The Republic of Iraq
General Company for Ports of Iraq (GCPI)

MASTER PLAN STUDY FOR PORT SECTOR IN THE REPUBLIC OF IRAQ

FINAL REPORT

DECEMBER 2015

Japan International Cooperation Agency

Ides Inc.
Nippon Koei Co., Ltd. (NK)
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Exchange Rates
Date: May 2014
1US$ = 1,163 Iraqi Dinar
1US$ = 101.72 Japanese Yen

Abbreviations

AFGP	Al Faw Grand Port
AIS	Automatic Identification System
APL	American President Line Limited
BOT	Build Operate Transfer
CI	Containerization International
C.I.I.T.I.	Italian Consortium for Iraqi Transport Infrastructure
CIPP	Complexo Industrial e Portuário do Pecém
CMA-CGM	Compagnie Maritime D'affrètement - Compagnie Générale Maritime
CY	Container Yard
dB	Decibel
D/D	Detailed Design
DWT	Dead Weight Tonnage
EBA	Endemic Bird Area
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMAP	A Empresa Maranhense de Administração Portuária
EMSA	European Maritime Safety Agency
ERP	Enterprise Resource Planning
E/S	Engineering Service
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	Europe Union
FAL	Convention on Facilitation of International Maritime Traffic
F/S	Feasibility Study
GC	General Cargo
GCPI	General Company for Ports of Iraq
GDP	Gross Domestic Product
GISIS	Global Integrated Shipping Information System
GT	Gross Tonnage
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAPH	International Association of Ports and Harbors
IBA	Important Bird Area
IBRD	International Bank for Reconstruction and Development
ICD	Inland Container Depot
IECAF	Italian Engineers and Consultants for Al Faw Grand Port
IEE	Initial Environmental Examination
IMF	International Monetary Fund
IMO	International Maritime Organization
INES	Integrated National Energy Strategy (INES)
IQD	Iraq Dinar
IQ-P1	Iraq Project No.1
IP	Implementation Program
IRC	Iraq Railway Company
IRR	Internal Rate of Return
ISO	International Organization for Standardization
ISPS Code	International Ship and Port Facility Security Code

ISQG	Interim Sediment Quality Guidelines
IT	Information Technology
IUCN	International Union for Conservation of Nature and Natural Resources
JBIC	Japan Bank for International Cooperation
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JO	Joint Operation
JTCA	Japan Transport Cooperation Association
JV	Joint Venture
KD	Kuwait Dinar
KZP	Khor Al Zubayr Port
LPG	Liquefied/Liquid Petroleum Gas
LSCI	Liner Shipping Connectivity Index
MC	Mobile Crane
MOE	Ministry of Environment
MOI	Ministry of Industry
MOIM	Ministry of Industry and Minerals
MOO	Ministry of Oil
MOT	Ministry of Transport
MOTr	Ministry of Trade
M/P	Master Plan
MPA	Mega Project Agency
NAFITH	NAFITH Logistics Services PSC
NDP	National Development Plan
NLS	Noxious Liquid Substances
NPV	Net Present Value
O/D	Origin-Destination
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OECF	Overseas Economic Cooperation Fund
OJT	On-the-Job Training
OPEC	Organization for the Petroleum Exporting Countries
PCS	Port Community IT System
PEL	Probable Effect Level
PFSA	Port Facility Security Assessment
PFSO	Port Facility Security Officer
PFSP	Port Facility Security Plan
PGA	Peak Ground Acceleration
POS	Port Operating IT System
PRF	Port Reception Facility
PRFD	Port Reception Facility Database
PS Card	Port Security Card
QGC	Quay-side Gantry Crane
PIANC	Permanent International Association of Navigation Congress
PKO	Peacekeeping Operations
PPP	Public Private Partnership
R/D	Record of Discussion

ROA	Return on Asset
ROE	Return on Equity
RS	Reach Stacker
RTG	Rubber Tyred Gantry Crane
SEA	Strategic Environmental Assessment
SEZ	Special Economic Zone
SOC	South Oil Company
SOLAS	International Convention for the Safety of Life at Sea
STEP	Special Terms for Economic Partnership
S/W	Scope of Work
TCP	Transport Corridor Project
TEU	Twenty-foot Equivalent Unit
TJP	Tanjung Priok Port
T-LOG	Transport Logistics
TOS	Terminal Operation System
UAE	The United Arab Emirates
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPS	Uninterruptible Power Supply
UQP	Umm Qasr Port
UQP-N	Umm Qasr Port North
UQP-S	Umm Qasr Port South
USCG	United States Coast Guard
VAT	Value Added Tax
VTS	Vessel Traffic Service
WTO	World Trade Organization
WHO	World Health Organization

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CHAPTER 1

Chapter 1. Introduction

1.1 Background of the Study

Following the Donor's Conference for the Reconstruction of Iraq, held in 2003, Iraq's economic recovery started and showed a remarkable growth of about 50% in 2004 followed by an average growth of 6.7% from 2005 to 2012. The IMF estimates that the growth rate of the Iraqi economy will be between 8.5% and 9.0 % in the coming years.

In order to support such economic growth, it is indispensable to ensure smooth import, export and distribution of goods through the restoration of gateway ports, particularly Umm Qasr Port and Khor Al Zubayr Port. In January, 2008, the governments of Iraq and Japan signed a loan agreement of \30.2 billion for the restoration of UQP, called "Port Sector Restoration Project". The project aimed at the restoration of the function of UQP by dredging the channel, removing wrecks from the channel, paving container yards, and providing power generators. In February, 2014, both governments signed another loan agreement for the restoration of KZP, and dredging.

