the Anzali Wetland on 30 March 2016, and they were tracked till on 5th April 2016. All stopped over in the Ghizil-Agaj State Reserve, which is a Ramsar site in Azerbaijan.

DP-146024 reached to the wetland (Kizlyar Bay) along the coast of the Caspian Sea in the Russian Republic of Dagestan as of 28th Apr 2016. DP-146026 reached the wetland (Volga Delta, Ramsar Site) along the coast of the Caspian Sea in Astrakhan in Russia as of 12th May 2016. DP-146027 reached the wetland (Achiskiye Lakes) along the coast of the Caspian Sea in the Russian Republic of Dagestan as of 23rd Apr 2016. DP-146028 reached the wetland along the coast of the Caspian Sea in the Russian Republic of Kalmykia as of 3rd May 2016. All of DPs have already arrived at DP's breeding range based on the IBA (Important Bird Area) information by Birdlife International. However, all of DPs with PTT do not start to breed because they are immature and nomadic movements of DPs with PTT are reported from ARGOS. The tracked migration routes are shown in Figure 3.2-9. The signal from the released DP on 28 Feb as the trial was stopped for unknown reasons on 6 Mar.

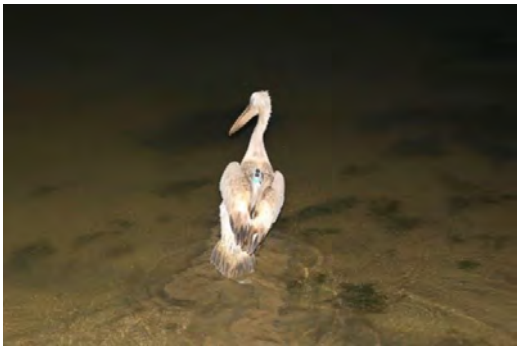
Additionally, only one immature Dalmatian Pelican was captured and tagged in Selkeh WR in 14th Mar 2019, the pelican (DP-165474) was still in the Sorkhankol WR as of 6th Mar 2019.

Local Foot trap

Attaching PTT



PTT (Nomad Science Inc. ATX-1) with Teflon ribbon



Released Pelican with PTT

Source: JICA Expert Team

Figure 3.2-8 Photos of Capturing Pelicans and Attaching PTT

Source: JICA Expert Team

Figure 3.2-9 Tracks of Dalmatian Pelicans with PTT in 2016

d) Result of the Purple Herons Tracking

The satellite tracking of Purple Heron was conducted by using three PTTs (light type of ATX-1 with 40 g) on 31 May 2017 and 1 June 2017. Three adults of Purple Heron were captured at a colony in reed bed in the west lagoon of the Anzali Wetland by foot trap. These three Purple Herons (ID165470, 165471, 165472) were tagged with PTT by the harness of Teflon ribbon and released immediately.

Source: JICA Expert Team

Figure 3.2-10 Purple Heron with Transmitter(PTT)

Source: JICA Expert Team

Figure 3.2-11 Map of Migration Route of Purple Heron by Satellite Tracking

The Heron (ID 1654740) left from the Anzali Wetland on 26 September 2017 and arrived at Izad Khast Dam Reservoir in Fars Province as wintering site about 700 km far from the Anzali Wetland on 13 November 2017 as shown in Table 3.2-8. The Heron is still staying there as of the end of April.

The Heron (ID165471) stayed in Anzali Wetland until 14 July 2017 and moved to Gizl Agaj State Reserve in Azerbaijan (Ramsar Site), and returned to the Anzali Wetland on 7 August 2017 as shown in Table 3.2-9. The summer of 2017 was very hot. Therefore the Heron might move to north across the border to avoid heat. The Heron stayed in the Anzali Wetland until 18 Dec. 2017 and then the signal was stopped. The reason is unknown.

The Heron (ID 1654742) started to migrate on 26 Sept. 2017 and arrived at Hawizeh Wetland on the border between Iran and Iraq about 700 km far from the Anzali Wetland on 7 Oct. 2017 as shown in Table 3.2-10. Hawizeh Wetland is identified as wintering site because the Heron stayed until signal stops.

It was clarified that ID165470 and ID165472 flew on their migration at night.

Table 3.2-8 Result of Satellite Tracking of Purple Heron (ID165470)

Date	Country	Province	Place
31 May - 7 Oct. 2017	Iran	Gilan	Anzali Wetland
8 Oct - 9 Nov. 2017	Iran	Gilan	Langrud
11 Nov. 2017	Iran	Qazvin	Rostam Abad Flood Plain
12 Nov. 2017	Iran	Markazi	Meyghan Salty Lake
13 Nov. 2017	Iran	Isfahan	Golpayegan
14 Nov. 2017– 30 Apr. 2018	Iran	Fars	Izad Khast Dam

Source: JICA Expert Team

Table 3.2-9 Result of Satellite Tracking of Purple Heron (ID165471)

Date	Country	Province	Place
31 May - 14 July, 2017	Iran	Gilan	**Anzali Wetland (Ramsar Wetland)**
15 Jul - 7 Aug, 2017	**Azerbaijan**	**Lenkeran**	**Gizl Agaj State Reserve (Ramsar Wetland)**
8 Aug - 14 Nov, 2017	Iran	Gilan	**Anzali Wetland (Ramsar Wetland)**

Source: JICA Expert Team

Table 3.2-10 Result of Satellite Tracking of Purple Heron (ID165472)

Date	Country	Province	Place
1 June - 25th Sep. 2017	Iran	Gilan	**Anzali Wetland (Ramsar Wetland)**
26 Sep. 2017	Iran	Lorestan	Dare-Bagh Dam
27 Sep - 4 Oct. 2017	Iran	Khozestan	Karkheh Wildlife Refuge
5 Oct - 6 Oct. 2017	Iran	Khozestan	Hoor al-Azim Wetland
7 Oct - 18 Dec. 2017	**Iraq**	**Maysan**	**Hawizeh Wetland (Ramsar Wetland)**

Source: JICA Expert Team

6) Reptile and Amphibian fauna survey

Different areas in/around the Anzali wetland were surveyed from the middle of March to the middle of September of 2018 by a survey team led by Dr. Dehdar, in cooperation with Mr.Mozaffari, Aria Herpetological Institute.

Fieldwork was a most for collecting data and for that we use two different methods: finding animal directly or finding their field signs including animal tracks, voices, shed skin and owl pellets. After finding the animal or its index, data was logged using digital cameras with GPS receiver. The coordinate data were extracted and imported to GIS for preparing distribution maps. Sample collection for suspicious species was done using mostly by bare hand also by a simple hand net and a snake hook. Pitfall traps for small reptiles in some habitats were set up. All animals were released after identification exactly at the same place. For the long-range survey, we used a binocular.

During the survey period, the survey team recorded three species of amphibian and 14 species of reptile in the Anzali Wetland summarized as the following tables. This checklist is the complete checklist of Anzali Wetland as of September 2018.

Table 3.2-11 Checklist of Reptiles in the Anzali Wetland in 2018

No	Order / Suborder	Scientific name	Common name	Farsi name
1	Cryptodira (Turtles & Tortoises)	*Emys orbicularis*	European Pond Turtle	اروپايي لاکپشت برکه‌اي
2		*Mauremys caspica*	Caspian Turtle	لاکپشت خزري
3		*Testudo graeca*	Spur-thighed Tortoise	لاکپشت مهميزدار
7	Lacertilia (Lizards)	*Lacerta strigata*	Caspian Green Lizard	خزري لاتاي سبز
8		*Darevskia chlorogaster*	Green-bellied Lizard	لاتاي شکم
9		*Cyrtopodion caspium*	Caspian Bent-toed Lizard	لاکپشت خميده خزري
10		*Pseudopus apodus*	European Glass Lizard	مار پوس
11		*Anguis colchica*	Slow Worm	مارمولک
12	Serpentes (Snakes)	*Natrix natrix*	Ringed Snake	ماربابي
13		*Natrix tessellata*	Dice Snake	مار پهن
14		*Zamenis longissimus*	Aesculapian Snake	مار درختي
15		*Elaphe dione*	Dione's Snake	مار ديون
16		*Dolichophis schmidti*	Fire Racer Snake	ماردشتي
17		*Platyceps najadum*	Dahl's Wipe Snake	مار سه‌خط

Source: Final Report of the Reptiles and Amphibians in Anzali Wetland, Omid Mozaffari. 2018
(Subcontracted by JET)

Table 3.2-12 Checklist of Amphibians in the Anzali Wetland in 2018

No	Order / Suborder	Scientific name	Common name	Farsi name
1	Anura (Frogs & Toads)	*Pelophylax ridibundus*	Marsh Frog	قورباغه مردابي
2		*Hyla orientalis*	Eastern TreeFrog	قورباغه درختي
3		*Rana pseudodalmatina*	Iranian Longlegged Frog	قورباغه جنگلي

Source: Final Report of the Reptiles and Amphibians in Anzali Wetland, Omid Mozaffari. 2018 (Subcontracted by JET)

Source: Omid Mozaffari(2019)

Figure 3.2-12 Reptiles and Amphibians in the Anzali Wetland

7) Fish fauna survey

The Anzali Wetland and inflowing rivers in the watershed were surveyed from Mar 2016 to Sep 2017 monthly by a survey team led by Dr. Abbasi, an expert of NIWAI. The sampling method was cast-net, hand hook, hand net and trolling. An electric shocker was used in the river as shown in the following figure. The checklist of fish is shown in the following table. As a result, 57 fish were recorded in the field survey in the Anzali Wetland and rivers in the watershed. Seventy-one (71) fish species were recorded in total in field survey and literature survey.

Source: JICA Expert Team

Figure 3.2-13 Fish Survey by NIWAI Team

Source: Keyvan Abbasi(2019)

Figure 3.2-14 Fish in the Anzali Wetland and Its Watershed

Table 3.2-13 Checklist of Fish in the Anzali Wetland and Watershed

No	Family	Scientific name	Farsi Name	2016-17	Wetland inside (W)	Anzali Rivers (R)	Wetalnd Estuary (E)	Native	Abundance in the habitat	Anadromous
1	Petromyzontidae	*Caspiomyzon wagneri*	کاسپین دمانگرد	✓	-	+	-	N	R	✓
2	Acipenseridae	*Acipenser persicus*	ت اس ماهی ایران					N	R	✓
3		*Acipenser stellatus*	ازون برون					N	R	✓
4	Anguillidae	*Anguilla anguilla*	مارماهی خاکی					A	E	✓
5	Clupeidae	*Alosa braschnikowi*	شگ ماهی براشنیکووی	✓	-	-	+	N	E	
6		*Alosa caspia*	کاسپین شگ ماهی	✓	■	-	+	N	E>W>R	
7		*Alosa kessleri*	شگ ماهی ماهاجر	✓	-	-	+	N	E>W	
8		*Clupeonella caspia*	کاسپین کیلکای	✓	-	+	-	N	E>W=R	
9	Cyprinidae	*Abramis brama*	ماهی سیم	✓	+	+	-	N	E=W>R	✓
10		*Alburnoides samiii*	عی اطه ماهی	✓	+	+++	-	E	W<R	
11		*Alburnus chalcoides*	شامکیلی	✓	++	++	++	N	E>W=R	✓
12		*Alburnus filippi*	مرواریدماهی کورا	✓	+	++	-	N	W<R	
13		*Alburnus hohenackeri*	مرواریدماهی قزاق	✓	++	++	+	N	W>R>E	
14		*Barbus cyri*	بارس ماهی کورا	✓	-	+	-	N	R	
15		*Blicca bjoerkna*	ماهی سیمین ماهی	✓	+++	+	+	N	W>E=R	
16		*Capoeta razii*	بزیاه ماهی رازی	✓	+	+++	+	E	E<W<R	
17		*Carassius auratus*	ماهی حوض رنگی	✓	+	+	-	O	W=R	
18		*Carassius gibelio*	ماهی حوض وحشی	✓	+++	++	+	A	W>R>E	
19		*Ctenopharyngodon idella*	کپور گیاهخوار	✓	+	+	-	A	E<W=R	
20		*Cyprinus carpio*	کپور معمولی	✓	+++	+	-	N,A	W>E>R	✓
21		*Hemiculter leucisculus*	بیاک یلی	✓	+++	++	+	A	E>W>R	
22		*Hypophthalmichthys molitrix*	کپور نقره ای	✓	+	+	-	A	W>E=R	
23		*Hypophthalmichthys nobilis*	کپور سرگنده	✓	+	-	-	A	W>E=R	
24		*Leucaspius delineatus*	ماهی جزنقره ای	✓	+	+	-	N	W>R	
25		*Leuciscus aspius*	ماهاش ماهی	✓	■	-	-	N	E=W<R	✓
26		*Luciobarbus capito*	بارس ماهی سرگنده	✓	+	+	-	N	E=W=R	✓
27		*Luciobarbus caspius*	کاسپین سس ماهی					N	E=W=R	
28		*Pelecus cultratus*	شمشیرماهی آبشوری ان					N	E=W	✓
29		*Pseudorasbora parva*	ماهی آمورن ما	✓	+	+	-	A	E<W=R	
30		*Rhodeus amarus*	ماهی مرجل یاه ای	✓	+	+	-	N	W>R	
31		*Rutilus caspicus*	کیلمه کاسپی مه	✓	+	+	+	N	E>W>R	✓
32		*Rutilus frisii*	کاسپین ماهی سفید	✓	+	+	++	N	E>R>W	✓
33		*Scardinius erythrophthalmus*	برخیاه	✓	++	+	-	N	W>E=R	
34		*Squalius turcicus*	ماهی سفید رودخانه ای	✓	+	++	-	N	E=W<R	
35	Cyprinidae	*Tinca tinca*	لای ماهی	✓	+	+	-	N	W=R	
36		*Vimba persa*	کاسپین سیاکیلی	✓	+	+	+	N	E>W=R	✓
37	Cobitidae	*Cobitis saniae*	وزنگرماهی سانیا	✓	++	+++	-	E	W=R	
38		*Sabanejewia caspia*	کاسپین وزنگرماهی	✓	++	+	-	N	W>E=R	
39	Nemacheilidae	*Oxynoemacheilus bergianus*	وزنگرماهی برگ	✓	-	+	-	E	R	
40	Siluridae	*Silurus glanis*	ایلیاه	✓	+	-	-	N	E=W=R	
41	Salmonidae	*Oncorhyncus mykiss*	قزل آلای رنگین کمان	✓	-	+	-	A	R	
42		*Salmo caspius*	کاسپین ماهی آزاد	✓	-	+	-	N	E=R	
43		*Salmo trutta*	قزل آلای خال قرمز					N	R	
44	Esocidae	*Esox lucius*	اردک ماهی	✓	++	+	+	N	W>R>E	
45	Gobiidae	*Benthophilus ctenolepidus*	مرس کتف اف					N	E	
46		*Benthophilus leobergius*	مرس کپت اره ای	✓	-	-	+	N	E	
47		*Knipowitschia caucasica*	گاوماهی قزقاز	✓	+	-	+	N	E<W	
48		*Neogobius caspius*	کاسپین گاوماهی	✓	-	-	++	N	E	
49		*Neogobius melanostomus*	گاوماهی گرد	✓	+	-	++	N	E>W	
50		*Neogobius pallasi*	گاوماهی شنی	✓	-	-	+++	N	E	
51		*Ponticola bathybius*	گاوماهی عمق زی					N	E	
52		*Ponticola goebelii*	گاوماهی زنان					N	E=W	
53		*Ponticola gorlap*	گاوماهی سرگنده	✓	+	+	-	N	E=W>R	✓
54		*Ponticola iranicus*	گاوماهی ایران	✓	+	+++	-	E	E<W<R	
55		*Ponticola syrman*	گاوماهی سیرمان					N	E=W	
56		*Proterorhinus nasalis*	گاوماهی بینی لوله ای	✓	+	+	-	N	W>E=R	
57		*Rhinogobius lindbergi*	گاوماهی خال گوی وس	✓	+	+	-	A	W=R	
58	Mugilidae	*Chelon auratus*	کفال طلایی	✓	-	-	+++	A	E	
59		*Chelon saliens*	کفال پوزه برآمک	✓	++	+	+++	N	E>W>R	
60	Atherinidae	*Atherina caspia*	گل آفتاب ماهی	✓	+	-	+++	N	E>W>R	
61	Poeciliidae	*Gambusia holbrooki*	ماهی گامبوزیا	✓	+++	++	-	A	E<W=R	
62	Syngnathidae	*Syngnathus caspius*	زی ماهی سوزن ماهی	✓	+	-	+	N	E=W	
63	Percidae	*Perca fluviatilis*	پرو خاچی طرخان	✓	+	-	-	N	W=R	
64		*Sander lucioperca*	پرو سفید	✓	■	-	■	N	E>W>R	✓
65		*Sander marinus*	پرو سیاه	✓	-	-	■	N	E	
66	Gasterosteidae	*Gasterosteus aculeatus*	ماهی سه خاره	✓	+	-	+	A	E>W=R	
67		*Pungitius platygaster*	ماهی نه خاره	✓	-	-	+	N	E=W	
68	Poeciliidae	*Poecilia reticulata*	ماهی گوپی					O	W=R	
69	Channidae	*Channa micropeltes*	ماهی سرماری					O	W	
70	Pangasiidae	*Pangasius sanitwongsei*	پنگاسیوس بانکاله					O	W	
71	Loricariidae	*Hypostomus plecostomus*	گربه ماهی زره دار					O	W	
Total				57	37+3	38	24+2	E:5 N:49 A:13 O:5	—	15
					57					

2016-2017/ ✓ Recorded in Field Suvery by NIWAI as JPA

Negative Mark (-) /Sign of Absence, Positive Mark (+) Sign of presence and the number of positive signs indicate the amount of presence in field surv

Square Mark (■) indicates the caught fish which were purchased from fishermen in the survey.

Natve/ N:native species, E: Endemic species, A: alien species, O: ornament fish

Abundance in the habitat/ R:river, W:wetland, E:estuary

Anadroumous/ ✓: anadromous fish

Source：Report on Fish abundance and reproduction biology in Anzali wetland and its inlet rivers, Keyvan Abbasi NIWAI. 2018

8) Flora survey

The comprehensive flora survey in the Anzali Wetland has not been implemented in the Project, even though the flora survey was on the action plan at the beginning of the project. The limited field survey of the aquatic plant was implemented to grasp the Anzali Wetland Environmental Education Center in Selkeh Wildlife Refuge in autumn in 2018. The survey recorded 50 vascular plant species as shown in Table 3.2-13. That was limited field survey of the plant only in Selkeh Wildlife Refuge in unappropriated season. Sixteen new plant species were recorded in addition to previous studies. It means the previous studies of the plant were not enough to grasp the flora of the Selkeh Wildlife Refuge.

According to Dr.Bahram Zehzad, 360 vascular plant species have been recorded by previous studies in the Anzali Wetland. Many studies about the plant were implemented before the Project. However, all of them was not enough to grasp the flora of the Anzali Wetland because there is no record of some common species in the Anzali Wetland. The flora of the Anzali Wetland must be more diverse and richer. Therefore, all season comprehensive vascular plant survey should be implemented as soon as possible.

Source: Zehzad and Mirzajani(2019)

Figure 3.2-15 Plants in Selkeh Wildlife Refuge

Table 3.2-14 Checklist of Vascular Plant in Selkeh WR in the Anzali Wetland

No	Family	Species (Scientific Name)	Previous studies	2018 study
1	Adoxaceae	*Sambucus ebulus*	+	+
2	Alismataceae	*Alisma plantago-aquatica*	+	
3	Amaranthaceae	*Amaranthus retroflexus*	+	
4		*Chenopodium album*	+	+
5		*Dysphania ambrosioides*		+
6		*Dysphania botrys*	+	
7	Apiaceae	*Berula erecta*	+	
8		*Eryngium caucasicum*	+	+
9		*Torilis japonica*	+	
10		*Spirodela polyrrhiza*	+	+
11		*Wolffia arrhiza*	+	
12	Araliaceae	*Hydrocotyle ranunculoides*	+	
13	Betulaceae	*Alnus glutinosa*	+	+
14	Brassicaceae	*Biscutella didyma*	+	
15		*Briza minor*	+	
16		*Capsella bursa-pastoris*	+	
17		*Cardamine hirsuta*	+	
18	Boraginaceae	*Myosotis anomala*	+	
19		*Myosotis scorpioides*	+	
20	Brassicaceae	*Nasturtium officinale*	+	
21		*Rorippa islandica*	+	
22		*Sisymbrium irio*	+	
23		*Typha latifolia*	+	+
24	Butomaceae	*Butomus umbellatus*	+	
25	Ceratophyllaceae	*Ceratophyllum demersum*	+	+
26	Caryophyllaceae	*Stellaria holostea*	+	
27		*Stellaria media*	+	
28	Compositae	*Artemisia annua*	+	+
29		*Artemisia vulgaris*	+	+
30		*Bidens tripartita*	+	+
31		*Centaurea iberica*	+	
32		*Conyza canadensis*	+	+
33		*Eclipta prostrata*		+
34		*Senecio leucanthemifolius*		+
35		*Silybum marianum*	+	
36		*Sonchus oleraceus*	+	
37		*Xanthium strumarium*	+	+
38		*Symphyotrichum squamatum*	+	+
39	Convolvulaceae	*Calystegia sepium*	+	
40	Cyperaceae	*Carex remota*	+	
41		*Carex riparia*	+	
42		*Cladium mariscus*	+	
43		*Cyperus longus*	+	+
44		*Cyperus rotundus*	+	
45		*Schoenoplectus lacustris*		+
46		*Schoenoplectus tabernaemontani*	+	
47	Dennstaedtiaceae	*Pteridium aquilinum*	+	
48	Equisetaceae	*Equisetum arvense*	+	
49	Haloragaceae	*Myriophyllum spicatum*		+
50		*Myriophyllum verticillatum*	+	
51	Hydrocharitaceae	*Hydrilla verticillata*	+	
52		*Najas marina*		+
53	Iridaceae	*Iris pseudacorus*	+	
54	Juncaceae	*Juncus bufonius*	+	
55		*Juncus effusus*	+	+
56	Lamiaceae	*Mentha aquatica*	+	
57	Leguminosae	*Gleditsia caspia*		+
58		*Lemna minor*	+	
59		*Lemna trisulca*	+	
60		*Melilotus officinalis*	+	
61	Leguminosae	*Trifolium fragiferum*	+	
62		*Trifolium repens*	+	
63	Lythraceae	*Lythrum salicaria*	+	
64		*Trapa natans*	+	+
65	Malvaceae	*Abutilon theophrasti*		+
66	Marsileaceae	*Marsilea quadrifolia*	+	
67	Menyanthaceae	*Nymphoides cristata*		+
68		*Nymphoides indica*	+	
69	Nelumbonaceae	*Nelumbo nucifera*	+	+
70	Onagraceae	*Epilobium hirsutum*	+	
71		*Ludwigia palustris*	+	
72		*Lycopus europaeus*	+	
73	Oxalidaceae	*Oxalis corniculata*	+	
74	Phytolaccaceae	*Phytolacca americana*	+	+
75	Plantaginaceae	*Plantago major*	+	
76		*Veronica persica*	+	+
77		*Veronica polita*	+	
78	Poaceae	*Avena fatua*	+	
79		*Cynodon dactylon*		+
80		*Digitaria ischaemum*	+	+
81		*Echinochloa crus-galli*	+	+
82		*Lolium persicum*	+	
83		*Microstegium vimineum*	+	
84		*Paspalum dilatatum*	+	+
85		*Paspalum paspaloides*	+	+
86		*Phalaris minor*	+	
87		*Phleum phleoides*	+	
88		*Phragmites australis*	+	+
89		*Poa trivialis*	+	
90		*Setaria viridis*		+
91		*Vulpia myuros*	+	
92	Polygonaceae	*Fallopia convolvulus*	+	
93		*Persicaria hydropiper*	+	
94		*Persicaria lapathifolia*		+
95		*Polygonum aviculare*	+	
96		*Rumex conglomeratus*	+	+
97	Potamogetonaceae	*Potamogeton crispus*	+	+
98		*Potamogeton perfoliatus*		+
99		*Stuckenia pectinata*	+	+
100		*Potamogeton nodosus*		+
101	Ranunculaceae	*Batrachium trichophyllum*	+	
102		*Ranunculus marginatus*	+	
103		*Ranunculus repens*	+	
104		*Ranunculus sceleratus*	+	+
105	Rosaceae	*Potentilla reptans*		+
106		*Rubus caesius*	+	
107		*Rubus persicus*	+	
108		*Rubus sanctus*	+	+
109		*Galium aparine*	+	
110	Salicaceae	*Populus caspica*	+	+
111		*Salix alba*	+	+
112	Salviniaceae	*Azolla filiculoides*	+	
113		*Salvinia natans*	+	
114	Solanaceae	*Datura stramonium*	+	
115		*Solanum dulcamara*	+	
116		*Solanum nigrum*	+	+
117	Taxodiaceae	*Taxodium distichum*		+
118	Thelypteridaceae	*Thelypteris palustris*	+	
119	Typhaceae	*Sparganium erectum ssp. neglectum*	+	+
120	Urticaceae	*Urtica dioica*	+	+
		Total 120 taxa	104	50

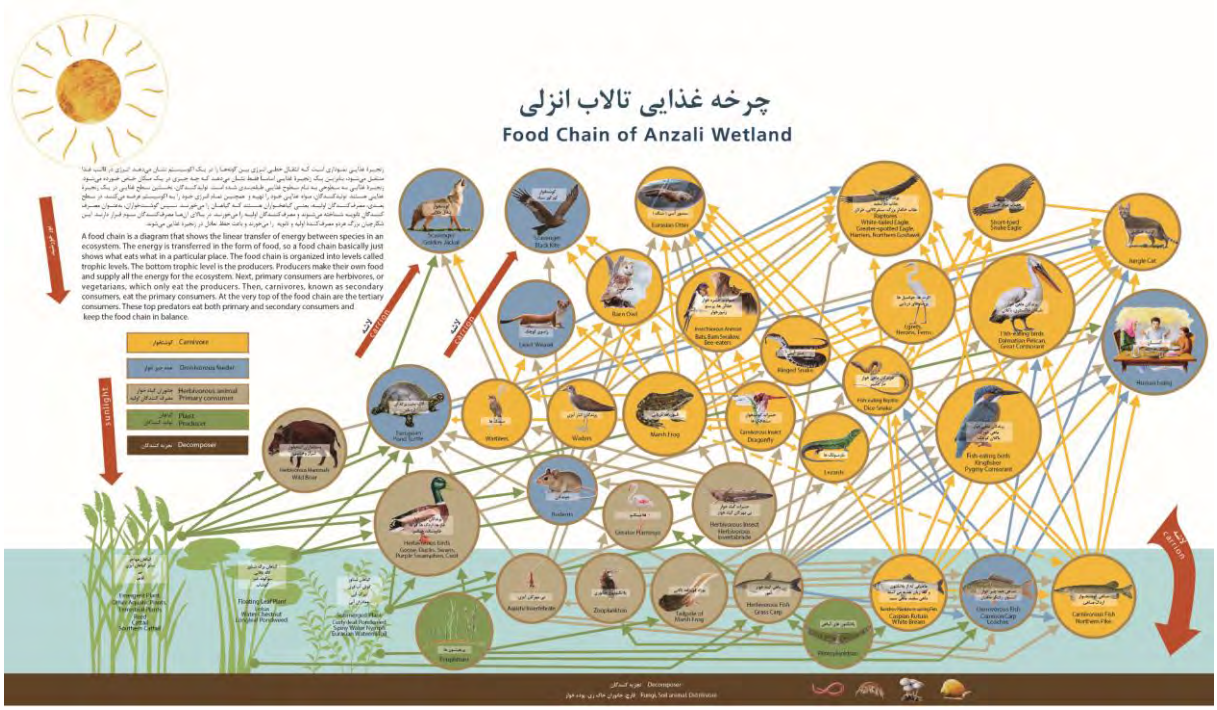
Source : Aquatic Plants Survey in Selkeh Wildlife Refuge, Bahram Zehza and Alireza Mirzajani(2019) (Subcontracted by JET)

8) The other fauna and flora

Insect, benthos, zooplankton, and phytoplankton survey have not been implemented in the Project, even though these surveys were on the action plan as part of comprehensive ecosystem survey as a joint pilot activity at the beginning of the Project.

9) Ecosystem

Chart of the food chain of the Anzali Wetland is shown in Figure 3.2-16. It is very complicated even though the chart shows only typical species in the Anzali Wetland. There are many predator animals as the top level of ecosystem pyramid. It means the wetland forms a very rich ecosystem based on the production of many plants. Also, the biomass of the Marsh Frog is very large, and many other animals including fish eat Marsh Frog in the Anzali Wetland. It is notable that Marsh Frog plays a very important role as a food resource in the Anzali Wetland Ecosystem. Local people get food from the Anzali Wetland as well. Local people eat many Coot, Ducks, Fish and Herb from the Anzali Wetland.



Source: JICA Expert Team

Figure 3.2-16 Food Chain of the Anzali Wetland

(4) JPA-2: Monitoring of the natural environment in the Anzali Wetland

In order to grasp the current situation of the wetland ecosystem, some indicator species should be selected based on the result of the comprehensive ecosystem survey.

As above-mentioned, the comprehensive ecosystem survey has not completed in the project. Therefore, it was difficult to select appropriate indicators. Limited monitoring has been implemented.

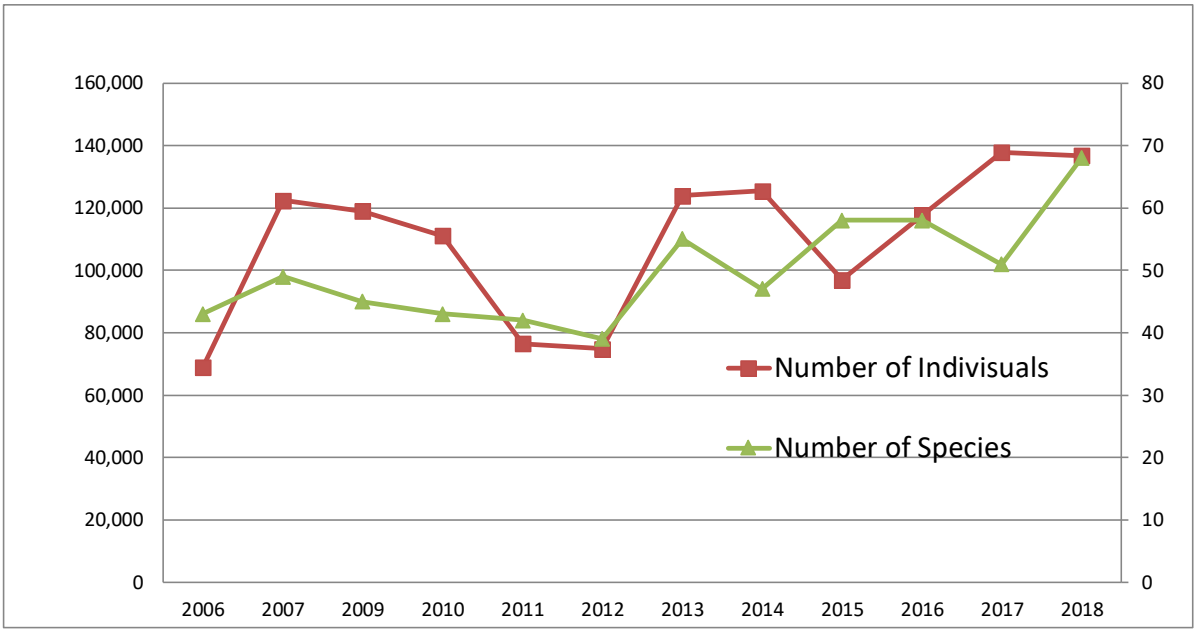
Table 3.2-15 Implementation Schedule of JPA-2
(Monitoring of the natural environment in the Anzali Wetland)

Activities		2015		2016		2017				2018				2019			Remarks
		1394				*1395*				*1396*				*1397*			
		2nd Year				**3rd Year**				**4th year**				**5th year**			
		Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	
Preparation of monitoring plan	Plan																
	Actual																
Review of related data and information	Plan																
	Actual																
Implementation of a tentative monitoring program	Plan																
	Actual																
Review of the monitoring data and prepartion of monitoring reports	Plan																
	Actual																
Wintering bird monitoring	Plan																Implemented by DOE Gilan
	Actual																
Implementation of breeding bird monitoring	Plan																Only breeding bird survey as a part of comprehensive ecosystem suvery was completed.
	Actual																
Implementation of fish monitoring	Plan																Only fish suvery as a part of comprehensive ecosystem suvery was completed.
	Actual																
Implementation of benthos monitoring	Plan																Any benthos suvery has not beeen implemented.
	Actual																

Source: JICA Expert Team

1) Wintering bird monitoring

DOE has been implemented the "International Waterbird Census (IWC)" based on the protocol of Wetland International. The result of the monitoring is shown in the following figure. It is very important information to check the health of the wetland ecosystem as a wintering bird habitat. Some of the questionnaires of RIS can be filled by using the result of this IWC monitoring. IWC monitoring must be implemented every mid-winter.



Source: JICA Expert Team prepared by using the data of DOE midwinter bird counting

Figure 3.2-17 Trend of Waterbirds in Midwinter in the Anzali Wetland

2) Monitoring by using visual observation tool

This monitoring was not included in the action plan at the beginning of the project.

Visual materials are an effective tool for any stakeholder to understand the current situations and issues of the Anzali Wetland quickly and adequately. Visual materials are very useful not only for presentation but also for a database of wetland information for WEC such as seasonal landscape change, vegetation succession, water level fluctuation, sedimentation deposit and activity progress of the survey area. Visual observation tools of wetland ecosystem support activities of WEC SC and other SCs.

a) GigaPan Photograph

GigaPan is gigapixel panoramic digital images with billions of pixels. The image of the GigaPan is huge panorama with fascinating details, all captured in the context of a single brilliant photo. Survey areas were typical areas such as Selkeh Wildlife Refuge. The gigapixel photos have been regularly taken to grasp the visual change of the survey areas. The gigapixel panoramic images can be seen on the website http://anzaliwetland.com or http://gigapan.com/profiles/Anzaliwetland/".

22 Aug 2014

19 Dec 2014

8 Mar 2015

27 Nov 2015

18 Mar 2016

12 May 2016

2 Dec 2016

6 June 2017

2 Feb 2018

23 Aug 2018

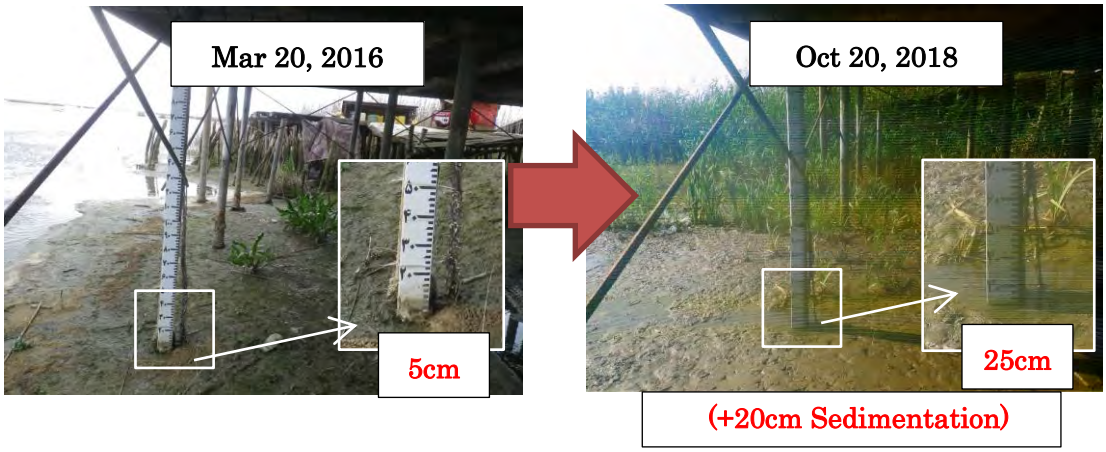
1 Feb 2019

Source: JICA Expert Team

Figure 3.2-18 Gigapixel Panoramas from Selkeh Bird Watching Tower

b) Time-lapse photo

Time-lapse cameras have been set in the Sorkhankol Wildlife Refuge. Waterproof time-lapse cameras have continually taken a photo every 90 minutes. The first purpose of the time-lapse photo at Sorkhankol WR was to monitor the water level fluctuation. However, the time-lapse photo also recorded a sedimentation deposit as shown in the following figure.



Source: JICA Expert Team

Figure 3.2-19 Sedimentation Deposit at Sorkhankol GS by Time-lapse Photo

c) Aerial photo and video by multi-copter

Multi-copters (DJI Phantom 4) took aerial photos and videos. The target area is all the Anzali Wetland. Many photos and videos were taken in the project. Typical aerial photos of the Anzali Wetland as shown in the following figure.

Selkeh WR on 19th Oct 2018 | **Chokum WR on 19th Oct 2018**

Sorkhankol WR on 11th Feb 2018 | **Pirbazar River and Pasikhan River on 25th May 2018**

Source: JICA Expert Team

Figure 3.2-20 Typical Aerial Photos of the Anzali Wetland

3) Necessity of the monitoring of restoration activities

Wetland ecosystems are very complicated. Nobody knows how the ecosystem would respond particularly to restoration/conservation activities such as dredging. However, some of the restoration activities were not monitored during the project period. Adaptive management is an organized system of learning designed to reduce uncertainty in ecosystem management. Dredging site has many various environmental factors such as vegetation, water depth. Correlation between environment factors and biodiversity factor by analyzing the monitoring data, DOE can make adaptive management plan.

(5) JPA-3: Wetland Conservation and Restoration Activity

This activity is implemented in order to secure the balance of the Anzali Wetland ecosystem by solving many issues such as drying of the wetland and succession of the vegetation, invasion by alien species, and fragmentation of ecological (river) network by dams based on the result of the comprehensive ecosystem survey.

Table 3.2-16 Implementation Schedule of JPA-3
(Wetland Conservation and Restoration Activity)

Activities		2015		2016		2017				2018				2019			Remarks
		1394		*1395*				*1396*				*1397*					
		2nd Year				**3rd Year**				**4th year**				**5th year**			
		Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	
Preparation of action plan	Plan																
	Actual																
Restoration of open water in drying Area	Plan																DOE dredged the Selkeh WR to restore the water surface out of JPA.
	Actual																
Management of vegetation succession	Plan																
	Actual																
Control of Alien Species	Plan																Water Hyacinth was detected in 2015 and atarted the removal activities.
	Actual																
Construction of Fishway	Plan																
	Actual																

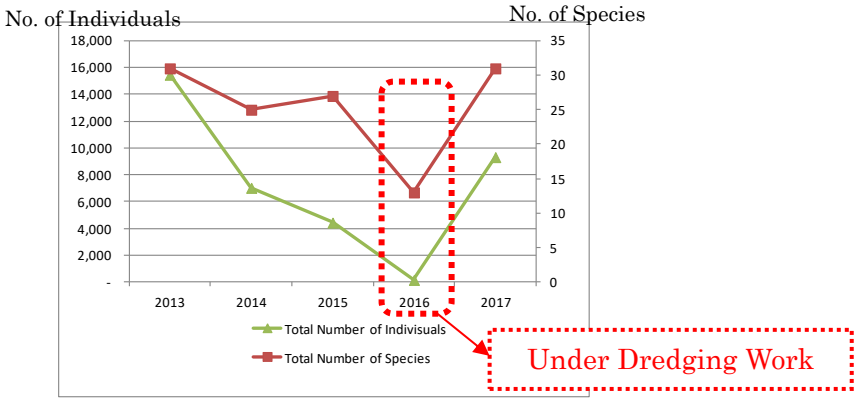
Source: JICA Expert Team

1) Restoration of open water in the drying area

Any restoration activities of open water in the drying area have not been implemented as JPA under the project. DOE Gilan dredged a part of the Selkeh Wildlife Refuge to restore the water body due to water drawdown. DOE Gilan has not been conducted any specific monitoring program for the dredging work. However, the bird survey of comprehensive ecosystem survey as a JPA recorded waterbirds and DOE Gilan conducted regular waterbird census every in mid-winter in Selkeh. Therefore, the general trend of waterbird can be seen from these data. The

number of species and individuals were drastically decreased during dredging works. After the dredging works, water body came back, and waterbirds were almost recovered in the winter of 2017 as shown in the following figure. A pump station was constructed and started to pump up water from the river to Selkeh Wildlife Refuge during summer of 2017. Vegetation was grown in water area in the summer of 2017 and water area was covered again by vegetation. Habitat type is always changing. Many waterbirds such as Mallard stayed in Selkeh Wildlife Refuge in winter of 2018. However, the roosting Pelicans were decreased in Selkeh compare with that in 2017 because of the vegetation growth.

The dredging activities were partially succeeded because the waterbird habitat came back by the restoration of the water area. However, the lack of an appropriate plan of dredging and no adaptive management based on the monitoring could not maximize the effectiveness of the activity.

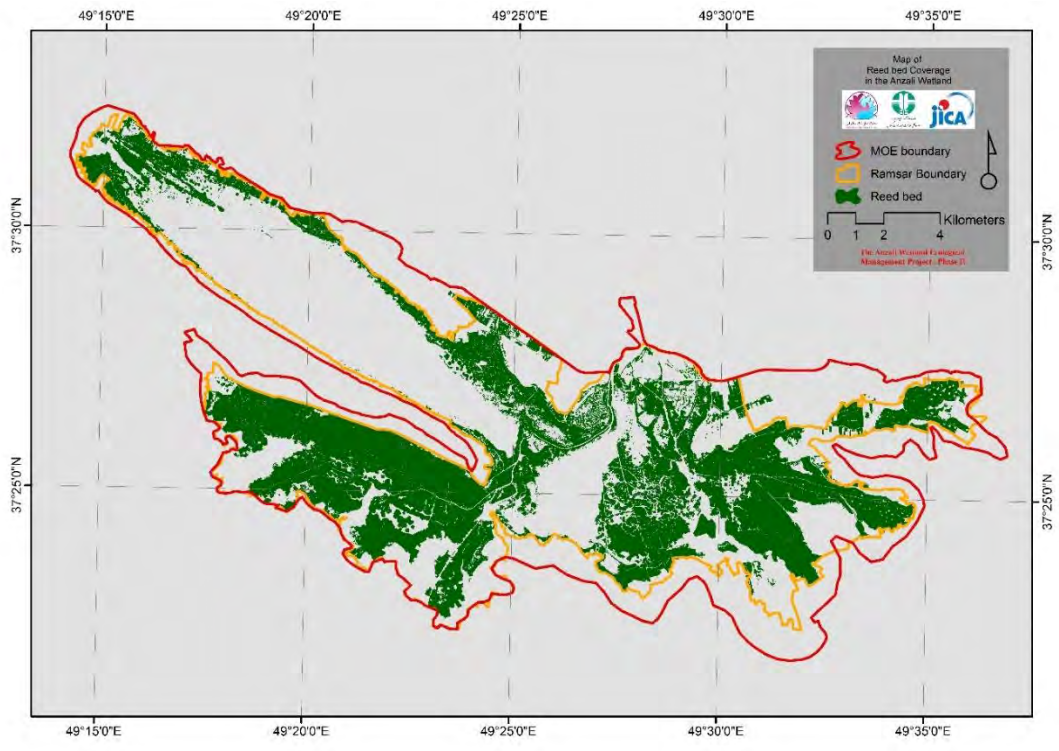


Source: Prepared by JET based on the result of DOE waterbird monitoring (except 2015) and bird survey as comprehensive ecosystem survey (January 2015)

Figure 3.2-21 Waterbird Monitoring in Mid-winter in Selkeh

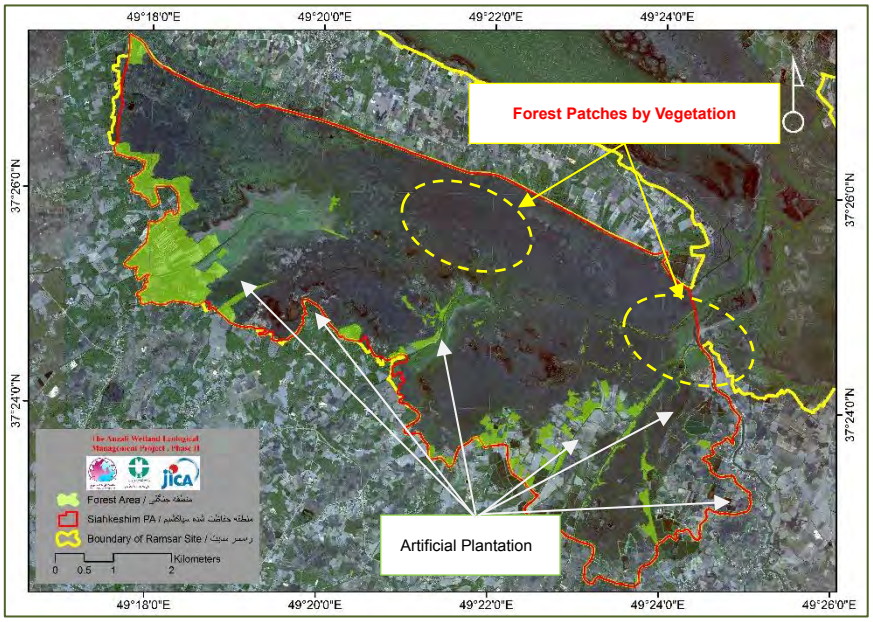
2) Management of vegetation succession

Almost half of the wetland is reed bed. Sometimes reed bed is considered as an indicator of drying. However, reed bed is one of the most important habitats of the Anzali Wetland. For example, Marsh Harrier, Purple Heron, and Purple Swamphen are breeding in Reed bed. Same area (9,200 ha) of Reed bed and the other aquatic plant community as of 2018 must be conserved as a component of mosaic habitat as shown in Figure 3.2-22. If the reed bed will successes to forest vegetation, the forest should be cut or removed. For example, there is some forestation of reed bed in Siakeshim PA in Figure 3.2-23 and Figure 3.2-24. Now the vegetation succession to forest looks slow.



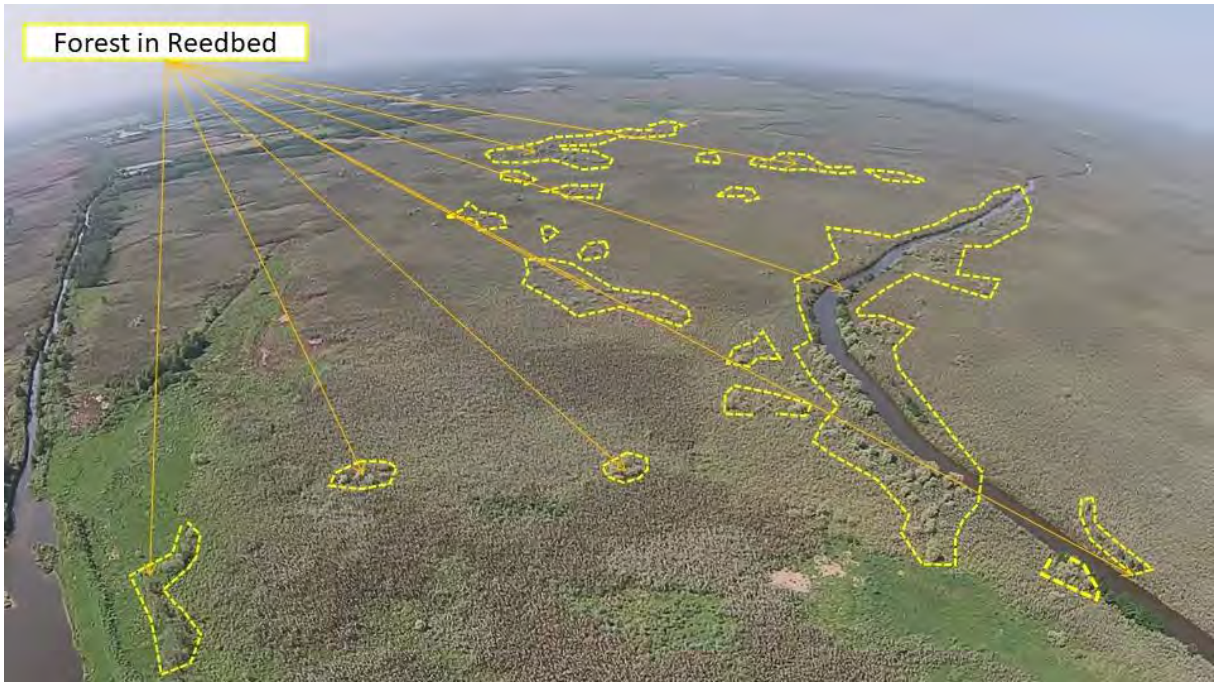
Source: JICA Expert Team

Figure 3.2-22 Reedbed of the Anzali Wetland as of 2018



Source: JICA Expert Team

Figure 3.2-23 Map of Forest in Reedbed of Siahkeshim PA as of 2018



Source: JICA Expert Team

Figure 3.2-24 Vegetation Succession to Forest from Reedbed in Siahkeshim PA (11th Sep 2014)

3) Control of Alien Species

Alien species is one of the most important issues to be solved in the Anzali Wetland.