To cope with the increase of cargo anticipated in the near future, Iraqi ports need further development and improvement of port facilities. It is therefore an urgent task to prepare a master plan for development of the major ports of Iraq, and to accelerate development of these ports in accordance with the master plan.

The Ministry of Transport Iraq, and the Japan International Cooperation Agency (JICA) agreed to support the General Company for Ports of Iraq (GCPI) to prepare a master plan for port sector, and signed Record of Discussion on Master Plan Study for Port Sector in the Republic of Iraq, in May 2013. The study team organized by JICA has completed the master plan study and prepared this report in December 2015.

1.2 Objectives of the Study

The Study is tasked with carrying out those activities listed in Table 1.2-1 in order to obtain the following outputs:

1) Port Sector Development/Administration Strategy (target year 2035)
2) Port Master Development/Administration Plan for Main Ports and Waterways (target year 2035)
3) Short Term Development Plan for Umm Qasr Port (UQP) and Khor Al Zubayr Port (KZP) (target year 2025)
4) Short Term Action Plan for Port Administration/Management/Operation (target year 2025)

In the course of the Study, it was recognized that pre-feasibility study for service berth and additional study on port security management and port reception facilities are important for the Master Plan. GCPI and JICA agreed to include these items in the Study and signed the "Amendment to the Record of Discussions on Master Plan Study for Port Sector" on 10 February 2015.

Table 1.2-1 Activities of the Study

No.	Activity
1	Review the Existing Studies and Analysis of the Present Condition
2	Formulation of National Port Sector Development/Administration Strategy (target year 2035)
3	Formulation of National Port Master Development/Administration Plan for Main Ports and Waterways (target year 2035)
4	Formulation of Short Term Development Plan for UQP and KZP (target year 2025)
5	Formulation of Short Term Action Plan -to Improve Port Administration / Management and Operation (target year 2025)
6	Technology transfer of preparation of development strategy, long and short-term development plans

1.3 Study Area

The Study covers the areas and ports that are related to the activities of the major ports in Basrah Province in the southern region of Iraq: UQP, Khor Al Zubayr, Al Maqil, Abu Flus and New Al Faw Ports. The access waterways to these ports and the adjacent areas are included in the study area.

The information related to ports in the adjacent countries that have a close trading relationship with Iraq shall be collected and, when needed, these ports shall be surveyed. The location of the existing major ports and the proposed project site for the new port in Basrah Province are shown in Figure 1.3-1. The existing Al Faw Port is not included in the study target since it is no longer functioning as a commercial port.

Source: The Data Collection Survey for Port Sector Development Plan in Iraq, JICA, 2012

Figure 1.3-1 Project Area

1.4 Implementation Structures

1.4.1 Members of the Study Team

The Study Team is headed by Dr. Sumio Suzuki and consists of six members from Ides Inc., five members from Nippon Koei and three members from Oriental Consultants Global (OCG) Co., Ltd. Members and their specialties are listed hereunder;

No.	Assigned Expertise Field	Expert Name	Company Name
1	Team Leader/Port Policy	Sumio Suzuki	Ides
2	Sub Team Leader/Regional Development/ Industry/ Port Facility Planning (1)	Shojiro Koga	Nippon Koei
3	Socio-Economic Analysis	Nobuhide Miyawaki	Ides
4	Transport Planning/ Demand Forecast	Hideki Yokomoto	OCG
5	Shipping and Navigation	Toshio Matsuda	OCG
6	Port Planning/ Administration/ Finance	Koji Kobune	Ides
7	Terminal Operation	Teruki Eto	Ides
8	Port Facility Design	Shingo Shiratori	OCG
9	Port Construction/Cost Estimation(1)	Masaomi Komoto	Nippon Koei
10	Port Construction/Cost Estimation(2)	Kiyoshi Mizutani	Nippon Koei
11	Natural Condition Survey	Satoshi Ando Shunsuke Homma	Nippon Koei
12	Environment and Social Considerations	Satoshi Sasakura Takeshi Sato	Ides
13	Port Security	Tadao Yamada	Ides
14	Port Facility Planning (2)	Nobuyuki Iinuma	Nippon Koei

The study team is assisted by local specialists under contract as follows:

	Data collection survey	Dheyaa A. Hasan	IdRC
	Assistant Environmental Specialist	Khajak Vartanian	
	Assistant Natural Survey Specialist	Duraid F. Ali	

1.4.2 Counterparts and Joint Coordinating Committee

(1) Members

The counterparts of this project are the Ministry of Transport (MOT), which is the competent agency for port administration, and GCPI, which is the implementing agency for management, operation and projects related to the ports.

Based on the Record of Discussion dated on May 17, 2013, Joint Coordinating Committee (JCC) was established in order to facilitate inter-organizational coordination and held four meetings. A list of members of JCC including participants of the first through the forth JCC meeting is shown as below:

JCC Members/Master Plan Study for Port Sector		
Position	Organization/Title	Name
Chair Person	Technical Deputy Minister, Ministry of Transport	H.E. Bangen Rekani
Project Director	Director General, GCPI	Riyadh Swadi Shamkhi
Members	**(GCPI)**	
	Assistant Director General	Adnan Muhsen Badr
	Project Director of IQ-P1 & IQ-P20	Hussain M. Abdullah

Assistant Project Director	Talib Abdullah Baysh
Project Manager of Procurement / IQ-P1&P20	Salih Hade
Administration Manager of Japanese Loan Office	Jalal Abdul-Wahid Faraj
Legal Advisor of Japanese Loan Office	MohammadAl-Sahalani
Director of Planning Department	Abdul Kareem Hariz Obaid
[Deputy Director]	Abdul Wahid K. Khfe
Director of Marine Inspection Department	Abdul Khaleq K. Abbas
[Deputy Director]	Abdul Khaleq Jameel Naser
Director of Marine Dredging Department	Sameer Abd-Ali Marzooq
[Deputy Manager]	Dheyaa Hashim Ahmed
[Head of Survey Section]	Dawood Salman Hussain
[Assistant of Head of Survey Section]	Najim Aldeen Abdullah
Director of Marine Salvage Department	Talib H. Thwenee
[Deputy Manager]	Khalid Abdul-Jabaar
Director of Navigation Department	Modar A. Ali Mohammed
Director of Marine Affairs Department	Hadi Jassim
Director of Marine Control	Kadhem Finjan
Manager of Media and Relationship Section	Anmar Alsafi
Manager of Project Section, Engineering Dept.	Zyara Dhwaeh Sirjel
IT Section	Alaa Shakir Abdul-Jabbar
Port Manager of UQP (North)	Hamid Bukhit Abdullah
[Assistant]	Haitham K. Hadi
Port Manager of UQP (South)	Hashim Adnan Abdul-Qader
[Deputy Manager]	Adil Khalaf.
[Manager of Technical Unit/ North & South UQP]	Sanaa Hussain Alwan
Port Manager of KZP	Atheel Abd-Ali Salman
[Deputy Manager]	Haider Fakher Nasir
[Legal Advisor/KZP]	Mustafa Fahed
[Manager of Technical Unit/KZP]	Sajad Nasir
[Assistant Manager of Technical Unit/KZP]	Moqdad Salim
Project Director of AFGP	Asaad A. Rashid
Port Manager of Al-Ma'qal Port	Hussain Hameed Dhaighm
[Deputy Manager]	Faisal Kadhem Ahmed
Port Manager of Abu Flous Port	Abdul-Adhem Jassim Bdewi
[Deputy Manager]	Najim Abdul-Allah
Representative of GCPI in MOT	Mazin Dawood Salman
(UNDP)	
UNDP-Iraq Project Procurement	Shiori Otan
UNDP-Iraq Liaison Officer	Jabbar Al-Haidery
(JICA)	
Transportation and ICT Group, Infrastructure and Peace building Department	Ken Imai
Chief Representative of JICA Iraq Office	Shohei Hara
Representative	Hiroshi Yoshikawa
Team Leader of JICA Study Team	Sumio Suzuki

Note: IQ-P1, IQ-P20; Port Sector Rehabilitation Project Phase I and Phase II

Participants of JCC and/or Workshop from Other Relevant Organizations / Master Plan Study for Port Sector	
Organization/Title	Name
MOT / Land Transport Company	Aarif Khair Allah
	Layla Talib Jassim
[Manager of Planning Dept.]	Fawzi Sadik
MOT / River Transport Company	Mohee Aldeen A. A.
Arabian Gulf Academy / President	Kareem Salim Hashim
Arabian Gulf Academy / Vice President	Ahmed Abdul- Jabbar
Arabian Gulf Academy / Secretary	Hussain Ali
Arabian Gulf Academy / Secretary	Fuaad Jaber
MOP / D.G. of the International Cooperation	Anwaar Jamil Buni
MOP / Engineer of Planning Sector Department	Hazim Ahmed Salah
MOP / Engineer	Ahmed Rateb Khleefan
MOP / Engineer	Fatin Majeed Hameed
MOP / Basra Office	Rushidi Abdulkaiq Tuma
	Ali Mohammed Sabeeh
MOF / Customs Director for Southern Region	Hasan Abdulrasool
MOF / Customs Manager for Southern Region	Hashim Obiad
MOF / Customs Directorate for Southern Region	Ahmed Aburasaq
MOO / South Oil Company	Ashour Khamees Faisal
MOO / South Oil Company	Abdulzahra A. Gazar
MOO / South Oil Company	Basim A. Naser
MOO / South Oil Company	Ammar A. Mousa
MOO / Iraqi Oil Tankers Company	Sami A. Abdullah
MOO / Iraqi Oil Tankers Company [Senior Manager]	Suhaila Salih Musa
MOO / Oil Lines and Piping Company	Dawood S. Ahmed
MOO / South Gas Company	Nuaman A. Salman
MOO / South Gas Company	Hameed Ahmed
MOO / Petrochemical Industries Company	Salim Jabbar
MOI / Fertilizer Factory in Basra	Silvana Zeki Yousif
MOI / Steel and Iron Company in Basra	Yahya Hameed Jaber
MOI / Steel and Iron Company in Basra	Kadhim A. Gater
MOI / Steel and Iron Company in Basra	Tawfik J. Hussein
MOEn / Basra Environment Directorate	Jassim Abdul-Hussain Jabbar
MOEn / Basra Environment Directorate	Zainab Samer Mahdi
MOEn / Basra Environment Directorate	Hamid Abd-muheel
Basra Council/Head of Industrial Committee	Anwar M. Shubber
Basra Council/Head of Electricity Committee	Majeeb Aziz Kareem
University of Basra / Marine Science Center	Abdul-Kareem Al-ka'abi
University of Basra / Marine Science Center	Nadia Almudaffer
University of Basra / Marine Science Center	Samer A. R. Altooi
University of Basra / Marine Science Center	Usama Q. Khaleefa
University of Basra / Marine Science Center	Sa'dy Salim
University of Basra / Marine Science Center	Wala’a M. Al-Musawi
University of Basra / Faculty of Oil and Gas	Abdul-Zahra Kh. Kareem

(2) JCC Meeting and Workshop

The first JCC meeting was held on September 16 and 17, 2013, in Basrah. The objective of the meeting was to discuss the outline of the Master Plan study included in the Inception Report for the Study. There were about 20 participants, and the Inception report was generally accepted by GCPI.