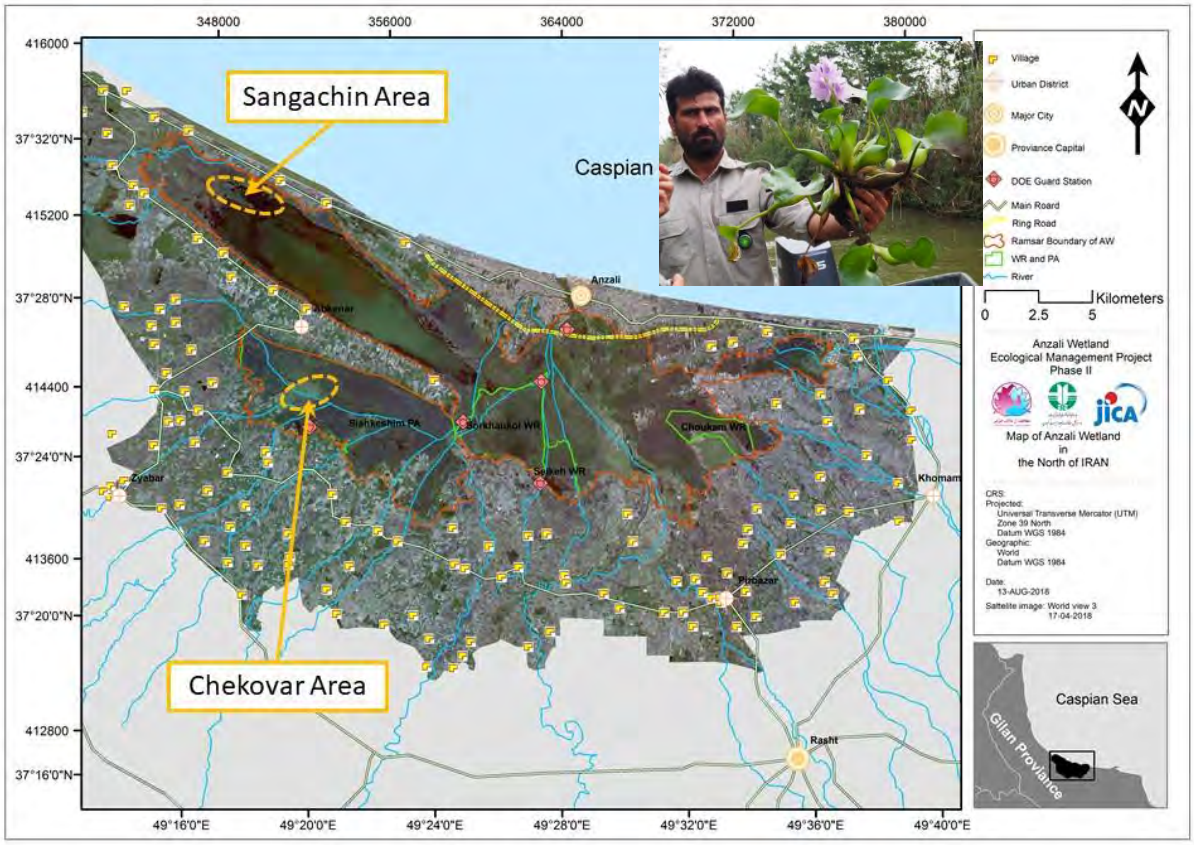
3-1) 100 of The World's Worst Invasive Alien Species (IUCN) in Anzali Wetland

IUCN listed "100 of the World's Worst Invasive Alien Species" which illustrates the incredible variety of species that have the ability, not just to travel in ingenious ways, but also to establish, thrive and dominate in new places. Today, the alien invasion is second only to habitat loss as a cause of species endangerment and extinction. Following three species of the 100 of the World's Worst Invasive Alien Species were introduced or potentially introduced to the Anzali Wetland.

a) Water Hyacinth (*Eichhornia crassipes*)

Water Hyacinth is an exotic free-floating aquatic plant from the Amazon River basin in tropical South America. It was firstly found Chekoval area in the Anzali Wetland on the bird survey in July 2015. It could cause many problems not only to the ecosystem but also to human life. Water Hyacinths were quickly spread in West Lagoon and Siahkeshim Protected Area and Central Area. And then many removal activities have been implemented by DOE and relevant organizations in cooperation with JET. A small number of Water Hyacinth is remained in Chekovar area and Sangachin area as of 2018 as shown in Figure 3.2-25. It is not easy to eradicate WH. However, it is not so difficult to manage as low-density situation. WH must be a

very low-density situation by frequent monitoring and removal. Considering this condition, the most effective and efficient method of Water Hyacinth in this situation is manual removal. The best way is frequent monitoring and small scale removal at low cost.



Source: JICA Expert Team

Figure 3.2-25 Important Areas for Water Hyacinth Control in the Anzali Wetland

b) Domestic Cat (*Felis catus)*

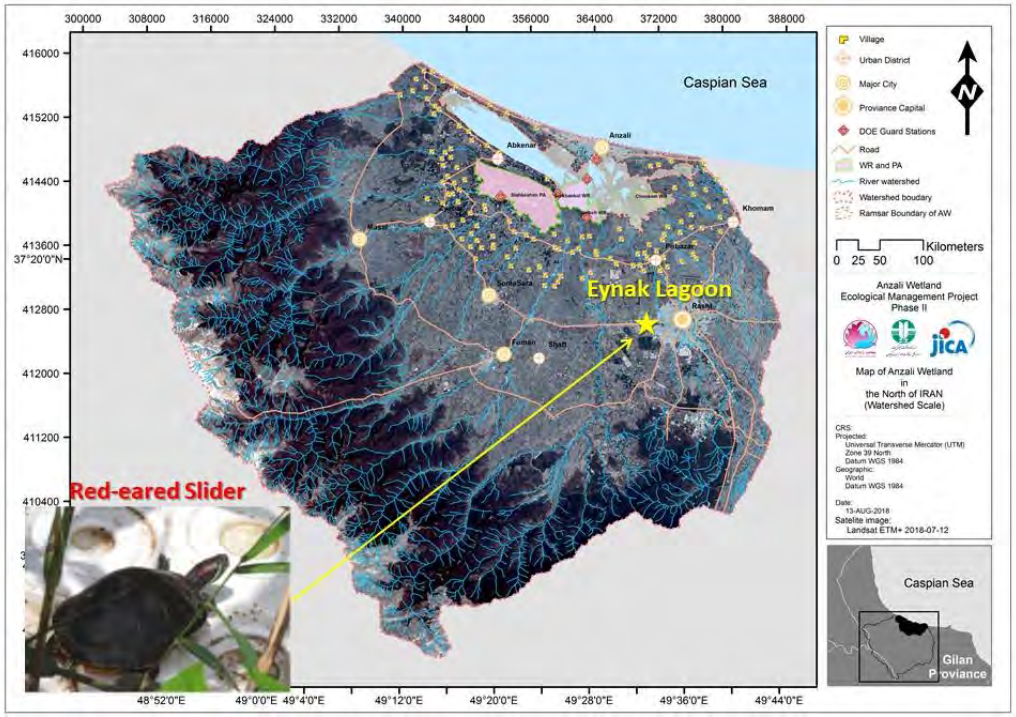
Domestic Cat is often forgettable to consider as notable predators which threaten native birdlife and other fauna. Especially, crossbreeding with free-ranging Domestic Cats is supposed to threaten the genetic integrity of Asiatic Wildcat(*Felis silvestris*) population. However, genetic study of Asiatic Wildcat in the Anzali Wetland has not been implemented. Therefore the information is not enough for the conservation of Asiatic Wildcat population. There are many Domestic Cat in the Anzali Wetland including protected areas. The genetic study should be implemented as soon as possible.

Source: JICA Expert Team

Figure 3.2-26 Camera-trapped Domestic Cat in Selkeh Wildlife Refuge

c) Red-eared Slider (*Trachemys scripta*)

Terrible Invasive Alien reptile, Red-eared Slider was found in Eynak Lagoon, the catchment area of the Anzali Wetland in 2018 as shown in Figure 3.2-27. Red-eared Slider was listed on the worst 100 alien species of IUCN. It is a very high potential threat of native turtles in the Anzali Wetland. Fortunately, Red-eared Slider was not recorded in our reptile survey in the Anzali Wetland in 2018. On the other hand, there is an unconfirmed report that Red-eared Slider has been observed in Anzali Wetland. Red-eared Slider must be removed from the entire area of the Anzali Wetland basin.



Source: JICA Expert Team (photo by Omid Mozaffari (2018))

Figure 3.2-27 Map of Eynak Lagoon Red-eared Slider (*Trachemys scripta*)

3-2) The Other Alien Species

a) Azolla (Azolla filiculoides)

Water fern, Azolla was introduced into Caspian Sea wetlands by rice-farmers in the 1970s. Azolla covered much of the water surface within the reedbed and Lotus community and open water surface for a long time with periodic increasing and decreasing.

JET started to cooperate with local farmers to utilize Azolla as a feed for Ostrich. Surprisingly Azolla was dramatically decreased in the summer of 2017 without any removal measures. In Sangachin area, west part of the west lagoon, very small amount of Azolla remained The Azolla would be increased again from the small remained flocks. After that, the signs of Azolla's increasing were found in West Lagoon and Sorkhankol Wildlife Refuge again. Therefore, it is very difficult to remove Azolla from the Anzali Wetland. Monitoring must be continued, and the utilization of Azolla paper production and feed for livestock such as Ostrich should be considered and started.

Source: JICA Expert Team

Figure 3.2-28 Azolla in Sangachin Area of the Anzali Wetland

b) Water Pennyworth (Hydrocotyle ranunculoides)

Water Pennyworth (*Hydrocotyle ranunculoides*) were introduced to the Anzali Wetland and spread out widely. *H. ranunculoides* competes with many native aquatic plant species. Also, its body is very green in winter. Therefore, it makes very unnatural landscape and scenery in winter. This plant should be removed. However, it is spread too widely to remove from Anzali Wetland. No activity to remove this plant was implemented.

Source: JICA Expert Team

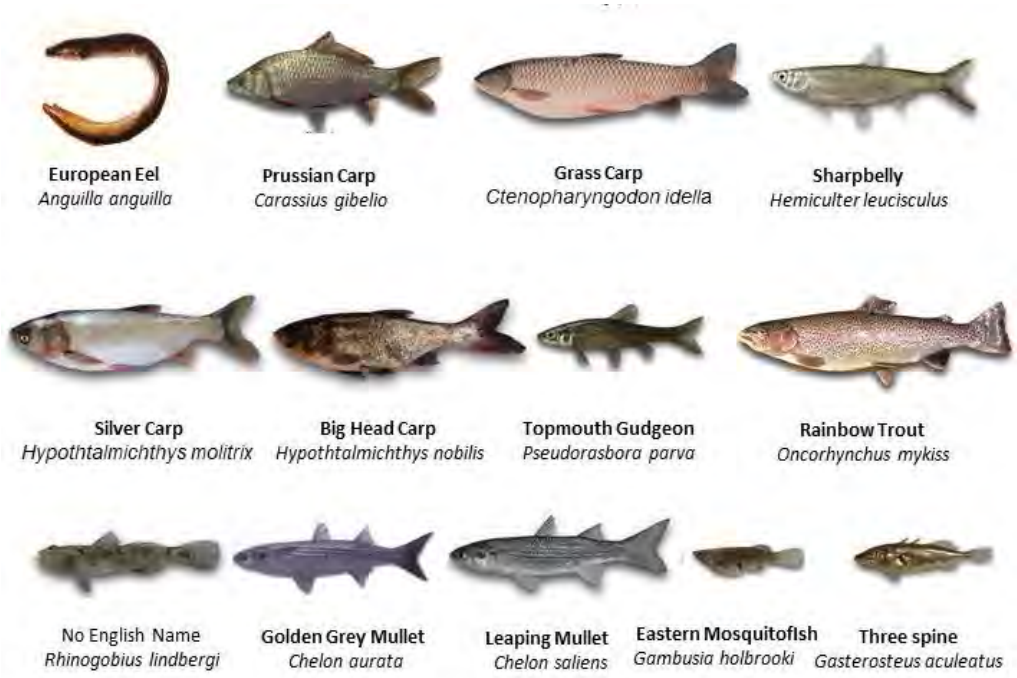
Figure 3.2-29 Water Pennyworth (Hydrocotyle ranunculoides)

c) Alien Fish

Many species including commercial fish were introduced and recorded to Anzali Wetland as shown in Figure 3.2-30. In addition to these species, aquarium fish was released to the Anzali Wetland such as Guppy (*Poecilia reticulata),* Giant Snakehead *(Channa micropeltes),* Giant pangasius *(Pangasius sanitwongsei)* and Common Pleco *(Hypostomus plecostomus)*. Owners of *a*quarium fish should be educated not to release them when they get them at the aquarium shop.

The information is not enough to manage these fish species. Monitoring should be implemented. And the introduction of commercial fish should be very careful.

No activity to remove this fish was implemented.



Source: Keyvan Abbasi et al. (2019) Anzali Wetland Basin Fishes, Abdoli and Naderi(2009) Biodiversity of Fishes of the Southern Basin of the Caspian Sea

Figure 3.2-30 Alien Fish Species in Anzali Wetland

d) Oriental River Prawn (*Macrobrachium nipponense*)

Oriental River Prawn (*Macrobrachium nipponense*) has been introduced and spread out wide as well.

Source: JICA Expert Team

Figure 3.2-31 Oriental River Prawn (Macrobrachium nipponense)

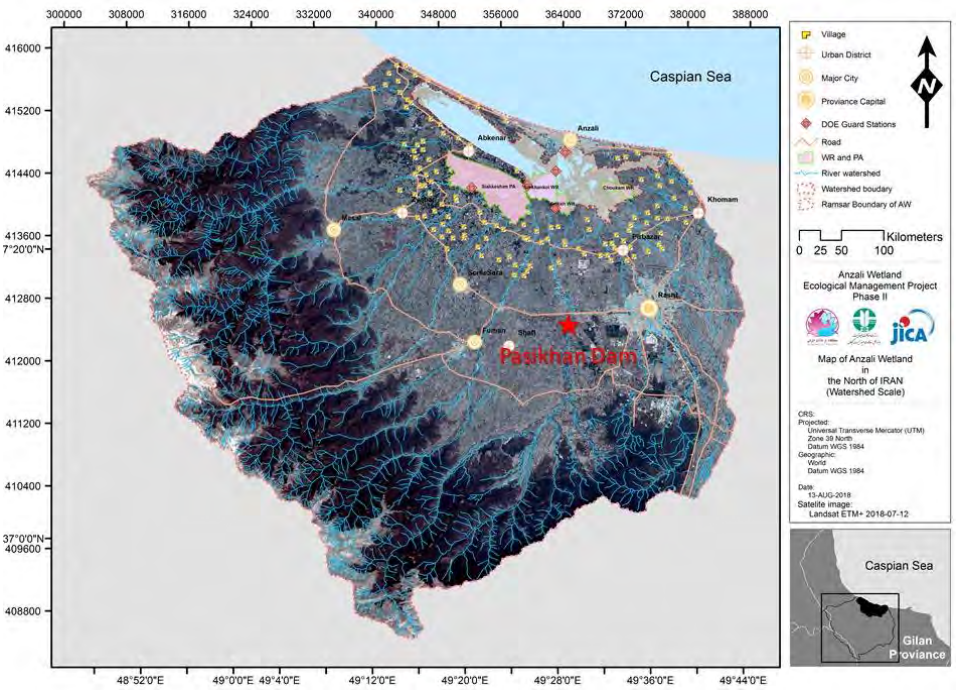
4) Fishway Installation

The fishway is one of the most important methods to restore an ecological network of the Anzali Wetland watershed. The fishway is a structure on artificial barriers such as dams to enable

migratory fish to go upstream. Several dams in the inflowing rivers into the Anzali Wetland are interrupting to migrate anadromous fish species such as Caspian Kutum (*Rutilus kutum*), Caspian Vimba (*Vimba vimba persa*), and Danube Bleak (Alburnus Chalcoides), to spawning sites upstream.

Pasikhan Dam was selected as a trial site to install a fishway. Pasikhan Dam is one of the big river structure at the midstream of the Pasikhan River. Siphon pipe type fishway is selected as an appropriate fishway type for the Pasikhan Dam. It can be installed without any damage to dam because of the simple structure of this fishway. Mr. Ota who is JICA Expert is the innovator of the siphon pipe type fishway, and he has a patent of it. He designed and produced the siphon pipe type fishway. JET installed the first one on 3 March 2018 and the second one was installed on 9 March 2018. That is the first time to install this type of fishway in Iran. Monitoring was planned in the spring migration season. However, the fishways didn't work as of the beginning of May because of no water flow in the river. There was less rainfall, and all of the river water was taken for irrigation. And then, the fishways were flown after heavy rain in summer. Siphon pipe type fishway is very flexible. It is very easy to install but not strong. The management method of the fishway should be considered. For example, before heavy rain, the fishway should be removed and install after the water level decreased.

In parallel with fishway construction, maintenance flow water should be secured to conserve the river ecosystem by stopping water overuse from the rivers for irrigation.



Source: JICA Expert Team

Figure 3.2-32 Map of Fishway (Pasikhan Dam)

Source: JICA Expert Team

Figure 3.2-33 Installed Siphon Pipe Type Fish Way on Pasikhan Dam

(6) JPA-4: Monitoring of Water and Sediment Qualities in the Anzali Wetland and its Watershed

1) Proposed JPA

a) Background

This working group (WG) under the Wetland Ecosystem Conservation SC focused on monitoring of water and sediment qualities in the Anzali Wetland. DOE Gilan is the organization legally responsible for environmental monitoring of the wetland and other public water bodies in Gilan, and thus DOE Gilan lead the activities of the WG. Aside from DOE Gilan, GWWC, RWWC, GRWC and NIWAI, participated in the WG because they are involved in issues related to water and aquatic environment, such as domestic wastewater management, river management, and management of fishery resources.

DOE Gilan has been implementing water quality monitoring in the wetland since as early as the 1990s, and has basic capacity for water quality monitoring. However, it continues to have difficulties in sustaining its monitoring activities. This is largely because monitoring has not been considered a priority by many stakeholders, including DOE Gilan. Decision makers are aware of the importance of scientific justification of their decisions based on monitoring data. However, data and claims presented to AWMC to support decision making are often unreliable, biased, or in many cases lacking, as they are prepared for the interest of businesses and governmental organizations submitting the proposals to AWMC for funding. Also, not many stakeholders, including decision makers, have background to evaluate technical proposals.

- This situation should be changed, because without reliable scientific data, it is not possible to make proper decision-making. Thus, this WG placed priorities on the following activities:
- Obtaining reliable water and sediment quality data that become the basis of future monitoring
- Making monitoring DOE Gilan's regular activities with recurrent budget

Regular reporting of monitoring results to support environmental decision-making. It is important to point out that this JPA was quite different from other JPAs in the sense that the activities were implemented mainly by staff of DOE Gilan, and not by external experts or sub-contractors hired through the project. It was hoped that this JPA directly contributed to enhancing capacity of DOE Gilan to mobilize resources, organize monitoring activities, and fulfil its legal obligation.

b) Proposed JPA

The following table summarizes the activities and the schedule of the planned and the actual implementation of activities. The activities of review of historical data and revision of the monitoring programs were carried out according to the schedule. However, implementation of the tentative and revised monitoring program, which required monthly sampling, were not implemented.

Table 3.2-17 Activities and Planed and Actual Implementation Schedule of JPA "Monitoring of Water and Sediment Qualities in the Anzali Wetland and Its Watershed"

Works/ Fiscal the Year	2014	2015	2016	2017	2018	2019-	Remarks
JPA(1-3) Monitoring of Water and Sedimant Qualities					Legend		Target Year: 2014-2019
Preparation for activities					Plan / Actual		
Implementation of Monitoring of Water and Sediment Qualities							
Review of related data and information							
Implementation of a tentative monitoring program							
Review of the monitoring data and preparation of monitoring reports							Continued review of monitoring data
Revision of the monitoring program							
Implementation of the revised monitoring program							Plan: 30 times; Actual 9 times

Source: JICA Expert Team

The following five steps were considered under this JPA, namely:

- Review of related data and information
- Implementation of tentative monitoring program
- Review of the monitoring data and preparation of monitoring reports

- Revision of the monitoring program
- Implementation of the revised monitoring program

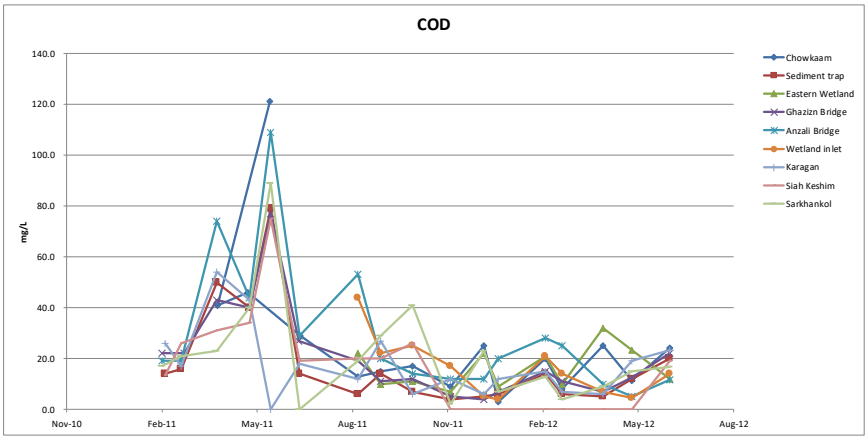
According to the original plan of the JPA, readily available monitoring data were to be reviewed first, and a tentative monitoring program was to be developed and implemented in 2015 to evaluate DOE Gilan's monitoring capability. Then, following the review of the results of the tentative monitoring program and preparation of the monitoring reports in 2015, the monitoring program was to be revised, and introduced from mid-2016 as the official monitoring program of DOE Gilan.

Sections 2) through 6) below summarizes the results of these activities. Then, Sections 3.2.5 and 3.2.6 summarizes the achievements and recommendations.

2) Review of Related Data and Information

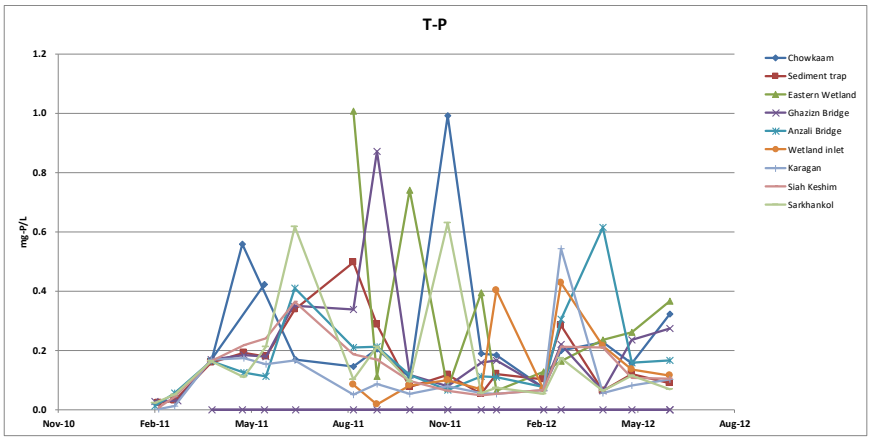
At the beginning of the project, data and information related to environmental monitoring were reviewed. They include monitoring data during the JICA M/P and the Phase 1 Project.

Figure 3.2-34 and Figure 3.2-35 show the seasonal variations of COD and T-P concentrations monitored in 2011 – 2012 during the Phase 1 Project. There was no doubt that DOE Gilan made a significant effort to implement the monitoring in this period. Nevertheless, it seemed the data was plagued with various errors and artifacts, and as the result it was impossible to interpret environmental conditions of the wetland based on the data. For example, COD showed a peak in May 2011, but such peak was not observed in May 2012 for unknown reason. Similarly, T-P data varied widely throughout the period. It was suspected that the T-P level was too elevated judging from the level of eutrophication in the wetland, though the reason was not clear.



Source: JICA Expert Team

Figure 3.2-34 Historical Monitoring Data of COD (2011-2012)



Source: JICA Expert Team

Figure 3.2-35 Historical Monitoring Data of T-P (2011-2012)

In order to interpret environmental conditions of the wetland and provide scientific basis of environmental management, DOE Gilan needed more reliable dataset.

3) Implementation of Tentative Monitoring Program

A monitoring program was proposed during the Phase 1 Project, but after the Phase 1 Project, the monitoring was suspended. Thus, it was decided to resume the monitoring program proposed in the Phase 1 Project as the tentative monitoring program. Table 3.2-18 summarizes the tentative monitoring program.

Table 3.2-18 Tentative Monitoring Program

Survey	Media	Parameters	Sampling Points	Frequency (per year)	Total Sample
Regular					
Rivers	Water	Water temp., air temp., EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO3-N, NO2-N, NH4-N, T-N, oil & grease, total coliform, fecal coliform, total Zn, dissolved Cu	8	12	96
		As, Cd, Pb, Zn, Hg, CN, pesticides	8	4 (every 3 months)	32
	Sediment	Particle size distribution, total organic carbon, Cd, Pb, Zn, As, Hg, Cu, Ni, pesticides	8	1	8
Wetland	Water	Flow rate (GWRC), water temp., air temp., transparency, EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO3-N, NO2-N, NH4-N, T-N, oil & grease, chlorophyll a, total coliform, fecal coliform, total Zn, dissolved Cu	8	12	96
		As, Cd, Pb, Zn, Hg, CN, pesticides	8	4 (every 3 months)	32
	Sediment	Particle size distribution, total organic carbon, Cd, Pb, Zn, As, Hg, Cu, Ni, pesticides	8	1	8

Survey	Media	Parameters	Sampling Points	Frequency (per year)	Total Sample
Regular					
Pollution Sources	Leachate and Wastewater	Flow rate, water temp., air temp., EC, DO, pH, SS, turbidity, BOD, COD, T-P, NH4-N, T-N, oil & grease, total coliform, fecal coliform, As, Cd, Pb, Zn, Hg, CN, pesticides	40	2	80
	Sludge	Total organic carbon, Cd, Pb, Zn, As, Hg, Cu, Ni, pesticides	15	1	15
Non-regular					
Rivers and Wetland	Water	Flow rate (GWRC), water temp., air temp., transparency, EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO3-N, NO2-N, NH4-N, T-N, oil & grease, chlorophyll a, total coliform, fecal coliform, total Zn, dissolved Cu, As, Cd, Pb, Zn, Hg, CN, pesticides	20	1	20
	Sediment	Particle size distribution, total organic carbon, Cd, Pb, Zn, As, Hg, Cu, Ni, pesticides	2	1	2
Pollution sources	Water	Flow rate, water temp., air temp., EC, DO, pH, SS, turbidity, BOD, COD, T-P, NH4-N, T-N, oil & grease, total coliform, fecal coliform, As, Cd, Pb, Zn, Hg, CN, pesticides	50	1	50
	Industrial sludge	Total organic carbon, Cd, Pb, Zn, As, Hg, Cu, Ni, pesticides	20	1	20

Source: JICA Expert Team

This program was presented as part of the Action Plan of the JPA, and approved at the JCC/AWMC in May 2015. However, from the onset, implementation of the tentative monitoring program faced serious difficulties. In Iranian FY2015 (July 2015 – June 2016), the Iranian side did not allocate the budget for the JPA activity. This was partial because the budget had to be ear-marked during the previous fiscal year. However, the main problem was the lack of general will to implement monitoring – many stakeholders believed that there were enough environmental data and the budget should be spent on other activities, especially physical restoration works.

Faced with the lack of the budget and wide support, it was decided to implement an activity that could be implemented without significant Iranian budget. A cross-examination (a comparative analysis) of water samples from the wetland (Sorkhankol), a river (Pirbazar River upstream of the sediment trap) and a sewage outfall (outfall in Anzali City) were selected as it would help the laboratories to improve analytical reliability. Six laboratories in the area (DOE Gilan, DOE-Anzali, GWWC, RWWC, NIWAI, a private laboratory in Rasht) participated in this activity. The table below summarizes the results for EC, COD, BOD, T-P, and T-N.

Table 3.2-19 Ranges of Concentrations of Water Quality Parameters in Comparative Analysis of Environmental Samples in May 2015

Parameter	Unit	Wetland (Sorkhankol)	River (Pirbazar)	Sewage (Anzali)
EC	µS/cm	10 - 1080	1089 - 1477	834 - 1574
COD	mg/L	6 - 43	12 - 77	32 - 220
BOD	mg/L	2 - 24	6 - 31	60 - 117
T-P	mg/L	0.13 - 0.88	0.43 - 3.77	0.48 - 35.2
T-N	mg/L	0.5 - 7.6	2.7 - 11.1	4.7 - 22.2

Source: JICA Expert Team

The results revealed existence of significant inter-laboratory variations, and it was difficult to determine results of which laboratories were close to the true concentrations of these parameters. Some extreme values were caused by simple errors in calculation or similar reasons, while it was suspected that other factors, such as difference in analytical methodologies and contamination of equipment and apparatus, also played some roles in the variations.

To examine these problems more closely, the same six laboratories implemented another comparative analysis in October 2015. This time synthetic reference samples with known concentrations of pollutants, prepared by mixing different amounts of reagents, was used for the comparison, and the laboratories analyzed them without knowing the expected concentrations. The results are shown in Table 3.2-20.

Table 3.2-20 Ranges and Actual Concentrations of Water Quality Parameters in Comparative Analysis of Synthetic Reference Samples in October 2015

Parameter	Unit	Actual Conc.	Results
NO_2-N	mg/L	0.02	0.000 - 0.030
		0.10	0.080 - 0.200
		1.0	0.19 - 1.00
NO_3-N	mg/L	1.0	0.40 - 1.40
		5.0	1.2 - 5.9
		15	10 - 18
NH_4-N	mg/L	0.5	0.44 - 0.80
		5.0	3.7 - 10.2
		15	10.3 - 15.9
PO_4-P	mg/L	0.1	0.00 - 0.51
		1.0	0.97 - 1.40
		5.0	4.50 - 6.00
COD	mg/L	20	17 - 42
		100	50 - 110
		200	150 - 208

Source: JICA Expert Team

The results were much better this time, but this is partly because the reference samples were free of interfering substances that exist in real environmental samples. Even with these reference samples, an error of 10% to 30% was not unusual.

4) Review of the Monitoring Data and Preparation of the Monitoring Reports

As explained above, DOE Gilan could not implement the tentative monitoring program as planned. Hence, the results of the comparative analyses were reviewed, and summarized in the Progress Report No. 2.

5) Revision of the Monitoring Program

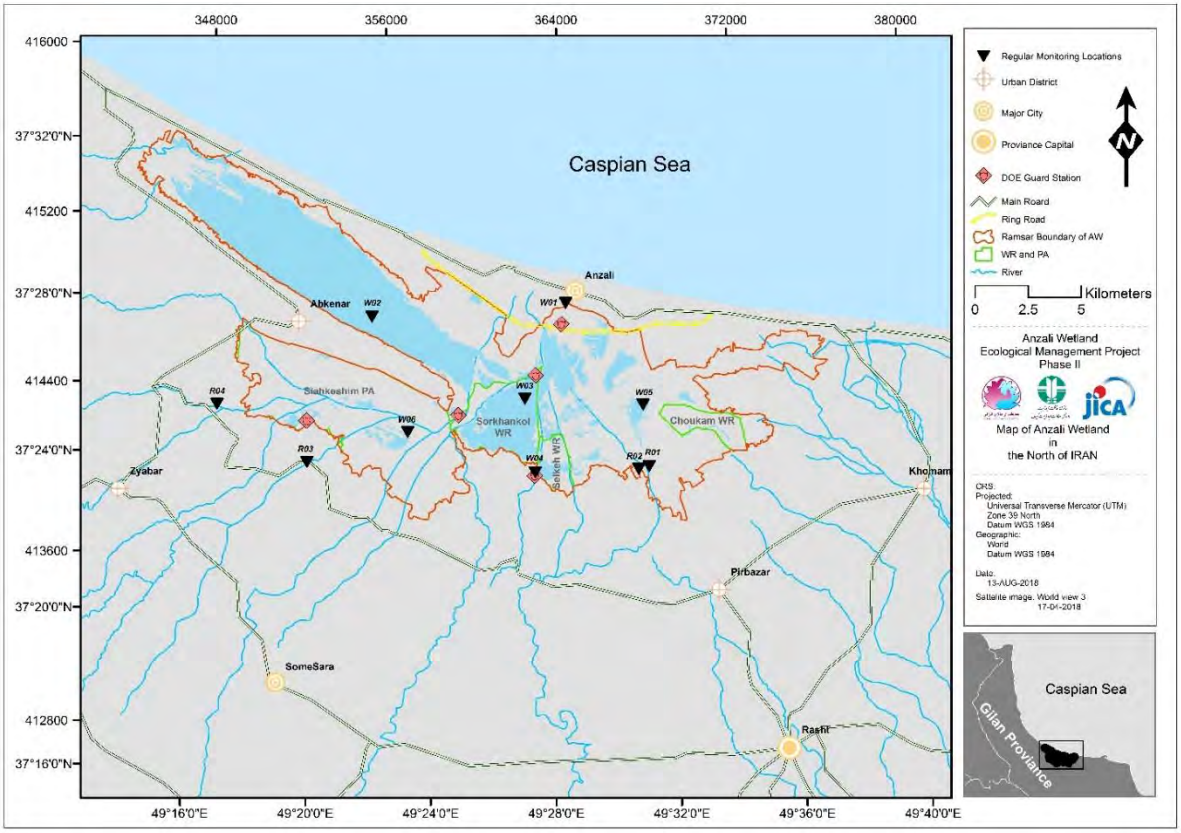
In March 2016, the monitoring program was revised significantly based on the results of the activities in the Iranian FY2015. Considering the budget problem encountered, the work load of the monthly monitoring program was significantly reduced from 16 locations to 7 locations. Also, the sediment monitoring proposed in the JPA was removed from the JPA as DOE Gilan decided to implement a separate sediment survey to develop sediment dredging plans. On the other hand, a program of salinity monitoring was added, as such information was deemed crucial to evaluate environmental conditions of the Anzali Wetland. Table 3.2-21 and Figure 3.2-36 summarize the sampling locations, frequency, analytical items and the objectives of the revised regular monitoring program and the salinity monitoring program. The maps of the monitoring locations of these programs are given in Table 3.2-22 and Figure 3.2-37.

Table 3.2-21 Revised Regular Monitoring Program

Category	Sampling Locations	Frequency	Analytical items	Main objective
Anzali Wetland	3 locations (Port (W01), Lagoon (W02), Sorkhankol (W03))	Monthly	Water temp., air temp., transparency, EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO3-N, NO_2-N, NH4-N, T-N, oil & grease, phenols, chlorophyll a, total coliform, fecal coliform, total (dissolved) Zn, dissolved Cu	To determine whether the water quality of the Anzali Wetland is improving or deteriorating in long-term To determine whether water qualities of the Anzali Wetland and feeding rivers satisfy the national environmental standards or not To evaluate water quality condition of wildlife refuge
	3 locations (Siakhesim (W05), Selke (W04), Chokum (W06))	Quarterly	Water temp., air temp., transparency, EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO_3-N, NO_2-N, NH4-N, T-N, oil & grease, phenols, chlorophyll a, total coliform, fecal coliform, total (dissolved) Zn, dissolved Cu	To evaluate water quality condition of wildlife refuges and protected area
Rivers	4 locations (Pirbazar (R01), Pasikhan (R02), Palangvar (R03), Khalkai (R04))	Monthly	Water temp., air temp., EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO3-N, NO2-N, NH4-N, T-N, oil & grease, phenols, total coliform, fecal coliform, total (dissolved) Zn, dissolved Cu	To determine whether water qualities of the Anzali Wetland and feeding rivers satisfy the national environmental standards or not

Note: items with "—" were proposed in the regular monitoring program developed in March 2016, but were not implemented in September 2016.

Source: JICA Expert Team



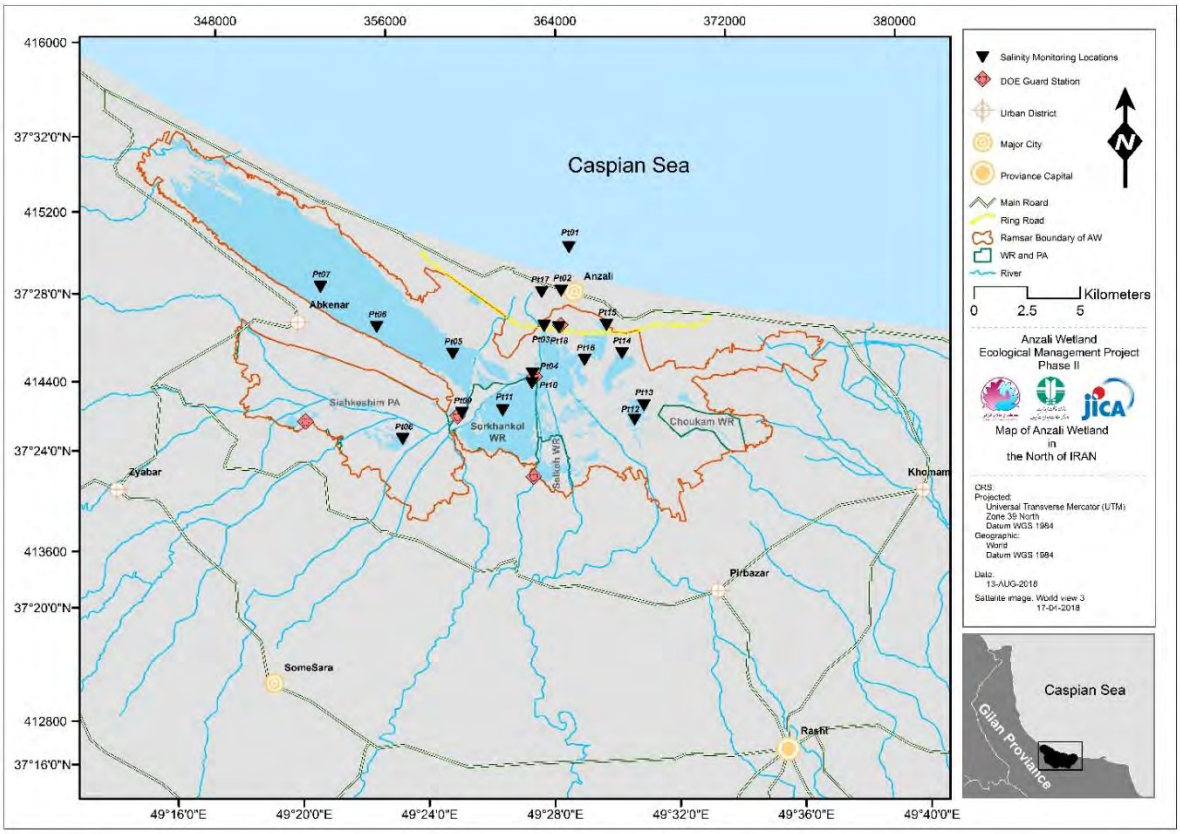
Source: JICA Expert Team

Figure 3.2-36 Sampling Locations of Regular Monitoring Program

Table 3.2-22 Salinity Monitoring Program

Category	Sampling Locations	Date	Analytical Items	Main Objective
Wetland	18 locations (top 50 cm and other depth if water is deep)	As needed	Water temp, air temp., DO, EC, salinity (portable water quality meter)	To evaluate whether there is significant mixing of the Caspian Sea water with water of the Anzali Wetland t

Source: JICA Expert Team



Source: JICA Expert Team

Figure 3.2-37 Sampling Locations of Salinity Monitoring Program

This revised programs (including the salinity monitoring and the monitoring of sediment) were explained in Progress Report No. 2 and was officially adopted at the 4th JCC on 6 June 2016.

6) Implementation of the Revised Monitoring Program

The JPA continued to face difficulty in securing the Iranian budget, and various efforts were made to improve the situation, which included discussions at the SC meetings as well as discussions with DOE HQ on budgeting and DOE's mandate. However, the budget was never made available largely because the management of DOE Gilan eluded the responsibility and never committed to regular monitoring of the wetland. The available budget was believed to be channelled to other activities. Thus, the monitoring activities were implemented in an ad hoc manner only when possible and cajoled by JET. The revised program required monthly sampling in accordance with the environmental standard of Iran issued by DOE, but the monitoring was implemented only nine times over the last 30 months since July 2016 until December 2018 – in September and December 2016, January-March, August and December 2017, and March and November 2018.

These activities, except the last monitoring in November 2018, were implemented by a staff of DOE Gilan (sampling) and the main laboratory of DOE Gilan (laboratory analysis). The last

monitoring in November 2018 was implemented by the members of Anzali Wetland Monitoring Office (AWMO). Details of the AWMO are explained in Section d).

6-1) Quality Control

The comparative analyses among laboratories in the region in 2015 (see Section 3) revealed existence of large inter-laboratory variabilities, and it was difficult to have full confidence in analytical data of some parameters, such as phosphorus, which is arguably the most important pollutant determining the level of eutrophication in the wetland. The laboratory of DOE Gilan tried to pinpoint the problem. However, it was following the protocol of the manufacturer of the analytical equipment, and the issue of data reliability could not be resolved easily.

To obtain reliable data, thus, more comparative analyses were carried out in March 2017 and August 2017, this time with laboratories in Japan, the Netherlands and Gilan. The results are given in Table 3.2-23.

Table 3.2-23 Comparative Analyses of Environmental Samples in March and August 2017

Sampling Date		8 March 2017			20 Aug. 2017		
Category	Location	COD (mg/L)	T-P (mg/L)	T-N (mg/L)	COD (mg/L)	T-P (mg/L)	Total IN* / T-N (mg/L)
Anzali Wetland	Lagoon	18 (12) [<10]	0.07 (0.041) [<0.10]	- (0.68) [0.44]	32.8 (33) {31.4}	0.08 (0.045) {0.051}	1.65 (1.1)
	Sorkhankol	9.9 (8.1) [<10]	0.06 (0.072) [0.16]	- (1.2) [1.3]	53.7 (60) {65.7}	0.11 (0.15) {0.084}	0.702 (1.3)
River	Pirbazar	375 (19) [23.9]	0.18 (0.30) [0.34]	- (4) [3.8]	33.05 (37) {39.5}	2.12 (1.9) {2.09}	18.0 (10)
	Khalkai	9.1 (5.7) [<10]	0.05 (0.089) [0.24]	- (1.8) [3.3]	4.87 (8) {11}	0.068 (0.0469) {0.046}	1.67 (1.0)

Note: number in ( ) was measure at Japanese laboratory using JIS K 0102 20.1 (COD), 45.4 (T-N) and 46.3.1 (T-P)

Note: number in [ ] was measured at Dutch laboratory using NENISO 15705 (COD), NEN 6646 (T-N) and ISO 6878/15923-1 (T-P)

Note: number in { } was measured at Environmental Research Institute in Rasht, Iran using Standard Methods for the Examination of Water and Wastewater, 5220 (COD), 4500-N (T-N) and 4500-P (T-P)

Note: * - DOE's data are sum of nitrate, nitrite and ammonia nitrogens; Japanese data are T-N

Source: DOE Gilan and JET

Because analytical methodologies are not the same across the laboratories, these data cannot be compared strictly. Nevertheless, the results were more or less consistent, and it was concluded that the results of the monitoring in March and August 2017 were reliable within the variability. In 2014, when the project started, there were no reliable data, and it was not possible to evaluate the pollution of the wetland. The project finally obtained reliable data that could be used as reference data for future monitoring activities.

6-2) Monitoring in August 2017

In this section, the results of the monitoring in August 2017 are summarized. The monitoring results of this month was selected because (i) in this month, both the regular monitoring and the salinity monitoring proposed in the JPA were implemented, and (ii) an additional sediment monitoring was implemented to evaluate the levels of toxic substances in the wetland. The regular monitoring was implemented in total nine times, but the results of other monitoring activities are not reported in this report as their reliability needs to be scrutinized further.

a) Regular Monitoring

Objectives

The regular monitoring program is the core program of the JPA designed to fulfill the following objectives:

- To determine whether the water quality of the Anzali Wetland is improving or deteriorating in long-term (in the order of decades)
- To determine whether water qualities of the Anzali Wetland and feeding rivers satisfy the national environmental standards or not
- To evaluate water quality condition of wildlife refuges and protected area
- To determine whether there are significant spatial differences in water quality of the Anzali Wetland or not, and to evaluate the cause of such spatial differences.
- To determine whether there is significant pollution of the wetland sediment by heavy metals and other organic chemicals

The program focused on capturing the situation of organic pollution and eutrophication in the wetland.

Methodologies

Table 3.2-24 and Table 3.2-25 summarizes the sampling locations and analytical items of the regular monitoring in August 2017.

Table 3.2-24 Program of Regular Monitoring in August 2017

Category	Sampling Locations	Date	Analytical Items	Main Objectives
Anzali Wetland	3 locations (Port, Lagoon, Sorkhankol)	20th Aug. 2017 20th Aug. 2017	Analysis at DOE: Water temp., air temp., transparency, EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO3-N, NO_2-N, NH4-N, ~~T-N, oil & grease, phenols~~, chlorophyll a, total coliform, fecal coliform, ~~total~~ (dissolved) Zn, dissolved Cu	To determine whether the water quality of the Anzali Wetland is improving or deteriorating in long-term To determine whether water qualities of the Anzali Wetland and feeding rivers satisfy the national environmental standards or not To evaluate water quality condition of wildlife refuge
Rivers	2 locations (Pirbazar, Khalkai)		Analysis at DOE: Water temp., air temp., transparency, EC, DO, pH, SS, turbidity, BOD, COD, o-phosphate-P, T-P, NO3-N, NO_2-N, NH4-N, ~~T-N, oil & grease, phenols~~, chlorophyll a, total coliform, fecal coliform, ~~total~~ (dissolved) Zn, dissolved Cu	

Note: parameters indicated by " " are proposed in the regular monitoring program amended in 2016, but were not measure in August 2017.

Source: JICA Expert Team

Table 3.5-25 summarize the analytical methodologies adopted by DOE Gilan.

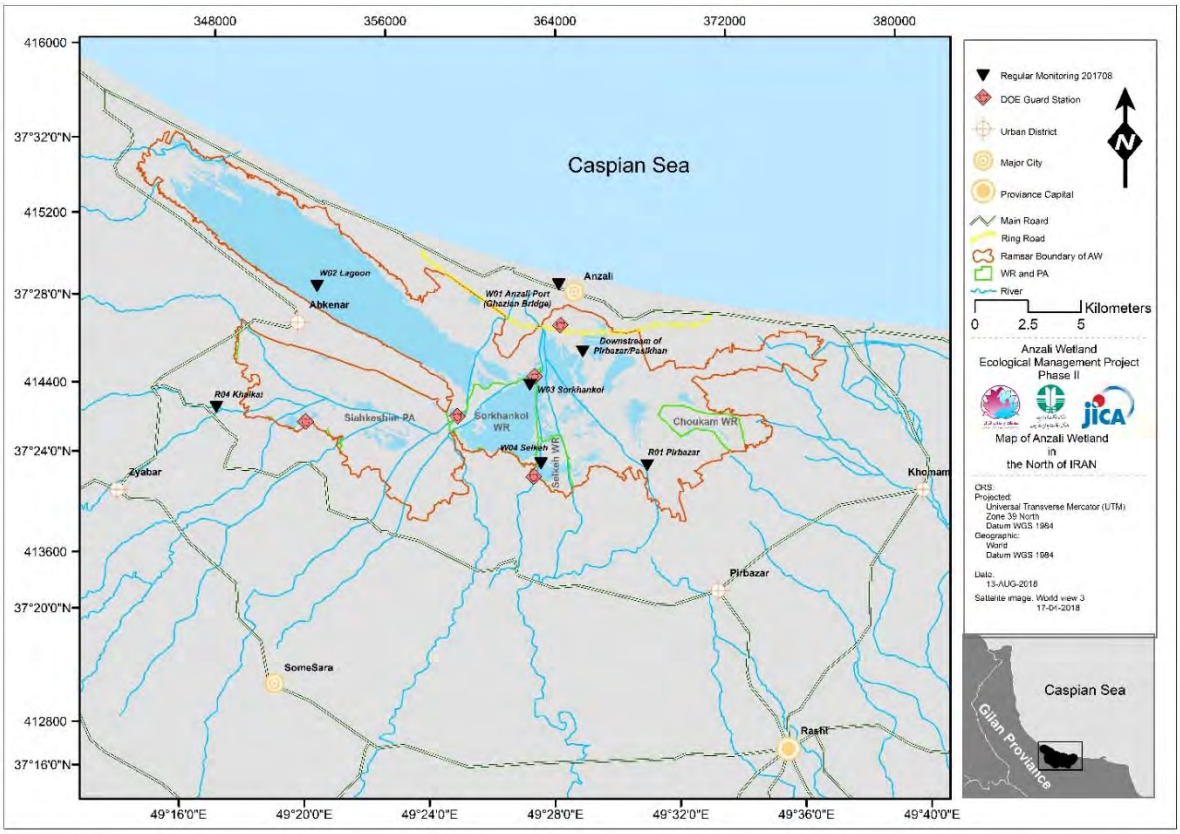
Table 3.2-25 Analytical Methodologies Used by DOE

Parameter	Methodology	Parameter	Methodology
Water temp., air temp.	Thermometer	NO2-N	Method 10019
Transparency	Secci disk	NH4-N	Method 10031
EC, salinity DO, pH	HACH 40d Portable Water Quality Meter	T-N	Method 10071
COD	Method 8000	Total coliform	MPN
BOD	BOD Sensor	Fecal coliform	MPN
Ortho-PO4	Method 8000	Chlorophyll a	APHA10200
Total P	Method 8190	Total Zn	AA
NO3-N	Method 8171	Dissolved Cu	AA

Note: Methodologies to be confirmed by DOE

Source: DOE

The sampling locations and their coordinates are shown in Table 3.2-26 and Figure 3.2-38. The samples were collected from the locations set in the original monitoring program. If the sites were too shallow and not accessible, they were collected at locations as close to the original positions as possible. As this regular monitoring was implemented together with the monitoring of toxic substances (explained below), locations of the monitoring of toxic substances (water and sediment) are also shown in the map.



Source: JICA Expert Team

Figure 3.2-38 Sampling Locations of Regular Monitoring in August 2017

Table 3.2-26 Coordinates of Sampling Locations in August 2017

Category	Location Name	Point	Easting (UTM)	Northing (UTM)	Lab (Water Quality)	Lab (Sediment Quality)
Anzali Wetland	Anzali Port (Ghazian Bridge)	W01	364179E	4148589 N	DOE	-
	Lagoon	W02	352797 E	4148512 N	DOE, Japan, ERI	Netherlands
	Sorkhankol	W03	362817 E	4143857 N	DOE, Japan, ERI	Netherlands
	Selkeh	W04	363343 E	4140154 N	-	Netherlands
	Downstream of Pirbazar/Pasikhan	-	365311 E	4145428 N	-	Netherlands
Rivers	Pirbazar	R01	368345 E	4140068 N	DOE, Japan, ERI	Netherlands
	Khalkai	R04	348056 E	4142815 N	DOE, Japan, ERI	Netherlands

Source: JICA Expert Team

The sampling was implemented on 20th August 2017 except for sediment sampling at Selkeh, which was implemented on 19th August 2017. The weather was fine, and there had been no major storm event prior to the sampling.