The second JCC meeting was held on February 25 and 26, 2014, in Basrah. There were about 30 participants on the 1st day, and about 20 on the 2nd. The Interim Report (1) was submitted by JICA Study Team and discussed in the meeting. JCC accepted the report and agreed that the port development master plan should be elaborated in line with Development Concept B, which aims at a balanced and well-coordinated development of both ports, UQP and Al Faw Grand Port (AFGP).

The third JCC meeting, originally scheduled for June 2014, was postponed due to the invasion of ISIS. It was held on 20 and 21 October, 2014, in Basrah. There were about 50 participants on the 1st day and 40 on the 2nd. The Interim Report (2) was submitted by JICA Study Team and discussed in the meeting. JCC accepted the report and GCPI agreed to inform JICA Study Team of the priority of Short/Mid-term Projects and the selection of one or two priority projects which need a pre-feasibility study. JICA suggested and GCPI agreed that the master plan shall be proposed based on one scenario, and GCPI would advise JICA Study Team of the preference for the Option 1 or Option 2.

GCPI delivered their comments on Interim Report (2) to JICA Study Team in November 2014, which indicated that Option 2 would be appropriate as a master plan for short/mid-term and long-term development. It also suggested that a service berth for dredgers and tugboats should be included as a priority project for pre-feasibility study, and additional study for port security management and port reception facilities for ship waste shall be included in the master plan. GCPI and JICA agreed to implement these additional studies and signed the "Amendment to the Record of Discussions on Master Plan Study for Port Sector" on 10 February 2015.

JICA Study Team made additional surveys in March and April, 2015, and prepared Interim Report on Additional Study Items and a handout of Pre-feasibility Study on Service Berth. A workshop was held on August 11 and 12, 2015, in Amman. Participating were 9 members from GCPI, 2 officers from UNDP Iraq, 3 officials from JICA Iraq and Jordan Office, 6 members from JICA Study Team, and assistants.

The forth JCC meeting was held on 6 and 7 October, 2015, in Basrah. There were about 50 participants on the 1st day and 45 on the 2nd. The Draft Final Report on Master Plan and Draft Summary Report of Pre-Feasibility Study on Service Berth, and their summary reports in Arabic were submitted to GCPI. Discussion was held on environmental issues related to the master plan and service berth, development of Al Faw Grand Port, present and future capacity of the ports, and other port management/operation issues. JCC accepted the reports and requested members to make comments on the Draft Final Report and Draft Summary Report of Pre-Feasibility Study within a month.

Taking into consideration these discussions and comments, JICA Study Team prepared the Final Report of Master Plan Study for Port Sector and Pre-Feasibility Study on Service Berth and submitted them to JICA Headquarter in December, 2015.

1.4.3 Schedule of the Study

The study schedule is shown in Figure 1.4-1

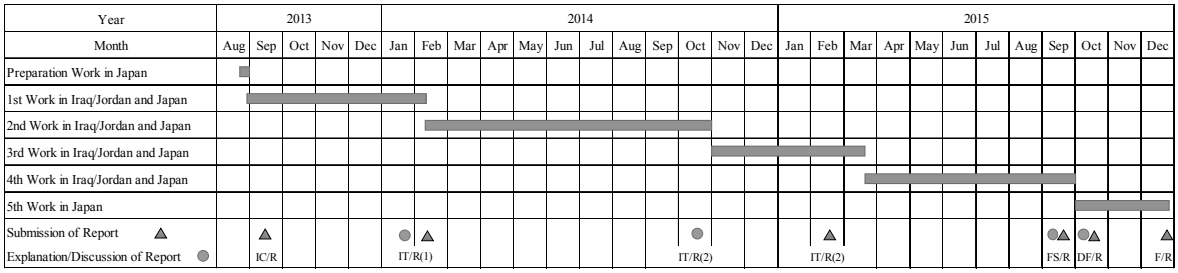


Figure 1.4-1 Work Schedule

CHAPTER 2

Chapter 2. Analysis for the Current Condition of the Port Sector

2.1 Past Related Studies

The Study Team has collected the following publications, which would provide information and data that the study team should pay attention and take into consideration.