Results

Table 3.2-27 summarizes the field data of the regular water quality monitoring conducted on 20th August 2017. Measurements were made at around 50 cm from the surface, except for the Sorkhankol site, where the measurement was done at around 20 cm from the surface, as the water was too shallow (about 50 cm deep).

Table 3.2-27 Field parameters of Regular Water Quality Monitoring in August 2017

Category	Location	Date and Time	Water Temp. (°C)	Air Temp. (°C)	EC (mS/cm)	Salinity (ppt)	pH	DO (mg/L) and DO Percent
Iranian Standard			-	-	-	-	6-9	8 mg/L (at least 50% of time) 5 mg/L (100% of time)
Anzali Wetland	Port	20th Aug., 2017 10:20	-	-	11.81	6.08	8.27	10.52 (137.9%)
	Lagoon	20th Aug., 2017 11:10	28.6	29.0	5.34	2.66	7.49	1.12 (14.7%)
	Sorkhankol	20th Aug., 2017 11:55	30.6	30.0	8.32	4.10	8.85	5.21 (70.0%)
River	Pirbazar	20th Aug., 2017 12:23	30.5	30.0	1.23	0.55	7.64	1.57 (20.2%)
	Khalkai	20th Aug., 2017 15:10	28.3	29.0	0.84	0.38	8.06	8.67 (113.1%)

Note 1: The values of temperature, pH, EC, Salinity and DO were measured on-site using thermometers and a portable water quality analysis.

Source: JICA Expert Team

The analytical results of general water quality parameters by DOE Gilan are summarized in the following table together with the results by Environmental Research Institute and the Japanese laboratory.

Table 3.2-28 Results of Water Quality Analysis by DOE in August 2017

Category	Location	Date and Time	DO (Lab) (mg/L)	pH (Lab)	EC (Lab) (mS/cm)	TSS (mg/L)	Turbidity (NTU)
Iranian Standard			8 mg/L (at least 50% of time) 5 mg/L (100% of time)	6-9	-	25	-
Anzali Wetland	Port	20th Aug., 2017 10:20	5.73	8.65	8.610	80.1	19.3
	Lagoon	20th Aug., 2017 11:10	1.105	7.59 [7.3]	4.390	12.4	6.71
	Sorkhankol	20th Aug., 2017 11:55	4.49	8.72 [7.26]	5.890	36.5	14.6
River	Pirbazar	20th Aug., 2017 12:23	0.303	7.51 [7.68]	1.133	35.5	13.8
	Khalkai	20th Aug., 2017 15:10	3.87	7.92 [8.3]	0.774	8.6	9.8

Category	Location	Date and Time	BOD (mg/L)	COD (mg/L)	T-P (mg/L)	NO3-N (mg/L)	NO2-N (mg/L)	NH4-N (mg/L)
Iranian Standard			6	-	0.13	-	0.03	1
Anzali Wetland	Port	20th Aug., 2017 10:20	19	42.8	0.55	2.3	0.101	4.1
	Lagoon	20th Aug., 2017 11:10	11	32.8 (33) [31.4]	0.08 (0.045) [0.051]	1.2 [0.78]	0.006	0.44
	Sorkhankol	20th Aug., 2017 11:55	14	53.7 (60) [65.7]	0.11 (0.15) [0.084]	0.5 [1.01]	0.002	0.2
River	Pirbazar	20th Aug., 2017 12:23	21	33.05 (37) [39.5]	2.12 (1.9) [2.09]	1 [2.87]	0.004	17
	Khalkai	20th Aug., 2017 15:10	3	4.87 (8) [11]	0.068 (0.0469) [0.046]	1.6 [0.65]	ND	0.07

Category	Location	Date and Time	Sum of NO3/NO2/ NH4-N	Chl-a (mg/L)	Total Coliform (MPN)	Fecal Coliform (MPN)	Dissolved Zn	Dissolved Cu	IRWQUI$_{SC}$
Iranian Standard			-	-	10000 (indirect, max permissible)	4000 (indirect, max permissible)	1 mg/L as total Zn assuming total hardness 100 mg/L	0.04 assuming total hardness 50-100 mg/L	
Anzali Wetland	Port	20th Aug., 2017 10:20	6.50	254.6	≥24000	4600	0.035	0.0287	14.0
	Lagoon	20h Aug., 2017 11:10	1.65 (1.1)	19.6	1500	40	0.082	0.0189	35.5
	Sorkhankol	20th Aug., 2017 11:55	0.702 (1.3)	63.2	480	≤3	0.032	0.0019	38.8
River	Pirbazar	20th Aug., 2017 12:23	18.0 (10)	-	≥24000	≥2400	0.023	0.0156	15.8
	Khalkai	20th Aug., 2017 15:10	1.67 (1.0)	-	≥24000	4600	ND	0.0279	49.7

Note: number in [ ] was measured at Environmental Research Institute

Note: number in ( ) was measure at Japanese laboratory

Source: JICA Expert Team based on data from DOE

The results were summarized as follows:

EC and Salinity

- EC and salinity were very high in the wetland due to intrusion of Caspian Sea water. Please see the section on the salinity monitoring below for the result of salinity monitoring conducted on 14th August 2017.

pH

- pH in the Caspian Sea is known to be as high as 8.5, and the result at the Anzali Port, 8.27, was consistent with this. The reason for very high pH at Sorkhankol site may be partially explained by a combination of intrusion of the Caspian Sea water and extensive algal activity in summer, which raises pH by consuming carbonate in water.

DO

- DO level was low at the Pirbazar River, Sorkhankol and the Lagoon. Pirbzar River site receives sewage from Rasht, and this seems to be the reason for low DO. With respect to Sorkhankol and the Lagoon, DO in the surface layer may be significantly higher due to algal activity, especially in summer. However, these water bodies are very shallow, and apparently the decomposition of organic matter in the bottom sediment affected the results.

TSS

- TSS in August 2017 was high at Port, Sorkhankol and Pirbazar River sites, and exceeded the Iranian Standard at these sites. High TSS at Sorkhankol is presumably due to high algal activity in the wetland. High TSS in Pirbazar River is most likely due to inflow of sewage and sediment from its basin.

BOD and COD

- BOD exceeded the Iranian standard at all stations but Khalkai River. High BOD in the Lagoon and Sorkhankol in August 2017 is attributed to high algal activity in summer. Behavior of COD is similar to that of BOD, as expected.
- High BOD in Pirbazar is most likely due to inflow of sewage. COD at Pirbazar in March 2017 was lower presumably because the sample was taken after a storm event.
- High BOD and COD at the Port is presumably due to combination of sewage and algal activity. It was suspected that, in addition to the water from Pirbazar River, a significant amount of domestic sewage from Anzali ends up in the Port via different channels. This needs more study.

Phosphorus

- T-P in August 2017 was near the Iranian Standard in Sorkhankol and exceeded the national standard in Pirbazar River and the Port.
- High T-P in Pirbazar River is most likely due to the inflow of domestic sewage from Rasht. Similarly, high T-P in the Port is largely due to inflow of domestic sewage from Rasht (via Pirbazar River) and Anzali (via channels in Anzali).
- Phosphorus is one of the most important water quality parameters in the wetland, because it often becomes the limiting factor of eutrophication. Thus, dynamics of phosphorus over time should be monitored carefully. It was noted that T-P in Sorkhankol in August 2017 was higher than in March 2017. Similar phenomenon has been observed in a eutrophic lake in Japan (Kasumigaura Lake), which was attributed to release of dissolved-form phosphorous from bottom sediment during rapid decomposition of the sediment under high temperature. This is also possible in Anzali Wetland, but in Anzali, other mechanisms, such as intrusion of the Caspian Sea water, mysterious disappearance of Azolla, etc., are at play. Thus, it is premature to comment on the dynamics of phosphorus in the Anzali Wetland.

Nitrogen

- NO2 and NH4 are toxic to many aquatic species. According to the results, concentrations of NH4 exceeded the Iranian standard in Pirbazar River and the Port. It is suspected that this is largely due to inflow of sewage from Rasht and Anzali.
- Although T-N is not regulated in Iran, the concentrations of T-N in Sorkhankol and the Lagoon are around the environmental standard in Japan (1.0 mg/L). According to the March 2017 data, the ratio T-N/T-P of Anzali Wetland was around 17 or higher, and it has been assumed that the Anzali Wetland is phosphorous-limiting. Nevertheless, the T-N/T-P ratio in August 2017 was much lower in Sorkhankol and much higher in the lagoon. More close examination of water quality along with a plankton survey is recommended.

Chlorophyll a

- Chlorophyll-a values are all extremely high. It seems there was a systematic error in determination.

Total Coliform and Fecal Coliform

- In August 2017, total coliform and fecal coliform exceeded the Iranian standard in the Port, Pirbazar River and Khalkai River. However, levels of these parameters were lower in the wetland. The reason is not clear.

$IRWQUI_{SC}$

- DOE developed Iran's surface water resources quality index ($IRWQUI_{SC}$) in 2014, and the index values were calculated based on concentrations of fecal coliform, BOD, nitrate, DO, EC, COD, NH4, PO4, turbidity, and pH. The results are shown in the last column of Table 11, and Table 12 shows how the results are interpreted. According to the results, water quality of Port was rated as "Very Bad" with scores less than 15, Pirbazar as "Bad", Lagoon and Sorkhankol as "Relatively Bad" and Khalkai as "Average".

Table 3.2-29 $IRWQUI_{SC}$ Values and Water Quality

Description	$IRWQUI_{SC}$ Values
Very Bad	Less than15
Bad	15-29.9
Relatively Bad	30-44.9
Average	45-55
Relatively Good	55.1-70
Good	70.1-85
Very Good	More than 85

Source: DOE

With respect to the four objectives set for the regular monitoring, the following conclusions were drawn based on the results of the monitoring conducted in August 2017.

Table 3.2-30 Conclusions of Regular Water Quality Monitoring in August 2017

Objective	Conclusions based on monitoring in August 2017
To determine whether water qualities of the Anzali Wetland and feeding rivers satisfy the national environmental standards or not	• According to the results in August 2017, the water quality of the Anzali Wetland (Sorkhankol, Lagoon) does not satisfy the Iranian Standard for DO, BOD, and possibly TSS, T-P and total Zn. The level of T-N was also high compared with the Japanese standard. The results are consistent with the eutrophic condition of the wetland. Zn appears to be high for a natural reason. • The Port and Pirbazar River are more polluted than the Anzali Wetland presumably due to inflow of domestic sewage. The water quality of Pribazar River does not meet the standard for DO, TSS, BOD, T-P, NH4-N, and total and fecal coliforms. • The values of DOE's new water quality index (IRWQUIsc) were calculated from concentrations of fecal coliform, BOD, nitrate, DO, EC, COD, NH4, PO4, turbidity, and pH. According to the results, water quality of Port was rated as "Very Bad" with scores less than 15, Pirbazar as "Bad", Lagoon and Sorkhankol as "Relatively Bad" and Khalkai as "Average". • With respect to heavy metals and toxic organic chemicals, the results of the water and sediment quality data in the wetland (Sorkhankol and Lagoon) generally did not indicate significant pollution with respect to these parameters. It seems background concentrations of some heavy metals, such as Cr, Ni and Zn, in the region are somewhat high, though sizable influence of human activities is also possible, for example in Pirbazar River. PCBs, chlorinated pesticides and other pesticides, were not detected this time. However, it should be noted that aquatic biotas are often extremely sensitive to such toxic substances. For the impact of low-level pollution by such substances, more focused investigation is needed.
To evaluate water quality condition of wildlife refuges and protected area	• In August 2017, water quality of only Sorkhankol wildlife refuge was examined. Water qualities of Chokum, Siakheshim and Selke were not examined this time because the water levels were too shallow. • With respect to sediment, the conditions of Sorkhankol and Selkeh were examined. The results showed that the levels of heavy metals and toxic organic chemicals are not extremely high in these areas. However, one should note that the levels of heavy metals, such as Cr, Ni and Zn, are not very low, either.
To determine whether there are significant spatial differences in water quality of the Anzali Wetland or not, and to evaluate the cause of such spatial differences.	• The number of samples is too limited to make any detailed assessment of spatial differences in water quality, but available water quality data seem to support existence of spatial variability in the wetland. • Pirbazar River is the most polluted water course in the area due to the inflow of wastewater from Rasht. • Judging from the water and the sediment quality data, Sorkhankol appears to be more polluted than other parts of the wetland because it is the lowest area in the wetland, and pollution tends to accumulate in Sorkhankol. Also, it is a large water body, and the water residence time is larger than most other parts of the wetland. However, detailed mechanism of how waters from different parts of the wetland, including Pirbazar/Pasikhan Rivers, eastern part, Siah Darvisian/Siakheshim, the Lagoon, and the Caspian Sea, flow into Sorkhankol and how internal mechanism within Sorkhankol affects water quality of Sorkhankol are not clear. • The lagoon is another major water body in the wetland, but environmentally it is significantly different from Sorkhankol. Though the Caspian Sea water seems to intrude into the lagoon in summer, it is relatively isolated from other parts of the wetland, and has its own dynamics. Water and sediment quality appear to be better in the lagoon. • Other areas, such as Siakheshim and the eastern part of the wetland (e.g., Chokum) are also isolated from other parts of the wetland, though the Caspian Sea water appears to intrude into the eastern part. These areas are covered by thick reed bed, which probably filters and absorbs pollutants, and help self-purify water. Water courses in these areas are too shallow for boat access, and monitoring data are very limited.
To determine whether the water quality of the Anzali Wetland is improving or deteriorating in long-term (in the order of decades)	• This is a long-term objective of the regular monitoring, and at this point, data are too limited to make inference about long-term change in water quality.

Source: JICA Expert Team

b) Salinity Monitoring

The Anzali Wetland is hydrologically connected to the Caspian Sea, and the unique environmental character of the wetland is believed to be strongly influenced by the intrusion of

the Caspian Sea water. However, the intrusion of the Caspian Sea water into the wetland had not been investigated in the past. Therefore, the salinity monitoring was included in the JPA.

Objective

The objective of the salinity monitoring is:

- To evaluate whether there is significant mixing of the Caspian Sea water with the water of the Anzali Wetland

Observation of salinity/electric conductivity in the wetland was a part of the monthly regular monitoring, but the monitoring locations in the wetland is limited to three locations, and this is not sufficient to capture the mechanism of intrusion of the Caspian Sea water. Thus, this program was designed separately to get a snapshot of salinity/electric conductivity at many locations in the wetland.

Methodologies

Table 3.2-31 summarizes the number of sampling locations, date of sampling, analytical items, and main objectives of the salinity monitoring. The parameters were measured by DOE's portable water quality meter (HACH 40d). Salinity reported in this program is the read out from the portable water quality meter, though it has been pointed out that the EC-salinity conversion for the Caspian Sea may be different from the conventional conversion based on Practical Salinity Scale 1978 (PSS-78).

Table 3.2-31 Program of Salinity Monitoring

Category	Sampling Locations	Date	Analytical items	Main objective
Wetland	19 locations (top 50 cm and other depth if water is deep)	14th August 2017	Water temp, air temp., DO, EC, salinity (portable water quality meter)	To evaluate whether there is significant mixing of the Caspian Sea water with water of the Anzali Wetland

Source: JICA Expert Team

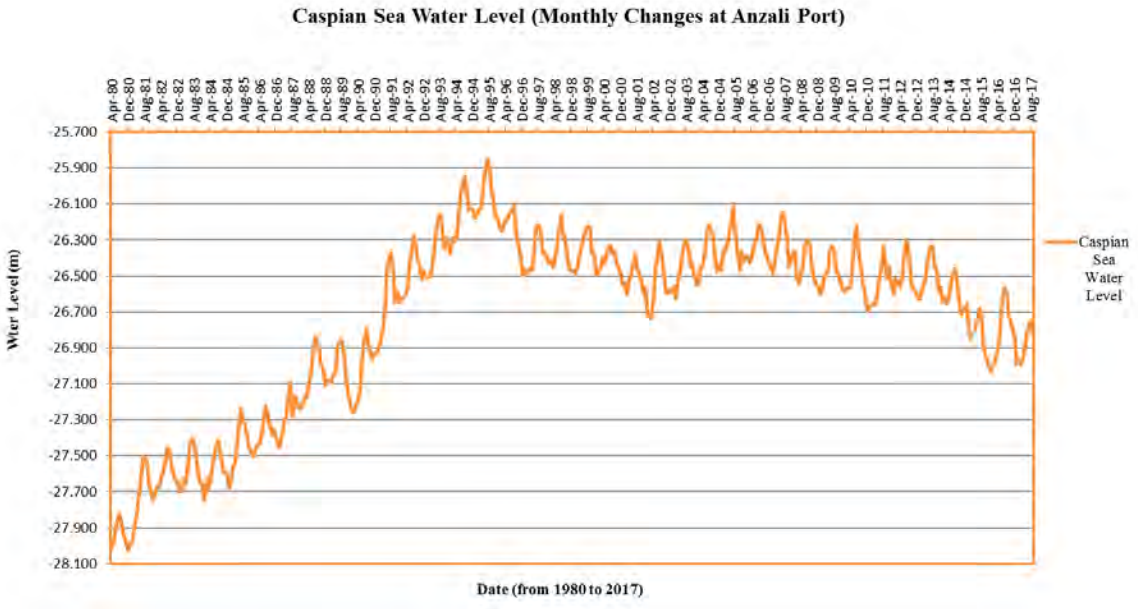
The monitoring was implemented at 19 locations in the wetland. Chokum (Pt12) was too shallow, and was not accessible this time. For the map of the locations, please see the result section below.

Table 3.2-32 Locations of Salinity Monitoring

No.	Location	Easting (UTM)	Northing (UTM)
Pt01	Caspian Sea (pt01)	364742	4150292
Pt02	Port (pt02)	364179	4148589
Pt03	Mian Poshteh bridge (pt03)	363482	4146650
Pt04	Nearby Sorkhankol (pt04; W12)	362944	4144395
Pt05	Eastern Lagoon (pt05; W10)	359187	4145324
Pt06	Middle of Lagoon (pt 06; W17)	355547	4146558
Pt07	Westen Lagoon (pt07; W18)	352797	4148512
Pt08	Siahkheshim (pt08; W06)	357113	4141908
Pt09	Siahdarvishan (pt09; W15)	359636	4142549
Pt10	Sorkhankol (pt10; W03)	362817	4143857
Pt11	Sorkhankol (pt11; W14)	361614	4142629
Pt12	Chokum	-	-
Pt13	Downstream of Chokum River (pt13; W13)	367580	4142840
Pt14	Water reservoirs Shalkuhy (pt14; Hasan Bekandeh)	367168	4145344
Pt15	Sosar Roga (pt15; W08)	366419	4146676
Pt16	(pt16; W13)	365398	4145027
Pt17	(pt17; W07)	363430	4148220
Pt18	(pt18; W11)	364193	4146554
Pt19	(Pt19; -)	362179	4143213
Pt20	(Pt20; -)	361252	4142283

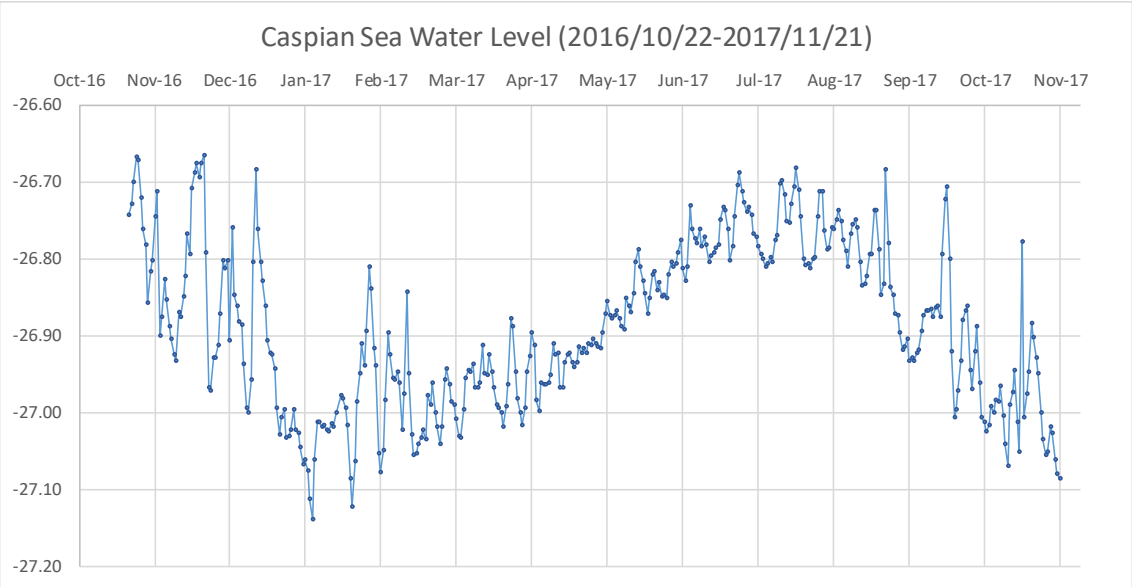
Source: JICA Expert Team

The monitoring was carried out on 14th August 2017. Figures below show the long-term (1980-2017) and an annual (2016-2017) fluctuation of the water level in the Anzali Port (Though the water level of the Caspian Sea is the main factor determining the water level at this station, it is somewhat affected by river flow from the wetland). This was the time that the water level of the Caspian Sea was the highest. As for the water levels in the wetland, the water level meters had not been re-calibrated, and thus no water level data were available. The weather was fine, and there had been no major storm event prior to the day of monitoring.



Source: JICA Expert Team

Figure 3.2-39 Changes in Water Level at Anzali Port (1980-2017)



Source: JICA Expert Team based on information from PMO

Figure 3.2-40 Changes in Water Level at Anzali Port

Results

Table 3.2-33 and Figure 3.2-41 summarize the results of the salinity monitoring in August 2017.

Table 3.2-33 Results of Salinity Monitoring in August 2017

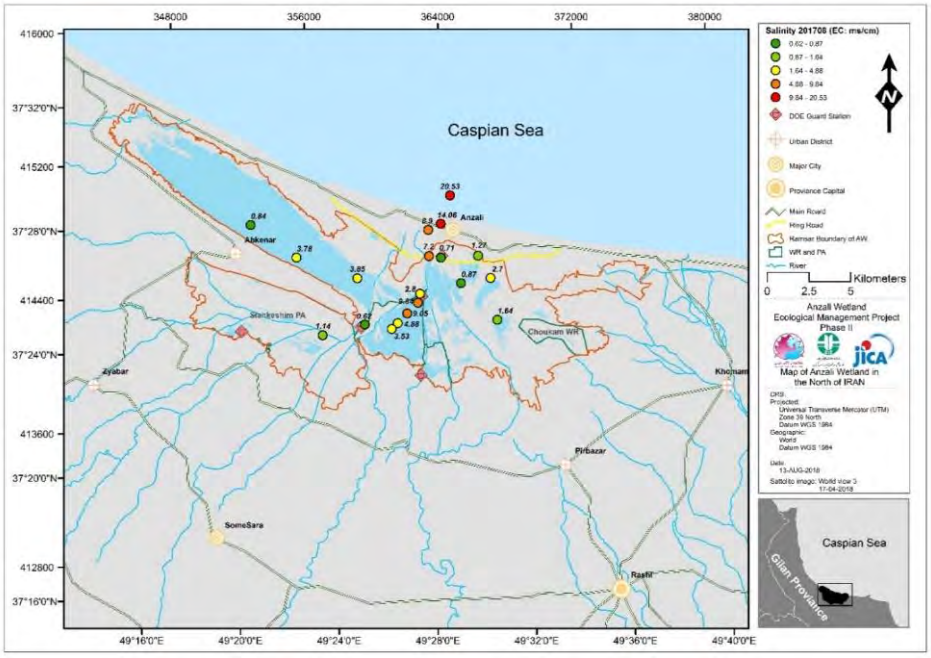
Location	Date and Time	Water Temp. (^{0}C)	EC (mS/cm) at 50 cm Depth	EC (mS/cm) at different Depth	Salinity (ppt) at 50 cm Depth	Salinity (ppt) at different Depth (about 50 cm from bottom)	DO (mg/L) and DO Percent
Pt 01 (Caspian Sea)	14th Aug., 2017 10:05	30.0	20.53	20.67 at 5m Depth	11.04	11.25 at 5m Depth	7.61 101.07%
Pt 02 (Port)	14th Aug., 2017 10:08	29.5	14.06	10.51 at 1.5m Depth	7.40	5.34 at 1.5m Depth	3.06 40.4%
Pt 03 (Mian Poshteh bridge)	14th Aug., 2017 12:30	29.9	7.20	5.02 at 7.5m Depth	3.57	2.51 at 7.5m Depth	8.36 112.2%
Pt 04 (Nearby Sorkhankol)	14th Aug., 2017 11:25	27.9	2.80	0.754 at 3.3m Depth	1.36	0.35 at 3.3m Depth	4.04 52.0%
Pt 05 (Eastern Lagoon)	14th Aug., 2017 10:20	28.5	-	3.85 at 40cm Depth	-	1.89 at 40 cm Depth	5.72 74.5%
Pt 06 (Middle of Lagoon)	14th Aug., 2017 10:33	27.8	3.78	4.18 at 1.04m Depth	1.88	2.12 at 1.04 m Depth	0.50 6.5%
Pt 07 (Western Lagoon)	14th Aug., 2017 10:43	29.6	0.844	0.689 at 1.4m Depth	0.38	0.31 at 1.4m Depth	9.23 121.7%
Pt 08 (Siahkheshim)	14th Aug., 2017 11:12	28.9	1.137	-	0.52	-	1.60 21.0%
Pt 09 (Siahdarvishan)	14th Aug., 2017 11:00	28.2	0.620	0.434 at 1.8m Depth	0.28	0.20 at 1.8 m Depth	5.74 74.4%
Pt 10 (Sorkhankol)	14th Aug., 2017 11:33	30.1	9.84	-	4.97	-	7.13 94.7%

Location	Date and Time	Water Temp. (^{0}C)	EC (mS/cm) at 50 cm Depth	EC (mS/cm) at different Depth	Salinity (ppt) at 50 cm Depth	Salinity (ppt) at different Depth (about 50 cm from bottom)	DO (mg/L) and DO Percent
Pt19 (Before pt 11)	14th Aug., 2017 11:37	30.0	9.05	-	4.56	-	4.31 57.1%
Pt 11 (Sorkhankol)	14th Aug., 2017 11:40	28.3	4.88	-	2.43	-	2.61 33.9%
Pt 20 (After pt 11)	14th Aug., 2017 11:43	28.3	3.53	-	1.73	-	2.35 30.5%
Pt13 (pt 12 (Chokum) and pt 13 (Downstream of Chokum river))	14th Aug., 2017 12:05	30.1	1.637	-	0.74	-	8.17 109.4%
Pt 14 (Water reservoirs Shalkuhy)	14th Aug., 2017 12:15	29.6	2.70	13.6 at 2.3m Depth	1.27	6.93 at 2.3m Depth	12.57 167.1%
Pt 15 (Sosar Roga)	14th Aug., 2017 12:20	29.0	1.272	16.17 at 2.95m Depth	0.58	8.66 at 2.95m Depth	2.91 38.0%
Pt 16	14th Aug., 2017 11:56	28.7	0.874	0.870 at 2.8m Depth	0.40	0.39 at 2.8m Depth	0.52 6.8%
Pt 17	14th Aug., 2017 10:10	29.4	8.90	8.08 at 1.6m Depth	4.52	4.08 at 1.6m Depth	2.87 37.6%
Pt 18	14th Aug., 2017 12:37	28.7	0.714	0.727 at 1.6m Depth	0.32	0.33 at 1.6m Depth	2.69 35.1%

Note 1: The values of temperature, EC, Salinity and DO were measured on-site using thermometers and a portable water quality analysis.

Note 2: The floodwater came in wetland, two days ago.

Source: JICA Expert Team



Source: JICA Expert Team

Figure 3.2-41 Spatial Distributions of Electrical Conductivity (mS/cm, 50 cm from surface) in the Wetland

EC and Salinity

- EC of the Caspian Sea outside of the Anzali Port at the depth of 50 cm was 20.53mS/cm, and the salinity was 11.04 ppt (according to the portable water quality meter) or roughly 1/3 of the oceans. These numbers are consistent with historical data.
- The results showed that EC and salinity in the Anzali Wetland were significantly higher in the downstream area, indicating intrusion of the Caspian Sea water. This is particularly true for Sorkhankol, which is the lowest area in the wetland, where the salinity was as high as 5 ppt or nearly half of the Caspian Sea. EC and salinity were high even in the eastern part of the lagoon.
- EC and salinity in the major channels in the wetland were much lower because they are the main pathways of fresh river waters into the Caspian Sea.
- It was noted that EC and salinity in the surface layer (50 cm) are higher than the deeper layer at many locations in the wetland. This is counter-intuitive because saline water is generally heavier than freshwater. The field record was double-checked, but apparently this was not a systematic error in copying numbers. It was hypothesized that this is because hot saline water in the surface layer (around 30 ^{0}C) of the wetland floated on the cooler freshwater (groundwater) discharged from the basin. Unfortunately, the temperatures of the bottom layers were not measured, and it is not possible to prove this hypothesis.
- While the data clearly showed intrusion of the Caspian Sea water into the wetland, the exact mechanism of saltwater intrusion and the reason why EC and salinity of the surface layer were higher are not clear at the moment.

With respect to the objective set for the salinity monitoring, the following conclusions can be made:

Table 3.2-34 Conclusions of Salinity Monitoring in August 2017

Objective	Conclusions based on monitoring in August 2017
To evaluate whether there is significant mixing of the Caspian Sea water with water of the Anzali Wetland	• The results clearly showed that there is a significant exchange of the Caspian Sea water and the water of the Anzali Wetland. On 14th August 2017, the salinity in Sorkhankol was roughly half of the Caspian Sea. • Intrusion of the Caspian Sea water is a very important ecological character of the Anzali Wetland, though further research is needed to elucidate how the intrusion occurs and what are the ecological impacts of the intrusion.

Source: JICA Expert Team

c) Monitoring of Toxic Substances

In this section, the results of analysis of heavy metals and toxic organic substances in both water and sediment conducted in March and August 2017 are presented. Monitoring of toxic substances was not included in the revised monitoring program because DOE Gilan decided to

implement a sediment survey separately from the JPA. Nevertheless, evaluation of levels of toxic substances was considered critical in understanding the environmental status of the wetland, as aquatic life, such as fish, benthos and planktons are often very sensitive to such stresses. There are many historical studies on pollution of the Anzali Wetland with toxic substances, but reliability of some of them is questionable, and it was of interest to confirm levels of these pollutants in the wetland.

Objectives

The monitoring of toxic substances was implemented in March and August 2017 with the objective of:

- To confirm the levels of heavy metals, pesticides and PCBs in water and sediments.

Methodologies

The monitoring of sediment was implemented twice, in March 2017 and August 2017. The monitoring of water was implemented in August 2017.

Table 3.2-35 Water Samples Analyzed in Japan in August 2017

Category	Sampling Locations	Date	Analytical items	Main objective
Anzali Wetland	3 locations (Port, Lagoon, Sorkhankol)	20th Aug. 2017	COD, T-P, T-N, Cd. Pb, Zn, chlropyrifos, butachlor, diazinon	To confirm the results of water quality monitoring by DOE
Rivers	2 locations (Pirbazar, Khalkai)	20th Aug. 2017		To confirm the levels of heavy metals and pesticides in water.

Source: JICA Expert Team

Table 3.2-36 Sediment Samples Analyzed in the Netherlands in August 2017

Category	Sampling Locations	Date	Analytical items	Main objective
Anzali Wetland	4 locations (Lagoon, Sorkhankol, downstream of Pirbazar/Pasikhan, and Selkeh)	20th Aug. 2017 (Selkeh 19th Aug. 2017)	As, Cr, Cu, Pb, Ni, Zn, Hg, PCBs, chlorinated pesticides, butachlor, diazinon, chlorpyrifos	To confirm the levels of heavy metals, pesticides and PCBs in sediments.
Rivers	2 locations (Pirbazar, Khalkai)	20th Aug. 2017		

Source: JICA Expert Team

The analytical methodologies are summarized in Table 3.2-37.

Table 3.2-37 Analytical Methodologies Used by Laboratory in Japan

Parameter	Methodology	Parameter	Methodology
COD	JIS K 0102 20.1	Zn	JIS K 0102 53.4 (ICP/MS) (as Total Zn)
T-N	JIS K 0102 45.4	Chlorpyrifos	GC/MC
T-P	JIS K 0102 46.3.1	Butachlor	GC/MS
Cd	JIS K 0102 55.4 (ICP/MS)	Diazinon	LC/MS
Pb	JIS K 0102 54.4 (ICP/MS)		

Source: JICA Expert Team based in information from the laboratory in Japan

Table 3.2-38 Analytical Methods Used by Laboratory in the Netherlands

Parameter	Methodology	Parameter	Methodology
As	NEN 6961/NEN 6966 C1	Hg	NEN 6961 / NEN-ISO 16772
Cr	NEN 6961/NEN 6966 C1	PCBs	CMA/3/I
Cu	NEN 6961/NEN 6966 C1	Chlorinated Pesticides	CMA/3/I
Pb	NEN 6961/NEN 6966 C1	Chlropyrifos	SPE/ LV-GC-MS (SOP M 886)
Ni	NEN 6961/NEN 6966 C1	Butachlor	LC-MS/MS (DIN38406-38)
Zn (non volatile)	NEN 6961/NEN 6966 C1	Diazinon	LC-MS/MS (DIN38406-38)

Note 1: Tested PCBs are No. 28, 52, 101, 118, 138, 153 and 180

Note 2: Tested chlorinated pesticides are α-HCH, β-HCH, lindane, γ-HCH, heptachlorine, α-endosulfan, β-endosulfan, endosulfansulfate, adlrin, dieldrin, endrin, isodrin, cis-heptachlor epoxid, trans-heptachlor epoxid, cis-chlordane, trans-chlordane, o,p-DDD, p,p-DDD, o,p-DDE, p,p-DDE, o,p-DDT, and p,p-DDT.

Source: JICA Expert Team based on information from the laboratory in the Netherlands

Results

Table lists the results of water quality analysis in Japan in August 2017. The results can be summarized as follows:

- With respect to heavy metals in water, concentrations were generally low, except Zn in the wetland, which exceeded the Japanese environmental standard and the Canadian guideline value for protection of aquatic life. It seems the background concentration of Zn is high in the area, but more study is needed to confirm this.
- None of the common pesticides analyzed in August 2017 were detected.

Table 3.2-39 Results of Water Quality Analysis in August 2017 in Japan

Category	Location	Cd (mg/L)	Pb (mg/L)	Total Zn (mg/L)	Chlorpyrifos	Butachlor	Diazinon
Iranian Standard		-	-	1 mg/L assuming hardness 100 mg/L	-	-	-
Japanese Standard		0.003	0.01	0.03	2×10^{-6}	-	-
Canadian Guidelines		9×10^{-5}	0.00318	0.03	<0.001	<0.001	<0.0007
Anzali Wetland	Lagoon	<0.001	<0.005	0.032	<0.001	<0.001	<0.0007
	Sorkhankol	<0.001	<0.005	0.014	<0.001	<0.001	<0.0007
River	Pirbazar	<0.001	<0.005	<0.006	<0.001	<0.001	<0.0007
	Khalkai	<0.001	<0.005	<0.009			

Note: Japanese Standard: T-N and T-P for Fishery 3rd grade; metals for protection of human health; total Zn for protection of aquatic life

Canadian Standard: Water Quality Guidelines for Protection of Aquatic Life (long-term)

Table 3.2-40 summarizes the results of sediment analyses in March and August 2017. The results are as follows:

- The concentrations of heavy metals in the sediment in the region are generally not extremely low presumably due to geological reason. However, none of the metal concentrations exceeded the PELs (probable effect levels) of Canadian Sediment Quality Guideline values for protection of aquatic life.
- None of the toxic organic substances were detected above the reporting limits, and it appears that the levels of pollution with such chemicals are generally not high. However, PELs of Canadian Sediment Quality Guidelines values for organic chemicals are generally extremely low, and reporting limits for routine analysis employed this time were often higher than PELs.

Table 3.2-40 Results of Sediment Quality Analysis in March and August 2017 in the Netherlands

Category	Location	As (mg/kg DW)	Cd (mg/kg DW)	Cr (mg/kg DW)	Cu (mg/kg DW)	Pb (mg/kg DW)	Ni (mg/kg DW)	Zn (mg/kg DW)	Hg (mg/kg DW)
Iranian Standard		-	-	-	-	-	-	-	-
Canadian Guidelines		17	3.5	90	197	91.3	-	315	0.486
Anzali Wetland	Lagoon	7.0 (8.0)	- (0.47)	42	34	15 (22)	35	62 (97)	0.06 (0.099)
	Sorkhankol	14 (12)	- (0.35)	61	41	20 (15)	48	98 (84)	0.074 (0.070)
	Selkeh	8.6	-	41	21	14 (24)	33	55	<0.050
	Downstream of Pirbazar/Pasikhan	14	-	55	45	20	42	140	0.10
River	Pirbazar	14 (12)	- (0.40)	69	43	19 (13)	55	97 (360)	0.068 (0.17)
	Khalkai	7.1 (12)	- (0.32)	56	25	<10	51	74 (94)	<0.050 (<0.05)

Category	Location	PCBs (mg/kg DW)	Chlorinated Pesticides (mg/kg DW)	Butachlor (mg/kg DW)	Diazinon (mg/kg DW)	Chlorpyrifos (mg/kg DW)
Iranian Standard		-	-	-	-	-
Canadian Guidelines		0.277	0.00138 – 0.624	-	-	-
Anzali Wetland	Lagoon	< 0.10 (< 0.010)	<0.10 and <0.20 (< 0.01)	<0.05	<0.05	<0.05
	Sorkhankol	< 0.10 (< 0.010)	<0.10 and <0.20 (< 0.01)	<0.05	<0.05	<0.05
	Selkeh	< 0.10	<0.10 and <0.20 (< 0.01)	<0.05	<0.05	<0.05
	Downstream of Pirbazar/Pasikhan	< 0.10	<0.10 and <0.20 (< 0.01)	<0.05	<0.05	<0.05
River	Pirbazar	< 0.10 (< 0.010)	<0.10 and <0.20 (< 0.01)	<0.05	<0.05	<0.05
	Khalkai	< 0.10 (< 0.010)	<0.10 and <0.20 (< 0.01)	<0.05	<0.05	<0.05

Note: Numbers in ( ) are results of monitoring in March 2017. Others are results in August 2017.

Note 2: Detection Limit for chlorinated pesticides: 0.10 mg/kg for α-HCH, β-HCH, lindane, γ-HCH, heptachlorine, α-endosulfan, β-endosulfan, endosulfansulfate, adlrin, dieldrin, isodrin, cis-heptachlor epoxid, trans-heptachlor epoxid, cis-chlordane, trans-chlordane, o,p-DDD, p,p-DDD, o,p-DDE, p,p-DDE, o,p-DDT, and p,p-DDT; 0.20 mg/kg for endrin.

Note 3: Canadian guideline values for PCBs is PEL for total PCBs

Note 4: Canadian standard for chlorinated pesticides is PEL for individual chlorinated pesticide for which PEL is available

The results of the monitoring of toxic substances in March and August 2017 are summarized as follows:

Table 3.2-41 Conclusions of Monitoring of Toxic Substances in March and August 2017

Objective	Conclusions based on monitoring in March and August 2017
To confirm the levels of heavy metals, pesticides and PCBs in water and sediments	• The results did not indicate any serious pollution by toxic substances. • However, the levels of heavy metals, such as Zn, are relatively high presumably due to geological reason. Also, the plain area of the watershed is agricultural area, and use of pesticides is not uncommon. Thus, further investigation of toxic substances is recommended.

Source: JICA Expert Team

6-3) Monitoring of Water Levels

This section explains the activity of monitoring of water level, which was newly added to the activity of this JPA in 2016.

a) Installation of Water Level Meters

Water level is one of the most important environmental parameters that determines the ecological character of the Anzali Wetland. For example, intrusion of the Caspian Sea is probably dictated by the difference in the water levels in the wetland and the Caspian Sea. Moreover, shallowing/drying of the Anzali Wetland, which is arguably the most serious environmental problem of the Anzali Wetland, may be caused by the decreasing Caspian Sea

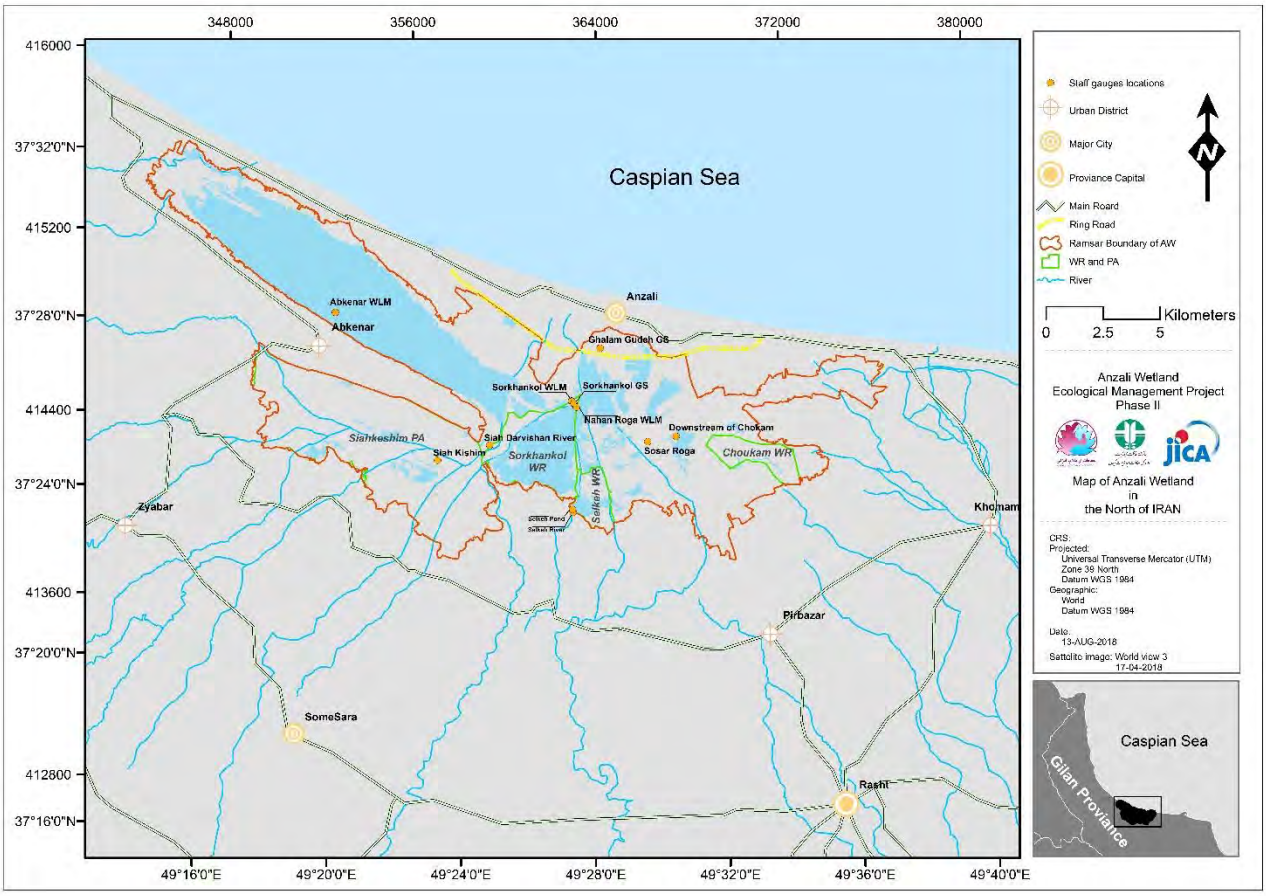
level in recent years, and not by sediment inflow or accumulation of organic matter. If this is the case, sediment traps and dredging have limited effectiveness in controlling the trend, and it could get worse if the Caspian Sea level retreats further with climate change. However, there were no historical data of water levels in the Anzali Wetland.

Thus, four float-type WLMs with radio transmitter were installed in Nahan Roga, Sorkhankol, Ab Kenar and Sosa Roga in 2014-2015, and monitoring was started in 2016. The locations of the WLMs are given in Table 3.2-42 and Figure 3.2-42 Photographs of the WLMs are given in Figure 3.2-43.

Table 3.2-42 Locations of Water Level Meters

No.	Location	Easting (UTM)	Northing (UTM)
2	Nahan Roga WLM	362955.00	4144381.00
4	Abkenar WLM	352596.84	4148267.85
6	Sorkhankol WLM	363164.59	4144110.29
7	Sosar Roga WLM	366299.30	4142595.81

Source: JICA Expert Team

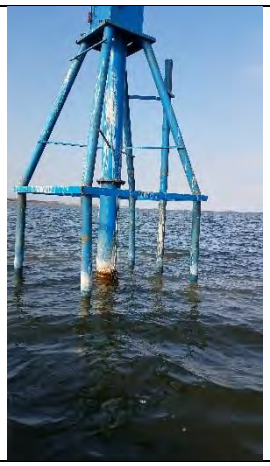


Source: JICA Expert Team

Figure 3.2-42 Locations of Water Level Meters and Staff Gauges


Sorkhankol WLM


Sosa Roga WLM


Ab Kenar WLM

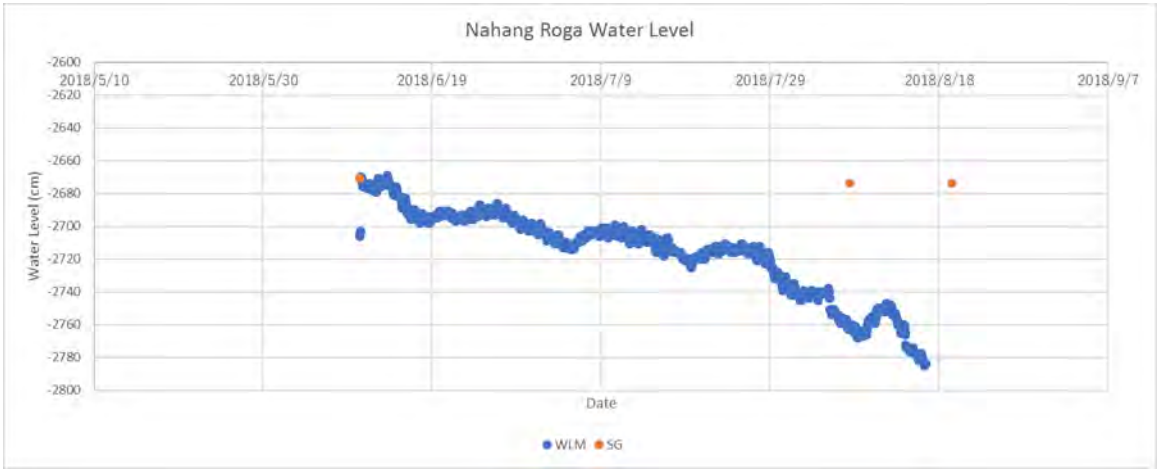

Nahang Roga WLM

Source: JICA Expert Team

Figure 3.2-43 Photographs of Water Level Meters

Unfortunately, these meters did not stabilize, and the location of Sosa Roga dried up. The meters at Nahang Roga, Sorkhankol and Ab Kenar were recalibrated in June 2018. But the meters continued to malfunction, as shown in Figure 3.2-44.

Figure 3.2-44 where the water level data of Nahang Roga WLM, after the calibration in June, is drifting downward from the data of the staff gauge (SG) installed at the same site. Thus, they were repaired in January 2019.



Source: JICA Expert Team

Figure 3.2-44 Drifting of Data of Nahan Roga WLM

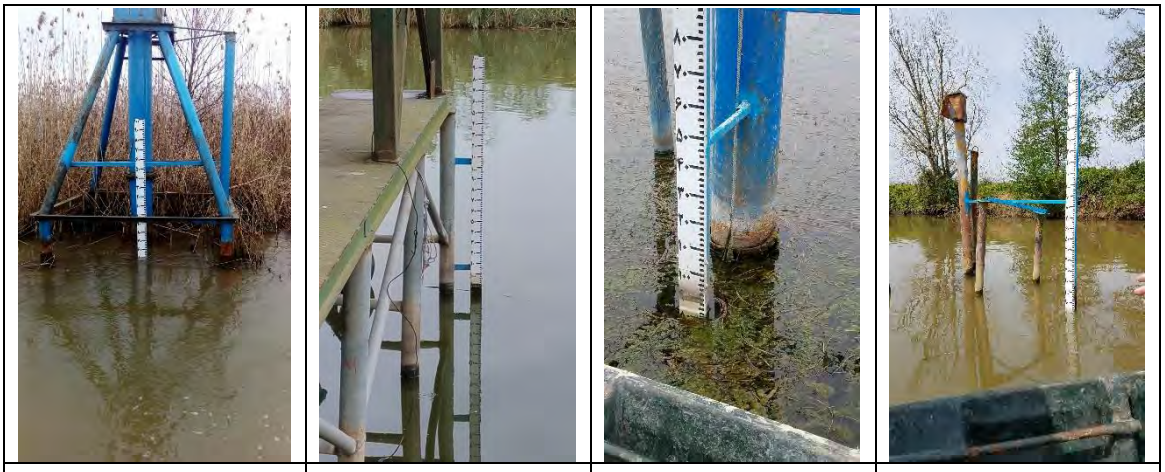
b) Installation of Staff Gauges

As the WLMs were not reliable, in total 11 staff gauges were installed in spring of 2018 to monitor water levels manually. The locations of the gauges are given in Table 3.2-43 and Figure3.2-45. Photographs of selected gauges are given in Figure 3.2-46

Table 3.2-43 Locations of Staff Gauges

No.	Location	Height of Gauge (m)	Easting (UTM)	Northing (UTM)	Elevation of Top of Gauge (m) (to be confirmed)
1	Ghalam Gudeh GS	3	364211.00	4146702.65	-24.531
2	Nahan Roga WLM	2	362955.00	4144381.00	-25.337
3	Sorkhankol GS	2	363053.92	4144282.84	-25.331
4	Abkenar WLM	3	352596.84	4148267.85	-24.562
5	Siah Darvishan River	3	359368.37	4142439.98	-24.724
6	Sorkhankol WLM	3	363164.59	4144110.29	-24.769
7	Sosar Roga	3	366299.30	4142595.81	-24.598
8	Selkeh River	2	363021.89	4139503.37	-25.341
9	Selkeh Pond	2	362998.00	4139621.00	-24.583
10	Downstream of Chokam	2	367544.69	4142826.58	-25.498
11	Siah Kishim	2	357079.46	4141777.85	-24.740

Source: Source: JICA Expert Team



Nahang Roga	Gharamgudeh	Ab Kenar	Siadarvishan

Source: JICA Expert Team

Figure 3.2-45 Photographs of Selected Staff Gauges

Unfortunately, the levelling survey of these gauges (and the water level meters) has not been as straightforward as a similar survey on a dry land because access in the wetland is limited, view is obstructed by tall reeds, and the ground is soft. Thus, elevations of these gauges are yet to be reconfirmed.

c) Monitoring of Water Levels

Table 3.2-44 and Figure 3.2-46 show the changes in the water levels in the Anzali Wetland during April – August 2018. As explained above, the elevations of these have to be verified, and the data should be considered tentative.

Table 3.2-44 Water Levels (meters) in the Wetland (Staff Gauges)

No.	Gauge Location	2018/4/12	2018/6/10	2018/8/7	2018/8/19	2018/11/22	2018/11/27
1	Ghalam Gudeh GS	-26.97	-26.69	-26.72	-26.73	-	-26.88
2	Nahan Roga WLM	-26.97	-26.71	-26.74	-26.74	-26.60	-26.39
3	Sorkhankol GS	-26.95	-26.70	-26.72	-26.73	-26.65	-26.51
4	Abkenar WLM	-26.84	-26.71	-26.72	-26.64	-	-26.36
5	Siah Darvishan River	-26.88	-26.59	-26.63	-26.62	-	-25.17
6	Sorkhankol WLM	-26.95	-26.69	-26.70	-26.72	-	-26.56
7	Sosar Roga	-26.90	-26.60	-26.63	-26.60	-	above gauge
8	Selkeh River	-26.80	-26.61	-26.58	-	-	
9	Selkeh Pond	-25.90	-26.13	-26.33	-	-	
10	Downstream of Chokam	-	-26.69	-26.66	-26.66		-25.62
11	Siahkishim	-	-26.19	TSA	TSA	-	above gauge

Note: -: not monitored; TSA: too shallow to access

Source: JICA Expert Team

Source: JICA Expert Team

Figure 3.2-46 Changes in Water Levels (To Be Verified) in the Anzali Wetland (April – November 2018)

Dynamics of water level in the wetland is very complex, as it is determined by the mass balance of inflowing surface water from rivers, inflowing groundwater, direct precipitation, evapotranspiration, outflowing surface water, and outflowing groundwater, and it is also influenced by the Caspian Sea level.

It seems the long-term fluctuation of the water level in the wetland is largely dictated by the water level of the Caspian Sea. This appears to be the reason why the wetland was very shallow in the 1980s when the water level was very low, became deeper in the late 1990s to early 2000s following the increase in the Caspian Sea water level, and became shallower again in recent

years, as the Caspian Sea level is retreating (see Figure 3.2-39). Also, the water level of the wetland appears to be influenced by the annual cycle of the Caspian Sea level, which is high in early summer and low in winter, as affected largely by the inflow from the Volga River. This seems to explain the observation in Figure 3.2-46 where the water levels in most locations in the wetland were lower in April 2018 and they went up in June – August 2018.

However, the Caspian Sea level is not the only factor determining the water level in the wetland, and this is making the interpretation of the water level difficult. On 27 November 2018, right after a heavy rain event, the water levels in many locations in the wetland were significantly higher than in August, especially in upstream areas within the wetland, such as Siakhisim, Siah Darvishan River (near the Siah Darvishan GS), Sosar Roga and downstream of Chokum. This appears to be a short-term rise in water level due to flooding, and the impact is less pronounced in the downstream and/or large water bodies, such as Ghalam Gudeh, Nahang Roga, and Sorkhankol and the lagoon. Most likely the water level in these areas will subside within several days.

Overall the limited observation using the staff gauges seem to support the hypothesis that the Caspian Sea level has a significant impact on the long-term water level of the wetland. Nevertheless, the water level data are too scarce to make any conclusions. To understand such dynamics, water levels have to be monitored more closely, perhaps hourly. To enable such frequent monitoring at different locations in the wetland, the water level meters should be repaired as soon as possible, and DOE Gilan needs to assign the monitoring tasks to guards and the staff of AWMO. See the Mid-term Plan for details.

6-4) Establishment of AWMO

a) Status of AWMO

In late 2017, DOE Gilan established the Anzali Wetland Monitoring Office (AWMO) in order to implement water and sediment quality monitoring in the Anzali Wetland. Table 3.2-45 summarizes the status of the AWMO as of November 2018.

Table 3.2-45 Status of Anzali Wetland Monitoring Office as of November 2018

Category	Condition
Name	Anzali Wetland Monitoring Office
Location	Adjacent to DOE-Anzali Office
Staff	8
Tasks	Monitoring of water and sediment qualities in the wetland
Many Equipment	Hach spectrophotometer (visible only), pH meter, DO meter, EC meter, ovens, incubator, autoclave (most equipment is outdated and need repair/replacement)
Reagent	Limited
Transportation	No car is available for monitoring

Source: JICA Expert Team

AWMO implemented its first monitoring in the wetland in November 2018. At that time, AWMO was not fully functional, and was in need of further development.

b) Development of AWMO

In November 2018, the staff of AWMO and JET discussed the future monitoring activities and jointly developed the Mid-term Plan. It is given in the Mid-term Plan.

(7) JPA-5: Environmental Zoning and Land Use Management Activity

An appropriate land use management should be started based on the updated zoning plan adapted to the current condition of the wetland and the land use guideline. The Action Plan of the Environmental Zoning and Land Use Management WG consists of data collection and field surveys, updating of the zoning plan, preparation of a land use guideline in each zone, installation of signboards on the boundaries of each zone, promotion of sustainable use of the wetland and enhancement of DOE guard station function.

Table 3.2-46 Implementation Schedule of JPA-5
(Environmental Zoning and Land Use Management Activity)

Activities		2015		2016		2017				2018				2019			Remarks
		1394				*1395*				*1396*				*1397*			
		2nd Year				**3rd Year**				**4th year**				**5th year**			
		Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	
Preparation of action plan	Plan																Done in 1st yaer
	Actual																
Data Collection, Field Survey	Plan																Enough daata were not provided to JET.
	Actual																
Updating Zoning Plan	Plan																Tentative zoning plan was prepared.
	Actual																
Preparation of Land Use Guideline in each zone	Plan																Tentative land use guideline was prepared.
	Actual																
Installation of Signboards on the boundary of each zone	Plan																Signboards were installed only on the boundaries of protected area.
	Actual																
Promotion of the Sustainable Use of the Wetland	Plan																
	Actual																

Source: JICA Expert Team

1) Data Collection and Field Survey

The necessary data including relevant legal data and geographical information and current situation of the wetland should be collected to update the zoning plan. However, the relevant organizations including DOE Gilan were reluctant to share some of the information to JET

because of security reason. Also, information sharing among the relevant organizations in Iran is not enough to manage the land use in the Anzali Wetland. Therefore, it was challenging to update the zoning plan and land use guideline based on the limited data.

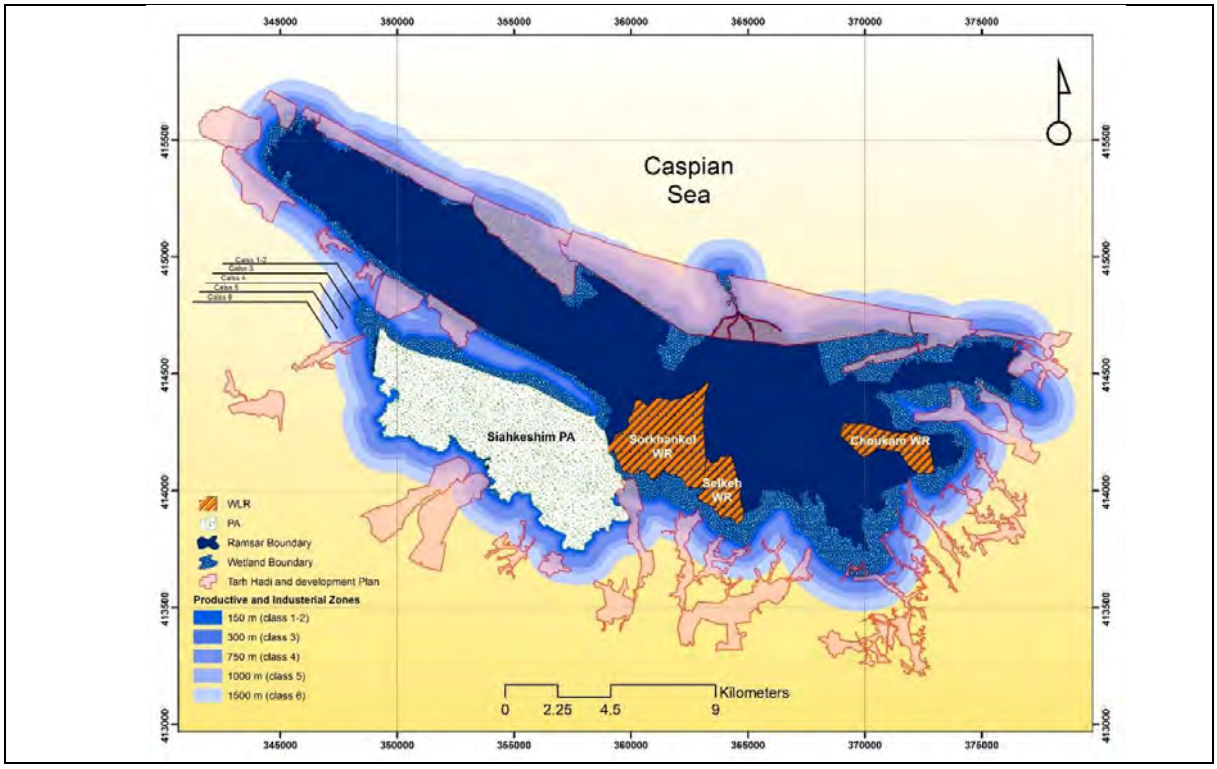
a) Related Laws and Regulations

There are many related laws and regulations related to manage the land use in/around the wetland as shown in Table 3.2-47 and Figure 3.2-47. These laws and regulations are very strict. Therefore, the Anzali Wetland must be protected very well with less human activity if all laws and regulations are complied. There are many illegal and gray land use and activities in these areas. They caused many conflictions between laws and local people.

Table 3.2-47 Laws and Regulations Related to Land Use Management of the Anzali Wetland

No.	Laws and Regulations	Related Area or Matter	Responsible Organization
1	Hunting and Fishing Law	Wildlife Refuge Protected Area	DOE
2	Law on Equitable Water Distribution	Boundary of wetland Buffer of wetland	Ministry of Energy(MOE)
3	Industrial and Productive Activities and Units Construction Criteria and Regulation	Class 1,2,3,4,5,6 for Industrial and Productive Activities and Units Construction	DOE
4	Tarhe Hadi Plan	Construction Area	Housing Foundation

Source: JICA Expert Team



Source: JICA Expert Team

Figure 3.2-47 Map of Areas Related Laws and Regulations

The boundary of wetland by MOE is one of the most important areas for the Anzali Wetland Conservation and life of local people.

"Boundary of Wetland" based on the Law on Equitable Water Distribution was finalized and published by Ministry of Energy (MOE) on 17 Oct 2017 as shown in Figure 3.2-48. It is larger than the Ramsar boundary and includes residential area and farmlands. MOE's wetland boundary was delimitated to control flood. It made many conflictions with local people and local governments because of land use limitation. There are actually many plans and zones based on various laws and guidelines. They caused many conflictions to be solved.


"شرکت سهامی آب منطقه ای گیلان"
"اطلاعیه"
این شرکت در راستای اصل ۴۵ قانون اساسی جمهوری اسلامی ایران و اختیار حاصله از تبصره ۱ ماده ۲ قانون توزیع عادلانه آب و به استناد ماده ۳ آیین نامه مربوط به بستر و حریم رودخانه ها و انهار، مسیل ها، مرداب ها، برکه های طبیعی و شبکه های آبرسانی و آبیاری و زهکشی مصوب ۷۹/۰۸/۱۱ هیات محترم وزیران، مبادرت به تعیین حد بستر و حریم تالاب انزلی مطابق با نقشه پیوست نموده است. لذا بدینوسیله به اطلاع کلیه اشخاص ذینفع (حقیقی و حقوقی) می رساند که برای کسب اطلاع از حد بستر و حریم تالاب انزلی به شرکت سهامی آب منطقه ای گیلان واقع در رشت، بلوار امام خمینی، دبیرخانه کمیسیون ماده ۳ مراجعه و چنانچه اعتراضی نسبت به میزان بستر و حریم رودخانه مذکور داشته باشند می توانند حداکثر ظرف مدت یک ماه از تاریخ انتشار این اطلاعیه اعتراض خود را به دبیرخانه کمیسیون مذکور تسلیم و رسید دریافت دارند. بدیهی است به اعتراضات واصله پس از انقضاء مهلت قانونی به هیچ وجه ترتیب اثر داده نخواهد شد.
روابط عمومی
شرکت سهامی آب منطقه ای گیلان

Source: Khazar Newspaper

Figure 3.2-48 Proclamation of Anzali Wetland Boundary of Anzali Wetland by MOE

b) Illegal Land Use

The south margin of the Anzali Wetland is almost farmland. Paddy field is the largest farmland. There are several large pastures for livestock and fish ponds for aquaculture as well. In addition, villages as residential areas are scattered. On the other hand, the north margin of the wetland is highly developed as urban area of Anzali city.

There are many land use in the Ramsar site boundary including WRs and PA. Many of them in WRs and PA is illegal land use such as farmland, plantation, pasture and Abbandan as shown in the following Table and Figure. Totally 1,353 ha (20.7%) in WRs and PA were detected based on the satellite image.

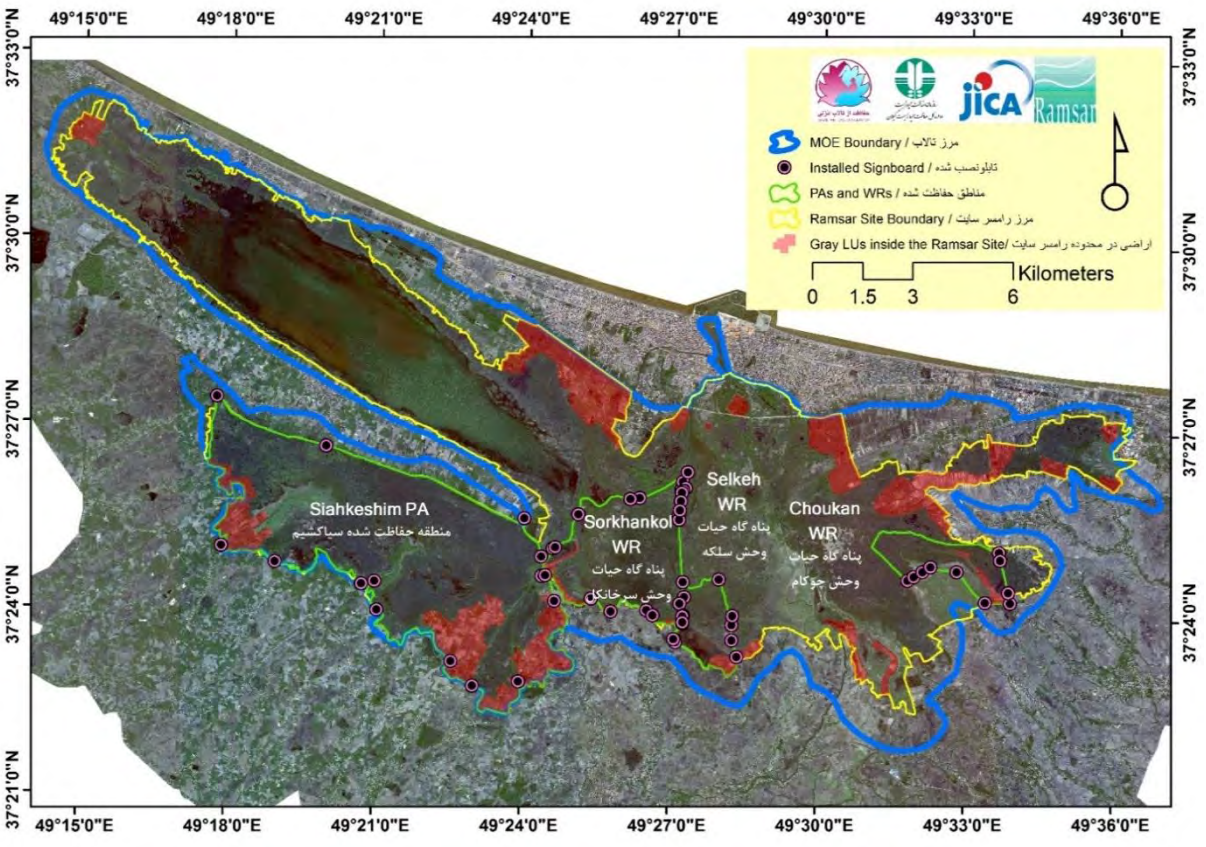
Some of land use in WRs and PA have been permitted from relevant organization due to ignorance, misunderstanding, lack of communication among relevant organizations, etc.

Therefore, sometimes they are difficult to identify whether illegal or legal. Actually, court fights often occur about the illegal land occupation.

Table 3.2-48 Illegal and Grey Land Use in WRs and PA in Anzali Wetland(2018)

No	Name of PA	Total Area (ha)	Farmland (ha)	Abbandan (ha)	Pasture (ha)	Plantation (ha)	Total LU (ha(%))
1	Selkeh WR	**360**	32	20	0	<1	**53 (14.7%)**
2	Sorkhankol WR	**1,209**	45	28	0	<5	**78 (6.5%)**
3	Choukam WR	**443**	29	5	91	<1	**126(28.4%)**
4	Siahkeshim PA	**4,498**	560	N/A	196	340	**1,096(24.3%)**
Total		**6,510**	**666**	**53**	**287**	**347**	**1,353(20.7%)**

Source: JICA Expert Team



Source: JICA Expert Team

Figure 3.2-49 Potential Illegal Land Use in Ramsar Boundary of the Anzali Wetland

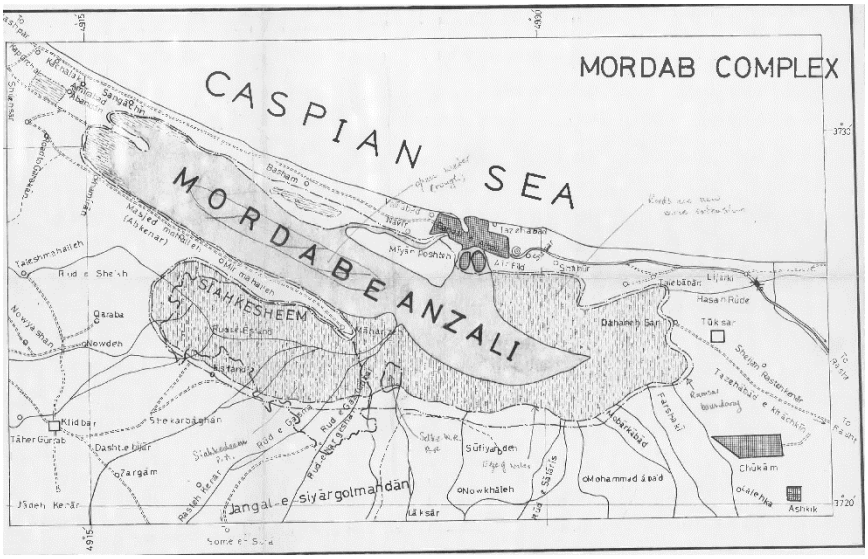
2) Updating Zoning Plan

The zoning plan was developed in the phase I project and approved by AWMC chaired by Provincial Governor in 2012. DOE Gilan in cooperation with relevant organizations should manage together to control land uses and activities in and around the Anzali Wetland based on the zoning plan.

the It is necessary to update the zoning plan to reflect the current situations to manage the land use and activities in and around the Anzali Wetland for promotion of the Wise Use concept.

a) Update of Ramsar Site Boundary

The Ramsar boundary of the Anzali Wetland has not been officially updated from 1975. It was very old and not precise geographically because it was drawn on a paper map as shown in Figure3.2-50. Ramsar Information Sheet (RIS) should be updated and should be submitted the GIS data of boundary based on the current situation. Contracting parties should update RIS every six years. However, information of Anzali Wetland was not updated for a long time. Therefore, JET supported to update RIS including GIS data of the boundary based on the request of DOE HQ. New RIS including GIS data of new boundary of Anzali Wetland was submitted to Ramsar Convention regional team in June 2018. (Current status of new RIS is under review by Ramsar regional team as of May 2019)



Source: Ramsar Convention

Figure 3.2-50 Previous Ramsar Boundary of the Anzali Wetland

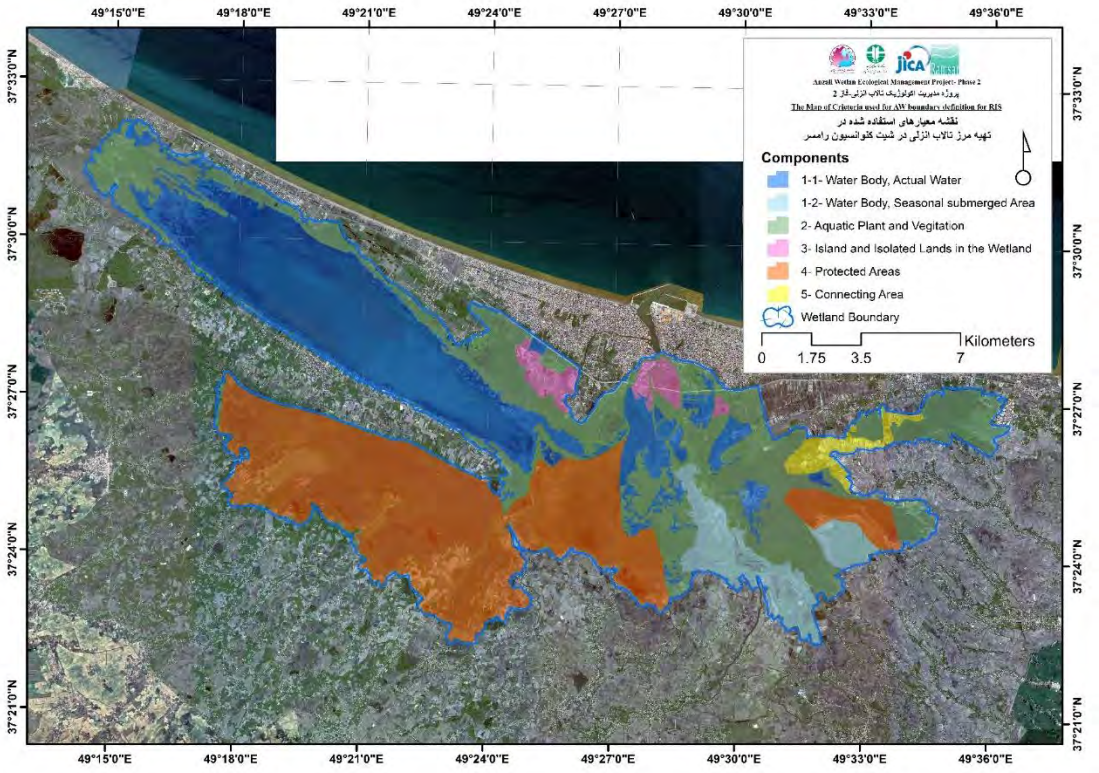
Considering all Ramsar Convention requirements and current situation of the wetland, criteria were determined for the Ramsar Site boundary as a core zone (wetland zone) of the Anzali Wetland as shown in Table 3.2-49.

New Ramsar Site boundary of the Anzali Wetland is shown in Figure 3.2-51. The area of the new Ramsar site boundary is 19,485 ha.

Table 3.2-49 Criteria of Ramsar Site Boundary of Anzali Wetland

No	Criteria
1	Actual water body and seasonal submerged land
2	Aquatic plant vegetations (reedbed, lotus community and the other emerged plant community)
3	Island and isolated land in wetland
4	Protected Areas (Selkeh, Sorkhankol, and Choukam Wildlife Refuges and Siahkesim Protected Area)
5	Area to connect main wetland with isolated eastern wetland as an ecological network

Source: JICA Expert Team



Source: JICA Expert Team

Figure 3.2-51 New Ramsar Boundary and Components

b) Update of Basic Zoning Plan of the Anzali Wetland

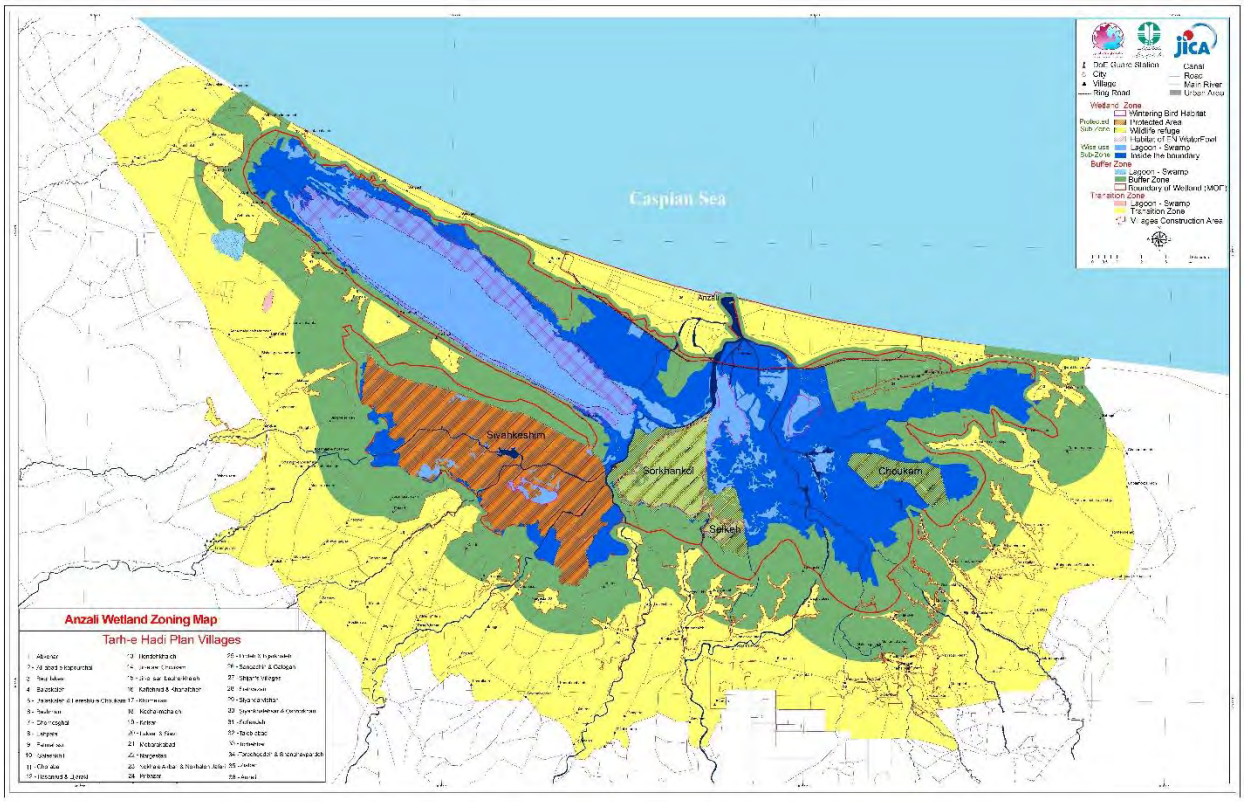
Establishment of a zoning scheme should normally involve stakeholders' participation in drawing the lines between the conflicting zones. Agreeing on the zoning and the management objectives for each zone (and hence what activities should and should not be permitted within each zone) is an important part of the process of establishing close involvement of local communities and other stakeholders in the management of the wetland. It is therefore proposed that the zones and the regulations for their use should be discussed in Environmental Zoning and Land Use Management WG of Wetland Ecosystem Conservation SC and then approved by the AWMC. After that, the plan and regulations should be disseminated to the wider public with

the use of maps and presentations in the surrounding communities. The presentations should include the rationale for establishing and delineating the zones, and a concise description of the functions of, and restrictions applied, within each zone. The three basic zones of the Anzali Wetland are defined as shown in Table 3.2-50. The basic zones map is shown in Table 3.2-50. The plan was mainly prepared by JET. Because the member of the WG including DOE Gilan focused on only the revision of the Boundary of Wetland (BOW) based on the Law on Equitable Water Distribution by MOE during the project period. BOW has already fixed. The purpose of the law is not the wetland conservation. Also, revision of the BOW cannot solve all of the many conflicts between local land uses. The updated zoning plan and land use guideline is a better solution of the many conflicts under the BOW. These plans should be finalized and approved in AWMC as soon as possible.

Table 3.2-50 Definition of Basic Zones of the Anzali Wetland

Zone	Sub Zone	Definition
Wetland Zone (Core Zone)	Protected Sub Zone	Protected sub zone must be protected strictly to maintain the ecological characteristics of the Anzali Wetland. All of the protected areas (*Siahkeshim Protected Area*, *Selkeh, Sorkhankol, and Choukam Wildlife Refuges*) are included within this Sub Zone.
	Wise-Use Sub Zone	Wise-use sub zone must be utilized for Wise Use (low impact and sustainably use) to maintain the ecological characteristics of the Anzali Wetland. The Wetland Zone is essentially the Anzali Ramsar Site, comprising the waterbody, seasonal wetland, aquatic plant communities and an area to connect main wetland with isolated eastern wetland as an ecological network. This area includes *Abbandan-dar* System.
Buffer Zone		Buffer Zone surrounds the Wetland Zone. This is the area that surrounds the wetland within which land use activities may directly affect the ecological character of the wetland itself, and therefore need to be controlled. The Buffer Zone includes the area within which seasonal or longer-term water level rises may be experienced. Thus, it is an eco-tone where the aquatic ecosystem blends into the terrestrial ecosystem, and as such may be a highly diverse and productive habitat. Some of the lands uses, and activities should be allowed with a condition such as flood measure and low impacted method. This zone in the inside of the boundary of wetland based on the Law on Equitable Water Distribution (including buffer zone of this boundary). This zone includes the area defined by "Industrial and Productive Activities and Units Construction Criteria" so that industrial facilities are classified and allowed depends on the distance from the wetland.
Transition Zone		Transition Zone surrounds the Buffer Zone. This zone is a transition area from conservation of ecosystem to local economic activities. The Transition Zone includes the Tarhe-Hadi Plan and 2 km-wide band from the Buffer Zone. The boundary of the transition zone may be varied locally to take account of existing features on the ground. x Most of the transition zone is under agricultural use, either as paddy fields, livestock and pasture or fish ponds.

Source: JICA Expert Team



Source: JICA Expert Team

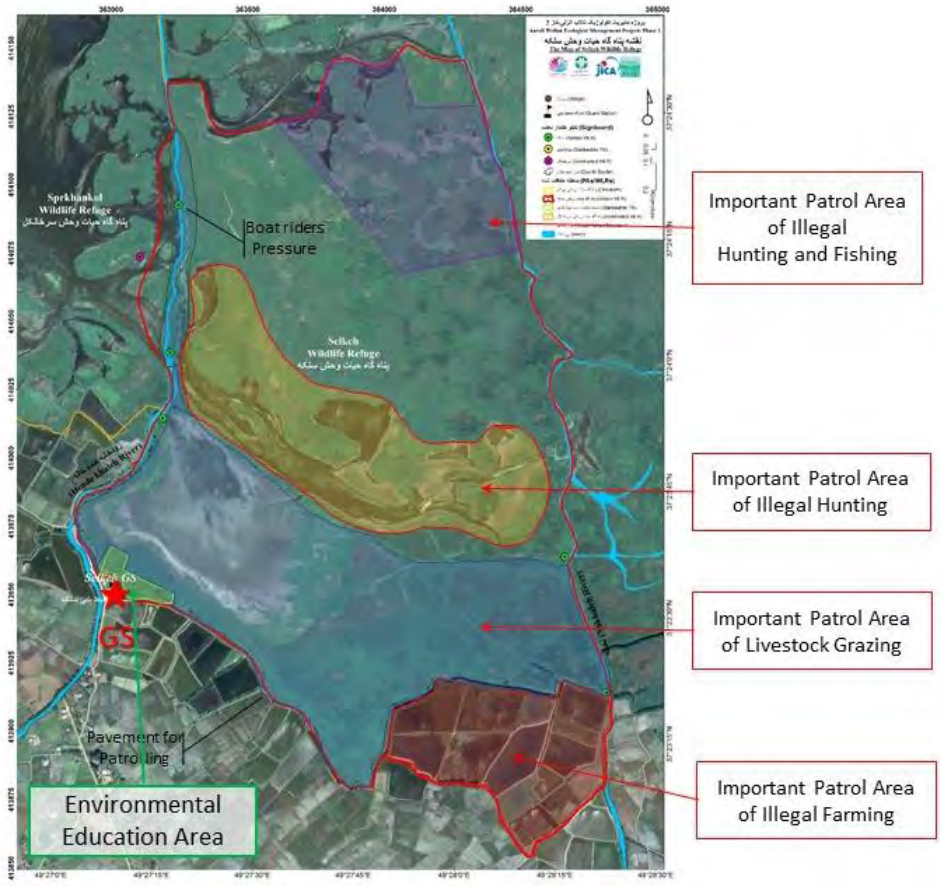
Figure 3.2-52 Basic Zoning Map of the Anzali Wetland

c) Preparation of Detailed Zoning Plan of Protected Areas

Three Wildlife Refuges and a Protected Area is the protected sub zone in the core zone of the Anzali Wetland. The protected sub-zone should be strictly protected. However, some areas in protected sub-zone should be utilized for environmental education and ecotourism to promote wise use and CEPA activities. Also, there are many illegal land uses in the protected sub zone. Therefore, a detailed zoning plan should be delineated for appropriate land use management of the protected sub zone as following.

[Selkeh Wildlife Refuge]

Proposal of detailed zoning plan of Selkeh WR is shown in the following figure.



Source: JICA Expert Team

Figure 3.2-53 Proposal of Detailed Zoning Plan of Selkeh WR

a) Environmental Education Area

Selkeh Wildlife Refuge has the Anzali Wetland Environmental Education Center with experience-based education facilities such as bird hide, boardwalk, observation deck and biotope near the GS. This area should be utilized for promotion for CEPA activity while conserving the wetland ecosystem. Detailed activities in the EE area are described in the chapter of environmental education.

b) Important Patrol Area for Livestock Grazing

There are many illegal and grey land use in the WR. Local livestock grazing is big pressure for wetland ecosystem. Livestock such as cows is destroying the habitat of wetland. For example, WR near the GS is very good habitat for breeding birds such as Black-winged Stilt and Whiskered Tern. Livestock crashes the nests of these birds. Livestock should be kept away from the WR. Fencing to surround the WR is the one way to keep livestock away.

c) Important Patrol Area for Illegal Hunting.

There have been detected many illegal nets to hunt birds in reed bed of this area. The patrol should be enhanced in this area.

d) Important Patrol Area for Illegal Hunting and Fishing.

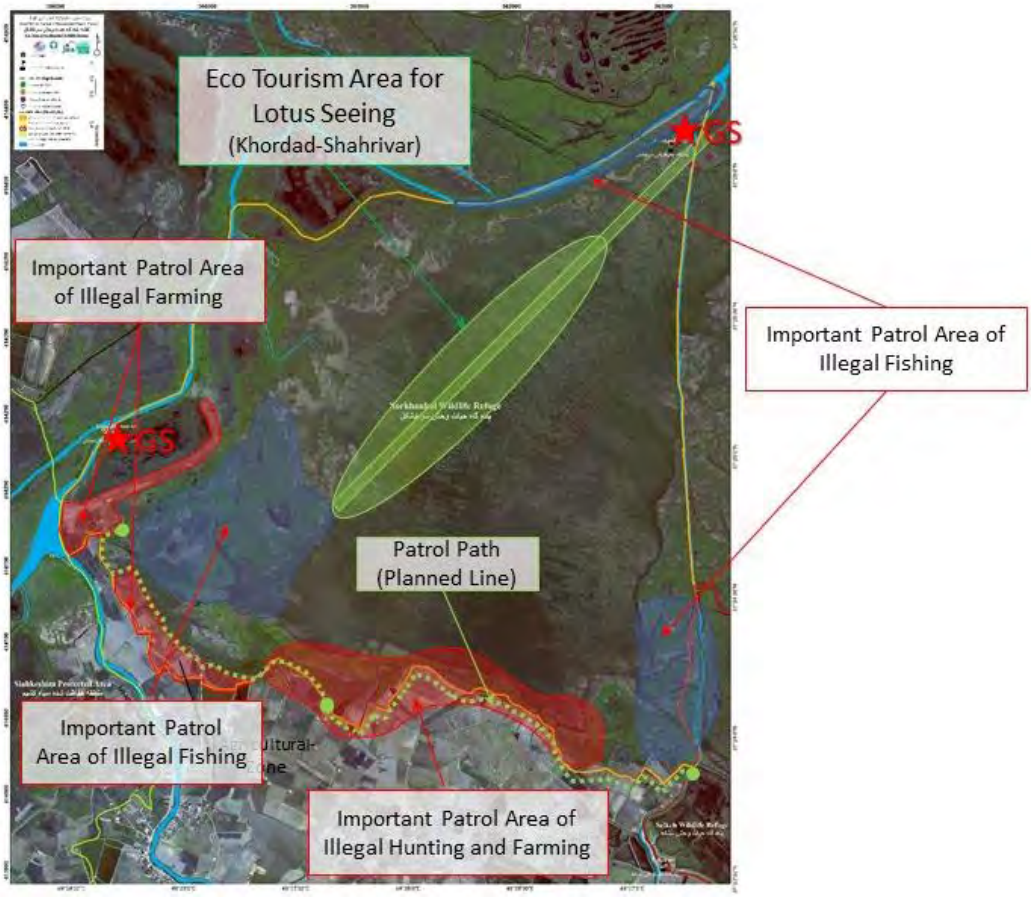
There have been detected illegal *abbandans* to hunt and fish. Patrol by DOE guard should be enhanced in this area.

e) Important Patrol Area for Illegal Farming

There have been used as farmland and fish pond in this area. The local landowners may have permission from the seven-person committee just after the revolution a long time ago. The legal situation should be clarified, and further land use should be controlled in this area.

[Sorkhankol Wildlife Refuge]

Proposal of detailed zoning plan of Sorkhankol WR is shown in the following figure.



Source: JICA Expert Team

Figure 3.2-54 Proposal of Detailed Zoning Plan of Sorkhankol WR

a) Ecotourism Area for Lotus Seeing

There is large Lotus community in Sorkhankol Wildlife Refuge. It is very famous sightseeing place of Lotus flower seeing. Only this area should be opened for local boat operators and tourists from Khordad to Shahrivar (Flower season of Lotus/ the end of May to the end of September). The speed of boat should be limited as 20 km/h for safety management. Using laud speaker for music should be prohibited. Taking plant body of Lotus and any the other creatures should be prohibited. Nature guide training for boat driver should be implemented to educate tourists.

b) Important Patrol Area for Illegal Hunting.

There have been detected many illegal nets, ponds as trap to hunt birds in reed bed of this area. The patrol should be enhanced in this area.

c) Important Patrol Area for Illegal Hunting and Fishing.

There have been detected illegal *abbandans* to hunt and fish. The patrol should be enhanced in this area.

d) Important Patrol Area for Illegal Hunting and Fishing.

There have been detected illegal *abbandans* to hunt and fish. Patrol by DOE guard should be enhanced in this area.

e) Important Patrol Area for Illegal Farming

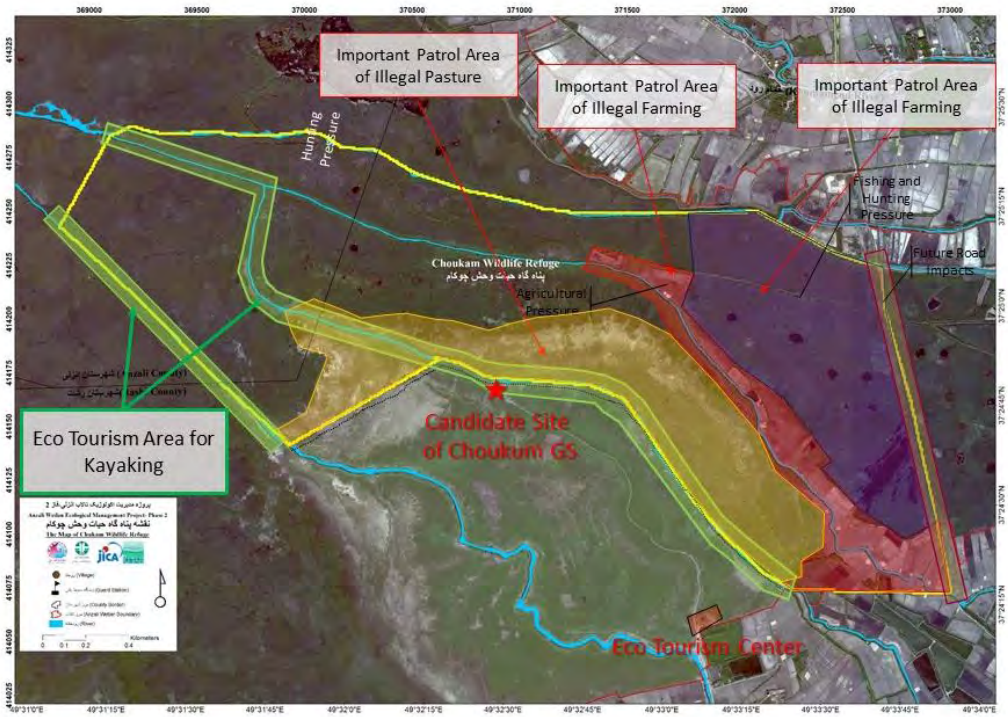
There have been used as farmland in this area. Some of the local landowners may have permission from the governmental organization. The legal situation should be clarified, and further land use should be controlled in this area. If obvious illegal land use is detected, these farmlands should be restored as the wetland.

f) Patrol Path Construction

Along the south coast of the WR, the narrow patrol path should be constructed. DOE guard can patrol the illegal hunting activity and farming by using motorbike.

[Choukam Wildlife Refuge]

Proposal of detailed zoning plan of Choukam WR is shown in the following figure.



Source: JICA Expert Team

Figure 3.2-55 Proposal of Detailed Zoning Plan of Choukam WR

a) Important Patrol Area for Illegal Farming

There has been used as farmland in this area. This area has been recently developed and expanded. Almost of farmlands are illegal. Legal situation should be clarified as soon as possible, and further land use should be controlled in this area. If obvious illegal land use will be detected, these farmlands should be restored as the wetland.

b) Important Patrol Area for Pasture

There is huge pasture developed by local villager. A part of the pasture out of the WR was developed based on the pasture plan under NRWGO. However, the pasture is illegally expanding and invaded inside of the WR. Patrol should be enhanced in this area. If obvious illegal pasture will be clarified , the illegal pasture area should be restored as the wetland.

c) Important Patrol Area for Illegal Hunting and Fishing.

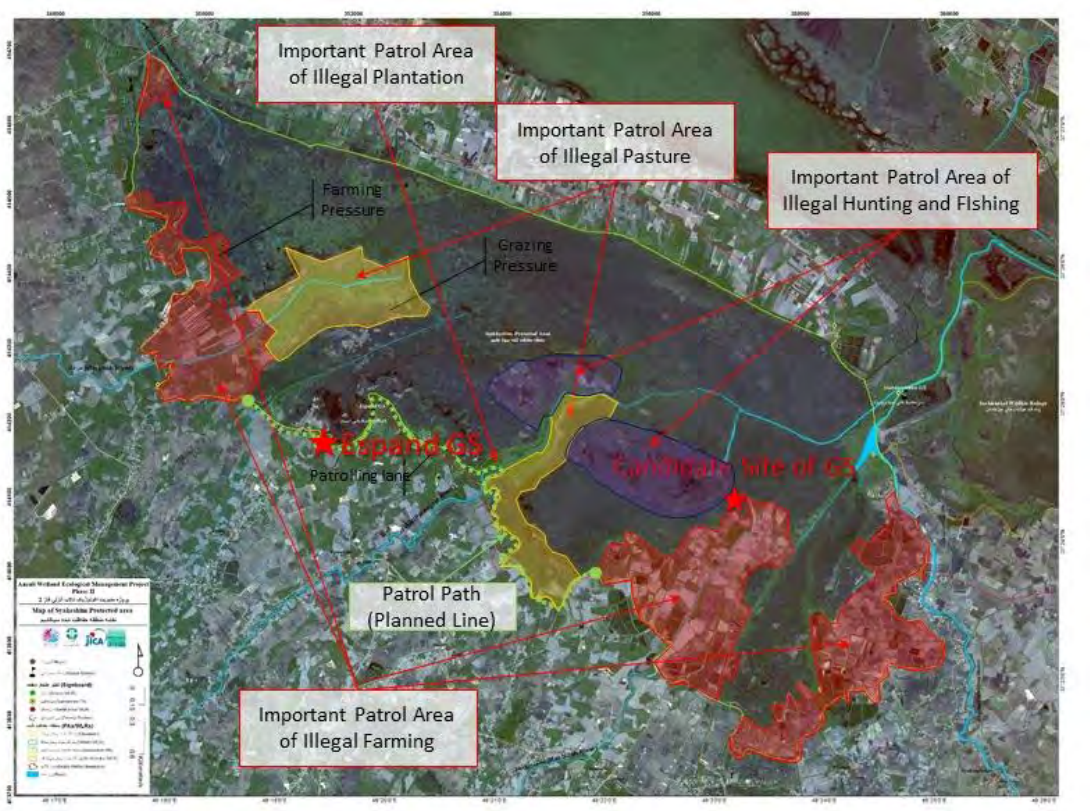
There have been detected illegal *abbandans* to hunt and fish. Patrol should be enhanced in this area.

d) Important Patrol Area for Illegal Hunting and Fishing.

There have been detected illegal *abbandans* to hunt and fish. Patrol should be enhanced in this area.

[Siahkesim Protected Area]

Proposal of detailed zoning plan of Siahkesim PA is shown in the following figure.



Source: JICA Expert Team

Figure 3.2-56 Proposal of Detailed Zoning Plan of Siahkesim PA

a) Important Patrol Area for Illegal Farming

There are huge farmlands in the PA and still expanding. Many of farmlands are illegal. Legal situation should be clarified as soon as possible, and further land use should be controlled in this area. If obvious illegal land use will be detected, these farmlands should be restored as the wetland.

b) Important Patrol Area for Pasture

There are huge pastures developed by local villager. The pasture is illegally expanding and invaded inside of the PA. Patrol should be enhanced in this area. If obvious illegal pasture will be clarified, the illegal pasture area should be restored as the wetland.

c) Important Patrol Area for Illegal Hunting and Fishing.

There have been detected illegal *abbandans* to hunt and fish. Patrol should be enhanced in this area. The hunting pressure is very high in this area. New GS should control this area appropriately.

d) Important Patrol Area for Illegal Plantation.

There are some illegal plantations in the PA. If obvious illegal plantation is clarified, the illegal plantation area should be restored as the wetland.

e) Patrol Path Construction

Along the south boundary of the PA, the narrow patrol path should be constructed. DOE guard can patrol the illegal hunting, pasture, plantation, and farming by using motorbike.

3) Preparation of Land Use Guideline

There are many complicated land uses and activities in the Anzali Wetland. It is impossible to solve these conflicts by some revision of boundaries of related laws and regulations completely. Detailed zoning plan and detailed land use guidelines should be prepared to promote wise uses and to solve conflicts based on the current situation. Land use guideline matrix is shown in the following table.

And the zoning map and GIS based on the zones in the table and the detailed zoning map should also be prepared, discussed and finalized as soon as possible.

They should be permitted and legalized by responsible organizations based on related laws.