(1) National Development Plan

a. National Development Plan 2010-2014, Ministry of Planning
b. National Development Plan 2013-2017, Ministry of Planning

(2) Iraqi Transport Master Plan

Transport Master Plan, Italian Consortium for Iraqi Transport Infrastructure (C.I.I.T.I), 2005

(3) Iraqi Port Development Plan

1) Iraq Port Study, UNDP Iraq Country Office, 2006
2) Port Sector Rehabilitation Project in the Republic of Iraq, JICA, 2006
3) Study for the project of the vitalization of Global Environment and Plant (Urgent Rehabilitation Project for Southern Iraqi Ports), Marubeni. Toa Construction and Fukada Salvage, JETRO, 2006
4) Iraq Port Sector Rehabilitation Project Phase I, GCPI, 2011
5) Information collection survey for Iraq Port Sector Development, JICA, 2012
6) Implementation Program for Port Sector Rehabilitation Project Phase II, GCPI, 2013

(4) Al Faw Grand Port Development Plan

1) Feasibility Study of the New Basrah Grand Port, (C.I.I.T.I), 2008
2) Engineering Consultancy Services for the New Al Haw Port – Republic of Iraq, GCPI, Consortium IECAF (Italian Engineers & Consultants for Al Faw), 2011-201

(5) IT Review of Iraqi Port

IT Review for Umm Qasr Port, Iraq, Seaport Innovations, Aps. 2013

The following is a brief introduction of these publications:

2.1.1 National Development Plan (NDP)

(1) National Development Plan 2010-2014

This is the Five Year Plan from 2010 to 2014 prepared to indicate the yearly investment program in the light of the project priority given from the medium and long-term view points.

The Plan aims at the following nine targets:

1) to boost GDP growth up to 9.38% over the planned period,
2) to create 3.0 to 4.5million jobs,
3) to diversify the Iraqi economy (especially, agriculture, industry, tourism, etc.)
4) to strengthen the roles of foreign and local private enterprises,
5) to upgrade the productivity by introducing the principle of competition,
6) to reduce the poverty rate by 30% from 2007 levels focusing on comprehensive rural development and creation of job opportunities,
7) to establish a fair distribution of infrastructure services and public services (water and sanitation, health, education, etc.),
8) to establish sustainable development that balances economic, social and environmental considerations, and

9) to strengthen the role of local government in developing their provinces.

In order to achieve the aims, the following six fields were focused on:

1) Crude oil extraction, as it guarantees sustainable financial resources,
2) Electricity, as one of the central activities relied upon by all production and life activities,
3) Agriculture, as it guarantees food security, reduction of food imports and creation of vast numbers of jobs, which can reduce unemployment in rural areas and alleviate poverty,
4) Social development services focused on water and sanitation, education, health, culture, youth and sports, and housing,
5) Transportation, as it is an important sector that supports the flow of economic activities and increases efficiency, and
6) Conversion industries, as Iraq possesses capabilities in terms of natural and human resources, that guarantee it a comparative advantage in many industrial activities such as petrochemical, chemical, fertilizer, cement, and food industries, which also constitute a crucial starting point for diversifying the national economy.

As a quantitative investment program, the plan aims at an investment of US$186 billion (218,000 trillion IQD) over the five-year period. Of this total amount, US$ 100 billion (or 53,7%) will be spent by the Iraqi central government in terms of 30% of annual budget, while the rest of US$86 billion (or 46.3%) will be invested by the private sector. The allocation of the investment to the respective economic sectors is as shown in Table 2.1-1 .

Table 2.1-1 Allocation of investment among economic sectors

Sector	Share (%)
Agriculture	9.5
Industry	30
Transportation and Communications	9
Construction, Building and Services	17
Education	5
Province Development	12.5
Kurdistan Region	17
Total	100

Source: NDP 2010-2014

For the transportation sector, outstanding issues and objectives to achieve are listed respectively by transport sub-sectors: Passenger and cargo land transport, roads, railways, ports, maritime transport and aviation.

For port sector, the following visions and objectives are announced:

Vision for port development

Main and secondary ports meet the nation's import and export needs, are able to compete with the ports of neighboring and nearby countries, and act as a starting point for Iraq's dry channel linking Asia, Europe, Turkey and Syria.

Objectives

1) Increase the capacity of existing ports and shipping lanes,
2) Utilize the available unused capacities of existing ports, which total about 3 million tons, and reduce reliance on the ports of neighboring and nearby countries for Iraq's foreign trade by increasing capacity of current Iraq Ports,
3) Transit to constructing major ports capable of receiving the largest ships, reduce transport costs to make Iraqi ports competitive and equip one of them with the requirements necessary to act as a dry port service, and
4) Strengthen the private sector's role in implementing, operating and providing port services.

Quantitative objectives

Approach

1) Increase the design capacity of those ports indicated in Table 2.1-2 by 2014,
2) Construct Al Faw Grand Port (AFGP) during the plan period (as shown in Table 2.1-3),and
3) Remove sunken vessels in shipping lanes as well as those close to docks during the plan period (as shown in Table 2.1-4)

Table 2.1-2 Development plan of major ports in Iraq（2010-2014）

Name of Port	2010		Berth required 2010-'14	2014	
	Number of Berths	Capacity 1,000 t/Yr		Number of Berths	Capacity 1000 t/Yr
Umm Qasr	22	7,500	19	41	14,000
Khor Al Zubayr	12	6,400	13	25	10,650
Maqul	6	1,500	8	14	3,600
Abu Flus	3	500	-	3	750
Total	43	16,650	40	83	29,000

Source: NDP 2010-2014

Table 2.1-3 Targeted quantitative objective for construction of Al Faw Port

Type of Berth	Item	2018	2038
Container Berths	Number of Berths	10-11	22
	Capacity/Yr (million TEU)	3	7
Ceneral Cargo Berth	Number of Berths	6-7	22
	Capacity/Yr (million ton)	10	40