Table 3.2-51 Land Use Guideline Matrix

No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Basic Zoning		Wetland Zone(Core Zone) Protected SZ			Wise Use SZ	Transition Zone	WZ Wise Use SZ	Transition Zone	Wz Wise Use Sub Zone		Transition Zone		Buffer Zone	Transition Zone		Buffer Zone	Transition Zone									
Zones	Wildlife Refuge /Protected Area	in	in	in	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out	out
	Ramsar Site	in	in	in	in	in	in	in	in	in	in	in	out	out	out	out	out	out	out	out	out	out	out	out	out	out
	Equitable Water Distribution (Boundary of Wetland)	in	bf	out	in	in	bf	bf	out	out	out	out	in	in	bf	bf	out	out	out	out	out	out	out	out	out	out
	Tarhe-Hadi Plan	out	out	out	out	in	out	in	out	out	in	in	out	in	in	out	out	out	out	out	out	in	in	in	in	in
	Construction Criteria (Class)	out	out	out	out	out	1,2	1,2	3	4	3	4	out	out	1,2	1,2	3	4	5	6	out	3	4	5	6	out
Construction Activities based on Construction Criteria and Regulations	Class 1 Food Factory	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Class 2 Loom Factory	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Class 3 Leather Factory	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Class 4 Cellulose Factory	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
	Class 5 Meta Factory	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
	Class 6 Non-Metal Factory	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Activitiies with construction works or land cover change works	Electrical power line	No	No	No	Zone Flood	Yes Flood	Zone	Yes	Zone	Zone	Yes	Yes	Zone Flood	Yes Flood	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Sewage Treatment Plant	No	No	No	Zone Flood	Yes Flood	Zone	Yes	Zone	Zone	Yes	Yes	Zone Flood	Yes Flood	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Road	No	No	No	Zone Flood	Yes Flood	Zone	Yes	Zone	Zone	Yes	Yes	Zone Flood	Yes Flood	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Railroad	No	No	No	Zone Flood	Yes Flood	Zone	Yes	Zone	Zone	Yes	Yes	Zone Flood	Yes Flood	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Restaurant	No	No	No	Zone Flood	Yes Flood	Zone	Yes	Zone	Zone	Yes	Yes	Zone Flood	Yes Flood	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Resident	No	No	No	Zone Flood	Yes Flood	Zone	Yes	Zone	Zone	Yes	Yes	Zone Flood	Yes Flood	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Farmland	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Pasture	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Livestock raising	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Plantation	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Cutting Tree	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Cutting Reed	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Canal Construction	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Fish Pond	No	No	No	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Canal Maintenance (including dredging)	Zone	Zone	Zone	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Ecosystem Restoration Work	Zone	Zone	Zone	Zone	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Activities without any construction work	Fishing	No	No	No	Yes	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Hunting	No	No	No	Yes	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Ab-Bandan	No	No	No	Yes	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Mass-tourism	No	No	No	Yes	Yes	Zone	Yes	Zone	Zone	Yes	Yes	Zone	Yes	Yes	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Activities for wetland consrvation	Reserch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Monitring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Environemental Education	Zone	Zone	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Eco-tourism	Zone	Zone	Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Removal of Alien Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Guard Station	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

bf buffer zone of the boundary of wetland based on the law on equitable water distribution

Yes	Activitiy is allowed
No	Activitiy is not allowed
Zone	Depends on detailed zoning plan
Flood	Flood measure is necessary

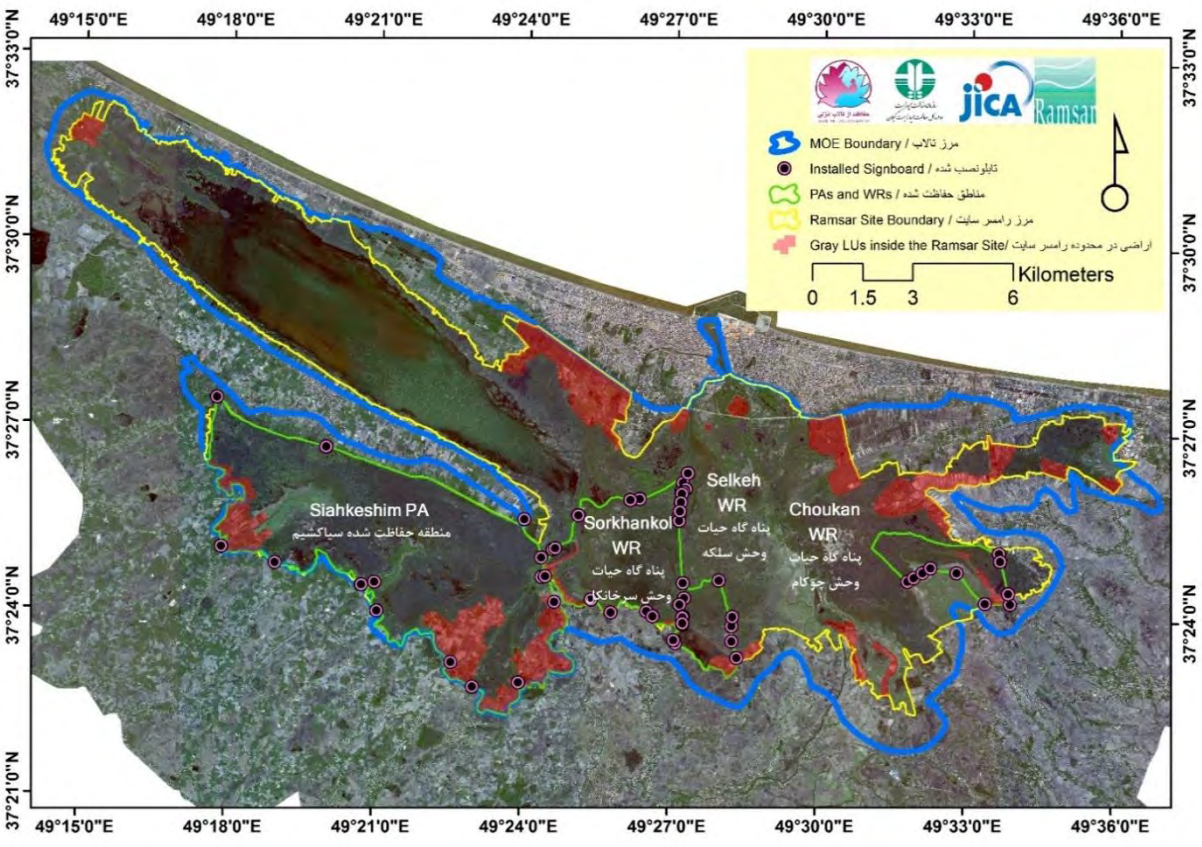
Source: JICA Expert Team

4) Installation of Signboard

The three wildlife refuges and one protected area are the most important cores of the Anzali Wetland Zoning Plans. However, the boundary of each protected area is not indicated by signboards fully. Therefore, not only visitors and local people but also DOE guards could not realize the boundary of protected areas. Enough number of warning signboards should be installed along the boundary of the protected areas.

In the project, 42 signboards have already been installed on the boundary of the Selkeh Wildlife Refuge(WR), Sorkhankol WR, Chokum WR and Siahkeshim Protected Area by JICA budget as shown in the following figures.

That was a great step to show the boundary for people. Almost main entrances of protected areas were indicated by these signboards. However, the Anzali Wetland is huge. Thus the other extra signboards should be installed by DOE.



Source: JICA Expert Team

Figure 3.2-57 Map of Installed Warning Signboards

Source: JICA Expert Team

Figure 3.2-58 Installed Warning Signboards on the Boundaries of WRs and PAs

5) Promotion of Wise Use (sustainable use) of the Wetland

Zoning plan and land use guideline were prepared based on the Wise Use concept. In operations phase of these plans, Wise Use is promoted.

6) Enhancement of DOE Guard Stations

Enhancement of DOE Guard Stations was not included in the action plan at the beginning of the project.

All of hunting activities were nationally prohibited in 2017 and 2018 winter due to Avian flu. Nevertheless, there were still many illegal hunting activities in the Anzali Wetland. The function of DOE guard station including human resource, facility and equipment is not enough to manage the huge Anzali Wetland including protected areas. One of the main reason, that Anzali Wetland was listed in the Montreux Record of Ramsar Convention, was excessive hunting. Thus, the control of illegal hunting is very important. That was the reason this activity was added in the project. the

a) Boundary Patrol

There are four protected areas as core areas in the Anzali Wetland. They should strictly be protected by DOE guards based on Law on Environment Conservation and Rehabilitation. However, there are many illegal and suspected illegal land uses in the areas as shown in Table . DOE guards did not know where is the exact boundary of protected areas because of lack of information sharing in DOE Gilan.

The boundary patrol aims at multiple objectives in order to enhance the land use management and governance by DOE Gilan in the Anzali Wetland. JET recommended and supported the followings as the objectives of boundary patrol:

- Familiarizing DOE guards with the boundaries of Wildlife Refuges and Protected Area in the Anzali Wetland
- Detecting possible illegal land uses and cracking down the illegal land uses in Wildlife Refuges and Protected Area
- Training how to control the illegal land uses to conserve the wetland ecosystems
- Installation of the large map at guard stations

Joint boundary patrols of protected areas were conducted 34 times for DOE guards at all five guard stations in cooperation with JET in 3rd year and 4th year as shown in the following table and figure. The patrols were conducted based on the latest DOE official boundaries. The guards found the patrol was very useful in land use management and protection and they were familiarized with the latest condition of land uses, activities and possible illegal land uses in the protected areas. As the results of the patrols, DOE guards noticed several illegal land uses in the protected areas.

Table 3.2-52 Conducted Boundary Patrols

No.	Date	Protected Area	Village or Place Name
1	25 Mar. 2017	Selkeh WR	Siahdarvishan and Hendehkhaleh
2	26 Mar. 2017	Sorkhankol WR	Ghalamgudeh, Siahdarvishan, and Nahang Rouga River
3	28 Mar. 2017	Sorkhankol WR	Ghalamghoodeh, Siahdarvishan, and Nahanghruga River
4	29 Mar. 2017	Selkeh WR	Siahdarvishan and Hendehkhaleh
5	12 Apr. 2017	Siahkesim PA	Chakuvar to Zyabear-Abkenar Road
6	24 Apr. 2017	Siahkesim PA	Ghazdeh, Chamesghal, and Nargestan
7	27 Apr. 2017	Siahkesim PA	Ghazdeh, Chamesghal, and Nargestan
8	29 Apr. 2017	Siahkesim PA	Siahdarvishan, Mahrouzeh, and Ghoraba
9	30 Apr. 2017	Siahkesim PA	Siahdarvishan
10	1 Aug. 2017	Selkeh WLR	West/East sides
11	2 Aug. 2017	Selkeh WLR	West/East sides
12	3 Aug. 2017	Selkeh WLR	West/East sides
13	5 Aug. 2017	Selkeh WLR	South side, Sufiandeh
14	6 Aug. 2017	Selkeh WLR	South side, Sufiandeh
15	7 Aug. 2017	Selkeh WLR	South side, Sufiandeh
16	8 Aug. 2017	Sorkhankol WLR	Hendekhaleh to Siadarvishan
17	9 Aug. 2017	Sorkhankol WLR	Hendekhaleh to Siadarvishan
18	10 Aug. 2017	Sorkhankol WLR	Hendekhaleh to Siadarvishan
19	12 Aug. 2017	Sorkhankol WLR	West/East sides from Ghalamgudeh
20	13 Aug. 2017	Sorkhankol WLR	West/East sides from Ghalamgudeh
21	14 Aug. 2017	Sorkhankol WLR	West/East sides from Ghalamgudeh
22	15 Aug. 2017	Sorkhankol WLR	West/East sides from Ghalamgudeh
23	16 Aug. 2017	Siahkesim PA	South side Espand to Fatmesar
24	17 Aug. 2017	Siahkesim PA	South side Espand to Fatmesar
25	19 Aug. 2017	Siahkesim PA	South side Fatmesar to Kolsar
26	20 Aug. 2017	Siahkesim PA	South side Fatmesar to Kolsar

No.	Date	Protected Area	Village or Place Name
27	21 Aug. 2017	Siahkesim PA	South side Cekuvar East and West of Morghak River
28	22 Aug. 2017	Siahkesim PA	South side Cekuvar East and West of Morghak River
29	23 Aug. 2017	Siahkesim PA	South side Cekuvar, Nodeh
30	24 Aug. 2017	Siahkesim PA	South side Ghoraba bridge
31	26 Aug. 2017	Siahkesim PA	East side Syadarvishan to Ghazdeh
32	27 Aug. 2017	Siahkesim PA	East side Syadarvishan to Ghazdeh
33	28 Aug. 2017	Siahkesim PA	Mahrouzeh Channel
34	29 Aug. 2017	Siahkesim PA	Mahrouzeh Channel

Source: JICA Expert Team


Source: JICA Expert Team

Figure 3.2-59 Patrol of Protected Area Boundaries by DOE Guards

b) Installation of the large map at guard stations

DOE guards did not know the exact boundary of protected areas very well. JET prepared and installed large maps of protected areas in Anzali Wetland with high-resolution satellite image to assist DOE guards. The large maps were installed at DOE Anzali office, DOE Somesara Office, DOE Rasht office, Ghalamgudeh guard station (GS), Sorkhankol GS, Selkeh GS, Siahdarvishan GS, and Espand GS.


Source: JICA Expert Team

Figure 3.2-60 Installed Large Map at DOE Guard Station

c) Patrol by using Multi-copter

Anzali Wetland is huge and partially covered by a dense reed bed. Therefore, it is very difficult to detect illegal hunting sites. Multi-copter is a very useful tool to find such illegal hunting site.

JET supported to detect illegal hunting site by using multi-copter based on DOE's request. Joint patrols were conducted by JET and DOE guards as shown in Table 3.2-53. As a result of the patrols, several illegal hunting sites with mist net and cottage were detected. DOE guards immediately controlled and removed the detected illegal mist net and cottages. This mean multi-copter is very useful to manage the protected areas as a tool. It is suggested to introduce multi-copters to patrol by DOE guards.

Table 3.2-53 Conducted Joint Patrol by Using Multi-copter

No.	Date	Patrolled Area
1	8 Feb 2017	Selkeh WR, Sorkhankol WR
2	9 Feb 2017	Selkeh WR, Sorkhankol WR
3	15 Feb 2018	Selkeh WR, Nokhaleh area
4	11 Mar 2018	Chokum WR
5	11 Nov 2018	Selkeh WR, Sorkhankol WR, Siahkesim PA
6	13 Nov 2018	Selkeh WR, Sorkhankol WR
7	16 Nov 2018	Selkeh WR, Sorkhankol WR
8	17 Nov 2018	Selkeh WR, Sorkhankol WR
9	25 Jan 2019	Selkeh WR, Sorkhankol WR
10	1 Feb 2019	Selkeh WR, Sorkhankol WR
11	15 Feb 2019	Selkeh WR, Sorkhankol WR

Source: JICA Expert Team

Source: JICA Expert Team

Figure 3.2-61 Joint Patrol by Using Multi-copter and Detected Illegal Hunting Site

DOE guard should manipulate the multi-copter to patrol illegal hunting and land use. JET has provided the series of the multi-copter training programs to the DOE Gilan to enhance their management capacities for the Anzali Wetland as shown in the following table and figure.

Multi-copter is to be widely utilized for monitoring of vegetation and wildlife, detection of illegal land use and patrol of illegal hunting as an effective tool for better management of the Anzali Wetland.

Table 3.2-54 Multi-copter Training Program

No.	Date	Place
1	14 Aug 2018	DOE Gilan (lecture)
2	10 Oct 2018	JBK village (field practice)
3	3 Mar 2019	JBK village (field practice)

Source: JICA Expert Team

Source: JICA Expert Team

Figure 3.2-62 Multi-copter Training Program

d) Equipment for Guard Station

In order to enhance guard station function, it is necessary to develop a comprehensive enhancement plan to control hunting and fishing in protected areas as shown in the following table.

Table 3.2-55 Proposal of Plan Comprehensive Enhancement of Guard Station Function

Item	Proposal	Remarks
Patrol system	✧ It is necessary to develop an effective patrol and report system.	
Human resource	✧ Number of guards should be increased	
Guard stations	✧ Guard Station of Chokum Wildlife Refuge should be established. ✧ Guard Station of east area of Siahkesim Protected Area should be established. ✧ Guard Station to cover west lagoon should be established around Abkenar.	
Equipment	✧ GPS receiver ✧ Binocular and telescope ✧ Digital camera with telelens ✧ Hovercraft to approach the shallow water area. ✧ Motorbike ✧ Internet connection and laptop PC at GS	These items should be introduced to control illegal hunting and fishing.
Facilities	✧ Patrol pass should be constructed to be easy to access the boundary of protected areas. ✧ Number of signboards should be installed on the boundary of	South of Sorkhankol is good place to construct a patrol path as pilot.
Budget	✧ More budget should be secured for fuel, etc.	Amount of fuel is not enough for daily patrol

Source: JICA Expert Team

In order to enhance guard station function, many equipment was handed over to DOE guard stations in April 2019 as shown in the following table.

Table 3.2-56 List of Provided Equipment to Guard Stations from JET

No	Equipment	Manufacturer	Product Name	Quantity
1	Handy GPS Receiver	Garmin	eTrex20 with micro SD	5
2	Binocular	Nikon	Monarch 7 (8×42)	10
3	Telescope	Kowa	TSN664M with TE-9Z (20-60x ZOOM)	5
4	Tripod	Vanguard	Espod CX 203AP	5
5	Digital Camera (1)	Canon	Powershot SX 60 HS with SD card	3
6	Digital Camera (2)	Nikon	Coolpix P900 with SD card	2
7	Multi-copter	DJI	Phantom 4 pro with tablet	3
8	TV monitor	Sony	Bravia 43 inch	2

Source: JICA Expert Team

3.2.5. Achievements

(1) Achievement of JPA-1: Implementation of Comprehensive Ecosystem Survey

1) Achievement

This JPA was implemented mainly to develop the capacity of DOE Gilan and other organizations with the goal to implement the comprehensive ecosystem survey. The major achievements of the JPA are as follows:

- Through the JPA, some reliable data of the ecosystem were grasped. These data can be used as the reference data for long-term wetland management, to update the RIS of the Ramsar Convention and baseline for planning the conservation and restoration activities, and this is considered a significant achievement. Among the key findings are:
  - The field survey recorded 21 mammal species, 243 bird species, 14 reptiles, 3amphibians, and 57 fish species. It was clarified the Anzali Wetland has significant value as wildlife habitat.
  - The migration route of Dalmatian Pelicans was identified by the satellite tracking. The destination as the breeding site was coastal wetlands of Caspian Sea in Russia including Volga Delta where is a Ramsar Site.
  - It was identified that Purple Heron breeding in Anzali Wetland migrated to the south Iran and Iraq.
  - Ramsar Information Sheet(RIS) on the Ramsar Convention was updated based on the result of the comprehensive ecosystem survey.

2) Problems Encountered

This JPA encountered various problems, such as:

- The Iranian budget was not allocated based on the action plan at the begging of the project except fish survey. Planktons, benthos, insect and macrophyte survey have not been implemented. It means the comprehensive ecosystem survey has not completed. The baseline survey of the ecosystem is one of the most important responsibilities of the DOE Gilan mandate. However, DOE did not understand very well and escaped from responsibility.

(2) Achievement of JPA-2: Monitoring of Natural Environment of the Anzali Wetland

1) Achievement

This JPA was implemented to develop the capacity of DOE Gilan to monitor the ecosystem for the adaptive management. The major achievements of the JPA are as follows:

- Through the JPA, the trend of waterbirds in mid-winter was clarified by DOE. These data can be used as the reference data for long-term wetland management, to update the RIS of the Ramsar Convention and baseline for planning the conservation and restoration activities. The key findings are:
  - ✧ It was clarified that the number of individual and species of waterbird in midwinter was increasing gradually.

2) Problems Encountered

This JPA encountered various problems, such as:

- Because of the delay or lack of the comprehensive ecosystem survey as JPA-1, it was difficult to plan the appropriate monitoring activity.

(3) Achievement of JPA-3: Wetland Conservation and Restoration Activities

1) Achievement

This JPA was implemented mainly to develop the capacity of DOE Gilan and relevant organizations with the goal to conserve and restore the ecosystem. The major achievements of the JPA are as follows:

- The introduction and expansion of Water Hyacinth as invasive alien species was detected in 2015. DOE Gilan in cooperation with the other organization started to remove the plant quickly. Most of the Water Hyacinth was removed and now is under control. It is necessary to continue the monitoring and small removal activity.

2) Problems Encountered

This JPA encountered various problems, such as:

- DOE Gilan implemented several restoration activities such as dredging without any discussion in SC. Such plan was not based on the reliable baseline survey such as comprehensive ecosystem survey. The plan did not set the specific target species and habitat. The impact and effectiveness of the activities were not monitored.

(4) Achievement of JPA-4: Monitoring of Water and Sediment Qualities in the Anzali Wetland and its Watershed

1) Achievement

This JPA was implemented mainly to develop the capacity of DOE Gilan and other organizations with the goal to implement monitoring of water and sediment qualities for adaptive management of the Anzali Wetland. The major achievements of the JPA are as follows:

- Through the JPA, reliable water and sediment quality data were obtained. These data can be used as the reference data for long-term wetland management, and this is considered a significant achievement. Among the key findings are:
  - Overall, the wetland is already eutrophic, though it has not exhibited signs of serious hyper-eutrophication, such as major algal blooms or massive fish kills. To prevent such problems to occur, it is important to control inflow of nutrients from domestic sewage and agricultural fields.
  - Concentrations of heavy metals are not extremely high, but, the levels of some heavy metals, such as Zn, are relatively elevated presumably due to a geological reason. The levels of toxic organic substances, such as PCBs and pesticides appeared to be low, though more data are needed to make an assessment.
  - The salinity monitoring under the JPA captured intrusion of the Caspian Sea water into the wetland. Moreover, monitoring of water level in the wetland has started. These data are also very important for environmental management of the wetland.
- In order to monitor water and sediment qualities in the wetland, DOE Gilan established the Anzali Wetland Monitoring Office in late 2017, and its first monitoring was implemented in November 2018. This is another significant achievement, as it clarified the structure and responsibility of water and sediment quality monitoring by DOE Gilan.

2) Problems Encountered

This JPA encountered various problems, such as:

- The Iranian budget was not allocated. Also, it was difficult to ensure active participation by DOE Gilan as DOE Gilan tried to avoid the responsibility. These are largely management issues. Only toward the end of the project, DOE Gilan established the Anzali Wetland Monitoring Office, but AWMO implemented only one monitoring under the JPA. Whether DOE Gilan could sustain the monitoring activities in the future is yet to be seen.

- From technical aspect, data reliability was the main issue encountered. While efforts were made to improve quality control, further efforts by DOE Gilan are essential.

The following Table summarizes the results of an evaluation of the JPA based on the Objectively Verifiable Indicators (OVIs).

Table 3.2-57 Evaluation of JPA based on OVIs

Objectively Verifiable Indicators	Results of JPA
JPA's progress status and important issues are presented to AWMC bimonthly by each SC members.	The progress and issues of implementation of the JPA were periodically reported to AWMC, though not bimonthly because the main agenda of AWMC was funding and not management of JPAs. JCC/AWMC meetings could not resolve the issues effectively during the course of the project. The mechanism of AWMC should be improved to resolve such issues.
Based on the results of JPAs, effective and concrete activities for wetland conservation and its methodologies are proposed through SCs.	The future monitoring plan was discussed first within DOE Gilan, then within the SC, and proposed to AWMC.
AWMC examines those plans with advisory group's advice.	The advisory group was never established.

Source: JICA Expert Team

(5) Achievement of JPA-5: Environmental Zoning and Land Use Guideline

1) Achievement

This JPA was implemented mainly to develop the capacity of DOE Gilan and many relevant organizations with the goal to manage the activities and land use in the Anzali Wetland. The major achievements of the JPA are as follows:

- The boundary of the Ramsar Site of the Anzali Wetland was updated based on the latest situation of the wetland and the criteria of the Ramsar Convention.
- The concept and draft of the Zoning Plan and Land Use Guideline was prepared to conserve the wetland ecosystem and promote wise-use.
- 42 warning signboards were installed on the boundary of three protected areas. People became to notice the entrance of the protected areas easily.
- The function of the DOE guard station was particularly enhanced by the boundary patrol, map installation, several pieces of training and equipment.

2) Problems Encountered

This JPA encountered various problems, such as:

- There is a lack of information sharing among the relevant organization about land use in the Anzali Wetland including protected areas. It caused many gray permissions of land use were issued by related organizations.
- The Boundary of Wetland(BOW) based on the Law on Equitable Water Distribution by MOE is a very strict rule to prohibit any activities and land use. BOW includes many land use by local people. The member of the WG including DOE Gilan focused on only the revision of the BOW during the project period. The purpose of the law is flood control but not the wetland conservation. The solution to satisfy both of them was possible. Also, the revision of the BOW cannot solve all conflicts between BOW and local land uses. The updated zoning plan and land use guideline is a better solution for the many conflicts under the BOW. However, the never-ending discussion against WRMC was continued, and there was not any progress to find common ground.

3.2.6. Recommendations

(1) Implementation of Comprehensive Ecosystem Survey

In the Project, DOE Gilan did not implement the comprehensive ecosystem survey very well. The baseline of the ecosystem is the most important information to manage the Anzali Wetland. Iranian organization including DOE often say as follows. “The surveys have already been implemented very much, therefore no need to survey anymore. Now is the time to implement actions.” It is completely wrong. According to the result of review by JET, there are many papers written by scientists about the Anzali Wetland independently. These papers are not useful to manage the wetland ecosystem, because these papers had the other academic purpose for scientist. In order to manage the wetland ecosystem, DOE should have ecosystem survey based on their own plan (this MTP) in cooperation with relevant organizations such as NIWAI.

Also, the Ramsar Information Sheet (RIS) of the Anzali Wetland must be updated at least every six years based on the Resolution VI.13 of the Ramsar Convention. It is an international obligation of DOE HQ and DOE Gilan. The RIS of the Anzali Wetland was recently updated in June 2018 with the support of JET just before COP13. Therefore, in order to grasp the baseline information to manage the Anzali Wetland all of items of comprehensive ecosystem survey must be implemented every 6 years.

(2) Implementation of Monitoring Programs Proposed in the Mid-term Plan

Monitoring is essential for environmental management, and it is a legal mandate of DOE. However, during the project, DOE Gilan was not able to implement the monitoring activities regularly. DOE is strongly urged to adopt the monitoring programs suggested in the Mid-term Plan as its official monitoring programs, and implement the monitoring according to the

programs. DOE Gilan established AWMO in late 2017, but as of late 2018, it still does not have enough resources to implement the proposed programs. DOE Gilan needs to allocate a recurrent budget and other resources to AWMO (see Mid-term Plan for details of minimal resources required) and ensure that the monitoring is implemented according to the programs.

(3) Adoption of QA/QC

Unlike raw wastewater, ambient concentrations of pollutants in the Anzali Wetland are generally fairly low, and detecting small changes in water quality with sufficient confidence is not easy, though such analytical capability is essential in understanding ecological dynamics, such as seasonal changes, impacts of river flow, intrusion of the Caspian Sea water, and spatial distribution of pollutants in the wetland. Blindly following analytical methodologies is not sufficient, and one needs to actively control reliability of analysis. DOE is strongly recommended to adopt full QA/QC protocols suggested in the Mid-term Plan, including internal quality control routines, participation in an inter-laboratory analytical competency program, etc.

(4) Monitoring Activities with Academic Institutions

Ecosystem of the Anzali Wetland is very complex, and without in-depth scientific knowledge, it is not possible to interpret monitoring data. For this, DOE is suggested to work with academic experts specialized in the following areas: (i) eutrophication, including algal dynamics, (ii) surface water hydrology and hydrodynamics, (iii) environmental analysis of heavy metals and toxic organic substances, (iv) other areas of interest.

(5) Integrated Monitoring of Different Environmental Items

JPA-4 has focused on monitoring of water and sediment qualities. However, DOE Gilan needs to monitor other factors, such as conditions of plants, mammals, birds, fishes, reptiles, amphibians, benthos and planktons, land use/encroachment, hydrology, sedimentation, and other items. These should be integrated under a unified framework for monitoring of the Anzali Wetland. It is suggested to expand the scope of AWMO, which is currently limited to monitoring of water and sediment qualities, to include all of these monitoring items. As the human resources of DOE are limited, some monitoring items may be contracted out to external experts. Nevertheless, DOE Gilan needs to put together all the monitoring programs, and to explain how different factors are interacting with each other and shaping the unique ecological character of the Anzali Wetland. Such programs should be developed within the overall scope of DOE Gilan's environmental monitoring programs for the whole province.

(6) Decision-making through Monitoring

As explained above, DOE Gilan was not able to implement regular monitoring throughout the project period. This is partly because many stakeholders, both DOE Gilan and other

organizations, tend to place too much emphasis on short-term, highly-visible outcomes, and overlook the importance of proper planning, progress monitoring, evaluation of effectiveness and follow-up activities. As the result, many conservation and restoration activities are implemented without monitoring, without feed-back mechanisms to optimize effectiveness and accountability of activities. For example, dredging in the wetland has been implemented without monitoring of the water level, sediment traps have been constructed without monitoring of accumulating sediment, and sewerage systems have been constructed in Rasht and Anzali without regular monitoring of water quality in the Anzali Wetland. To build feed-back mechanisms into the activities, DOE HQ, the provincial government, and PBO are urged to require proper planning, progress monitoring, evaluation of effectiveness and follow-up activities in authorizing any major activities.

(7) Land Use Management by Using the Update Zoning Map and Land Use Guideline

Regarding the BOW based on the Law on Equitable Water Distribution, relevant organizations are discussing for a long time to revise BOW without any compromise. It was very unproductive. The purpose of the law is flood control but not the wetland conservation. Also, only revision of the BOW cannot solve all conflicts between BOW and local land uses. JET recommend the solution to satisfy both flood control and wetland conservation. The updated zoning plan and land use guideline is a better solution for the many conflicts under the BOW. They should be finalized and approved by AWMC. The draft plan is described in the Mid-term Plan.

3.3. Watershed Management

3.3.1. SC Meetings

The Watershed Management Sub-committee (WSM SC) has been organized in June 2014. The WSM SC consists of representatives of relevant organizations that have jurisdictions over mountain areas, plain areas, etc. The meetings of the WSM SC were held during this technical project as shown in Table 3.3-1. The activities of site visit also were shown in Table3.3-2.

Table 3.3-1 Discussion Results of WSM SC Meetings

No.	Date	Main Discussions
1	22 Jun 2014	JET presented the outlines of the WSM SC targets
2	29 Jun 2014	JET presented outlines of Anzali Wetland Ecological Management Project
3	6 Jul 2014	MOJA presented about Anzali Wetland Restoration Project (sediment traps and canal dredging)
4	13 Jul 2014	JET explained the schedules of four sublet works
5	27 Jul 2014	JET suggested draft TOR for four sublet works
6	3 Aug 2014	JET suggested draft TOR in Farsi for four sublet works
7	10 Aug 2014	SC members submitted lists of local companies
8	16 Aug 2014	JET suggested final TOR for GIS and final TOR for Data collection in English
9	26 Aug 2014	JET suggested final TOR for Bathymetric survey in English and Persian JET suggested contract documents and invitation to tender in English and Persian
10	2 Sep 2014	Discussed about Pasikhan boring location and four (4) WLM equipment locations
11	10 Sep 2014	Dr. Asadi (Gilan University professor) presented about boring sublet work.
12	8 Oct 2014	SC members discussed about the sediment issues at Anzali wetland Three model rivers of Khalkai, Masule, and Pasikhan were selected for studying JPAs.
13	21 Oct 2014	Reviewed for Five-Year Plans (2014-2018) of Each Organization and Proposal for Khalkai River JET emphasized the importance for collecting information of the five-year plans of each organization for discussing Action Plans.
14	29 Oct 2014	JET presented the draft Action Plan for three model rivers SC members reviewed the action Plans JET explained the schedule for WSM Works in November
15	12 Nov 2014	JET explained the change of Boring Survey location according of site visit on 7th November 2014 JET reported the installation of Alloy Plate at the Sosar and Nahang Roga
16	18 Nov 2014	GIS sublet company reported the first progress report Data collection sublet company reported the first progress report
17	29 Nov 2014	Bathymetric survey sublet company reported the first progress report
18	7 Dec 2014	Boring survey sublet company reported the first progress report
19	16 Dec 2014	SC members discussed about the issues of the boring survey Decided the sediment sampling method and responsibility organization for water level measurement structures design
20	21 Jan 2015	GIS sublet company reported the draft final report Data collection sublet company reported second progress report
21	3 Feb 2015	Bathymetric survey sublet company reported the second progress report SC members discussed about joint pilot activities
22	10 Feb 2015	Decided the Action Plan and Joint Pilot Activities
23	25 Apr, 2015	Collection of guideline, manual Cost norm of GRWC to repair the TOR for Planning work
24	25 Apr, 2015	Approval procedure of Action Plan and JPA plan by AWMC Necessary data/information of NRWGO to prepare the TOR Agenda of next SC meeting

No.	Date	Main Discussions
25	28 Apr, 2015	TOR preparation for Planning work
26	04 May, 2015	1st TOR Taskforce meeting
27	05 May, 2015	Preparation of AWMC presentation
28	07 May, 2015	Revising AWMC presentation
29	09 May, 2015	Revising AWMC presentation
30	11 May, 2015	TOR preparation for Planning work
31	12 May, 2015	Revising AWMC presentation Management of WSM-SC
32	13 May, 2015	TOR preparation for Planning work
33	17 May, 2015	Meeting with DG of GRWC regards to presentation of WSM-SC at AWMC
34	17 May, 2015	DG of NRWGO attended to hear presentation of WSM-SC at AWMC
35	19 May, 2015	TOR preparation for Planning work
36	24 May, 2015	Cost estimation for the planning work
37	24 May, 2015	Issue of water level measurement equipment
38	26 May, 2015	Issue of water level measurement equipment
39	02 Jun, 2015	Discussion of TOR, satellite image purchase and tender
40	06 Jun, 2015	Discussion of tender, TOR and identification slope erosion
41	09 Jun, 2015	Finalize and authorize TOR by WSM-SC members
42	16 Jun, 2015	Discussion of satellite image purchasing and preparing long list of consultant companies
43	20 Jun, 2015	Discussion of satellite image purchasing and preparing long list of consultant companies
44	23 Jun, 2015	Schedule of contract Selection Method for Long List and Short List Allocation of Responsibility of each organization
45	15 Aug, 2015	Situation of proposals submission Water level measurement equipment installation Presentation for new Project Manager
46	31 Aug, 2015	Situation JPA in Khalkai and Morghak Rivers Water level measurement equipment installation GRWC last survey in Khalkai and Morghak Rivers
47	03 Oct, 2015	Major agreed points with Mahab Ghodss related to the JPA TOR
48	20 Oct, 2015	Mahab Ghodss presentation about their method for survey
49	14 Nov, 2015	Meeting with NRWGO about tree indicator
50	24 Nov, 2015	Tree indicator
51	06 Dec, 2015	14th WSM SC meeting (with Mahab)
52	09 Jan, 2016	Meeting for talking about JPA and Budget and fixing the first workshop date with NRWGO
53	09 Jan, 2016	Meeting for talking about JPA and Budget and fixing the first workshop date with GRWC
54	19 Jan, 2016	1st Workshop on WSM- SC Project of JPA
55	30 Jan, 2016	Technical comment on Mahab Ghodss Progress Report Management and Promotion of Gravel Collection at Check Dams Budget Allocation Meeting with Mr. Dabiri
56	14 Feb, 2016	Analysis of candidate JPA, Review this year activity, NRWGO selection for Joint Pilot Activity (JPA), GRWC selection for Joint Pilot Activity (JPA)
57	14 Fab, 2016	Mahab Ghodss watershed expert judgment about different type of erosion, Paddy field sediment generation Select some specific watershed management activity as candidate for JPA Management the deposited sediment behind the river structures
58	15 Fab, 2016	Meeting with NRWGO about mountainous area planning.
59	16 Fab, 2016	Meeting with NRWGO about mountainous area planning.
60	24 Apr, 2016	JPA Project Deciding about allocating the JICA budget to NRWGO or (and) GRWC Integrated Planning Survey

No.	Date	Main Discussions
61	17 Fab, 2016	GRWC selection for Joint Pilot Activity (JPA)
62	28 Fab, 2016	Objective of Anzali Wetland Ecological Management Project and the purpose of JPA Definition of Loan project and Technical cooperation project
63	29 Feb, 2016	Review of evaluation of candidate project for JPA JICA investment, for WSM-SC JICA technical support, for WSM-SC JET recommendation for JPA with Japanese budget GRWC explanation about proposing the constructing intake weir facility Requirement of GRWC and NRWGO to JET
64	01 Mar, 2016	Japanese contribution investment for JPA Necessary items for detail design study Selection of area for detail design stage Schedule of Detail Design (DD) stage, Selection of Supervisor company
65	05 Mar, 2016	Discussion with NRWGO about Detail design
66	07 Mar, 2016	Select one JPA for using JICA's budget (which organization will use JICA's budget) Conduct detail design study and detail ground topographic survey by NRWGO budget
67	07 Mar, 2016	Summary of the study results by Mahab Ghodss (MGCE) Review of GRWC candidate project for JPA NRWGO founding for detail design The base of detail design study Letter to deputy governor office
68	23 Apr, 2016	JPA Project Deciding about allocating the JICA budget to NRWGO or (and) GRWC Integrated Planning Survey
69	15-May, 2016	Select The JPA for main river course
70	17-May, 2016	General Discussion about Japanese techniques Final Report of Mahab Ghodss JPA site selection for Mountainous area Construction of sediment trap by DOE
71	18-May, 2016	Meeting with NRWGO about DD TOR
72	23-May, 2016	Require items for adding to DD survey contract How will JET supervise and advise consultant
73	31-May, 2016	Method of topo-survey for residential area Method of topo-survey of the steep slope
74	5-Jun, 2016	Agreement of discussion of watershed management Sub-committee under Anzali Wetland Management Committee. JPA discussion about the JPA in the mountainous area Tentative schedule of 3rd year and 4th year of the JICA project. New member for WSM SC New sediment trap of DOE
75	28-Jun, 2016	JPA in Khalkai and Morghak River (Alenze) Sediment trap in Pasikhan
76	11-Aug, 2016	Review the progress of DD consultant company
77	11-Aug, 2016	Control the Topographic maps Cross sections and longitudinal profiles Classification map and Initial structures layout
78	20-Aug, 2016	Reviewing PowerPoint of AWMC meeting
79	22-Aug, 2016	Introducing JET new local expert, AWMC meeting presentation, Concentrated point for DD survey
80	23-Aug, 2016	Requesting from DD consultant to provide the comparison table between different countermeasures
81	24-Aug, 2016	Discussion about the grazing licenses and licensed pastures
82	24-Aug, 2016	Reviewing the AWMC meeting PowerPoint
83	24-Aug, 2016	Discussing about the Iranian payment manner for construction contracts
84	27-Aug, 2016	Discussing about the Iranian payment manner for construction contracts
85	4-Sep, 2016	DOE new sediment trap in Pasikhan River

No.	Date	Main Discussions
86	11-Sep, 2016	Reminding the deadline for submitting the result of DD survey, Reviewing the result of last AWMC meeting, Discussing about the DOE new sediment trap
87	13-Sep, 2016	Receiving sample of GRWC construction contract and supervising contract
88	13-Sep, 2016	Receiving sample of NRWGO construction contract
89	18-Sep, 2016	Request from NRWGO to prepare the short list of contractors, request to arrange a site visit with the selected contractors, discuss about the inflation rate and the method of balancing the estimated prices
90	19-Sep, 2016	Reviewing the result of DD study and discuss about; Soil filling in the water way, prior segment for starting the construction, installing the drainage pipe under the ground
91	22-Sep, 2016	Detailed Design of JPA at Alenze (Road crossing methodology)
92	24-Sep, 2016	Modification of detailed design (DD) of erosion control measures at Alenze
93	25-Sep, 2016	Meeting with NRWGO rangeland office about the stake holders meeting and licensed areas in Alenze sub-basin
94	2-Oct, 2016	Modification of detailed design (DD) of erosion control measures at Alenze- Soil walls and ford crossing
95	3-Oct, 2016	Modification of detailed design (DD) of erosion control measures at Alenze- Water channel
96	30-Oct, 2016	Selection of JPA with GRWC Preparation of 'Mid-term Plan
97	1-Nov, 2016	Map of soil failures and the eroded areas Selected countermeasures for slope area
98	6-Nov, 2016	Selection of JPA with GRWC Preparation of 'Mid-term Plan'
99	25-Dec, 2016	Evaluating the result of DD survey for Alenze JPA the schedule of holding tender for selecting contractor and SV consultant The schedule of construction The responsibility of each related organization
100	12-Jan, 2017	comments on the result of DD survey for revising the reports and designs base on the JET revision
101	22-Jan, 2017	Mid-term plan issue Application of JPA Project GRWC Passed Budget of Flood Control Unit price of river structure construction and topographic survey
102	6-Feb, 2017	Introducing NRWGO reliable contractors for preparing short list of tender
103	19-Feb, 2017	Explain about the Alenze JPA Technical discussion about the Masoule watershed management project and the effect of this project on the Anzali wetland conservation
104	4-Mar, 2017	Technical discussion about the Masoule watershed management project and the effect of this project on the Anzali wetland conservation
105	16-Apr, 2017	General explain about the Alenze project by showing the videos and photos of the project site explain about different phases and the importance of the deadline of construction of each phase Arrange the joint site visit
106	17-Apr, 2017	Discuses about the detailed construction plan Process of workshop equipping
107	18-Apr, 2017	Discuses about the detailed construction plan Discuses about the construction methodology Discuses about the stone dumping site
108	22-Apr, 2017	methodology of preparing daily report and weekly report process of signing the contracts control the quality of sample sack before order for purchase insurance issue

No.	Date	Main Discussions
109	23-Apr, 2017	Report of results of tenders report of Joint site visit Weekly program of supervision of the construction work arrange the Ground-breaking ceremony Report of justification on the Masule mountain area construction work as one of the necessary works for wetland conservation
110	24-Apr, 2017	1st weekly meeting, considering the preparation of detail construction plan for Alenze project receiving daily report and weekly report
111	29-Apr, 2017	signing the consultant contract change the chef supervisor
112	1-May, 2017	2nd weekly meeting, receiving daily report and weekly report detail construction schedule this week operation problem and issues
113	8-May, 2017	3rd weekly meeting, considering redesigning and relocating the structure No 17-2 and 17-4 receiving daily report and weekly report
114	26-Jul-2017	The effect of control the erosion in Masule River mountainous area on Anzali wetland conservation
115	23-Aug-2017	Shearing the result of joint site visit for selecting the prior sub basin and area for starting DD survey and construction work at Masule basin
116	4-Oct-2017	The WSM SC future activities. The progress of detailed design (DD) survey for Masule (Dulichal Sub-basin) project.
117	14-Nov-2017	Briefing the Preparation of Mid-Term Plan (2020-2030) Mr. Asadi presentation about the Japan training trip
118	25-Nov-2017	Concept of Mid-Term Plan in Main River Course (2020-2030)
119	3-Dec-2017	Review the WSM- SC activities during the Japanese experts absent WSM SC mid-term plan Alenze second phase construction Plan of holding workshops
120	18-Dec-2017	The progress of GRWC midterm plan preparation for river protection The progress of WSM SC mid-term plan preparation
121	30-Dec-2017	NRWGO requested from WSM SC to support Masule project technically WSM SC members decided to request JET to help SC members by technical advises to support Masule project The Masule project consultant company presented the project schedule and plan to SC members
122	7-Feb-2018	Alenze project 2nd phase, 2018 Anzali wetland dredging activities Masule project topographic survey methodology
123	14-Feb-2018	Collecting SC members signature for dredging letter Informing to the consultant company about the topographic survey methodology for Masule Project DD survey
124	24-Feb-2018	Organization and Mandates of GRWC Preparation of Midterm Plan Budget System for GRWC Activities
125	03-Mar-2018	Masule Project Detailed Design survey Dredging Projects GRWC Detailed Design Work at the Morghak River in 2017
126	06-Mar-2018	Result of Masule site visit and sending SC recommendation letter to NRWGO about the consultant performance Preparing recommendation letter for request budget for Morghak DD survey by JET Distributing the revised and translated MM for Morghak DD Signing the MM by GRWC DG before sending the letter to governor office.

No.	Date	Main Discussions
127	14-Mar-2018	Result of topographic survey for 30 ha of project area Preparing budget request letter for Morghak DD survey by GRWC to governor office. TOR for Morghak river DD survey.
128	04-Apr-2018	Alenze construction second phase (road opening, tender holding, SV consultant employment) Masule JPA Morghak river DD survey (budget request letter, cost estimation, MM for signing) Dredging issue
129	18-Apr-2018	Discuses about the result of Masule site visit based on the GRWC surveyor report The progress of budget request for Morghak DD survey Report the progress of Alenze second phase Arrangement for inspecting the result of Alenze first phase after one year reliable period. Check the progress of SC letter about the dredging issue
130	25-Apr-2018	Masule JPA topographic survey Tender holding for Alenze second phase The progress of budget request for Morghak DD survey Sending letter to road constructing office
131	01-May-2018	Masule JPA topographic survey Result of tender opening for Alenze second phase The progress of budget request for Morghak DD survey Progress of tender holding for selecting contractor for Alenze second phase Review and revise the progress of sending letter to road constructing office
132	09-May-2018	TOR and schedule preparation for Morghak river DD study. Request budget for Morghak river DD study.
133	12-May-2018	Selecting SV consultant for Alenze 2nd phase. Progress of Masule DD study. Dredging issue in wetland area. Morghak river DD study.
134	16-May-2018	Request budget for Morghak river DD study. Dredging issue in wetland area. AWMC secretariat responsibilities. WSM SC meetings venue.
135	22-May-2018	Present to DOE about Morghak river DD study.
136	28-May-2018	Chart of AWMC, SCs and secretariat in Anzali wetland management project.
137	13-June-2018	Control the result of topographic survey in Masule area include the longitudinal and cross sections. Discus about the concept of structures design in Masule project. AWMC and SCs tasks in Anzali wetland management project.
138	20-June-2018	Effect of happened flood in Alenze construction area. Progress of Alenze 2nd phase construction.
139	16-July-2018	Siahdarvishan sediment trap restoration. Progress of Alenze second phase construction. Following the Morghak river DD study.
140	27-August-2018	Dredging sediment traps by DOE. Dredging a water channel of Pirbazar river by GRWC. NRWGO activities as the secretary of WSM SC.
141	09-October-2018	Siahdarvishan sediment trap dredging. Suggestion of suspended sediment trap in Sorkhankol area.
142	29-October-2018	Finalized mid-term plan for main river course management. JET comments on DOE consultant presentation about the Siahdarvishan sediment trap. Priority of 10 rivers for main river course management. Suggestion of suspended sediment trap in Sorkhankol area.
143	03-November-2018	Answer to SC members and JET comments about the Siahdarvishan sediment trap dredging. Priority of 10 rivers for main river course management.

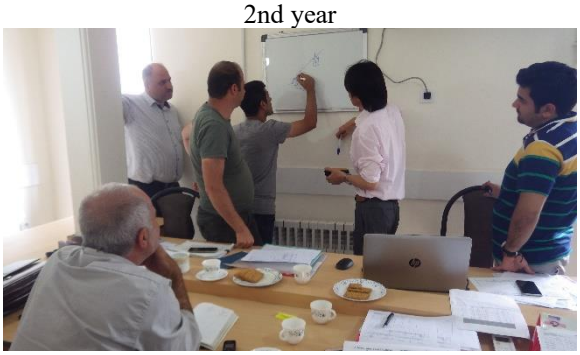
No.	Date	Main Discussions
144	28-November-2018	Mid-term plan for mountainous area of Anzali wetland basin JET letter to AWMC regarding to objection the DOE plan about Siahdarvishan sediment trap

Source: JICA Expert Team

1st year

2nd year

3rd year



4th year

5th year

Source: JICA Expert Team

Figure 3.3-1 Watershed Management Sub-Committee Meetings

Table 3.3-2 Activities of Site Visit

No.	Date	Member	Site	Purpose
1	13 May 2014	JET	Masule upper stream	Confirm river and stream condition of Masule, where debris flows have been occurred.
2	17 May 2014	DOE Gilan and JET	Anzali Wetland, existing sediment traps	Confirm the situation of wetland
3	21 May 2014	DOE Gilan and JET	Lower stream of Chafroud River (west lagoon)	Confirm the situation of river and wetland
4	22 May 2014	DOE Gilan and JET	Siahkeshim Protected Area	Confirm the situation of wetland

No.	Date	Member	Site	Purpose
5	26 May 2014	NRWGO and JET	Khalkai River basin	Confirm the situation of river and wetland
6	28 May 2014	JET	Lower stream of Khalkai River and Siahkeshim Protected Area	Confirm the sediment flow situation
7	1 June 2014	JET	Rice fields and water reservoirs in the plain area of Khalkai River basin	Confirm the sediment flow situation around rice field
8	3 June 2014	NRWGO and JET	Masule mountainous area	Confirm erosion control measures constructed by NRWGO
9	23 June 2014	NRWGO and JET	Maule upper river basin	Confirm sediment flow in the upper stream
10	28 June 2014	DOE Gilan and JET	Sorkhankol Wildlife Refuge	Confirm TBM which installed during JICA MP Study
11	11 Sep 2014	DOE Gilan and JET	Existing sediment trap (Siahdarvishan), Sorkhankol Wildlife Refuge	Confirm situation of constructed sediment trap
12	17 Sep 2014	NRWGO and JET	Masule mountainous area	Confirm the erosion condition without measures
13	13 Dec 2014	DOE Gilan and JET	Sediment traps (Pasikhan, Siahdarvishan), Plangvar River of Siahkeshim Protected Area, Sorkhankol Wildlife Refuge	Confirm water level in wetlands and rivers, and signboards
14	4 Feb 2015	DOE Gilan and JET	Water level measurement installation sites	Confirm the river conditions at the Water Level Measurement Structures
15	6 May, 2015	JET	Khalkai River	Check the condition for TOR preparation
16	28 May, 2015	NRWGO, GRWC, JET	Khalkai River	Check the condition for TOR preparation
17	04 June, 2015	JET	Khalkai River	Check the mainly erosion places
18	6 June, 2015	JET	Khalkai River	Check the condition for TOR preparation
19	01 July, 2015	JET	Pasikhan River	Check the sediment condition of intake weir
20	03 July, 2015	JET, DOE Gilan	Anzali Wetland	Maintenance of water level gauge
21	20 Aug, 2015	DOE Gilan, JET	Sorkhankol	Check the water level gauge
22	23 Aug, 2015	JET	Sorkhankol	Check the water level gauge
23	25 Aug, 2015	JET	Sorkhankol	Check the water level gauge
24	28 Oct., 2015	JET	Khalkai and Morghak River	Survey of sediment condition of existing river structures
25	02 Nov., 2015	JET, NRWGO, MGCE	Khalkai and Morghak River	Check the accessibility to mountainous stream
26	08 Nov., 2015	JET	Anzali Wetland	Maintenance of water level gauge
27	22 Nov., 2015	JET	Khalkai River	Video recording of sediment condition in main river course
28	29 Nov., 2015	JET	Morghak River	Video recording of sediment condition in main river course
29	07 Dec., 2015	JET, NRWGO	Khalkai River	Sampling test of tree indicator

No.	Date	Member	Site	Purpose
30	17 Jan., 2016	JET	Anzali Wetland	Maintenance of water level gauge
31	7 May, 2016	NRWGO, JET	Khalkai basin (Khoshke Darya)	Check the site condition for JPA site selection
32	10 May, 2016	NRWGO, JET	Morghak basin (Alenze)	Check the site condition for JPA site selection
33	24-May, 2016	NRWGO, JET and DD consultant company	Alenze sub-basin	Site Survey of Alenze for Topographic briefing
34	30-May, 2016	NRWGO, JET, DOE, Geology center and DD consultant Co.	Alenze sub-basin	Checking the Alenze JPA project site with the WSM SC members
35	29-Jun, 2016	JET	Anzali Wetland	Installing the Abkenar WLME and repairing the Sorkhankol WLME
36	3-Jul, 2016	NRWGO, DOE, GRWC	Masal, Khalkai River	Select the location of rubber dam and review the design of rubber dam
37	2-Aug, 2016	NRWGO and DD consultant company	Alenze sub-basin	Mark the location of initial recommended structures
38	6-Aug, 2016	JET, DOE	Anzali Wetland	Repairing the Sorkhankol WLME (Change the GMS modem)
39	13-Aug, 2016	NRWGO, JET and DD consultant company	Alenze sub-basin	Examination the initial layout of recommended structures by the DD consultant company
40	17-Aug, 2016	NRWGO, JET and DD consultant company	Alenze sub-basin	Taking video by quadcopter
41	27-Sep, 2016	NRWGO and JET	Alenze sub-basin	Showing the site condition to contractors
42	18-Jan, 2017	JET	Khalkai and Morghak River	Checking the MGCE planed structures for Khalkai and Morghak rivers basin
43	19-Apr, 2017	JET, SV Consultant Co. and Contractor	Alenze sub-basin	Showing the Alenze project site and the location of designed structures to the contractor and consultant Companies
44	25-Apr, 2017	JET, SV Consultant Co. and Contractor	Alenze sub-basin	Taking video by quadcopter and control the existing footpath in the slop area
45	30-Apr, 2017	NRWGO, JET, DOE, Masal Red Crescent, SV Consultant Co. and Contractor	Alenze sub-basin	Ground breaking ceremony-Alenze Project
46	6-May-17	NRWGO, SV Consultant, Contractor, JET local members	Alenze construction site	Check the Safety condition Check the condition of workshop equipping Check the result of Ground breaking Survey at the stream area
47	13-May-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Check the safety condition and installed caution signboards Check the constructed temporary footpath Check the progress of stone collection Check the excavation of Wall No. 17-3 Control the condition of water diversion at the upstream of existing stream Check the result of Ground breaking Survey at the slope area

No.	Date	Member	Site	Purpose
48	20-May-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Check the progress of construction of wall No. 17-3 Check the condition of cross section at the location of Wall No. 17-4 for considering revising the drawings. Delineate the stone area at the slope area
49	27-May-17	NRWGO, SV Consultant, Contractor, JET local members	Alenze construction site	Control the safety issue during work by heavy equipment Check the progress of construction of wall No. 17-2 Check the excavation of Wall No. 17-1
50	3-Jun-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Check the progress of construction of wall No. 17-2 Check the progress of construction of wall No. 17-1 and consider changing the design base on the existing soil condition at the site Control the excavating of traces at the slope area phase 1
51	8-Jun-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Check the progress of construction of wall No. 17-1 Discus about the design of ford crossing and finalize the design Check the condition of cross section of Wall No. 17-5 and existing bed rock at the longitudinal profile of stream for considering revising the drawings of Wall No 17-5 and WC No. 17-3 Control the progress of construction of traces at the slope area phase 1 Control the material transportation for constructing counter line structures at the slope area phase 1
52	13-Jun-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Initial inspection for slope area phase 1- Terracing work
53	17-Jun-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Inspection the safety condition at the construction site Final inspection for slope area- phase 1
54	20-Jun-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Final setting the location of designed structure for slope area- phase 2 Controlling the terracing activity at the stream area- phase 1 Controlling the soil excavation and soil compaction activity for foundation of WC No. 17-1
55	24-Jun-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Control the progress of WC No. 17-1 construction Control the progress of ford crossing construction Control the soil excavation of terraces for slope area-phase 2
56	1-Jul-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Final inspection for stream area- phase 1 Control the terracing work for slope area-phase 2
57	8-Jul-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Final inspection for slope area- phase 2 Control the progress of excavation of W No. 17-4

No.	Date	Member	Site	Purpose
58	15-Jul-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Control the progress of construction of W No. 17-4 Controlling the terracing activity at the stream area- phase 2 Final setting the location of designed structure for slope area- phase 3
59	22-Jul-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Control the progress of construction of WC No. 17-2 Controlling the terracing activity at the stream area- phase 2 Controlling the terracing activity at the slop area- phase 3 Taking video from construction site at slope area and stream area with drawn
60	25-Jul-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Final inspection for stream area- phase 2 Control the progress of excavation of W No. 17-4-1
61	29-Jul-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	Control the progress of construction of W No. 17-4-1
62	1-Aug-17	NRWGO, SV Consultant, Contractor, JET	Alenze construction site	make decision about adding some supplemental structure for erosion control at the stream bank Controlling the terracing activity at the slop area- phase 3 Taking video from construction site at slope area and stream area with drawn
63	5-Aug-17	NRWGO branch offices (Masal, Somesara, Rezvanshahr, Rasht, Shaft), JET, Governor office	Alenze construction site	Holding workshop and site visit for Gilan NRWGO branch offices experts
64	13-Aug-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Final inspection for slope area- phase 3 Control the progress of construction of W No. 17-4-2 Control the progress of excavation of W No. 17-4-3
65	15-Aug-17	NRWGO, JET, MOJA, DOE, GC, Consultant Co.	Masule basin, Dulichal sub-basin	Selecting the prior sub basin and area for starting DD survey and construction work at Masule basin
66	19-Aug-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Control the progress of construction of W No. 17-4-3 Control the progress of excavation of enclosing basements (Slope area- phase 4) and final decision making about enclosing area
67	26-Aug-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Control the progress of construction of W No. 17-4-3 Control the progress of construction of WC No. 17-3 Control the progress of enclosing work (Slope area- phase 4)
68	30-Aug-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Holding seminar site visit for other provinces NRWGOs Control the progress of excavation of wall No. 17-5 Control the progress of stream bank covering with soil bags

No.	Date	Member	Site	Purpose
69	2-Sep-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Control the progress of construction of W No. 17-5 Control the progress of enclosing work (Slope area- phase 4)
70	10-Sep-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Final inspection for slope area- phase 4
71	14-Sep-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Control the progress of enclosing work (Slope area- phase 4) Taking video from construction site at slope area and stream area with drawn
72	16-Sep-17	NRWGO, JET, Consultant Co. and Contractor CO.	Alenze construction site	Final inspection for slope area- phase 4 (Enclosing work)
73	18-Sep-17	NRWGO, GRWC, MOJA, JICA, JET, Consultant Co. and Contractor CO.	Alenze construction site	Holding closing ceremony and final inspection for all implemented projects at slope area and stream area with JICA representative person
74	15-Nov-17	JET	Dastak rubber dam, Kiashahr City	Visit the constructed fish way facilities on the river
75	23-Nov-17	JET	Jointing point of Khalkai and Morghak river	Control the existing cross structure at the Khalkai and Morghak river Confirm the contain of the initial prepared mid-term plan
76	12-Dec-17	NRWGO, JET, MOJA	Roudbar City	Control the existing drop irrigation system and water supplying to dray area for simulating at the eroded mountain area to control the sediment
77	28-Feb-17	NRWGO, JET and GRWC	Downstream of Morghak River	Confirm the location of planed structures for first phase of Mid-Term plan detailed design survey including: Design Fish Way for existing intake weir. Design revetment for river eroded bank protection and control sediment generation. Design first new planned drop including stream type fish way.
78	05-Mar-18	NRWGO and JET	Masule, Dulichal sub-basin	Confirm the site condition and the availability of topographic survey Survey and check the first prior area for construction work
79	10-Apr-18	NRWGO and JET	Alenze construction site	Control the condition of access road to Alenze construction site Control the condition of the constructed structures at Alenze area
80	11-Apr-18	NRWGO, GRWC, MOJA, GC and JET	Masule, Dulichal sub-basin	Control the accuracy of topographic survey Discuses about the necessary countermeasures and preliminary structure design for the target area.
81	20-May-18	NRWGO, JET, Alenze 2nd phase SV Consultant and Contractor and Alenze 1st phase Contractor	Alenze construction site	1st inspection before the end of the defect reliability period of Alenze 1st phase construction.
82	01-August-18	NRWGO and JET	Alenze construction site	Taking video by drone for checking effect of happened flood.

No.	Date	Member	Site	Purpose
83	15-August-18	NRWGO, JET, Alenze 2nd phase SV Consultant and Contractor	Alenze construction site	Confirming the method of repair work for damaged water channels. Control the progress of Alenze 2nd phase construction.
84	19-August-18	NRWGO, JET and Alenze 1st phase Contractor	Alenze construction site	Final inspection before the end of the defect reliability period of Alenze 1st phase construction.

Source: JICA Expert Team

Totally, 144 WSM SC meeting were held between June 2014 to March 2019 which respectively, 22, 46, 45, 18 and 13 meeting were held in the first year to the fifth year of the project.

The members of the WSM SC discussed the main subjects in each year as shown below:

(1) The main agenda in First year

I) Methods of sublet works for understanding the situations of the watershed of the Anzali Wetland and the wetland area, II) The present sediment issues in the watershed of the Anzali Wetland, III) High priority areas in the wetland /river basins for sediment countermeasure, IV) Existing action plans for ten rivers, and V) Selection of beneficial projects to be proposed as the JPAs.

(2) The main agenda in second year

I) TOR preparation of the comprehensive watershed management planning study, II) review and information sharing of the progress and the results of the study to the SC members, and III) Selection of the Joint Pilot Activities of the WSM SC.

(3) The main agenda in third year

I) Support NRWGO for TOR preparation of the detailed design survey for Alenze construction as a JPA, II) Review and information sharing of the progress and the results of the detailed design survey to the SC members, and revise and preparing the drawings of the Alenze construction as a Joint Pilot Activity of the WSM SC. III) preparing Mid-term Plan.

(4) The main agenda in fourth year

I) Support NRWGO for cost estimation and drawing preparation and budget request for Alenze second phase construction as 2018 JPA, II) Proving the effectiveness of control the erosion in Masule River mountainous area on Anzali wetland conservation and III) Preparing the concept of Mid-Term Plan in Main River Course (2020-2030)

(5) The main agenda in fifth year

I) confirming the progress of JPAs and sharing the results with all SC members II) responsibilities of AWMC, SCs and secretariat in Anzali wetland management project and III) considering the sediment dredging issue especially in Siahdarvishan sediment tarp.

3.3.2. Meetings between Relevant Organizations and JET

Meetings were held between relevant organizations and JET in addition to the SC meetings as shown in the following table.

Table 3.3-3 Meetings between Relevant Organizations and JET

No.	Date	Participant Organizations	Main Discussions
1	5 Jul 2014	Geology Research Center	Request some data such as volcanic ash distribution layer map, geological map, conducted boring survey data
2	6 Jul 2014	Crisis Management	Request data information about flood event or precipitation rate
3	7 Jul 2014	MOJA	Discussion about existing sediment traps mechanism
4	27 Dec 2014	GRWC	Request GRWC five development plan
5	8 Jun 2014	PMO	Hearing PMO project content
6	2 Jun 2014	MOJA	Explain JICA Project and request Cooperation with JICA project
7	19 Jun 2014	MO	Request cooperation submitting meteorology data
8	20 Sep 2014	Anzali DOE	Discussion about installation gate samples
9	2 Feb 2015	NRWGO, GRWC and DOE	Meeting with GRWC and NRWGO about JPA
10	7 Feb 2015	NRWGO and GRWC	Pre-meeting for JPA Field Survey
11	8 Feb 2015	Masal City governor, GRWC, NRWGO, and DOE Gilan	Discussion about joint pilot activity
12	03 May, 2015	PMO, DOE (Anzali), JET	Hearing & discussion of PMO dredging & sediment trap plan
13	24 May, 2015	Tarahan Alboz Consultant Company, JET	Discussion of technical methodologies on planning work
14	17 Oct, 2015	JET and MGCE	Meeting with Mahab Ghodss expert team
15	01 Nov, 2015	JET and MGCE	Sediment Discharge Model (MPSIAC) Goal of Sediment Control Artificial Sediment Production Structure Plan
16	04 Nov, 2015	JET and MGCE	Agreement for Adjustment the TOR and contract Reports submission deadline
17	15 Nov, 2015	JET and MGCE	Agreement of Adjustment Output Report of TOR Revising of Field Survey Report (1) and (2) Survey Sections of Mountainous River/Stream
18	06 Dec, 2015	JET and MGCE	Tree indicator sampling Reports submitting deadline
19	20 Jan, 2016	JET, NRWGO, DOE Gilan, GRWC and MGCE	1st Workshop for informing the progress of integrated planning survey. The informed topics are: • Summary of Joint Pilot Activities • Progress Report of Integrated Planning Survey

No.	Date	Participant Organizations	Main Discussions
20	01 Fab, 2016	JET, NRWGO and MGCE	Alternative Method for Mountainous Survey NRWGO Comments in Progress Report 2 (Mr. Asadi) Request from MGCE to NRWGO JET Comments in Progress Report
21	02 Fab, 2016	JET, NRWGO and MGCE	NRWGO Comments in Progress Report 2 (Mr. Asadi) Request from MGCE to NRWGO, JET Comments in Progress Report 2 Concept of Plan Establishment
22	17 Fab, 2016	JET, GRWC, NRWGO	Meeting about increasing Anzali wetland water level
23	21 Fab, 2016	JET, NRWGO and MGCE	Planning and strategy establishment in mountainous area Planning and strategy establishment in main river NRWGO comments on MGCE presentation
24	08 Mar, 2016	JET and MGCE	Explain about the comments in Draft final report Explain about preparing countermeasures and plans
25	09 Mar, 2016	JET and MGCE	Explain about the comments in Draft final report Explain about preparing countermeasures and plans
26	19 Apr, 2016	JET and MGCE	Review the JET comments on draft final report and check the proses of revising
27	20 Apr, 2016	JET and MGCE	Review the JET comments on draft final report and check the proses of revising Important events date
28	08 May, 2016	JET, NRWGO, DOE Gilan, GRWC and MGCE	2nd Workshop for informing the result of integrated planning survey. The informed topics are: • Summary of Joint Pilot Activities • Final Report of Integrated Planning Survey
29	15-May, 2016	JET, GRWC Consultant	Revetment construction in Pirbazar river for flood control
30	15-May, 2016	JET, GRWC	Meeting with GRWC DG about JPA selection
31	1-Jun, 2016	JET, GRWC	Candidate project for JPA in main river course
32	1-Jun, 2016	JET, NRWGO, DOE	Constructing the second sediment trap in Pasikhan river
33	5-Jun, 2016	DOE, JET, MO, MOJA, GRWC, NRWGO	Meeting about new suggested sediment trap by DOE for Pasikhan River
34	24-Sep, 2016	NRWGO and JET	NRWGO arranges the site visit for nominated contractors Stakeholders Meeting (SHM) for Alenze construction
35	28-Sep, 2016	JET	Meeting with Bank Office for evaluating the nominated contractors financial condition
36	28-Sep, 2016	NRWGO and JET	Reporting the progress of JPA to NRWGO DG
37	29-Sep, 2016	NRWGO, Road Construction and Transportation Organization and JET	Asking from Road Construction and Transportation Office to supporting the Alenze JPA by opening the existing access road before starting the construction
38	29-Sep, 2016	NRWGO and JET	Introduction of Erosion Control Project to Stake Holders
39	7-Dec, 2016	JET, Bank Officer	Meeting with bank officer and ask for evaluating financial condition of short listed contractor
40	18-Dec, 2016	NRWGO, JET	Meeting with NRWGO about the JPA budget issue
41	20-Dec, 2016	NRWGO, JET	Meeting with Watershed Management deputy (Dr. Yousefpoor) about the JPA budget issue
42	19-Feb, 2017	NRWGO, Short listed Contractors, JICA, JET	First pre-bid meeting for selecting contractor explain about the bid documents
43	26-Feb, 2017	NRWGO, Short listed Contractors, JET	Second pre-bid meeting for selecting contractor explain about the bid documents

No.	Date	Participant Organizations	Main Discussions
44	27-Feb, 2017	Short listed consultant companies, JET	Interview with short listed consultant Co. explain about the Alenze construction project
45	28-Feb, 2017	Short listed consultant companies, JET	Interview with short listed consultant Co. explain about the Alenze construction project
46	1-Mar, 2017	Short listed consultant companies, JET	Interview with short listed consultant Co. explain about the Alenze construction project
47	5-Mar, 2017	NRWGO, JET and Shafaroud Forest Co.	Meeting with Shafaroud Forest Co. to explain about Alenze JPA and ask for supporting the project by opening and repairing the access road before and during the construction period
48	30-Mar, 2017	JET, Short listed SV Consultant Co.	Distributing draft tender document for SV consultant selecting bid
49	3-Apr, 2017	JET, Short listed SV Consultant Companies	Distributing tender document for SV consultant selecting bid
50	9-Apr, 2017	JICA, JET, Short listed contractor Companies	Opening bid for Contractor selecting
51	10-Apr, 2017	JICA, JET	Opening bid for SV Consultant Co. Selecting
52	12-Apr, 2017	JICA, JET, Contractor Co.	Negotiation with first contractor (The contractor which proposed lowest cost)
53	13-Apr, 2017	JICA, JET, Contractor Co., SV consultant Co.	Negotiation with second contractor (The contractor which proposed second lowest cost) meeting with first SV consultant (The consultant with highest rank)
54	15-Apr, 2017	NRWGO, JET	Share the result of tenders asking for signing the contract of SV consultant Co. and Contractor Co. NRWGO responsibilities during the Alenze construction project Inviting for Ground-breaking ceremony
55	26-Apr, 2017	Red crescent, JET	Explain about the Alenze project and request for supporting the construction team during the constructing the Alenze construction project inviting for ground breaking ceremony
56	11-Jun-17	NRWGO, JET	Holding workshop for NRWGO experts in order to: Share the information of the Joint Pilot Activity Explain about the importance of consists of study, planning, design and implementation for watershed management project
57	2-Aug-17	NRWGO branch offices (Masal, Somesara, Rezvanshahr, Rasht, Shaft), JET, Governor office	Holding provincial workshop for NRWGO branch offices experts in order to: Share the information of the Joint Pilot Activity The good practices of the watershed management, which consists of study, planning, design and implementation of erosion control, including Japanese technologies and management system was shred to the attendants
58	8-Aug-17	NRWGO, FRWO, JET	Share the information of the Joint Pilot Activity Comparison between NRWGO & JPA construction and management
59	27-Aug-17	JET, NRWGO, Deputy governor	Share the information of the Joint Pilot Activity Inform about planed seminar and site visit schedule and Invite development deputy governor office to deliver a speech for seminar.
60	29-Aug-17	NRWGO (Gilan, Sari, Chalous, Chaharmahal and	Holding seminar for other provinces NRWGO in order to: Share the information of the Joint Pilot Activity The good practices of the watershed management, which

No.	Date	Participant Organizations	Main Discussions
		Gorgan Provinces) FRWO, JICA, JET, GRWC, DOE, GC, Consultant Co.	consists of study, planning, design and implementation of erosion control, including Japanese technologies and management system was shred to the attendants
61	17-Sep-17	NRWGO, FRWO, JET, JICA	Wrap- up meeting about the held seminar Future construction plan in Alenze
62	24-Oct-17	JET, Tarahan Alborz Sabz Consultant Engineering Co.	Calculating B/C for Alenze JPA Common method for calculating the BCA in Iran
63	11-Nov-17	GRWC, JET	Collect the information of constructed fish way structures in Gilan province Collect the existing fish way structure design from GRWC
64	4-Mar-18	NRWGO, JET	Inspection the Alenze constructed structures after one year reliable period NRWGO inspector team Alenze second phase contract and tender
65	10-Mar-18	GRWC, JET	Preparation of justification report for Morghak river DD survey Preparation of WSM SC support letter about budget request for Morghak river DD survey from governor office
66	15-May-18	NRWGO, JET and Alenze 2nd phase SV Consultant	Interview the Alenze 2nd phase SV Consultant. Arrangement for 1st inspection before the end of the defect reliability period of Alenze 1st phase construction with consultant.
67	30-May-18	NRWGO, JET, Alenze 2nd phase SV Consultant and Contractor	Interview the Alenze 2nd phase contractor. Arrangement for 1st inspection before the end of the defect reliability period of Alenze 1st phase construction with contractor.
68	02-June-18	NRWGO, JET and Masule DD Survey SV Consultant	Concept of necessary countermeasures for Masule project.
69	09-August-18	NRWGO, JET and Alenze 2nd phase SV Consultant	Monitoring and maintenance the Alenze 1st phase construction. Method of evaluating the volume and cost of damaged part of structures.
70	11-August-18	NRWGO and JET	Fix the final inspection before the end of the defect reliability period of Alenze 1st phase construction. Arrange the weekly meetings and WSM SC meeting NRWGO new counterpart.
71	13-August-18	GRWC and JET	Monitoring and maintenance the Alenze 1st phase construction Arrangement for next WSM SC meeting
72	14-August-18	NRWGO, JET and Alenze 2nd phase SV Consultant	Monitoring and maintenance the Alenze 1st phase construction Final inspection before the end of the defect reliability period of Alenze 1st phase construction with contractor. Progress of Alenze 2nd phase construction work
73	21-August-18	NRWGO, JET, Alenze 2nd phase SV Consultant and Contractor	Method of repairing the damaged water channels. Schedule and plan of repair work.
74	27-August-18	GC, GRWC and JET	Morghak River DD survey. Siahdarvishan sediment trap dredging
75	03-November-18	GC, NRWGO and JET	Mid-term plan for main river course Priority of 10 rivers for main river course management Suspended sediment trap at Sorkhankol area
76	06-November-18	GC, GRWC, NRWGO and JET	Priority of wetland areas for main river course management. Priority of 10 rivers for main river course management.

Source: JICA Expert Team


1st year


2nd year


3rd year


4th year


5th year

Source: JICA Expert Team

Figure 3.3-2 WSM SC workshops and the Meetings between Relevant Organizations and JET

The main subjects of these meeting in each year was as shown below:

(1) First year

I) Explain JICA Project and request Cooperation with JICA project, and II) collecting existing data and information related to Anzali Wetland watershed basin.

(2) Second year

The meetings were mainly related to the sub-contract work (The comprehensive watershed management planning study). Also, two workshops were held on 20th January and 8th May, 2016 in order to I) share the information and understandings of the project, especially the WSM SC activities with related organization officers, and II) share and learn the methodologies of integrated sediment control planning.

(3) Third year

Those meetings were mainly related to the pre-discussion and facilitation of the "Construction Work for Mountainous Erosion Control at Alenze Sub-Basin of Masal River Basin in 2017". Also, one Stakeholders meeting for Alenze Local People was held on 29th September, 2016 in order to I) share the information and understandings of the erosion control project, especially in the Alenze Sub-basin, II) Ask from local people to cooperate with contractor and NRWGO during construction and III) protect and maintain the constructed erosion control structures after the construction.

(4) Fourth year

The meetings were mainly related to share the information and the results of good practices of the watershed management, which consists of study, planning, design and implementation of erosion control, including Japanese technologies and management system with other organization. Also, one workshops and one seminar were held in fourth year of the project. The workshop was held with NRWGO cooperation regards to WSM SC JPA (erosion control construction at Alenze) on 2nd August, 2017 and its site visit was conducted on 5th August, 2017. The seminar was held on 29th August 2017 and its site visit was conducted on the next day in order to share the information of the Joint Pilot Activity (JPA) under the project.

(5) Fifth year

The meetings were mainly related to the I) Giving technical advices to NRWGO about selecting SV consultant and contractor for Alenze second phase construction as 2018 JPA, II) Giving technical advices to NRWGO about concept of necessary countermeasures for Masule DD Survey, III) arrangement for inspection before the end of the defect reliability period of the Alenze first phase construction as 2017 JPA and IV) monitoring and maintenance of the Alenze first phase construction as 2017 JPA.

3.3.3. Preparation and Implementation of the Action Plans

(1) Outline of the Action Plan

The action plan was prepared based on the results of hearing 5-year plans of NRWGO and GRWC. Check dam construction, planting, and other erosion recovery works planned by NRWGO were listed in the plan. And, mainly river protection works such as revetment, drop, apron, were listed for each river basin.

(2) Progress and Achievement

The model river basin, Masal River Basin, was selected from 10 river basins. At the time, WSM-SC didn't decide the JPA, because they considered that the integrated planning survey for erosion and sediment control should be necessary to decide the JPA.

Then, in 2015 the study was taken. The DD survey at Alenze, which was selected as the JPA target area based on the results of the study. The DD survey was conducted in 2016, and the construction with supervision work was carried out in 2017. In 2018, the flowing JPA (Alenze2018) was taken and parallelly, monitoring and maintenance work on JPA 2017 was taken. Then, the series of model series work; planning, DD, construction with supervision, and monitoring & maintenance work, have been achieved completely as JPA. This achievement will be used as "Alenze Model" effectively for implementation of the Mid-Term-Plan.

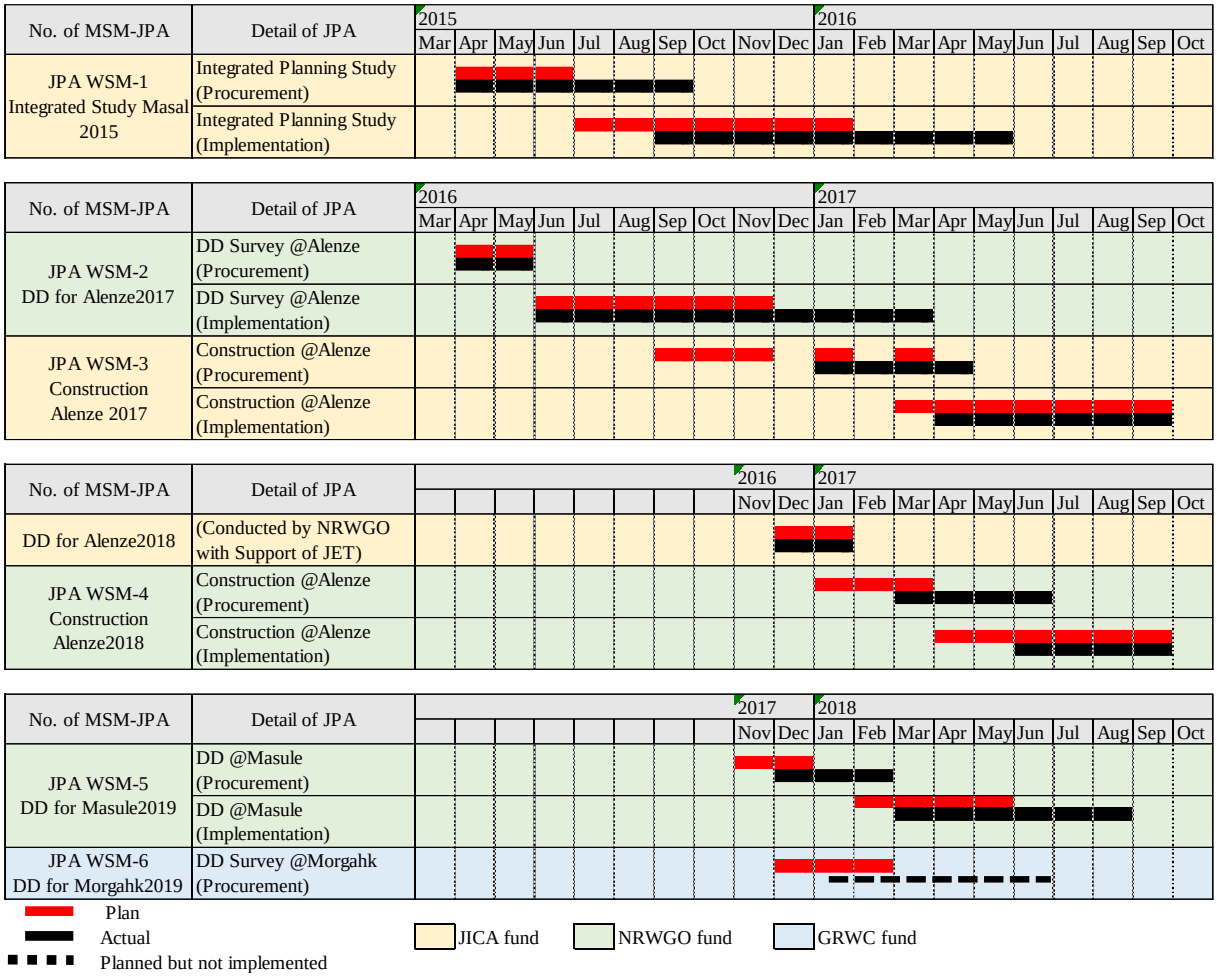
The achievement by Iranian side were not provided, because the information was confidential.

3.3.4. Implementation of the Joint Pilot Activities

The number of the Joint Pilot Activities (JPAs) conducted under the WSM-SC were six (6) shown in Figure below. The summary of JPAs are described below.

1) JPA WSM-1: Integrated Planning Study: Erosion and sediment mechanism were studied, and sediment sources were identified. Total volume of sediment per year was estimated and the ratio of origin of sediment was 80% from mountain and 20% from river. In the mountain area, erosion risky area (sub-basin) were identified and 3 candidates places for the JPA (construction activity) were selected from them. WSM-SC, NRWGO (implementation agency) and JET took site visits and selected 1 place for the JPA using criteria.
2) JPA WSM-2: Detailed design survey (DD survey) was conducted at the selected area (Alenze). One consultant was procured by NRWGO and DD survey was conducted.
3) JPA WSM-3: Construction work at Alenze was conducted by JICA fund. JICA Iran Office was the client and NRWGO was the implementation agency. JET supported JICA for all tasks and WSM-SC gave some advices.
4) JPA WSM-4: Construction work at Alenze, which followed the JPA 2017. The Iranian side owned the cost and NRWGO was the implementation agency. JET support NRWGO for all tasks.
5) JPA WSM-5: Detailed survey at Masule was conducted by NRWGO and its budget. At first, NRWGO aimed a modern design as same as the design at Alenze. However, the procured consultant work was not satisfied NRWGO, WSM-SC and JET. Their work (ground survey) lacked accuracy and revision and field check took much time.
6) JPA WSM-6: Detailed design survey at Mogahl River basin. GRWC would like to take DD survey with advices by JET. They prepared survey TOR supported by JET and WSM-SC

confirmed the importance. However, unfortunately, Iranian side never allocate the budget for this. Then, it was stopped.



Source: JICA Expert Team

Figure 3.3-3 Implementation Bar Chart of JPAs under WSM SC

3.3.5. Sub-contract Works

Four kinds of the surveys have been conducted by local consulting firms under sublet contracts with JET to obtain basic data and information as follows. Before commencement of the surveys, the short-list of local consulting firms for bidding and the scope of the works were discussed and finalized under the Watershed Management SC. Progresses of the works were reported by the local consulting firms several times at the Watershed Management SC as well as at DOE Gilan. Based on the comments by the Watershed Management SC, the surveys were completed by the end of February 2015.

(1) GIS Survey

1) Background and objectives

Sedimentation has been controversial as one of significant negative issues for Anzali Wetland conservation. In this sublet work, a GIS survey was carried out to comprehend the land use changes in the recent 10 years, especially forest and rangeland distributions.

2) Target area

The watershed of the Anzali Wetland. The total estimated area is about 3,610 km^2.

3) Scope of the survey

The items included in the scope of the survey are (a) preparation of land use map in 2003 and 2013, (b) comparison of land use condition between 2003 and 2013, and (c) detailed forest condition survey (forest degradation and deforestation condition in Masule mountainous area, approximately 100 km^2).

4) Results of the survey

The differences of each land use category between 2003 and 2013 are shown below. The forest area has decreased by 230.8 km^2 between 2003 and 2013 due to deforestation. Most of the deforestation occurred in the mountainous area. NRWGO has to confirm the actual deforestation condition and what caused the deforestation.

Table 3.3-4 Comparison of Land Use between 2003 and 2013

Category	2003 (km^2)	2013 (km^2)	Difference
Paddy	959.9	842.3	-117.6
Urban	182.3	210.7	28.4
Water	88.4	69.5	-18.9
Tea farms	15.6	26.1	10.5
Bare soil	172.5	165.7	-6.8
Grass	248.2	440.3	192.1
Pastures	104.1	142.9	38.8
Trees & Orchards	58.8	161.7	102.9
L D. Forest	154.0	145.6	-8.4
D. Forest	477.4	596.5	119.1
H.D. Forest	1249.1	907.6	-341.5
Total Forest	1880.5	1649.7	-230.8
Wetland	109.7	110.6	0.9
Total Area	3819.5	3819.5	0

Source: Prepared by JET based on the report of GIS sublet work.

The land use maps in 2003 and 2013 and the map of deforestation area developed by the GIS work are shown in Attachment-5 of Progress Report No.1. The details of the deforestation area will be checked, and the drives behind deforestation will be identified by NRWGO in order to take necessary measures.

(2) Bathymetric and Topographic Survey

1) Background and objectives

Sedimentation has been controversial as one of significant negative issues for the Anzali Wetland conservation. In this sublet work, bathymetric/topographic survey was carried out to examine where the sediment is accumulating in the wetland. In the past, a bathymetric survey was carried out during JICA Master Plan Study in 2003 (M/P Study). The survey this time aimed to compare the topography under water in the wetland between 2003 and 2014 and to identify the locations in the wetland where significant deposition of sediment has occurred since 2003.

2) Target area

Different target areas in the wetland were selected based on the work as shown below.

3) Scope of the survey

Table 3.3-5 Confirmation and Duplication of TBMs Installed by JICA MP Study

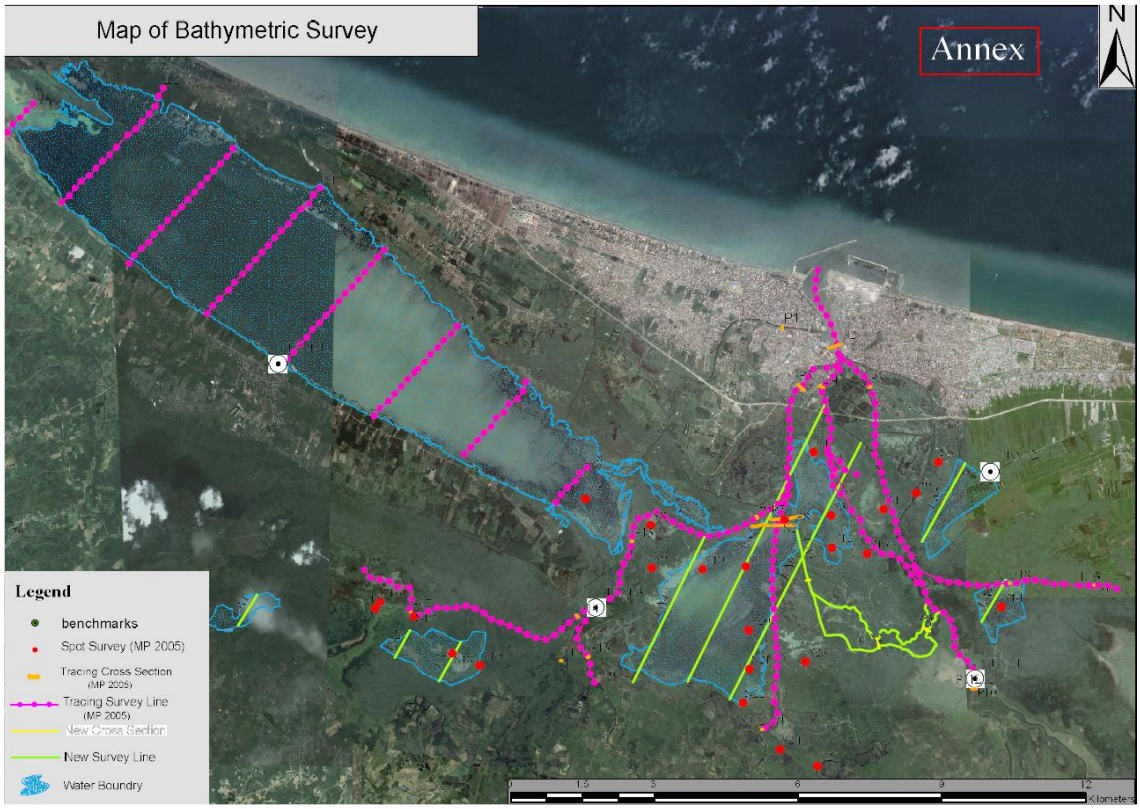
Location	Anzali lagoon, Wetland
No. of TBM to be confirmed	1 location (TB1)
No. of TBM to be duplicated	3 locations (TB2, TB3 and TB4)

Source: JICA Expert Team

Table 3.3-6 Work (2): Bathymetric Survey Using Echo-Sounder

Location:	Anzali lagoon, Channels in the surrounding wetland, Selected spots in the wetlands
No. of survey lines:	8 lines for west Anzali lagoon 2 lines for south Anzali lagoon 7 lines for east Anzali lagoon 5 lines for channels in the east Anzali wetland 2 lines for channels in the east Anzali wetland
No. of spots	25 spots
Estimated total length of survey lines:	Approx. 93 km

Source: JICA Expert Team



Source: JICA Expert Team

Figure 3.3-4 Location Map of Bathymetric Survey

4) Results of the survey

In the west lagoon, the result of the bathymetric survey showed that the change in bed elevation from the one during M/P Study in 2003 ranges from -83 cm to +83 cm. Unfortunately, the previous temporary benchmarks (TBMs) installed during M/P Study in 2003 are not remaining anymore. Therefore, the result is not very accurate or reliable. However, this time survey results can be utilized for monitoring from now on.

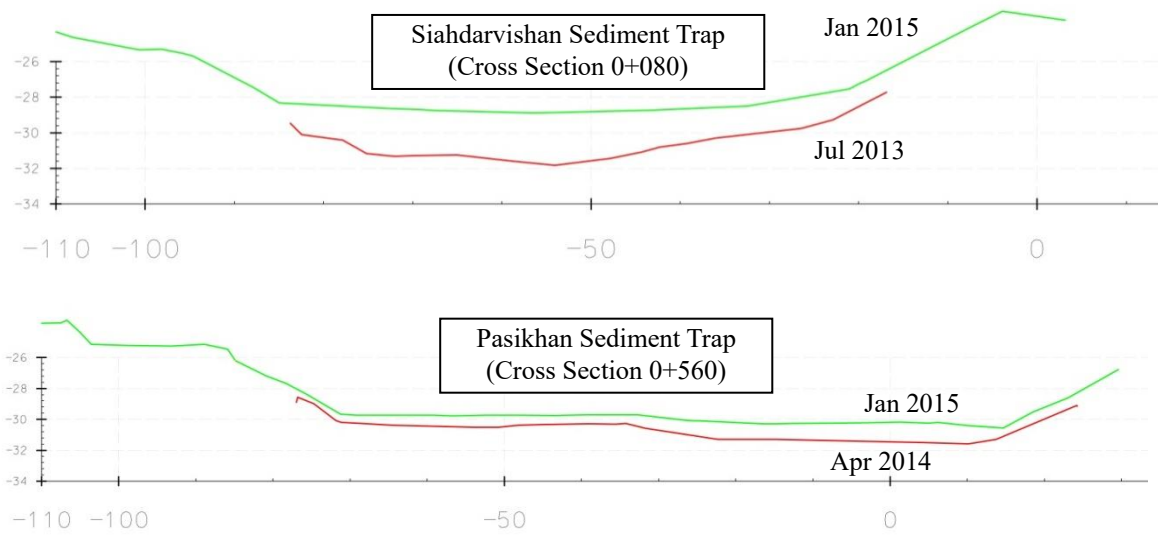
Table 3.3-7 Bed Elevation Difference between 2003 MP Study and 2015 Survey in West Lagoon

(Unit: m)

No. of Point	Line 1	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7
No. 1	0.13	-0.83	0.13	0.46	-0.12	0.19	0.16
No. 2	-0.26	-0.27	0.32	0.25	0.17	0.55	0.17
No. 3	-0.31	-0.31	0.31	0.35	0.07	0.35	0.40
No. 4	-0.45	-0.16	0.32	0.25	-0.05	0.29	0.50
No. 5	-0.18	-0.26	0.24	0.17	-0.07	0.02	0.44
No. 6	-0.37	-0.29	0.17	0.12	0.00	0.23	-0.15
No. 7	-0.66	0.55	-0.26	0.06	-0.04	0.19	
No. 8	-0.46	-0.43	-0.04	0.13	0.24	0.01	
No. 9	-0.16	-0.4	-0.08	0.02	0.07	0.22	
No. 10	-0.42	-0.56	-0.07	-0.08	0.06	-0.06	
No. 11	-0.44	-0.63	-0.13	-0.09	0.09		
No. 12	-0.64	-0.4	-0.12	-0.05	0.03		
No. 13	0.83	-0.57	-0.25	-0.03	0.49		
No. 14	0.42	-0.59	-0.17	-0.15			
No. 15		-0.59	-0.18	0.07			
No. 16			0.11	-0.47			
Count	14	15	16	16	13	10	6
Max	0.83	0.55	0.32	0.46	0.49	0.55	0.5
Min	-0.66	-0.83	-0.26	-0.47	-0.12	-0.06	-0.15
Average	-0.21	-0.38	0.02	0.06	0.07	0.20	0.25

Source: Prepared by JET based on the report of Bathymetric Survey sublet work.

In the Siahdarvishan sediment trap which is located at the confluence point of Masule and Pishroudbar Rivers, the average elevation difference was approximately 2 m over the period of about 2 years between 18th July 2013 and 15th Jan 2015. In the Pasikhan sediment trap which is located at the confluence point of Pasikhan and Pirbazar Rivers, the average difference in elevation was approximately 1 m over the period of about 1 year between 16th April 2014 and 14th Jan 2015. The deposition rate is thus roughly 1 m/year in both sediment traps. However, the previous temporary benchmarks (TBMs) erected during the topographic survey for these sediment traps had been also lost and the reliability of the past data are not clear. A new TBM was installed beside each sediment trap under the sub-contract work. A continuous monitoring is recommended by using the results and installed TBMs.



Source: JICA Expert Team

Figure 3.3-5 Cross Section Comparison in Sediment Traps

(3) Data Collection and Compilation Survey

1) Background and objectives

The purpose of the survey is to collect and compile existing data/information from relevant organizations. In addition, some simple analyses are included in this survey.

2) Target area

The watershed of the Anzali Wetland. The total estimated area is about 3,610 km^2.

3) Scope of the survey

The following data/information were collected.

Table 3.3-8 Data and Information under the Data Collection and Compilation Survey

No.	Survey Item	Necessary Data
1	Topographic information	Contour map
		River map
		Slope distribution map
2	Geological information	Geological map & its explanation
3	Soil information	Soil map & its explanation
4	Vegetation information	Vegetation map & its explanation
5	Meteorological information	Rainfall
		Temperature
		Wind
6	Hydrology information	River flow rate
		Sedimentation volume
		Wind-blown sand
7	Land use information	Land use map
8	Information on land failure, land slide, gully erosion, etc.	Land failure/slide survey report/ document/ map
9	Information on damages caused by land failure, landslides, sediment-related disaster, erosion, etc.	Existing disaster records
10	Information of existing watershed control facilities, sabo facilities	Facility distribution map

Source: JICA Expert Team

4) Results of the survey

Most of required data were collected from relevant authorities, and some inconsistencies, such as the inconsistent contour lines in the topographic map, were rectified by the sub-contractor. The detailed information of collected data is shown in Attachment-6 of Progress Report No. 1.

(4) Boring/Topographic Survey and Water Level Measurement Equipment Installation

1) Background and objectives

The main objective of this survey was to investigate the process of sedimentation in the wetland by analyzing sediment samples collected from the mouths of selected rivers in the wetland where sedimentation is pronounced. In addition, this sub-contract work was implemented to install water level measurement equipment in the wetland so that fluctuation of water levels in the wetland can be monitored.

2) Target area

Anzali Wetland

3) Scope of the survey

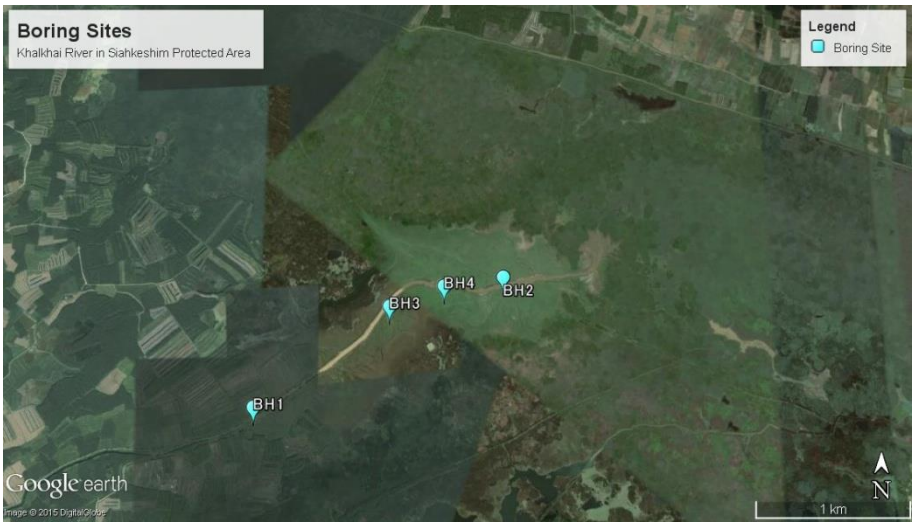
Work (1): Boring survey at Khalkai River

Work (2): Boring survey at Pasikhan River

Work (3): Water level measurement equipment installation at 4 locations

4) Results of the survey

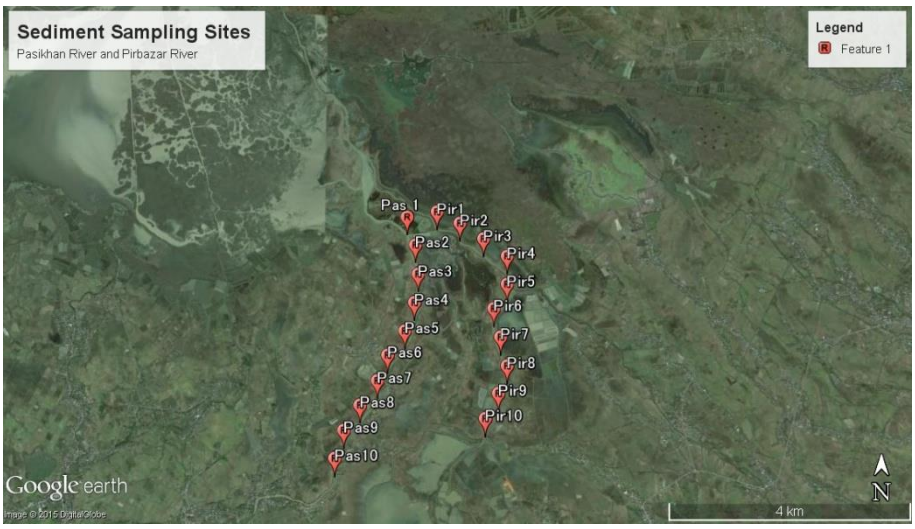
Boring Survey at Khalkai River Sites: In order to investigate the sedimentation process in Siahkeshim Protected Area, boring was carried out at four sites (Figure 3.3-3) in the floodplain of Khalkai River to the depth of 12 to 35 meters below the surface depending on location. At each site, the boring log of deposited sediment was made, and core samples were analyzed for particle size distribution. Selected core samples from BH3 were decided analyzed for Cs-137 to estimate the sediment deposition rate. But because there was no laboratory which can estimate the deposits age, it was not completed.



Source: JICA Expert Team

Figure 3.3-6 Location Map of Boring Sites

Boring survey at Pasikhan River Sites: Due to unusually high water level and strong flow of Pasikhan River in November 2014, the boring works in the Pasikhan River were cancelled; instead, in total 40 sediment samples were collected from Pasikhan River and Pirbazar River (20 cross-sections, two samples from each cross-section, see Figure 3.3-4) using a grab sampler, and analyzed for particle size distribution.



Source: JICA Expert Team

Figure 3.3-7 Location Map of Sediment Sampling Sites in Pasikhan River and Pirbazar River

Installation of Water Level Measurement Equipment: Four automated water level meters were procured for installation at Abkenar, Nahang Roga, Sorkhankol and Sosar Roga (see Figure 3.3-5). Two meters have been installed at Nahang Roga and Sosar Roga in the first year of the project, and water level monitoring has started. And the remaining two meters has installed as JPA in the second year of the project.

Source: JICA Expert Team

Figure 3.3-8 Location Map of Sites for Installation of Water Level Measurement Equipment

3.3.6. Achievements

As described in Chapter 3.3.1, the WSM-SC aimed to transfer the technology includes Japanese technology to Iranian side by implementation of the series of works from planning study, DD

survey, construction with supervision, and monitoring & maintenance. Almost the full package of works is covered by the JPA WSM-1 to WSM-4.

However, the above covers the mountain area but not covered the main river course and wetland area.

3.3.7. Recommendations

As the achievement above, one procedure from planning until monitoring & maintenance work were implemented with cooperation with Iranian side and Japanese side, and most of necessary technologies were transferred to them, mainly NRWGO Gilan. It is highly recommended that the C/P of NRWGO will expand the transferred technologies to the other NRWGO experts. As described in the Mid-Term-Plan, the erosion risk area in the Anzali Wetland Basin is approx. 25 thousand ha and current NRWGO's capacity and budget can achieve only 13 ha per year, it means 2000 years will be used for cover the all necessary area. Therefore, the Mid-Term-Plan period, the next 10 years, shall be used for the training for NRWGO to get familiar to the transferred technologies and outsourced works. The technologies and skills of control outsource can improve their capacity rapidly and improvement of NRWGO's capacity is crucial to shorten the period above. If they will able to improve their capacity 26 times compared with current one, the necessary period 2000 year can be shortened to 100 year. It is quite possible in accordance with Japanese case, which budget for the forest conservation increased about 24 times from 1960' to 2000.

Unfortunately, this project was not able to cover the main river course project well, because of limitation of the budget and the Japanese experts' assignment. However, it is also, highly expected that GRWC will improve their capacity for the river conservation referring to the technology transfer to NRWGO.

3.4. Sewage Management

3.4.1 SC Meetings

Meetings of Sewage Management SC were held as shown in the following table.