Source: NDP 2010-2014

Table 2.1-4 Removal plan of sunken vessels

Name of Port	2010	2011	2012	2013	2914	Total
Umm Qasr	3	2	1	2	2	10
Khor Al Zubayr	1	2	2	2	2	9
Maqul	1	1	1	2	2	7
Abu Flus	3	3	2	2	2	12
Removal by Japanese Loan	8					8
Total	16	8	6	8	8	48

Source: NDP 2010-2014

(2) National Development Plan 2013-2017, Ministry of Planning

In 2013, a new National Development Plan, 'NDP 2013-2017' was published. The following is a brief introduction of the objectives of the new NDP:

Targets announced in NDP 2013-2017

The Plan estimates the GDP by sector up to 2017 as shown in Table 2.1-5. Incidentally, the exchange rate between Iraq Dinar (IDR) and US Dollar as of November 26, 2013 was 1 US$ = 1,162.45 IDR. The average growth rate shown in the Table denotes the average over the five-year period from 2013 to 2017. The GDP share by sector is shown in Table 2.1-6.

Table 2.1-5 GDP estimate shown in NDP 2013-2017

Billion Dinar

	Economic Activity	2012 Base	Ave. Groqth	2013	2014	2015	2016	2017
1	**Agriculture, Forestry, Fishery**	**10,152.0**	**5.47%**	**10,480.3**	**10,818.9**	**11,648.6**	**12,194.9**	**13,249.9**
	Mining and Quarrying	**170,060**	**15.53%**	**193,805**	**221,572**	**236,461**	**298,495**	**349,992**
2	Crude oil	112,044	18.70%	132,996	157,867	187,388	222,429	264,023
3	Other type of Mining	1,034	6.71%	1,075	1,118	1,223	1,293	1,431
4	Manufacturing	4,419	3.68%	4,515	4,613	4,850	5,003	5,294
5	Electricity and Water	3,320	7.97%	3,477	3,640	4,049	4,325	4,872
6	Construction and buildingt	13,783	8.92%	14,509	15,238	17,193	18,509	21,129
7	Transfer, transportation and storage	15,678	8.78%	16,491	17,347	19,492	20,959	23,880
8	Wholesale, Retail, hotel, and similar	19,782	8.22%	20,742	21,750	2,266	25,976	29,363
	Non-oil	58,016	8.18%	60,809	63,705	49,073	76,066	85,969
	Finance, Insurnce and real Estate Services	**21,657**	**7.23%**	**22,580**	**23,544**	**25,935**	**27,544**	**30,702**
9	Insurance and banking	3,777	8.65%	3,970	4,173	4,681	5,028	5,719
10	Home ownership	17,880	6.92%	18,610	19,371	21,254	22,515	24,983
	Social and Personal Development Services	**36,558**	**7.07%**	**38,084**	**39,674**	**43,614**	**46,258**	**51,439**
11	Social Development Service	33,008	7.18%	34,408	35,867	39,487	41,917	46,686
12	Personal Service	3,550	6.01%	3,676	3,807	4,128	4,340	4,753
	Total Activities excluding oil	**126,383**	**7.5%**	**131,954**	**137,741**	**130,271**	**162,062**	**181,361**
	Total of all activities	**238,427**	**13.3%**	**264,950**	**295,608**	**317,659**	**384,491**	**445,384**

Source: NDP 2013-2017

Table 2.1-6 Estimates of FDP share by sector

	Economic Activity	2012 Base	2013	2014	2015	2016	2017
1	**Agriculture, Forestry, Fishery**	**4.3%**	**4.0%**	**3.7%**	**3.7%**	**3.2%**	**3.0%**
	Mining and Quarrying	**71.3%**	**73.1%**	**75.0%**	**74.4%**	**77.6%**	**78.6%**
2	Crude oil	47.0%	50.2%	53.4%	59.0%	57.9%	59.3%
3	Other type of Mining	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%
4	Manufacturing	1.9%	1.7%	1.6%	1.5%	1.3%	1.2%
5	Electricity and Water	1.4%	1.3%	1.2%	1.3%	1.1%	1.1%
6	Construction and buildingt	5.8%	5.5%	5.2%	5.4%	4.8%	4.7%
7	Transfer, transportation and storage	6.6%	6.2%	5.9%	6.1%	5.5%	5.4%
8	Wholesale, Retail, hotel, and similar	8.3%	7.8%	7.4%	0.7%	6.8%	6.6%
	Non-oil	24.3%	23.0%	21.6%	15.4%	19.8%	19.3%
	Finance, Insurnce and real Estate Services	**9.1%**	**8.5%**	**8.0%**	**8.2%**	**7.2%**	**6.9%**
9	Insurance and banking	1.6%	1.5%	1.4%	1.5%	1.3%	1.3%
10	Home ownership	7.5%	7.0%	6.6%	6.7%	5.9%	5.6%
	Social and Personal Development Services	**15.3%**	**14.4%**	**13.4%**	**13.7%**	**12.0%**	**11.5%**
11	Social Development Service	13.8%	13.0%	12.1%	12.4%	10.9%	10.5%
12	Personal Service	1.5%	1.4%	1.3%	1.3%	1.1%	1.1%
	Total Activities excluding oil	**53.0%**	**49.8%**	**46.6%**	**41.0%**	**42.1%**	**40.7%**
	Total of all activities	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: NDP 2013-2017

Goals of respective sectors in the five-year development plan

The development goals of respective sectors presented in NDP 2013-2017 are as follows:

Agriculture Sector

a) Increasing the GDP of the agriculture sector,

b) Expanding the coverage of both plant and animal production to meet Iraq's nutritional needs (food security), and

c) Satisfy Iraq's water resource needs

The quantitative goals are shown in Table 2.1-7 and Table 2.1-8 for plants and animals, respectively.