Table 3.4-1 Sewage SC Meetings

No.	Date	Main Discussions
1	12 July 2014	• Introduction of proposed activities in the phase II project • Report of the current water environmental condition and the outlines of sewage management activities in the Anzali Wetland basin
2	24 Sept 2014	• Review of existing projects and major issues for sewage management • Proposal of ideas for the joint pilot activities • Introduction of experiences and examples in Japan
3	28 Feb 2015	• Confirmation of the implementation schedule of each proposed joint pilot activity • Proposal of the methodology of progress management of joint pilot activities • Introduction of experiences and examples in Japan
4	9 May, 2015	• Preparation of AWMC
5	12 May, 2015	• Preparation of AWMC
6	10 Feb., 2016	• Solution for lack of budget for joint pilot activities
7	2 September 2018	• The Manufacturer should provide one treatment unit as a sample package to be installed in Mobarak Abad Village so that Sewage SC members check the performance of the package. • If the test result fail to conform to the mentioned technical specification confirmed by SC members, the contractor is obliged to do adjustment quickly as far as to reach the conditioned specifications. • Guarantee and Warrantee should be hand over to Iranian side (RWWC) after receipt of all the packages. • JICA would better to do payment after receiving the SC confirmation for the performance of the sample unit as well as receiving all 28 other units. • On the conditions above, Sewage SC determined to receive the on-site treatment package to be procured by JICA Iran.
8	17 November 2018	• RWWC would like to receive the answer from ATP Co. regarding the technical comment raised by RWWC • Installation of the first package shall be completed by ATP Co. as soon as possible.

Source: JICA Expert Team

3.4.2 Meetings between Relevant Organizations and JET

Table 3.4-2 Meetings between Relevant Organizations and JET

No.	Date	Participated Organizations	Main Discussions
1	28 May 2014	GWWC	• Introduction of the project - Phase II • Request for selection of personnel in the SC
2	10 June 2014	RWWC	• Introduction of the project - Phase II • Request for selection of personnel in the SC
3	1 July 2014	RWWC	• Current situation and issues of sewage management in rural area • Request for preparation of 1st SC meeting

No.	Date	Participated Organizations	Main Discussions
4	2 July 2014	GWWC	• Current situation and issues of sewage management in urban area • Request for preparation of 1st SC meeting
5	24 August 2014	GWWC	• Current situation and issues of sewage management in urban area
6	24 August 2014	RWWC	• Current situation and issues of sewage management in rural area
7	3 September 2014	GWWC	• Current situation and issues of sewage management in urban area
8	3 September 2014	RWWC	• Current situation and issues of sewage management in rural area
9	13 September 2014	GWWC	• Ideas for the joint pilot activities • Request for preparation of 2nd SC meeting
10	13 September 2014	RWWC	• Ideas for the joint pilot activities • Request for preparation of 2nd SC meeting
11	20 September 2014	GWWC	• Request for arrangement of the meeting with the central government (NWWC)
12	28 September 2014	NWWC	• Introduction of the project - Phase II • National policies on sewage management in Iran • How to request the necessary data to NWWC • Current situation of sewerage project in Tehran
13	26 November 2014	GWWC	• Limiting conditions of the joint pilot activities • Proposal of the contents of joint pilot activities
14	2 December 2014	RWWC	• Limiting conditions of the joint pilot activities • Proposal of the contents of joint pilot activities • Confirmation of the Action Plan of sewage management in rural area
15	9 December 2014	GWWC	• Confirmation of the Action Plan of sewage management in rural area • Selection of the joint pilot activities
16	14 December 2014	RWWC	• Selection of the joint pilot activities • Selection of the target village of the joint pilot activities
17	8 February 2015	GWWC	• Confirmation of the implementation schedule of the joint pilot activities • Request for preparation of 3rd SC meeting
18	8 February 2015	RWWC	• Confirmation of the implementation schedule of the joint pilot activities • Request for preparation of 3rd SC meeting
19	9 February 2015	DOE Gilan	• Preparation of Anzali Wetland Management Committee
20	18 February 2015	GWWC	• How to progress the Joint Pilot activities
21	27 May, 2015	GWWC, DOE Gilan	• Procedure of JICA's portion of Joint Pilot Activity-1
22	30 May, 2015	GWWC, DOE Gilan	• Preparation of draft Minutes of Meeting for Joint Pilot Activity-1
23	7 June, 2015	RWWC, DOE Gilan	• Fund procurement for Joint Pilot Activity-5
24	13 June, 2015	GWWC, DOE Gilan	• Required conditions for the selection of contractor
25	29 June, 2015	RWWC, DOE Gilan, Gilan Provincial Governor Office	• Fund procurement for Joint Pilot Activity-5
26	25 August, 2015	RWWC, DOE Gilan	• Fund procurement for Joint Pilot Activity-5 • TOR of the Basic Study work for Joint Pilot Activity-5
27	31 August, 2015	GWWC, DOE Gilan	• Confirmation of draft Minutes of Meeting for Joint Pilot Activity-1 • Recheck of the required scope of JICA's portion of Joint Pilot Activity-1

No.	Date	Participated Organizations	Main Discussions
28	19 Sep., 2015	GWWC, DOE Gilan	• Limited price of JICA's portion of Joint Pilot Activity-1 • Conditions of tax, insurance and guaranty for the contract of construction work
29	26 Sep., 2015	RWWC, DOE Gilan	• Preparation of the explanatory meeting in Esfand Village • Defrayment of operation and maintenance cost of on-site sewage treatment units which will be installed in Esfand Village • Confirmation of draft TOR of the Basic Study work for Joint Pilot Activity-5
30	24 Nov. 2015	RWWC, DOE Gilan	• Preparation of the explanatory meeting in Esfand Village • Defrayment of operation and maintenance cost of on-site sewage treatment units which will be installed in Esfand Village
31	28 Nov., 2015	GWWC, DOE Gilan	• Checklist of environmental and social issues in the construction work • Conditions of House Connection work
32	1 Dec., 2015	GWWC, DOE Gilan	• Condition of limited budget of JICA side for joint pilot activities • Request for allocation of additional budget from Iranian side for joint pilot activities
33	5 Dec., 2015	RWWC, DOE Gilan	• Confirmation of current situation and next move for fund procurement for Joint Pilot Activity-5
34	8 Dec., 2015	GWWC, DOE Gilan	• Confirmation and modification of draft Minutes of Meeting for Joint Pilot Activity-1
35	21 Jan., 2016	Esfand Village Council RWWC, DOE Gilan	• Request for understanding and cooperation for Joint Pilot Activity-5 (Development of on-site sewage treatment) • Confirmation of schedule of explanatory meeting and demonstration for Esfand Village people
36	28 Jan., 2016	RWWC, DOE Gilan	• Preparation of the ceremony in Esfand Village
37	1 Feb., 2016	GWWC, DOE Gilan	• Budget for House Connection work
38	7 Feb., 2016	RWWC, DOE Gilan	• Design conditions for on-site sewage treatment system to be developed in Esfand Village • Iranian budget for development of on-site sewage treatment system in Esfand Village
39	8 May, 2016	GWWC	• Confirmation of progress situation of the construction work of vacuum sewerage system
40	14 May, 2016	RWWC, DOE Gilan Local consultant	• Confirmation of the Draft Final Report of the basic study on the on-site sewage treatment project
41	10 August, 2016	GWWC, DOE	• Solution for the problem of delay in the construction work • Preparation of TOR on the House Connection Work
42	14 August, 2016	RWWC, DOE	• Fund procurement for the development project of on-site sewage treatment system in Esfand Village • Review of the basic study report which were prepared by a local consultant last fiscal year
43	15 August, 2016	GWWC, DOE, Local consultant (construction supervisor), Local construction company	• Solution for the problem of delay in the construction work

No.	Date	Participated Organizations	Main Discussions
44	29 November, 2016	RWWC, DOE	• Implementation schedule of the development project of on-site sewage treatment system in Esfand Village
45	3 December, 2016	GWWC, DOE, Local consultant (construction supervisor), Local construction company	• Deadline of the construction work • Schedule of O&M training
46	15 January, 2017	RWWC, DOE	• Current situation of the budget allocation for the development project of on-site sewage treatment system in Esfand Village • What to do next for the implementation of the joint pilot project for RWWC
47	1 May, 2017	RWWC, DOE	• Current situation of the budget allocation for the development project of on-site sewage treatment system in Esfand Village
48	13 May, 2017	GWWC, DOE	• Candidate contractors of the house connection work • Implementation schedule of the house connection work
49	6 August, 2017	RWWC, DOE	• Confirmation of the progress situation of RWWC's portion in the pilot project of development of on-site sewage treatment system in Mobarak Abad Village • Confirmation of target number of on-site sewage treatment units to be purchased by JICA's budget
50	22 November, 2017	RWWC, DOE	• Confirmation of the progress situation of RWWC's portion in the pilot project of development of on-site sewage treatment system in Mobarak Abad Village • Request for several data necessary for the procurement work of JICA's portion
51	29 November, 2017	GWWC, DOE	• Confirmation of the progress situation and schedule of JICA's portion in the house connection work
52	21 April, 2018	GWWC, DOE	• Sharing the information about the Re-bidding procedure of JICA Iran Office for house connection work • Request GWWC to nominate the candidate local construction companies again
53	21 April, 2018	RWWC, DOE	• Confirmation of the progress situation of RWWC's portion in the pilot project of development of on-site sewage treatment system in Mobarak Abad Village • Confirmation and sharing the schedule of procurement work of JICA's portion
54	31 July 2018	GWWC, DOE, KBS Co. JET	• Result of Bidding of house connection work • Construction schedule • Arrangement for the preparatory works
55	31 July 2018	RWWC, DOE, JET	• Currency for Bidding
56	12 August 2018	RWWC, DOE, ATP Co., JET	• Technical clarification for bid evaluation • Procedure for the implementation of the Contract
57	04 October 2018	RWWC, DOE, JET	• Budget for RWWC's installation work • Guarantee and After-sales service of ATP Co. • Water quality test and confirmation of the performance of the package
58	07 October 2018	GWWC, DOE, Anzali WWC, KBS Co., Pars Peyab Co., JET	• Work permission • Procedure for the construction work • Construction Schedule • Supervision and monitoring of the works

No.	Date	Participated Organizations	Main Discussions
59	07 October 2018	RWWC, DOE, ATP CO., JET	• Delivery schedule of first package • Work demarcation of installation between RWWC and ATP Co. • Procedure for evaluation of performance of the first package
60	20 November 2018	RWWC, DOE, ATP CO., JET	• ATP Co. shall submit the cost estimate for installation work to RWWC for their budgeting • Trial run of the package for one month shall be conducted
61	15 December 2018	RWWC, DOE, ATP CO., JET	• Confirmation of the evaluation procedure of the first package • Schedule of the water sampling and testing
62	17 December 2018	GWWC, DOE, JET	• Schedule for demonstration of the vacuum sewerage system

Source: JICA Expert Team

3.4.3 Preparation and Implementation of the Action Plans

In the first year, Sewage Management SC has discussed and studied the current conditions and issues about sewage management in Anzali Wetland watershed, and has proposed the draft Action Plan and JPAs to be implemented from the second year to fifth year.

(1) Action Plan for FY 2014 – FY 2018

1) Overall strategies

The Action Plan for sewage management has been proposed based on the following strategies:

- To be based on the project plans and the priority level of each member organization of the SC; and
- To follow the national strategy and the development program of the central government of Iran (National Water and Wastewater Engineering Company of Iran)

2) Action Plan for sewage management in urban areas

The Action Plan for sewage management in urban areas consists of the construction works and the operation and maintenance works of sewerage systems in Rasht, Anzali, Somesara and Fuman which will be implemented by GWWC.

Table 3.4-3 Action Plan Schedule for Sewage Management in Urban Area

City	Work	Target Facility	Fiscal Year				
			2014	2015	2016	2017	2018
Rasht	Construction	STP		(Expansion)			
		Sewer Network					
	Operation & Maintenance	STP					
		Sewer Network					
Anzali	Construction	STP					
		Sewer					
	Operation & Maintenance	STP					
		Sewer Network					
Somesara	Construction	STP					
		Sewer Network					
	Operation & Maintenance	STP					
		Sewer Network					
Fouman	Construction	STP					
		Sewer Network					
	Operation & Maintenance	STP					
		Sewer Network					

Source: JICA Expert Team

3) Action plan for sewage management in rural areas

The Action Plan for sewage management in rural areas consists of the construction works and the operation and maintenance works of the centralized community sewage treatment systems and the on-site sewage treatment units respectively, which will be implemented by RWWC.

Table 3.4-4 Action Plan Schedule for Sewage Management in Rural Area

Work	Target	Fiscal Year				
		2014	2015	2016	2017	2018
Water Quality Monitoring	STPs					
	Industries					
Supervision of Implementation of Sewerage Projects	Rasht Industrial City					
	8 Cities lead to Anzali Wetland					
	Villages lead to Anzali Wetland					

Source: JICA Expert Team

4) Action plan for water quality monitoring of the effluent from STPs and industries

DOE Gilan will continue to execute the water quality monitoring of effluent from STPs and industries as before. In addition, DOE Gilan will monitor the progress status of the development

of the wastewater treatment system in the Rasht Industrial City, sewage treatment systems in urban areas and rural areas from FY 2015.

Table 3.4-5 Action Plan Schedule for Water Quality Monitoring of the Effluent from STPs and Industries

Category	Work	Fiscal Year				
		2014	2015	2016	2017	2018
Centralized Community Sewage Treatment Project	Construction in Two Villages	■	■			
	Operation & Maintenance in Two Villages		■	■	■	■
On-site Sewage Treatment Project	Operation & Maintenance of the Existing Pilot Unit	■	■	■	■	■
	Construction in One Prioritized Village		■	■	■	
	Operation & Maintenance in One Prioritized Village			■	■	■
	Expansion to Whole Anzali Wetland Watershed					■

Source: JICA Expert Team

(2) Proposed Joint Pilot Activities

1) Strategies for Prioritization and Selection of Joint Pilot Activities

Sewage Management SC has prioritized and selected the JPAs based on the following strategies.

- To select one construction work in urban areas of the Anzali Wetland watershed, and to support the selected construction work financially and technically;
- To study other approaches and methodologies for sewage management in urban areas in order to accelerate the development projects of sewer networks as soon as possible;
- To conduct a pilot study to gain new insight and experiences that would benefit sewage management in Gilan Province or the whole country of Iran;
- To accelerate the on-site sewage treatment project in rural areas, and to support the project financially and technically.

2) Items of Proposed Joint Pilot Activities

a) Construction work of the vacuum sewage collection system in one area located near the Anzali Wetland in the western area of Anzali City (JPA-1)

b) Study on the possibility of enhancing the capacity of Rasht STP (JPA-2)

c) Study on treatment and recycling of sewage sludge (JPA-3)

d) Review and improvement of the plan and the design of the sewer network in Rasht in order to reduce the number of planned pump stations (JPA-4)

e) Development and operation of on-site sewage treatment system in one target village (JPA-5)

At the end of the first year, Sewage Management SC had a plan to implement the all of five joint pilot activities, however, in the second year Sewage Management SC decided to focus on JPA-1 and JPA-5 based on the condition of budget limitation.

3.4.4 Implementation of the Joint Pilot Activities

(1) Development Project of Vacuum Sewerage System in Koliver Area of Anzali City

1) Background and objective(s)

Treatment and disposal of sewage (wastewater) which are generated from urban areas located around the Anzali Wetland are performed by Gilan Water and Wastewater Company (GWWC). Presently, there are existing three (3) sewage treatment plants (STPs) in Rasht City and Anzali City and part of sewage is treated in both cities, however, the development of sewer pipelines has not been proceeded smoothly due to lack of funds. Therefore, sewage which is generated from only 10 - 20% of residents in both cities is now treated appropriately, while untreated sewage is directly discharged into rivers and the Anzali Wetland from the areas in which sewer pipelines has not yet been developed, and this condition has caused the water pollution of rivers in urban areas and the Anzali Wetland.

In light of above-mentioned current condition and problems, it is necessary to make progress the development of sewerage system earlier and steadily in order to conserve and maintain the beautiful waterfront, the attractive landscape and the rich ecosystem of the Anzali Wetland. Therefore, the Sewage SC has decided to implement a joint pilot activity with the following objectives.

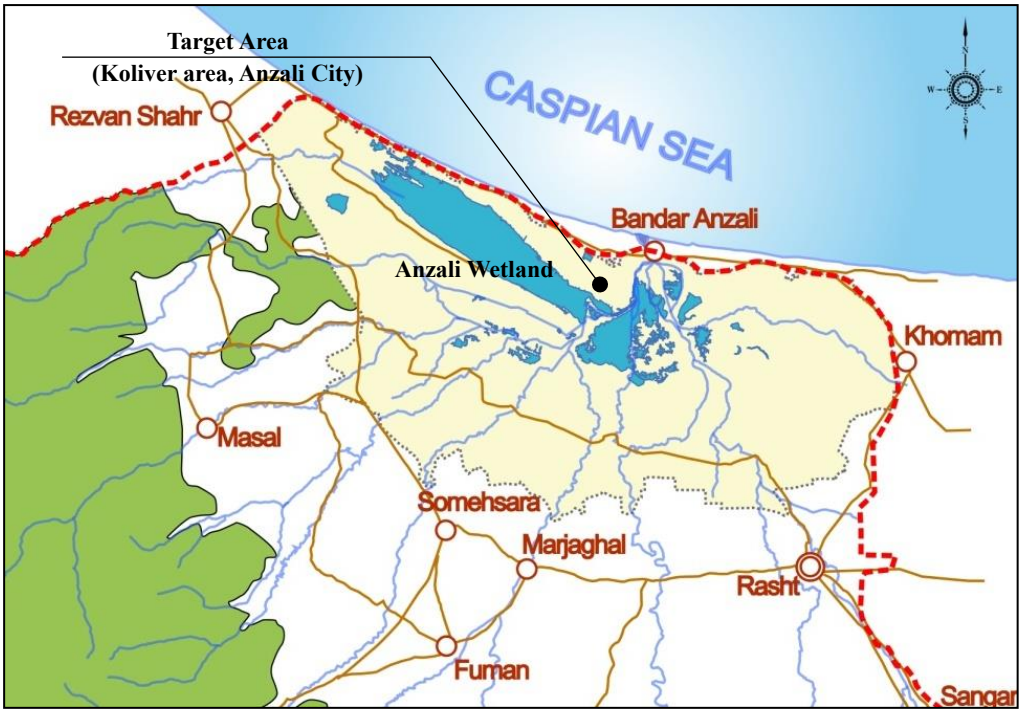
i) To support GWWC technically and financially to progress the development of sewer pipelines in urban areas as much as possible,

ii) To implement a project whose feature is new to Gilan Province or all over Iran to utilize the result of the activity in the sewerage projects in other areas and provinces.

2) Specifications of the activity

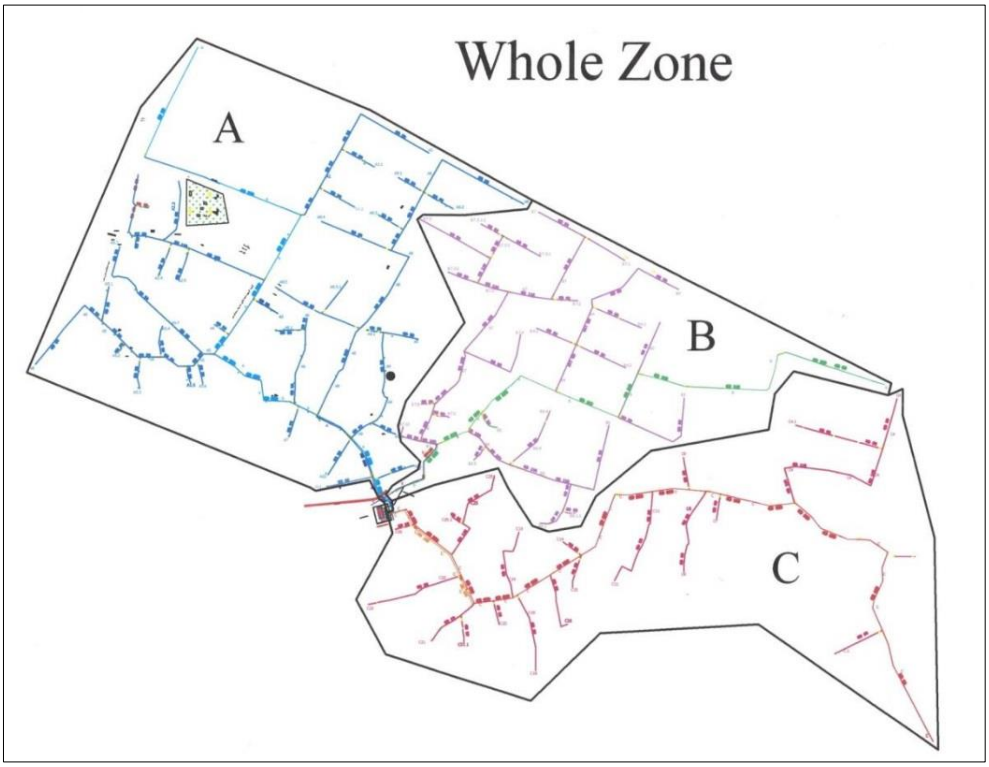
i) Project name: Development Project of Vacuum Sewerage System in Koliver Area of Anzali City

ii) Target area: approx. 50 ha



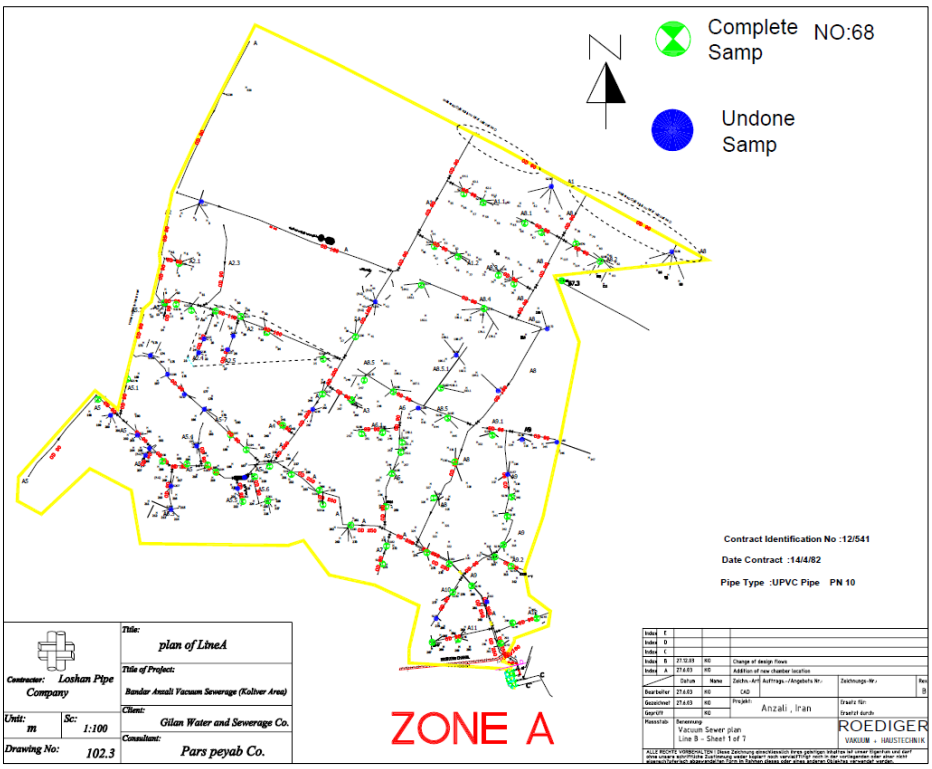
Source: JICA Expert Team

Figure 3.4-1 Location of the Target Area of Development Project of Vacuum Sewerage System



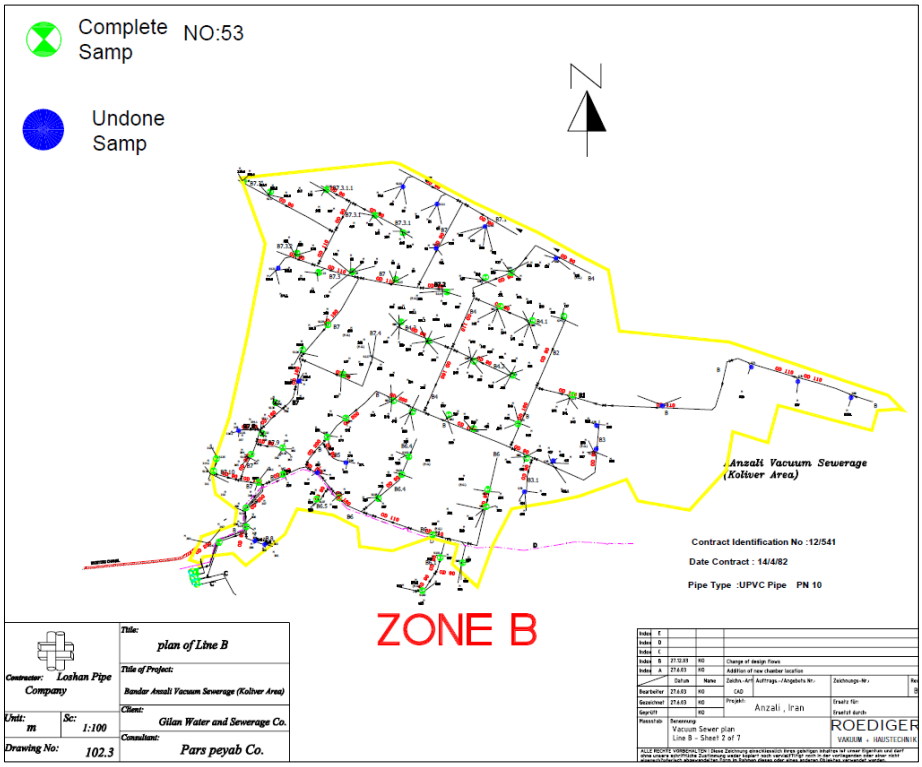
Source: GWWC

Figure 3.4-2 Layout of Sewage Collection Facilities in the Whole Zone of Koliver Area of Anzali City



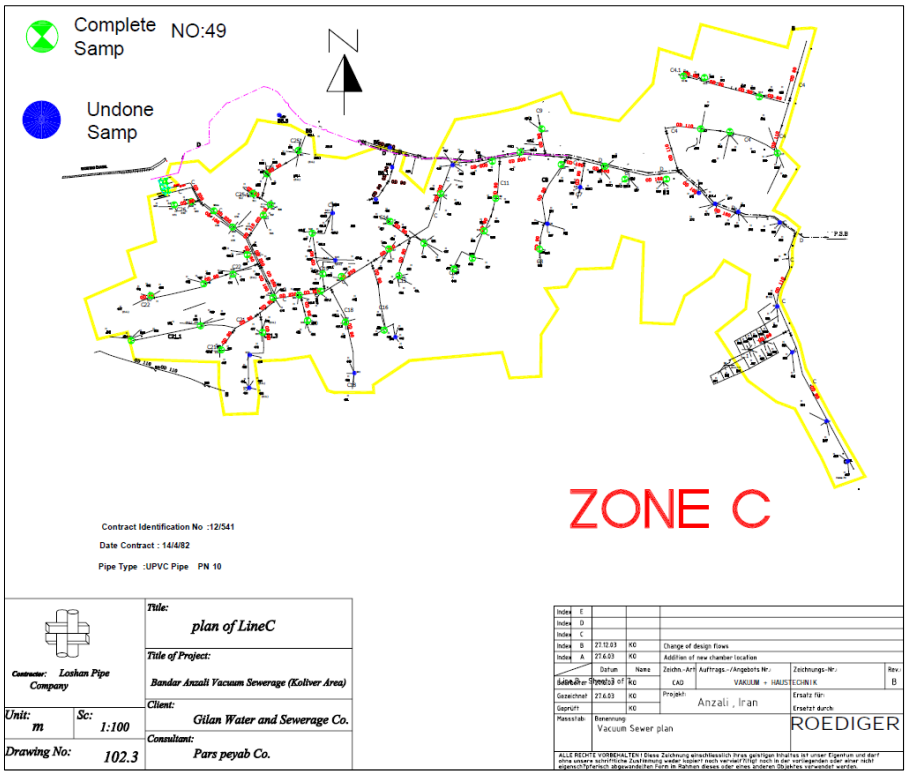
Source: GWWC

Figure 3.4-3 Layout of Sewage Collection Facilities in Zone-A of Koliver Area



Source: GWWC

Figure 3.4-4 Layout of Sewage Collection Facilities in Zone-B of Koliver Area



Source: GWWC

Figure 3.4-5 Layout of Sewage Collection Facilities in Zone-C of Koliver Area

iii) Target number of residential people: approx. 5,000 persons

iv) Contents of construction works

I. Phase-1

- JICA's budget:
  1) Installation of 170 chambers (manholes) and vacuum valve units
  2) Procurement of equipment for operation & maintenance of vacuum sewerage system
  3) Procurement of a power generator for emergency
  4) Execution of training of operation for GWWC's staff
- GWWC's own budget: Installation of pipes (12.8 km)

II. Phase-2

Connection work between each house and the vacuum sewerage system (House connection)

- JICA's budget: 170 houses
- GWWC's own budget: 400 houses

v) Selected Contractor

I. Phase-1: Luleh sazi-e Lowshan Co.

II. Phase-2: Kariz Beton Shomal Co.

3) Progress

Progress of each phase of the joint pilot project is as follow.

i) Phase-1

Preparation of construction plan: June – September, 2015

Selection of contractor: October – December, 2015

Construction work: December, 2015 – February, 2017

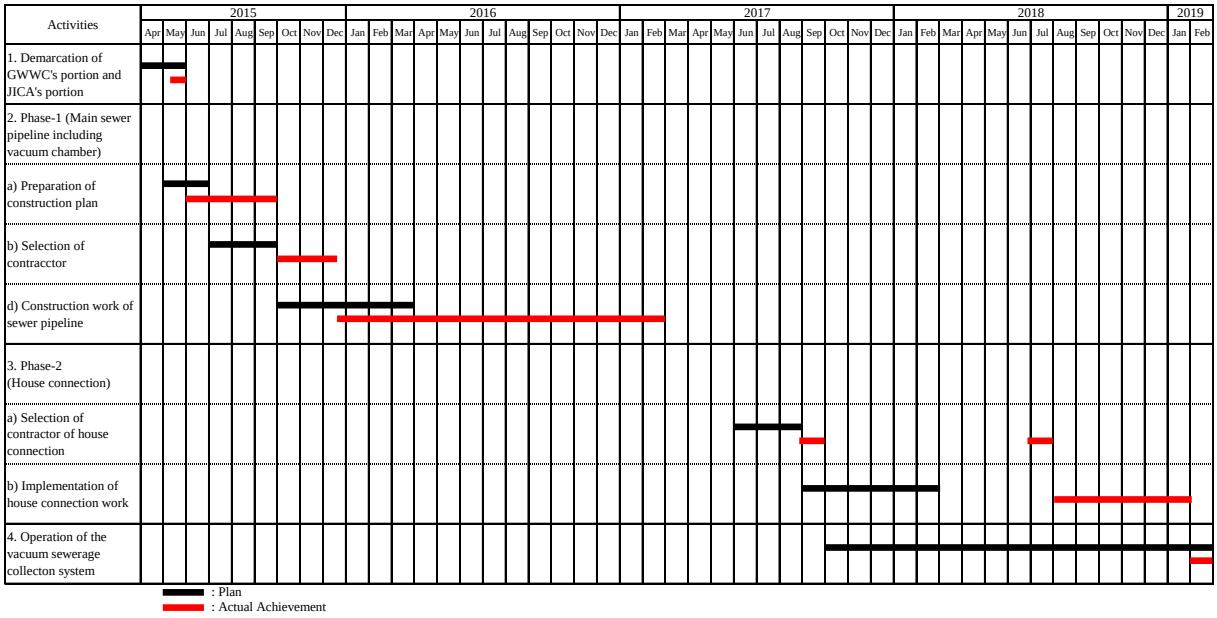
ii) Phase-2

Selection of contractor: September, 2017 and July, 2018

Implementation of house connection work: August, 2018 – January, 2019

4) Planned schedule and actual achievement

The planned schedule and the actual achievement are described as below.



Source: JICA Expert Team

Figure 3.4-6 Planned Schedule and Actual Achievement of the Joint Pilot Activity to Develop Vacuum Sewerage System in Koliver Area of Anzali City

(2) Development Project of On-site Sewage Treatment System in Rural Area

1) Background and objective(s)

Treatment and disposal of sewage (wastewater) which are generated from rural areas located around the Anzali Wetland are performed by Rural Water and Wastewater Company (hereinafter called RWWC). Presently, RWWC intends to implement the development project of on-site sewage treatment system in rural area based on the national polity, however, only one (1) pilot on-site sewage treatment packages are working which treat sewage generated from only public facilities, and the development of on-site sewage treatment system for each household has not yet launched because of lack of funds.

In light of above-mentioned current condition and problems, it is necessary to develop the on-site sewage treatment system earlier and steadily in order to conserve and maintain the beautiful waterfront, the attractive landscape and the rich ecosystem of the Anzali Wetland. Therefore, the Sewage SC has decided to implement a joint pilot activity with the following objectives.

i) To support RWWC technically and financially to develop the on-site sewage treatment system in rural areas as much as possible

ii) To make it an opportunity to expand the development of rural sewage treatment to whole Anzali Wetland watershed

2) Outline of the Project

i) Target Area

Mobarak Abad Village as shown in Figure 3.4-7 was selected as the target area of the Project. The domestic wastewater in the village are being discharged into Siyah Rudkhanh River which is flowing into Anzali Wetland.

Source: JICA Expert Team

Figure 3.4-7 Location of Mobarak Abad Village

ii) Project Component

The project consists of two phases:

a) First phase

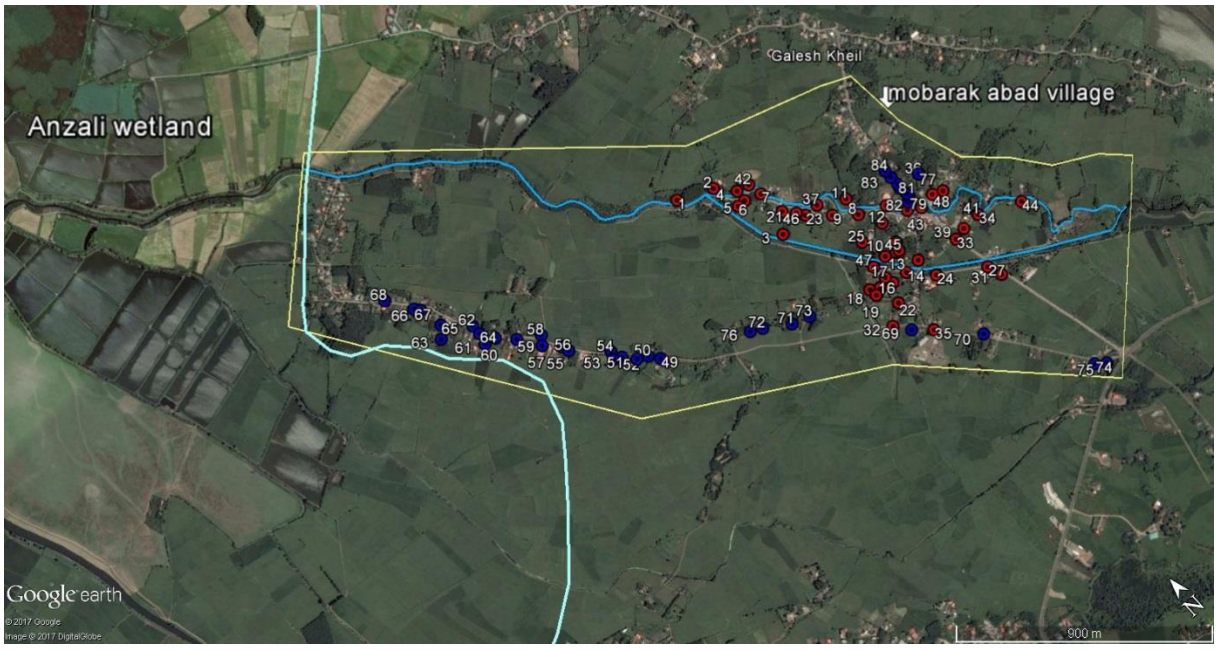
- Procurement and installation of 50 on-site treatment packages: RWWC's budget

b) Second phase

- Procurement of 35 on-site treatment packages: JICA budget

- Installation of the above packages: RWWC's budget

Figure 3.4-8 shows the planned installation location of the on-site treatment packages.



Installation sites of packages that was procured and installed by RWWC (50 places)

Installation sites of packages to be procured with JICA's budget and installed by RWWC (35 places)

Source: JICA Expert Team

Figure 3.4-8 Planned Installation Sites of On-site Sewage Treatment Packages

3) Progress of the Project

3) - 1: First Phase (RWWC's budget)

The progress of first phase was as follows:

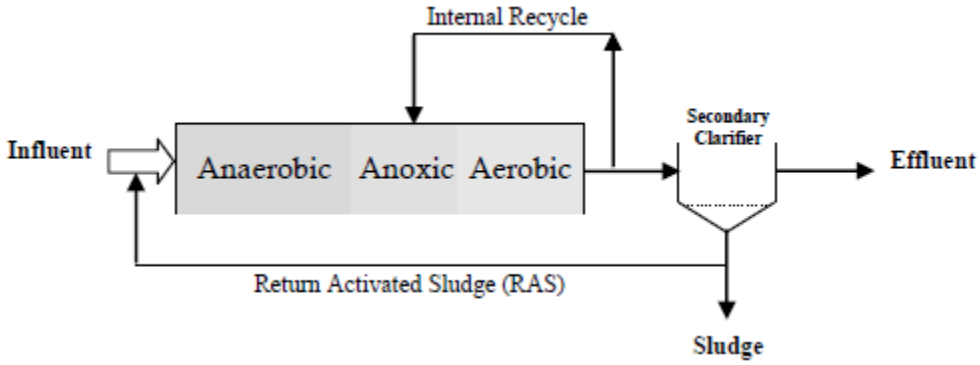
i) The procurement contract was signed between RWWC and the Supplier: July 2, 2017

Supplier: Tajhiz Ab Jam Co.

Treatment process: A2O process

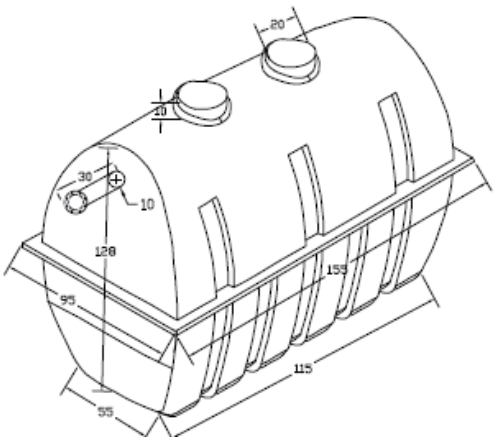
Capacity: Single house: 20 packages, Double house: 20 packages, Triple house: 10 packages

Figure 3.4-9 and Figure 3.4-10 show the flow diagram of A2O treatment process and isometric view of the treatment package (Single house type), respectively.



Source: Tajhiz Ab Jam Co.

Figure 3.4-9 Flow Diagram of A2O Treatment Process



Source: Tajhiz Ab Jam Co.

Figure 3.4-10 Isometric View of Treatment Package (Single House Type)

ii) Site visit and meeting with the village council by RWWC and JET: August 5, 2017


Source: JICA Expert Team

Figure 3.4-11 Meeting with the Council of Mobarak Abad Village and Site Visit (5 Aug. 2017)

iii) Installation of 50 packages was completed by November, 2017.




Source: JICA Expert Team

Figure 3.4-12 Sample Photo of Treatment Package installed in Mobarak Abad Village

3) – 2: Second Phase (JICA and RWWC's budget)

i) Site visit and confirmation of current condition of installation site was conducted by JET and RWWC: December 4, 2017.

Source: JICA Expert Team

Figure 3.4-13 Site Visit and Confirmation of Current Condition of Installation Site

ii) JET submitted an explanation paper to JICA Iran office which proposes procurement of the treatment packages of Tajhiz Ab Jam Co. by negotiated contract: December, 2017.

iii) The price negotiation between JICA Iran office and Tajhiz Ab Jam Co. was conducted. However, the negotiation did not reach the agreement. Thus, it was decided that the procurement be conducted by the competitive bid in the next fiscal year: February, 2018.

iv) JET prepared the following procurement documents based on the information from RWWC: May, 2018

a. Technical requirements
b. Cost estimate
c. Short list of the supplier

Due to the budget limitation of JICA, the number of the package was changed to the following:

Single house type:	28 nos.
Double house type:	1 no.

v) JICA Iran office distributed the bidding documents to the short-listed suppliers: July 11, 2018

vi) The bid opening was conducted at JICA Iran office: August 5, 2018

Arman Tadbir Palayesh Engineering Co. (ATP CO.) won the bidding. Then, the technical evaluation of the bid was commenced by JET, DOE and RWWC.

vii) JET sent the letter to JICA Iran office concerning the technical evaluation result, which stated the technical bids of ATP Co. was appropriate: August 15, 2018

viii) The Contract was signed between JICA Iran office and ATP Co. and witnessed by RWWC: September 11, 2018.

The contract prescribes the following procedure:

a. At first, ATP Co. delivers one package. Then, RWWC together with ATP install the package and start up the package. Then, the test run of the package (Duration: 30 days) shall be conducted.
b. If the packages were evaluated to be appropriate as a result of the test run, the Inspector (JET) shall issue the certificate and the payment shall be made.
c. Then the delivery of the remaining 27 packages shall be commenced

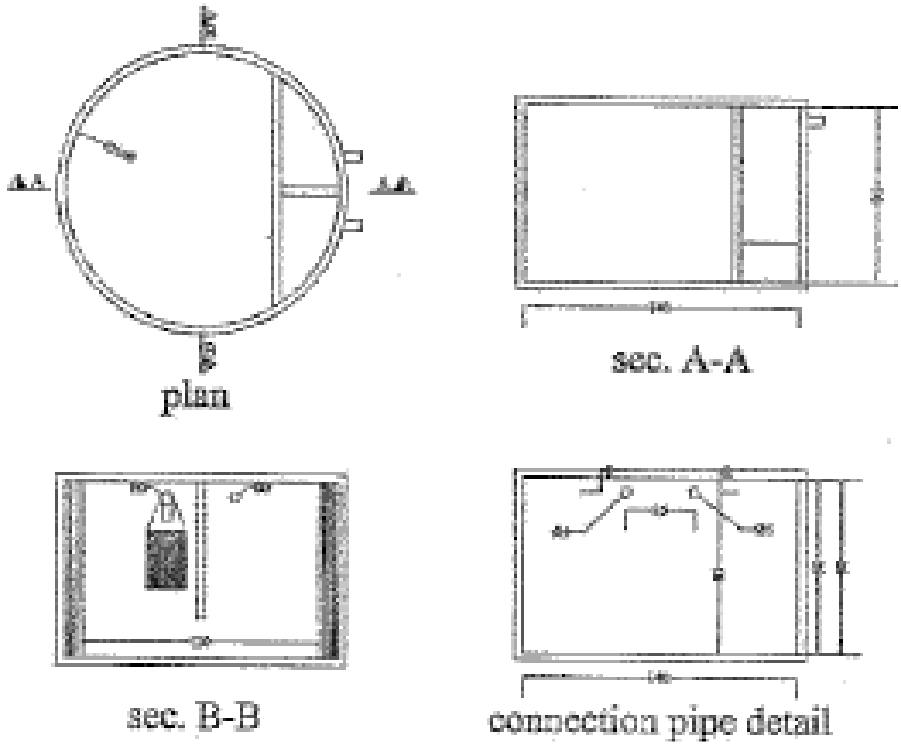
Table 3.4-6 shows the technical specification of the package. Figure 3.4-11 and Figure 3.4-12 shows the general drawings and P&I diagram of the package, respectively.

Table 3.4-6 Technical Specification

Technical Requirements (Both Single House Type and Double House Type)

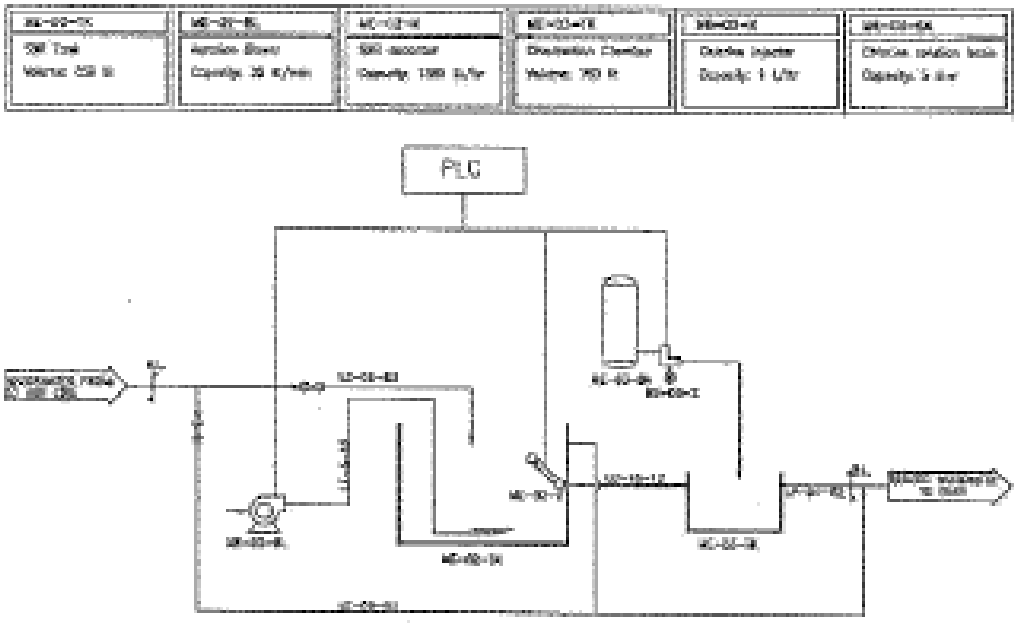
	Purchaser's Requirement	Statement of the Bidder
1	Packages are able to be grounded and the body is resistant and non-corrosive to environmental factors	Yes
2	The treatment packages are fully isolated and there is no possibility for surrounding water penetration.	Yes
3	Equipped with odor control system and microorganism reduction system.	Yes (package covered and odorless)
4	Treatment process by removing Nitrate and Phosphate and other organic pollutants.	Yes (TN= 9 mg/l , TP= 5.1 mg/l)
5	The BOD of effluent shall be less than 20 mg/l	Yes (BOD= 20 mg/l , COD= 40 mg/l , TSS= 10 mg/l)
6	Equipped with fix media and deep aeration.	Yes
7	Zero sludge production	Yes
8	Low energy consumption (single-phase electric power)	Yes (max. power requirement is 60 watts)
9	The measure for reducing annoying sound and vibration shall be taken.	<60 dB (based on blower catalogue)
10	Installation and starting up the packages are the responsibility of the Supplier, based on the separate contract between RWWC and the Supplier.	Yes
11	Production/manufacturing process of the packages are subject to supervision of RWWC.	Yes

Source: ATP CO.



Source: ATP CO.

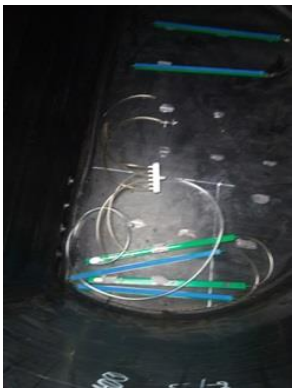
Figure 3.4-14 General Drawings



Source: ATP CO.

Figure 3.4-15 P&I Diagram

ix) The first package was delivered to the site: October 10, 2018



x) Installation and start-up were completed, and the test run was commenced: November 28, 2018













xi) Test run was conducted: November 28 to December 27, 2018

xii) Sampling and analysis of the treated water were conducted by RWWC and DOE: December 26, 2018 to January 11, 2019, and the result of effluent quality analysis is described below.

Table 3.4-7 Result of Effluent Quality Analysis

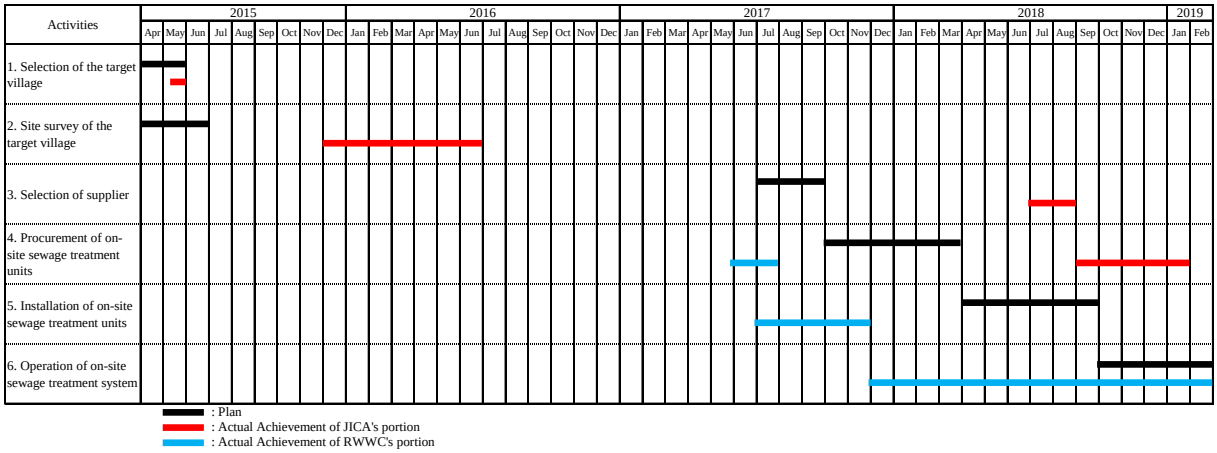
Item of water quality	Analysis result of DOE	Analysis result of RWWC	Required effluent level
BOD	100 mg/L	112 mg/L	20 mg/L
COD	210 mg/L	260 mg/L	40 mg/L

Source: RWWC and DOE Gilan

Based on the analysis, Sewage Management SC found that the quality of treated water is much higher than the required effluent level and the installed package did not meet the required treatment capability.

4) Planned schedule and actual achievement

The planned schedule and the actual achievement are described as below.



Source: JICA Expert Team

Figure 3.4-16 Planned Schedule and Actual Achievement of the Joint Pilot Activity to Develop On-site Sewage Treatment System in Rural Area

3.4.5 Sub-contract Works

In the joint pilot activity for the development project of on-site sewage treatment system in rural area, a basic study was implemented by a local consultant to decide the number, size and location for installation of each required on-site sewage treatment unit from December, 2015 to May, 2016.

This sub-contract work was implemented through the following steps.

i) Preparation of Request for Proposals of basic study: November – December, 2015

ii) Issuance of Request for Proposals: 13 December, 2015

iii) Contract negotiation with selected consultant: 22 December, 2015

iv) Contract agreement: 23 December, 2015

The selected consultant: Pars Peyab Consulting Engineers

v) Preparation of the final report of basic study: May, 2016

3.4.6 Achievements

The status of achievement of the original purposes of joint pilot activities are summarized below.

(1) Development Project of Vacuum Sewerage System in Koliver Area of Anzali City

No.	Purpose	Achievement
1	To select one construction work in urban areas of the Anzali Wetland watershed, and to support the selected construction work financially and technically.	Achieved. Sewage SC selected one construction project of vacuum sewerage system in Anzali City and JICA supported financially and technically.
2	To implement a project whose feature is new to Gilan Province or all over Iran to utilize the result of the activity in the sewerage projects in other areas and provinces.	Achieved. This is the first project in Iran to develop vacuum sewerage system. Therefore, GWWC and other related organizations could study new approaches and methodologies.

(2) Development Project of On-site Sewage Treatment System in Rural Area

No.	Purpose	Achievement
1	To accelerate the on-site sewage treatment project in rural areas, and to support the project financially and technically.	Partially achieved. The joint pilot activity was started at a target village, then RWWC could obtain necessary budget from Gilan Provincial Government and install 50 on-site sewage treatment units. However, because of problems on the selected supplier, JICA's portion could not be completed by the end of the project period.
2	To make it an opportunity to expand the development of rural sewage treatment to whole Anzali Wetland watershed	Not yet achieved. Sewage Management SC could not conduct any activities to promote the rural sewage treatment to other villages.

3.4.7 Recommendations

1) GWWC should continue the development of sewerage system in Rasht City and Anzali City, especially the development of sewer network should be accelerated to complete the sewerage system in urban areas of the Anzali Wetland watershed and mitigate the largest pollution load on the Anzali Wetland.

2) RWWC should expand the on-site sewage treatment system to whole rural areas of Anzali Wetland watershed with use of the experience and know-how obtained by the joint pilot activity of the Project.

3.5. Waste Management

3.5.1. SC Meetings

The WM SC meeting held during the project period was summarized in Table 3.5-1.

Table 3.5-1 Record of WM SC

No.	Date	Major Topic
1	1 July 2014	1st Solid Waste Management SC Meeting were held to present the object of and contents of this project
2	9 July 2014	2nd Solid Waste Management SC Meeting were held to present the current condition and issues of solid waste management, and discuss the schedule of Action Plan preparation
3	23 Sep 2014	3rd Solid Waste Management SC Meeting were held to discuss the issues and Action Plan strategy
4	10 Nov 2014	4th Solid Waste Management SC Meeting were held to discuss the Action Plan and proposed JPA
5	8 Nov 2015	5th Solid Waste Management SC Meeting were held for Sharing the progress of Joint Pilot Activities and information of current solid waste management condition
6	13 Jan 2016	6th Solid Waste Management SC Meeting were held for Introducing AP and JPA and JET and the progress of JPA and to discuss about collection recyclable waste and compost generation in Rural area and to present the model area in Gilan for composting activities
7	26 October, 2016	8th Solid Waste Management SC Meeting were held for sharing the current progress of the construction of the waste station in DSS and sharing the time schedule of the activities for third year.
8	22 April, 2017	9th Solid Waste Management SC meeting were held for sharing the progress of Joint Pilot Activity in DSS and the waste station's operation system and also sharing the progress of JPA "Waste bring-back system" in Anzali City
9	11 September 2017	The 10th Waste Management SC was held and discussed on the progress and the plan of the JPAs.
10	14 November 2018	The 11th Waste Management SC was held as seminar to share results and lessons learnt from JPAs by inviting relevant stakeholders.

Source: JICA Expert Team

3.5.2. Meetings between Relevant Organizations and JET

In addition to the SC, the meetings and related activities held with the concerned organizations during the project period were summarized in Table 3.5-2 to Table 3.5-6.

Table 3.5-2 Record of Meetings and Related Activities (1st Project Year)

No.	Date	Participant Organizations	Main Discussions
1	3 June 2014	WMO Rasht	• Explanation of this Project including the activities and schedule • Current situation and issues of solid waste management in Rasht municipality
2	17 June 2014	DOE Gilan	• Explanation of this Project including the activities and schedule • Current situation and issues of solid waste management of DOE • Request of establishment of Waste Management SC
3	18 June 2014	DOE Gilan	• Questionnaire survey for each municipality in the watershed of Anzali Wetland of DOE Gilan
4	19 June 2014	DOE Gilan	• Explanation of purpose of the preparation of Action Plan and Joint Pilot Activities
5	24 June 2014	WMO Rasht, DOE Gilan	• Situation of collection and 3R activities in Rasht municipality and others
6	28 June 2014	DOE Gilan	• Preparation of 1st Waste Management SC

No.	Date	Participant Organizations	Main Discussions
7	3 July 2014	Rural Affairs Office in Gilan Provincial Office, DOE Gilan, NGO	• Information of 3R (reduce, reuse, recycle) and composting activities
8	5 July 2014	DOE Gilan	• Preparation of 2nd Waste Management SC • Table of contents of Action Plan
9	10 July 2014	Member of Environmental Education SC	• Introduction of environmental education in Japan, related to solid waste management
10	12 July 2014	Member of Solid Waste Management Committee in Gilan Province	• Discussion of issues related to municipal and medical waste management in Gilan province
11	30 August 2014	DOE Gilan	• Progress of current condition survey and collection of information of existing action plans
12	31 August 2014	Rural Affairs Office, DOE Gilan	• Current situation and issues of solid waste management in rural area in the watershed of Anzali Wetland
13	2 September 2014	DOE Gilan	• Answer on questionnaire survey
14	3 September 2014	Masal, Shanderman	• Current situation and issues of solid waste management in Masal and Shanderman cities
15	4 September 2014	DOE Gilan	• Water quality in Saravan landfill site, waste collection net
16	9 September 2014	DOE Gilan	• Preparation of 3rd Waste Management SC
17	29 September 2014	DOE Gilan, WMO Gilan	• Explanation of C/P training of Waste Management SC in Japan
18	27 October 2014	MRMO	• Explanation of this Project including the activities and schedule • Information of solid waste management in Iran • Discuss issues and strategy of solid waste management in the watershed of the Anzali Wetland
19	30 October 2014	DOE Gilan	• Preparation of 4th Waste Management SC
20	8 November 2014	DOE Gilan, Gilan WMO, Rural Affair Office	• Existing M/Ps and strategy of Action Plan
21	14 February 2015	DOE Gilan, Gilan WMO, Rural Affair Office	• Explanation of Action Plan and JPAs • Explanation of presentation material of AWMC

Source: JICA Expert Team

Table 3.5-3 Record of Meetings and Related Activities (2nd Project Year)

No.	Date	Participated Organizations	Main Discussions
1	From 25 May up to 4 July 2015	DOE Gilan Sofiyandeh-Kapourcha-Tahergurab-Khanevane-Gasht-Khortum-Nasirmahalleh-Mobarakabad-Dahanesar Shijan and Khalesara Village	• Discussion about waste management system in these 10villages. • Investigate about waste collection system and population and residence cooperation in each village. • Demonstrating Japanese models for waste recycling and waste management system in each village.
2	6 July, 2015	DOE Gilan, Gilan WMO	• Discussion about the purpose and plan of JPA of the river net
3	18 July 2015	EO, DOE	• Discussion about the implementation of JPA in primary schools in Rural area for waste management
4	19 Oct 2015	DOE Gilan, DOE Research committee	• Explaining technical issue in river net project • Discussion on Anzali leachate treatment project
5	21 Oct 2015	DSS Village	• Explanation of waste characterization survey
6	26 Oct 2015	Gilan WMO, DOE Gilan	• Explaining River net project • Discussing about the budget for river net

No.	Date	Participated Organizations	Main Discussions
7	26 Oct 2015	DOE Gilan (Mr.Rezanejad)	• Discussing about the budget for river net
8	29 Oct 2015	EO, DOE Gilan	• Training schools for collecting recyclable waste • Providing facilities for waste separation in schools
9	1 Nov 2015	JBK Village and council members	Explanation of Cleaning Event in JBK
10	8 Nov 2015	Gilan WMO, RAO, DOE Gilan	• Progress of JPA and AP • Issues of Anzali and Rasht
11	9 Nov 2015	MRMO, DOE Gilan	• Explaining the JPA and AP • Describing waste characterization survey in DSS
12	5 Dec 2015	Gilan WMO, DOE Gilan	• Discussions on progress of budget for Net • Explaining of forming Two Rivers Committee
13	8 Dec 2015	DSS Village	Explaining the waste characterization survey result and separate collection methodology
14	9 Dec 2015	DOE Gilan (Mr. Ghezelhosseini, Head of Educational Department)	• Explaining waste return back system plan in Anzali Wetland
15	13 Dec 2015	DOE Anzali, DOE Gilan	• Explaining JPA • Discussions of waste return back system plan in AW • Meeting with boat riders associations
16	14 Dec 2015	Municipality and Rural Management Organization (MRMO)	• Explaining the waste characterization survey in DSS • Talking about Composting promotion in DSS
17	14 Dec 2015	Crisis Management Organization DOE Gilan, GRWC	• Presentation of two projects (JET net project+ Shahrab Sanat Pars Consultant Co. net project) in two river committee
18	16 Dec 2015	RAO, DSS Village	• Discussion on result of DSS waste characterization survey • Negotiation about the necessary equipment and facilities for installing the waste station • Describing the organizational responsibility in DSS project
19	19 Jan 2016	MRMO	• Explanation of JPA • Discussion on collection recyclable waste and composting generation in DSS • Explaining the problems and issues JET encountered for establishing waste station in DSS
20	30 Jan 2016	DSS Village	• Second workshop for generating compost and waste characterization activities
21	1 Feb 2016	MRMO, Siahsufyan Village, DOE Gilan, Gilan WMO, Gilan RAO, others	• Seminar of compost production in rural area

Source: JICA Expert Team

Table 3.5-4 Record of Meetings and Related Activities (3rd Project Year)

No.	Date	Participated Organizations	Main Discussions
1	17 October, 2016	DSS Village chief	Discussing about the waste station operation and selection of 10 households for training and disseminating waste management (recycling and composting) activity through the village
2	19 October, 2016	RAO and DOE	Site visit of the waste station in DSS and viewing the progress of the construction. Responsibilities of each organization for progressing the JPA in DSS

No.	Date	Participated Organizations	Main Discussions
3	23 October, 2016	DSS Village chief, 10 trainers in DSS	Explanation on the instruction of the operation of waste station and sharing the brochures and asking them to promote the waste segregation and compost production among their neighbors. Asking the village chief to prepare a list of the whole residents in the village so each trainer can train based on that list.
4	28 December, 2016	Khomam District officer and DSS Village	Making decisions for opening ceremony of waste station and the arrangements and coordination's procedure
5	3 January, 2017	DSS Village chief, DOE, Operator of the station	Making decisions and discussion about the efficient operation of the waste station
6	5 January, 2017	Anzali Municipality, DOE Anzali	Introducing JET and their activities. Explaining Waste bring back system as one of JPA in Anzali.
7	9 January, 2017	Khomam District Office, DSS Village	Preparation of the contract for DSS waste station's operation Confirming the provision of Electricity in the station by the village chief Discussing about the schedule of opening ceremony
8	15 January, 2017	Khomam District Office, DSS Village, Contractor for the waste collection	Fixing the location of opening ceremony (school next to the station) Discussion about the agreement's conditions
9	25 February, 2017	Anzali Municipality, DOE Anzali and DOE Gilan(technical deputy)	Explaining about two JPAs in Anzali (visitor center and waste bring back campaign) and receive the confirmation from Anzali municipality to support JET for these pilots
10	6 March, 2017	DOE Anzali and Boat rider associations	Explaining about 10 days campaign in Anzali for introducing waste bring back system and informing the boat rider association for implementation this pilot and make them ready to support JET
11	6 March, 2017	Rasht Governor, Khomam District officer,	Opening ceremony of waste management pilot in DSS Village (efficient collection of recyclable waste and promotion of composting)
12	16 April, 2017	DSS Village Chief, Ms. Moghimi (staff in station) and village council	Discussion about the issues of the station operation and non-alignment of the contractor to the condition of the contract. Confirming the necessity of Environmental monitoring through the village to extend the activity in DSS.
13	18 April, 2017	Khomam District Office and DSS Village	Claim of JET for unclearness of the agreement conditions and asking to improve the operation by preparation of a detailed and clear contract. Declaring the first date for environmental education.
14	22 April, 2017	Khomam District Office and DSS Village	Talking about the proposed incentive methods by JET and flow of recycling waste and economic benefit.
15	23 April, 2017	Village Chief+ Contractor and Secretary of District Officer	Talking with the contractor of the waste station to clarify some unclear points in the agreement.
16	24 April, 2017	Khomam District Office and Village Chief	Discussion on the utilization of the waste station benefit ad income and the related national regulations. Informing the participants in the meeting that JET is supposed to have a questionnaire survey in near future to find out the residents' attitudes for selecting the type of incentive and managing the benefits.

Source: JICA Expert Team

Table 3.5-5 Record of Meetings and Related Activities (4th Project Year)

No.	Date	Participated Organization	Major Topic
1	30 August 2017	DOE	- Discussing current status and issue on recyclable collection and home composting JPAs
2	31 August 2017	DSS	- Discussing current status and issue on recyclable collection and home composting JPAs
3	3 September 2017	DSS	- Improving operation of recyclable collection station
4	5 September 2017	DSS, DOE	- Planning installation of awareness raising signboards
5	12 September 2017	DSS	- Improving and expanding of home composting activity
6	13 September 2017	DSS	- Examining location of awareness signboards

No.	Date	Participated Organization	Major Topic
7	18 September 2017	DOE-Anzali	- Planning of waste bring-back campaign for fishermen
8	20 September 2017	DOE-Somehsara	- Planning of waste bring-back campaign for fishermen
9	23 September 2017	DSS	- Holding community workshop on recyclable collection and home composting activities
10	24 September 2017	DSS	- Instructing transaction of collected recyclables
11	21 October 2017	DOE	- Discussing progress and issue on JPAs
12	22 October 2017	DSS	- Discussing current status and issue on recyclable collection and home composting JPAs
13	23 October 2017	Boat stations	- Planning of waste bring-back campaign
14	26 October 2017	DSS	- Instructing segregated waste collection of recyclables
15	29 October 2017	Boat stations	- Preparation of waste bring-back campaign
16	1 November 2017	DSS	- Instructing transaction of collected recyclables
17	1 November 2017	Khomam District, DSS	- Discussing progress and interim achievement of recyclable collection and home composting JPAs
18	2 November 2017	Boat stations	- Instructing implementation of waste bring-back campaign
19	4 November 2017	Khomam District, DSS, the neighbor villages	- Holding workshop to introduce recyclable collection and home composting activities in DSS Village
20	7 February 2018	DOE	- Discussing progress and issue on JPAs
21	7 February 2018	DSS	- Discussing current status and issue on recyclable collection and home composting JPAs
22	10 February 2018	DOE	- Planning installation of awareness raising signboards
23	12 February 2018	Hendekhare	- Planning installation of awareness raising signboards in Hendekhare Village
24	13 February 2018	JBK	- Planning installation of awareness raising signboards in JBK Village
25	18 February 2018	DOE	- Discussing progress and issue on JPAs
26	11 May 2018	JBK	- Discussing installed signboards in JBK Village

Source: JICA Expert Team

Table 3.5-6 Record of Meetings and Related Activities (5th Project Year)

No.	Date	Participated Organization	Major Topic
1	27 October 2018	DOE	- Discussing current status of JPAs and preparation for seminar.
2	28 October 2018	DSS	- Discussing current status and issue on recyclable collection and home composting JPAs - Discussing preparation for seminar.
3	5 November 2018	DSS	- Checking locations to install river waste net.
4	11 November 2018	JBK	- Checking locations to install river waste net.
5	12 November 2018	DOE	- Discussing preparation for seminar.
6	19 November 2018	DSS, JBK	- Installing river waste net.
7	21 November 2018	DSS, JBK	- Monitoring operation of river waste net.

Source: JICA Expert Team

3.5.3. Preparation and Implementation of the Action Plans

The action plan on waste management was formulated by WM SC in the 1st project year, of which components are presented in Table 3.5-7. Among the planned components, "Introduction of valuable recyclable waste collection in rural area," "Promotion of organic waste home composting and in-house treatment in rural area," "Waste bring-back awareness raising

campaign in the Anzali Wetland basin" and "Introduction of waste river net in the Anzali Wetland basin" were selected as JPA implemented under the project.

Table 3.5-7 Action Plan on Waste Management

No	Components	Item
1	Introduction of effective collection and transportation system with consideration of 3R (reduce, reuse, recycle) in rural areas and small cities	Introduction of valuable recyclable waste collection in rural area
		Promotion of organic waste home composting and in-house treatment in rural area
2	Improvement toward effective collection and transportation system with consideration of 3R (reduce, reuse, recycle) in urban areas	Introduction of segregated collection system in Rasht municipality
		Introduction of segregated collection system in Anzali municipality
		Introduction of source segregation plan in Somesara municipality
3	Development of solid waste management and monitoring system in the Anzali Wetland	Waste bring-back awareness raising campaign in the Anzali Wetland basin
4	Development of monitoring system in rivers near the Anzali Wetland	Introduction of waste river net in the Anzali Wetland basin
5	Development of improved solid waste treatment and disposal facilities in the watershed of the Anzali Wetland	Improvement of Saravan Landfill Site
		Improvement of Anzali Landfill Site
		Improvement of composting plant in Rasht
		Improvement of composting plant in Anzali
6	Preparation of plans to promote solid waste management in the watershed of the Anzali Wetland	Revision of Gilan SWM M/P and preparation of M/Ps of 3 zones in Anzali watershed
		Preparation of SWM plan of each municipality

Source: JICA Expert Team

3.5.4. Implementation of the Joint Pilot Activities

(1) JPA-1: Valuable recyclables collection

The valuable recyclables collection JPA in DSS Village was started from 6 March 2017, and varieties of the interventions to enhance residents' participation and cooperation were applied, and amount of collected and sold recyclables as well as sales proceed were monitored.

(a) Examination on operational system

i) Trial on bring-in method (from March to September 2017)

In the initial stage of the JPA, the residents were asked to bring their recyclables to the recycling station as procurement of the collection truck by RAO was in delay. At that time, the operation of JPA had faced on many difficulties mainly because of lack of understanding of C/Ps on the operation method, confusion among residents on the new requirement on waste discharge. Therefore, JET and the C/Ps discussed and clarified the operational procedure of the recycling station activity based on the 6 months performance of the activity in September 2017.

At first, the recyclable items which can be sold to the existing recycling market was reconfirmed, and it was decided to separate PET bottles from "plastic" and aluminium cans from "metal" as it was found that their purchasing prices were much higher if segregated. In the course of discussions, JET instructed the C/Ps that it is necessary to periodically review the separation category as purchasing prices of recyclable items fluctuates by influence of recycling market conditions. Although it was desirable to increase sales proceeds by detailed segregation, it was necessary to examine its feasibility considering residents' acceptability and the work load of the station operator. Through the above adjustment and coordination, the operational procedure of the station operator was clarified and the sorting containers with designed stickers were set-up in the recycling station as shown in Figure 3.5-1.

Sorting Containers for Each Recyclable

Designed Stickers for Each Recyclable

Source: JICA Expert Team

Figure 3.5-1 Sorting Containers and Designed Stickers for Recyclables Collection

ii) Segregated waste collection service (from October 2017 to date)

The segregated waste collection service for recyclables was started from October 2017 after arrival of the collection truck procured by RAO, and it was scheduled to be performed on every Thursday morning. Besides, DSS Village cancelled the contract with the waste collection service provider and decided to provide non-recyclable waste collection service on every Wednesday morning by the village itself by using the collection truck granted by RAO. The scenery of recyclable waste collection service was shown in Figure 3.5-2.

Source: JICA Expert Team

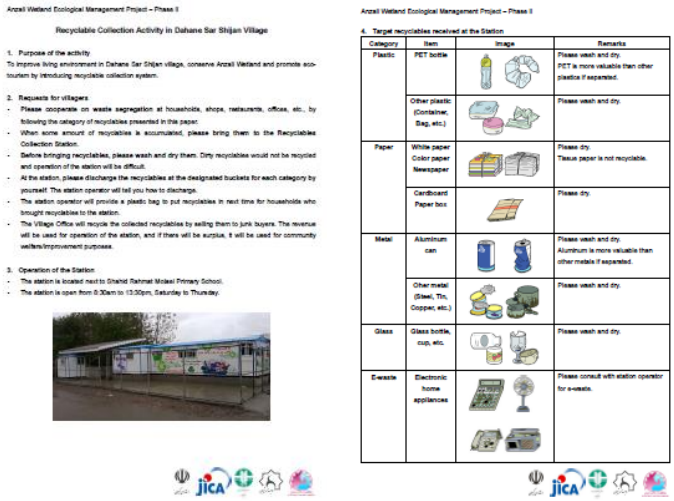
Figure 3.5-2 Segregated Waste Collection Service for Recyclables

(b) Public relations and awareness raising

During the JPA, the following public relations and awareness raising activities were conducted in order to obtain residents' cooperation on segregated waste discharge.

i) Distribution of leaflets

The leaflet explaining significance and purpose of the activity as well as procedure to discharge recyclables (including the location and operational time of the station, target recyclable items, etc.) was prepared and distributed to residents through opportunities such as workshops. The image of the leaflet was shown in Figure 3.5-3.



Source: JICA Expert Team

Figure 3.5-3 Leaflet for Recyclables Collection Activity

ii) Installation of signboards

The signboards were installed at the 7 locations in the village so as to encourage the residents' further participations to the recyclables collection activity as shown in Figure 3.5-4. The signboard was designed with the C/Ps and the message saying, "bring recyclable waste to the recycling station and put the other waste into garbage containers in order to conserve Anzali Wetland and the beautiful village" was adopted. The locations to set up signboard were selected by the C/Ps considering the places where residents gather, the places where waste littering and illegal dump were concerned.

	
Designed Signboard	Example of Installed Signboard

Source: JICA Expert Team

Figure 3.5-4 Signboard for Recyclables Collection Activity

iii) Door-to-door household visit and distribution of recyclable waste bag

Following the commencement of the segregated waste collection service in October 2017, the village staff conducted the door-to-door visit to each household to ask for cooperation to the activity. In this occasion, the designed plastic bags to discharge segregated recyclable waste were distributed to the residents as promotion material as shown in Figure 3.5-5.

Source: JICA Expert Team

Figure 3.5-5 Designed Bag to Discharge Recyclable Waste

iv) Holding community workshops

Several community workshops were held in the course of JPAs on recyclable collection as well as home composting, so as to obtain residents' participation and cooperation. Besides, the JPA activities were introduced to the primary school students in the village as part of environmental education. The scenery of the workshops was shown in Figure 3.5-6.

	
Community Workshop	Workshop for Primary School Students

Source: JICA Expert Team

Figure 3.5-6 Community Workshops

(c) Guidance on sale of collected recyclables

The sale of collected recyclables was one of the important activities of the JPA, and it was desired to increase the sales proceed as much as possible in order to operate the activities in sustainable manner. In the initial stage of the activity, the village staff was selling the collected recyclables to the junk buyers coming to the village, however, the staff had faced on many difficulties such as the buyers couldn't be contacted easily and didn't come to the station as promised, and the purchasing price was low.

Therefore, the JET conducted survey on existing recyclable buyers including Rasht City, and the village staff negotiated with these buyers and sold to the buyer who offered more favourable conditions. In consequences, the purchasing price of recyclables in the 3rd transaction in November 2017 was much higher than the previous 2 times, and the village staff could find the buyer who offered better purchasing price in the 4th transaction in January 2018. The scenery of sales of recyclables was shown in Figure 3.5-7.

	
Measurement of Collected Recyclables	Price Negotiation with Buyer

Source: JICA Expert Team

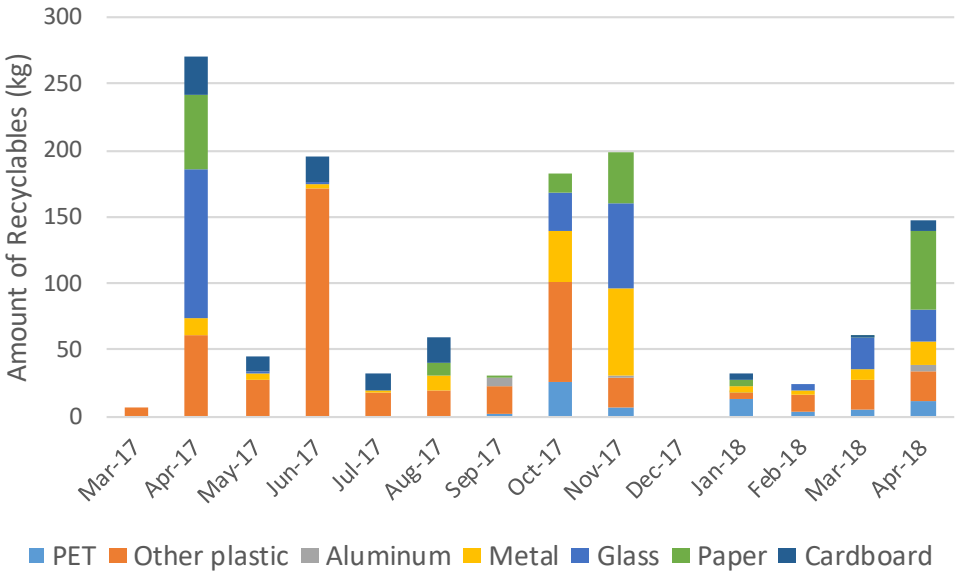
Figure 3.5-7 Sales of Collected Recyclables

(d) Monitoring and evaluation

i) Amount of collected recyclables

The amount of collected recyclables from March 2017 to April 2018, which was recorded by the recycling station operator was presented in Figure 3.5-8. For the 14 months operation of the recyclables collection activity in DSS Villages, the village succeeded to collect 1,284 kg of recyclables in total and its monthly average was 92 kg. Considering that the waste generation ratio in DSS Village which was investigated by the JET was 0.392 kg/day/person, and there were 1,128 persons in the village, the monthly waste generation amount in the village was estimated at 13,265 kg/month. Among that, the recyclable waste ratio accounted for 15%, which was also investigated by the JET, therefore, the potential of recyclable amount generated in DSS Village was estimated at 1,990 kg/month. Hence, it was calculated that the recyclable collection activity recovered about 4.6% of total recyclable waste generated in the village.

As shown in Figure 3.5-8, the amount of collected recyclables fluctuated by month. It was assumed that relatively high amount of collected recyclables was realized when some interventions were performed, i.e., the initial campaigns in April 2017, the reactivation activities (distribution of leaflet and signboard as well as holding workshops) in June 2017, introduction of segregated waste collection service and distribution of the waste bag in October to November 2017. Therefore, it is understood that the village will need to continuously apply interventions to encourage residents' participation and cooperation. Nevertheless, it was a remarkable achievement that the village could continuously implement the recyclables collection activity, which is an advanced effort on solid waste management in the country, for 2 years up to February 2019.

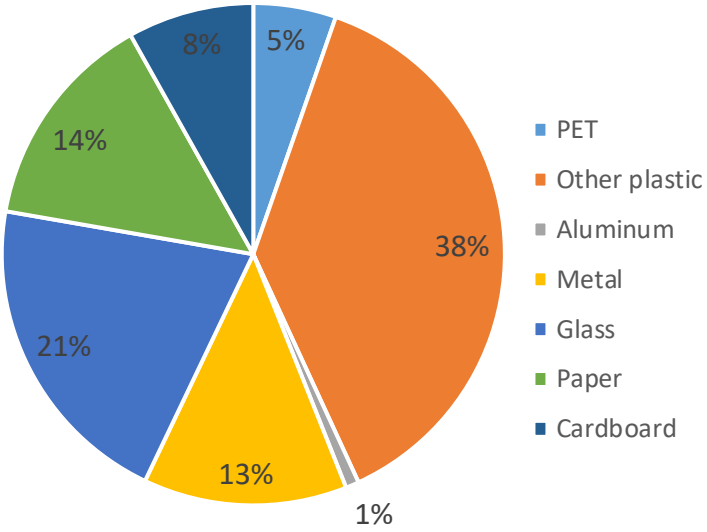


Source: JICA Expert Team

Figure 3.5-8 Amount of Monthly Collected Recyclables by Category

ii) Composition of collected recyclables

The composition of collected recyclables was presented in Figure 3.5-9. Among the 7categories of the recyclables which is currently applied in the recycling station, "Other plastic" accounted for 38%, followed by "Glass" (21%), "Paper" (14%) and "Metal" (13%) and "Cardboard" (8%). "PET bottle" and "Aluminum" were the categories of which purchasing prices were highest, but their proportion was only 5% and 1%, respectively.



Source: JICA Expert Team

Figure 3.5-9 Composition of Collected Recyclables

iii) Sales proceed of collected recyclables

The record of sales of collected recyclables was presented in Table 3.5-8. The total amount of sold recyclables by 3 March 2018 was 1,517 kg and its sales proceed was IRR 7,102,150 (USD 169). The monthly sales proceed which was calculated based on 1-year operation (from March 2017 to February 2018) was about IRR 592,000 (USD 14) per month.

As understood in the table, the purchasing prices for each category was generally improving, which indicated that the village staff enhanced their operational capacity and could deal with the buyers who offered better prices. In the 4th transaction, the village succeeded to sell "glass", which was not able to sell before that, and could sell "tin" by separating from other "metal" and realized better purchasing price.

Table 3.5-8 Record of Sales of Collected Recyclables

Transaction		1st	2nd	3rd	4th	5th
Date		3-May-17	2-Jul-17	1-Nov-17	7-Jan-18	3-Mar-18
PET	Amount (kg)	7		77	17	8
	Price (IRR/kg)	10,000		8,000	8,000	15,000
	Revenue (IRR)	68,000		616,000	136,000	112,500
Other plastic	Amount (kg)	43	180	160	70	32
	Price (IRR/kg)	5,000	4,500	4,500	4,000	6,500
	Revenue (IRR)	215,100	810,000	720,000	280,000	206,700
Aluminum	Amount (kg)			36	2	3
	Price (IRR/kg)			25,000	45,000	71,400
	Revenue (IRR)			900,000	99,000	178,500
Tin	Amount (kg)				84	
	Price (IRR/kg)				6,000	
	Revenue (IRR)				504,000	
Metal	Amount (kg)	15	21	63	69	15
	Price (IRR/kg)	2,500	2,000	4,000	4,000	7,500
	Revenue (IRR)	36,250	42,000	252,000	276,000	112,500
Glass	Amount (kg)	100			212	
	Price (IRR/kg)	0			2,350	
	Revenue (IRR)	0			498,200	
Paper	Amount (kg)	134	25	142		4
	Price (IRR/kg)	3,000	2,000	4,000		5,000
	Revenue (IRR)	401,400	50,000	568,000		20,000
Total	**Amount (kg)**	**298**	**226**	**478**	**454**	**61**
	Revenue (IRR)	**720,750**	**902,000**	**3,056,000**	**1,793,200**	**630,200**

Source: JICA Expert Team

iv) Cost required for the activity

The major initial cost spent for the recyclables collection activity was construction of the recycling station supported by JICA and the collection truck procured by RAO as shown in Table 3.5-9. It is obvious the investment cost spent for the activity was not affordable for the villages, therefore, some financial mechanism to support the initial cost required for the activity as well as some measures to minimizes initial cost for the activity should be examined, if the C/Ps intends to expand the activity in future.

Table 3.5-9 Initial Cost for Recyclables Collection Activity

Item	Cost	Funded by
Construction of Recycling Station	IRR 612,000,000 (USD 14,571)	JICA
Procurement of Collection Truck	IRR 560,000,000 (USD 13,333)	RAO

Source: JICA Expert Team

As for the operational cost, regular operational cost such as salary for the station operator and other expenses such as electricity cost for the station and fuel cost for the collection truck were born by the village, and JICA supported the intervention cost to promote residents' participation and cooperation. Assuming the average regular operational cost was about IRR 2,300,000 per month, it could not by covered by the revenue from sales proceed of collected recyclables, which was about IRR 592,000 per month as mentioned above.

However, the village had changed the waste collection system during the activity from entrusting to the service provider to direct operation by the village and could save a part of the waste collection service cost that used to be paid to the service provider, which was about IRR 9,000,000 per month. By utilizing this budget, it is considered that the village can sustain operation of the activity by its own budget and revenue.

Table 3.5-10 Operational Cost for Recyclables Collection Activity

Item	Cost	Funded by
Regular Operational Cost		
Salary of the recycling station operator	IRR 2,000,000 per month	DSS
Other expenses for operation (electricity, fuel, plastic bag, etc.)	IRR 300,000 per month	DSS
Intervention Cost		
Equipment for the recycling station	IRR 2,470,000	JICA
Installation of 7 signboards	IRR 52,500,000	JICA
Procurement of designed plastic bags	IRR 6,600,000	JICA

Source: JICA Expert Team

(2) JPA-2: Organic waste home composting and in-house treatment

According to the waste amount and composition survey conducted by the JET, about 70% of solid waste discharged from the village households was organic waste such as kitchen leftovers. It is understood that there is high potential to reduce amount of solid waste by applying composting and/or in-house treatment of those organic waste. Therefore, the JPA on household level organic waste composting and in-house treatment activity was implemented in DSS Village in parallel with the recyclables collection JPA.

(a) Trial on home composting by volunteer households

The trial on home composting was started from February 2016 by recruiting the volunteer villagers who were interested in producing compost. The households tried home composting by using Styrofoam boxes and compost bed provided by the JET. Besides, there were not a few households who tried in-house treatment of kitchen waste by mixing with fallen leaves in their garden or farmland. Also, there were many households who were using their kitchen waste for feeding their livestock and pets. The scenery of trial on home composting and in-house treatment by the volunteer households was shown in Figure 3.5-10.

Source: JICA Expert Team

Figure 3.5-10 Trial on Home Composting and In-house Treatment of Kitchen Waste

(b) Trial on seed compost production by Takakura Method

It was found by the inspection of the volunteer households' practice on home composting that most of the households applied in-house treatment of kitchen waste by digging a hole in their garden and put kitchen waste so as to be naturally decomposed. As for the households who were trying home composting using Styrofoam boxes or containers prepared by themselves, it was observed that fermentation process was not well promoted because of insufficient management. Therefore, the JET tried to produce seed compost by Takakura Method and distributed it to the desired households as a promoter of fermentation process. Figure 3.5-11 shows the process of seed compost production.

Fermentation liquid made from yogurt and yeast	Seed compost fermentation by rich husk, rice bran and fermentation liquid

Source: JICA Expert Team

Figure 3.5-11 Trial on Seed Compost Production by Takakura Method

(c) Monitoring and evaluation

i) Number of households participated in the activity

The number of volunteer households participated in the home composting activity was 13 households. Although the participation ratio was low, it should be noted that there were considerable number of households who were already trying in-house treatment of kitchen waste or utilizing kitchen waste to feed livestock and pets.

Considering that the 361 households resided in DSS Village, the JPA could only be performed with 3.6% of the population in the village. However, home composting and in-house treatment of organic waste contribute to about 70% reduction of solid waste in each household. It can be understood that the activity brought not negligible impact on waste reduction in the village. Besides, it should be noted that the activity also contributed to raising awareness of the villagers on solid waste management issue.

ii) Cost required for the activity

The procurement cost of home composting equipment disbursed for each household was IRR 290,000 (USD 6.9) and its breakdown was shown in Table 3.5-11.

Table 3.5-11 Procurement Cost for Home Composting

Item	Unit	Cost (IRR)
Compost container (styrofoam box)	1 box	150,000
Compost bed (Vermi compost)	3 kg	60,000
Thermometer	1 unit	30,000
Shovel	1 unit	20,000
Glove	1 unit	30,000
Total		**290,000**

Source: JICA Expert Team

iii) Ripple effect the activity

The JPAs on home composting activity and recyclables collection activity in DSS Village got attention in Khomam District and Gilan Province as an advanced effort on solid waste management in the region. Khomam District held a workshop to disseminate the activities in DSS on 4 November 2017 and conducted a field visit on 13 November 2017 by inviting surrounding 4 villages as shown in Figure 3.5-12. Besides, the activities in the village was taken up by the regional and the national TV programs as shown in Figure 3.5-13.

Source: JICA Expert Team

Figure 3.5-12 Workshop and Field Visit for Surrounding Villages

Source: Provided by DSS Village

Figure 3.5-13 Scenery of JPAs Broadcasted on TV Program

(3) JPA-3: Waste bring-back awareness raising

Waste littering is one of the major issues on solid waste management in Anzali Wetland, and it was acknowledged by the JET and the C/P that raising awareness of tourists and fishermen is necessary. Therefore, the following activities were planned as awareness raising campaign to prevent waste littering in the area and promote bringing-back waste.

- Awareness raising campaign for tourists using the major boat stations in the Wetland
- Awareness raising campaign for fishermen using the major boat stations in the Wetland

- Installation of awareness raising signboards

(a) Awareness raising campaign for tourists

There are many tourists visiting the Anzali Wetland who take boats for sightseeing. According to the DOE Anzali branch office, there are about 20 boat stations for tourists and the awareness raising campaign was implemented in the 5 major boat stations among them. The campaign was held on the Nowruz holidays from 19 to 28 March 2017 (10 days), when many tourists were expected to visit the Wetland. During the campaign, the surveyors explained outline of the project and purpose of the campaign to the tourists, and asked cooperation to bring-back their waste by providing the designed plastic bags to put waste.

As the result of campaign, it was observed that tourists rarely discharged waste on the boats, but they discharged some waste paper/plastic packages nearby the boat stations. Therefore, it was understood that it would be effective that DOE and the boat station staff continuously conduct awareness raising campaigns and ask tourists to cooperate on waste bring-back by equipping with dust boxes and awareness raising signboards at boat stations. The scenery of the campaign for tourists was shown in Figure 3.5-14.

Source: JICA Expert Team

Figure 3.5-14 Waste Bring-back Awareness Raising Campaign for Tourists

(b) Awareness raising campaign for fishermen

The awareness raising campaign for fishermen was conducted at the major 2 boat stations in SDV Village, which were introduced by the DOE Anzali and Somehsara branch offices. The campaign was implemented on the holidays in November 2017 (in total 9 days), when many fishermen were expected to visit the wetland. During the campaign, the surveyors explained outline of the project and purpose of the campaign to the fishermen, and asked cooperation to bring-back their waste by providing the designed plastic bags to put waste.

During the campaign, the waste bags were provided to 337 fishermen and more than 70% of them cooperated to bring-bask their waste. There were some fishermen who bring-back not only their own waste but also the waste scattered around their fishing points. As result, about 180 L/day of waste in average could be collected during the campaign. Therefore, it was understood that fishermen using the boat stations were generally cooperative and concerned about Anzali Wetland environmental conservation, and it would be effective that DOE Gilan and the boat station staff continuously conduct awareness raising campaigns and ask fishermen to cooperate on waste bring-back by providing waste bags. The scenery of the campaign for tourists was shown in Figure 3.5-15.

Source: JICA Expert Team

Figure 3.5-15 Waste Bring-back Awareness Raising Campaign for Fishermen

(c) Installation of awareness raising signboards

The above described campaigns could only access to the tourists and the fishermen who were using the boat stations. On the other hand, it was observed that there were other tourists and fishermen who access to the Anzali Wetland not through the boat stations, and they were considered to be more difficult to access and manage. Therefore, the JET and the C/P discussed and agreed to install awareness raising signboards in the villages nearby the wetland.

Considering synergy of the project activities, HDH Village where the environmental education center is located, and JBK Village where eco-tourism center is located were selected as the target villages. The 14 signboards in HDH Village and the 13 signboards in JBK Village were installed by discussing appropriate locations, design and message with the C/P and the concerned village staff. The examples of the signboards installed in each village are shown in Figure 3.5-16.

	
Signboard installed in HDH Village	Signboard installed in JBK Village

Source: JICA Expert Team

Figure 3.5-16 Awareness Raising Signboards on Waste Bring-back

(4) JPA-4: River waste collection

Prevention of waste inflowing to Anzali Wetland is regarded as one of the important activities for Anzali Wetland conservation, therefore, a trial on installation and operation of river waste net was implemented in DSS and JBK Villages.

(a) Procurement of river waste net

The locations to install river waste nets were selected by field inspection with the village chiefs in DSS and JBK. Then, the river waste nets were produced at the local fishing equipment store in Anzali City. The specification of the net was examined by referring to Japanese practice and experience and designed as below. The procured nets were presented in Figure 3.5-17.

- Net length: 20 m (considering river width at installation points)
- Net height: 50 cm
- Net mesh: 5 cm
- Styrofoam float was equipped with upper rope so as to catch waste floating in the river, and metal weight was equipped with bottom rope.
- The length of ropes was 40 m and they were bound with poles or trees at river sides.


Source: JICA Expert Team

Figure 3.5-17 Produced River Waste Net

(b) Installation and operation of the net

The river nets were installed in DSS and JBK Villages on 19th November 2018. It was discussed and agreed with the village officers that periodical removal of captured waste is the most critical task for sustainable operation of the net. As the result of performance monitoring after the net installation, it was confirmed that huge amount of waste was inflowing to DSS and JBK Villages through the rivers and the nets could capture it appropriately as shown in Figure 3.5-18. Hence, it was confirmed that installation of the river waste net at downstream of the rivers was effective to prevent waste inflowing to the Anzali Wetland.


Operation of river waste net in DSS Village


Operation of river waste net in JBK Village

Source: JICA Expert Team

Figure 3.5-18 Operation of Installed River Waste Net

5) Other activities planned in the Action Plan

The progress of other activities planned in the Action Plan but not covered as JPA under the project are as follows.

- Introduction of segregated waste collection system in urban area
  There are several recycling stations in operation in Rasht City and waste generators in the city are disposing their recyclable waste at the stations. Also, there is a recycling station in Khomam District and the district is providing recyclable waste collection service for residents. However, segregated waste collection system has not been introduced in the urban areas and further effort to promote 3R activity is desired.
- Improvement of existing landfill sites and composting plants
  As far as the JET acknowledges, no significant improvement on the existing landfills and composting plants in the project area was observed, and the situation at landfills especially the environmental problems at Saravan Landfill is regarded as critical issue. Further effort by the concerned organizations for improvement of the landfills as well as planning of a new sanitary landfill and examination of introduction of intermediate waste treatment facility to reduce amount of disposed waste is required.
- Formulation of revised solid waste management plan in the Anzali Wetland basin
  WMO of Gilan Province has already drafted the revised solid waste management master plan but it has not been approved yet. Further effort by the concerned organizations for formulation and enforcement of the solid waste management plan is required.

(5) Planned schedule and actual achievement

The planned schedule of WM SC activities from 2nd to 5th project years was formulated at the end of the 1st project year after studying current situation on waste management in the project area and formulating the Action Plan, and its achievement was presented in Table 3.5-12 to Table 3.5-15. The activities of which performed schedule were changed from the planned schedule, were highlighted in the table.

Table 3.5-12 Plan and Achievement of WM SC Activities (2nd project year)

Activities	Plan/ Actual	2015									2016					
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
(1) Solid WasteManagement Data Base																
a) Follow up and add more data by Waste Management SC		■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■▶
(2) Recyclable Waste Collection JPA																
a) Preparation of general plan and cost estimation		━━	━━													
b) Preparation of detail plan and selection of operator				━━	━━	━━	━━									
c) Procurement of facility, equipment and material	Plan							━━	━━	━━	━━	━━				
	Actual							━━	━━	━━	━━	━━	━━	━━	━━	━━
d) Implementation of recyclable waste collection																
(3) Home composting JPA																
a) Preparation of general plan and cost estimation		━━	━━													
b) Preparation of detail plan				━━	━━	━━	━━									
c) Procurement of equipment and material								━━	━━	━━	━━					
d) Implementation of home composting												━━	━━	━━	━━	━━
(4) River Waste Net JPA																
a) Preparation of plan and cost estimation		━━	━━	━━												
b) Preparation of JPA detail plan					━━	━━	━━	━━								
c) Design and Procurement of River Waste Net	Plan								━━	━━	━━	━━	━━	━━		
	Actual															
d) Installation and operation of river waste net																
(5)Monitoring the other action plans except JPAs		■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■▶
(6) Other Trainings and Workshops		■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■▶
(9) Waste Management SC Meeting (every month)	Plan	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Actual								●		●					

Source: JICA Expert Team

Table 3.5-13 Plan and Achievement of WM SC Activities (3rd project year)

Activities	Plan/ Actual	2016						2017					
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
(1) Solid WasteManagement Data Base													
a) Follow up and add more data by Waste Management SC		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪▶
(2) Recyclable Waste Collection JPA													
a) Preparation of general plan and cost estimation													
b) Preparation of detail plan and selection of operator													
c) Procurement of facility, equipment and material	Plan	■■■	■■■	■■■									
	Actual	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■				
d) Implementation of recyclable waste collection	Plan				■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
	Actual									■■■	■■■	■■■	■■■
(3) Home composting JPA													
a) Preparation of general plan and cost estimation													
b) Preparation of detail plan													
c) Procurement of equipment and material		■■■	■■■	■■■									
d) Implementation of home composting		■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
(4) River Waste Net JPA													
a) Preparation of plan and cost estimation													
b) Preparation of JPA detail plan													
c) Design and Procurement of River Waste Net	Plan	■■■	■■■	■■■									
	Actual												
d) Installation and operation of river waste net													
(5)Monitoring the other action plans except JPAs		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪▶
(6) Other Trainings and Workshops		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪▶
(9) Waste Management SC Meeting (every month)	Plan	●	●	●	●	●	●	●	●	●	●	●	●
	Actual				●						●		

Source: JICA Expert Team

Table 3.5-14 Plan and Achievement of WM SC Activities (4th project year)

Activities	Plan/ Actual	2017						2018					
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
(1) Solid WasteManagement Data Base													
a) Follow up by Waste Management SC													
(2) Recyclable Waste Collection JPA													
1) Recyclable waste collection activity in DSS													
a) Preparation of general plan and cost estimation													
b) Preparation of detail plan and selection of operator													
c) Procurement of facility, equipment and material													
d) Implementation of recyclable waste collection													
2) Recyclable waste collection activity in other villages													
a) Consideration of possibility of implementation	Plan												
	Actual												
b) Implementaion of training for other villages	Plan												
	Actual												
c) Dissemination to other villages	Plan												
	Actual												
(3) Home composting JPA													
a) Preparation of general plan and cost estimation													
b) Preparation of detail plan													
c) Procurement of equipment and material													
d) Implementation of home composting	Plan												
	Actual												
e) Dissemination to other villages	Plan												
	Actual												
(4) Waste Bring-back Awareness Raising JPA													
a) Implementation of survey													
b) Preparation of detail plan													
c) Procurement and installation of equipment	Plan												
	Actual												
d) Implementation of awareness raising activities													
(5) Preparation of Mid-term Plan													
(6) Monitoring the Other Action Plans Except JPAs													
(7) Other Trainings and Workshops													
(8) Waste Management SC Meeting (every month and at milestones)	Plan	●	●	●	●	●	●	●	●	●	●	●	
	Actual			●									

Source: JICA Expert Team

Table 3.5-15 Plan and Achievement of WM SC Activities (5th project year)

Activities	Plan/ Actual	2018						2019		
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
(1) Solid WasteManagement Data Base										
a) Follow up by Waste Management SC		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▶	
(2) Recyclable Waste Collection JPA										
1) Follow-up of recyclable waste collection activity in DSS village		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▶	
2) Follow-up of dissemination and expantion of the activity in other villages		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▶	
(3) Home composting JPA										
1) Follow-up of home composting activity in DSS village		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▶	
2) Follow-up of dissemination and expantion of the activity in other villages		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▶	
(4) Waste Bring-back Awareness Raising JPA										
1) Follow-up of waste bring-back awareness raising activity		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▶	
(5) River Waste Net JPA										
1) Design and Procurement of River Waste Net	Plan									
	Actual				━	━				
2) Installation and Operation of River Waste Net in DSS and JBK Villages	Plan									
	Actual					━	━	━	━▶	
(6) Preparation of Mid-term Plan										
1) Preparation of draft Mid-term Plan for Waste Management SC		━	━	━	━					
2) Finalization of Mid-term Plan for Waste Management SC							━	━		
3) Apprval of Mid-term Plan for Waste Management SC									●	
(7) Waste Management SC Meeting (every month and at milestones)	Plan	●	●	●	●	●	●	●	●	
	Actual					●				

Source: JICA Expert Team

3.5.5. Achievements

The four JPAs which were planned in the project, i.e., i) valuable recyclables collection activity, ii) organic waste home composting and in-house treatment activity, iii) waste bring-back awareness raising activity and iv) river waste collection activity, were well performed although there were some delay and modification of the planned activities tin the course of the project implementation. The counterparts and the other concerned organizations enhanced their capacity on planning, implementation, monitoring and evaluation of the activities. The mid-term action plan on waste management was formulated by utilizing the experience and know-how obtained through the JPAs.

3.5.6. Recommendations

After completion of the project, Waste Management Sub-committee shall be responsible for implementation of the planned activities in the Mid-term Action Plan on Waste Management for Anzali Wetland Conservation. It is necessary for smooth implement the planned activities to utilize the experience and know-how obtained through the JPAs.

Waste Management Sub-committee shall provide such lessons learnt from the JPA to villages, municipalities/cities which will newly start the activities. It will be effective to hold workshops and study tours to share the experience of JPAs under the Project by inviting those villages.

Waste Management Sub-committee shall well communicate and coordinate with Anzali Wetland Management Committee (AWMC) to secure budget allocation required for implementation of the planned activities. For this purpose, Waste Management Sub-committee

shall be responsible for formulation of implementation, monitoring and supervision system of the planned activities, so as to report performance and achievement of the activities to AWMC.