Table 2.1-7 Vegetation Production quantity indicators

Unit 1,000 ton

Item	2011	Average Annual Growth	2013	2014	2015	2016	2017
Wheat	2809	10.8%	3,784	4,360	4,806	5,252	5,697
Rice	173	10.6%	176	220	234	249	263
Barley	820	6.7%	953	1,024	1,094	1,166	1,236
Maize	288	18.6%	794	963	1,148	1,352	1,571
Tomato	913	19.6%	1,638	2,000	2,378	2,826	3,356
Potato		28.0%	1,057	1,390	1,776	2,251	2,836
Onion		5.2%	211	240	249	258	258
Dates		11.5%	679	770	857	952	1,050

Source: NDP 2013-2017

Table 2.1-8 Farm animal number growth

Unit 1,000 Heads

Animal Type	2008	Average Annual Growth	2013	2014	2015	2016	2017
Sheep & Goat	9197	7%	13,084	14,000	14,980	16,029	17,151
Cows	2552	3%	2,959	3,048	3,139	3,223	3,330
Buffalo	286	5%	365	383	402	42	443
Deer	58	4%	70	73	76	79	82
Meet Chicken	34,000	15%	68,384	78,641	90,437	104,002	119,602
Egg Chiken	2000	15%	4,023	4,626	5,320	6,118	7,107

Source: NDP 2013-2017

2) Oil and gas sector

The quantitative goals of oil and gas sector are shown in Table 2.1-9.

Table 2.1-9 Goals of crude oil and gas production and export

Item	Volume of Production or processing		
	Unit	2012	2017
Crude Oil Production	Million barrel / day	3.2	9.5
Crude oil export	Million barrel / day	2.6	6
Capacity of crudeoil storage in boded warehouse	Million barrels	10.987	30.057
Associated gas production	MMSCF/day	1,574	5,500
Liquid gas production	ton/day	880	2600
Liquidation capacity	1,000 barrel/day	600	950
Oil product storage capacity	Equivalent Days consumption	40	100
Gas flaring	MMSCF/day	800	100
Preserving environment by combating pollution			

Note: MMSCF Million Stabdard Cubic Feet

Source: NDP 2013-2017

(3) Transportation sector

The quantitative goals are shown in respective transport subsectors as follows:

a) Road and bridge

Table 2.1-10 Goals of road and bridge upgrading

Item	Unit	2012	2013	2014	2015	2016	2017	Total
Highway	km		116	40	282	248	600	1,286
Arterial Road	km	75	93	146	291	161	175	941
Main Road	km	485	807	775	541	788	1,108	4,504
Secondary Road	km	115	246	104	273	225	185	1,148
Concrete Bridges	No.	8	25	20	16	11	13	93
Bridges	No.		8	6	7	4	4	29
Steerl Bridges	No.						2	2

Source: NDP 2013-2017

b) Railway

Table 2.1-11 Goals of railway upgrading

Item	Unit		2012	2013	2014	2015	2016	2017
New Railway length	Km	Annual				400	1,000	1,500
		Cumulative	1,931	1,931	1,931	2,331	3,331	4,831
Total length of Rail Network	Km	Annual		369	200	1,400	2,400	3,375
		Cumulative	2,915	3,284	3,484	4,884	7,284	10,659
Increase in Passenger Transport Capacity	Million Pax.	Annual		1	1	4	23	35
		Cumulative	1	2	3	7	30	65
Increase in Cargo Transport Capacity	Million ton	Annual		1	1	38	58	233
		Cumulative	4	5	6	44	102	335

Source: NDP 2013-2017

c) Ports

Table 2.1-12 Goals of port development

Name of Port	2013		Berth required	2017	
	Number of Berths	Capacity 1,000 t/Yr	2013-'17	Number of Berths	Capacity 1000 t/Yr
Umm Qasr	**22**	7,500	19	41	14,000
Khor Al Zubayr	12	6,400	13	25	10,650
Maqul	9	2,250	5	14	3,600
Abu Flus	3	500	-	3	750
Total	46	16,650	37	83	29,000

Source: NDP 2013-2017

In Table 2.1-12, the number of existing berths and the capacity of respective ports shown in the column of 2012 are the same as those presented in NDP 2010-2014 except Al Maqil Port. Al Maqil Port increased usable berth from 6 in 2010 to 9 in 2012. With the three additional berths, the port expanded capacity from 1,500,000 ton in 2010 to 2,250,000 ton in 2012. The targets indicated in the column of 2017 are the same as those indicated in NDP 2010-2014.

Al Faw Grand Port (AFGP)

The development goal of Al Faw Grand Port shown in NDP 2013-2017 is the same as that announced in NDP 2010-2014 (see Table 2.1-3).

2.1.2 Iraqi National Transport Master Plan

(1) Transport Master Plan, Italian Consortium for Iraqi Transport Infrastructure (C.I.I.T.I), 2005

This Transport Master Plan aims at proposing an integrated inter-modal transportation system to contribute to the socioeconomic development of Iraq and focuses on the following features:

1) the role of the Iraqi transport system in opening Iraq to the international markets, and
2) the introduction of proper infrastructure and inter-modal facilities into the Iraqi transport system in order to equip the backbone of the future "Dry Channel" (from the Indian Ocean to the Mediterranean Sea).

The basic concept of this Transport Master Plan is adopted in NDP 2010-2014 and NDP 2013-2017. The Transport Master Plan is elaborated on the basis of the estimates of GDP growth rate shown in Table 2.1-13

Table 2.1-13 Estimates of GDP growth rate adopted in the Transport Master Plan

Year	Total	Oil	Non-oil
2004 – 10	15.94	12.88	22.62
2010-15	6.52	2.34	12.16
2015-20	4.73	0.14	8.76
2020-25	4.63	-	7.39
2025-30	4.47	-	6.38
2030-35	4.07	-	5.36
2004-35	6.94	2.78	10.67

Source: Iraqi Transport Master Plan, Workshop presentation material, 2005

The Transport Master Plan estimates the import cargo volumes to Iraq from various regions of the world as shown in Table 2.1-14 on the basis of the GDP growth rate estimates mentioned above.

Table 2.1-14 Estimates of import cargo volume (1,000 ton/year)

Year	Middle East Libya, Egypt	Rest of Africa	Europe	Asia	America	Total
2004	9	1	3	2	0	16
2010	1,633	441	693	691	165	3,623
2012	2,813	1,012	1,368	1,482	340	7,015
2020	4,721	2,080	2,570	2,928	637	12,936
2025	7,604	3,467	4,228	4,890	976	21,166
2030	11,295	5,322	6,417	7,517	1,384	31,934
2035	15,614	7,596	9,068	10,742	1,832	44,852

Source: Iraqi Transport Master Plan, Workshop presentation material, 2005

The Transport Master Plan assumes that the container transport will play a pivotal role in future cargo flows, and estimated the cargo inflow into Iraq in terms of Iraqi domestic containers and transit containers between Asia and the Mediterranean Sea.

	2015	2030
Domestic container	1,000,000 TEU	2,000,000 TEU
Transit container	2,000,000 TEU	4,000,000 TEU

Three development scenarios were prepared to cope with the increase of container cargoes in the coming decades.

1) Do nothing (existing /new Kuwait ports are supporting the traffic growth)
2) Enlarging the Umm Qasr Port (UQP)

3) Building a new terminal in the open sea

For the purpose of comparing the amount of investment required to realize these three alternative development scenarios, the construction and annual maintenance costs were estimated for the cases of developing a container terminal having capacity of 1.35 million TEU per year at Umm Qasr Port and at a new port in the open sea (see Table 2.1-15). It is assumed that five (5) 300m long container berths are required to handle 1.35 million TEU per year).

Table 2.1-15 Construction and annual maintenance costs for the container terminals

Million Euro

	Umm Qasr Port Expansion	New Offshore terminal
Main Cost		
Civil Works for the termial	295	376
Civil work for the causeway	-	336
Capital Dredging work	200	-
Handling equipment	124	124
Rail system for th econtainer terminal	15	15
Total Coast	634	851
Design and Survey	18	24
Project management and supervision	25	34
Rtotal investment cost	678	910

Million Euro

Yearly maintenenca cost	Umm Qasr Port Expansion	New Offshore terminal
Civil works	1.5	2.1
Dredging of terminal basin	10	**0**
Dredging of access channel	11	**0**
Equipment	3.5	3.5
Total yearly maintenance cost	26	6

Source: Iraqi Transport Master Plan, Workshop presentation material, 2005

On the basis of the comparison of costs of the two alternative scenarios, it was concluded that the construction of a new port is advantageous to the expansion of Umm Qasr Port, because of the substantial costs of annual maintenance over the project period of 30 years. However, though the cost of yearly dredging the terminal basin and access channel of the new offshore terminal is assumed to be zero in Table 2.1-15, in reality, at the new offshore terminal, it is inevitable and yearly maintenance will be necessary. Therefore, further careful examination for the project cost is required.

The Transport Master Plan proposes a staged project implementation in accordance with the increase of container cargo volume as follows:

1) A container terminal having an annual capacity of 1.35 million TEU can be constructed in stages with lower cost in Umm Qasr Port than the construction of the new offshore terminal.
2) Umm Qasr Port has capacity to handle the import and export containers of Iraq up to 2015. Then, the capacity of the port should be expanded gradually until the container volume reaches 2 million TEU/year. Thus, the port is sustainable until around 2030.
3) In such case that the growth of the volume of the container traffic is rapid and that the trade of Iraq is influenced by the capacity of port, the new offshore terminal should then be taken into consideration as the long-term counter plan.

(2) Transport Master Plan Study - Stage 2, Dar Al-handasah Shair and Partners, 2013

This 15-month study started in March 2013 as a continuation of the above mentioned master plan study. This study is scheduled to complete in the middle of 2014.

2.1.3 Development Plans of Iraqi ports

(1) Iraq Port Study, UNDP Iraq Country Office, 2006

On the basis of the survey of the situation of ports in Iraq, the study identified outstanding issues and problem areas, and proposed restoration programs of the ports, especially Umm Qasr Port, and the access waterways between the Arabian Gulf and Umm Qasr Port, on the basis of the analyses of causes and the countermeasures.

(2) Study for the project of the vitalization of Global Environment and Plant (Urgent Rehabilitation Project for Southern Iraqi Ports), JETRO (Marubeni. Toa Construction and Fukada Salvage), 2006.

This is a feasibility study on the rehabilitation of ports in southern Iraq with the technical assistance of the Japanese government. The study examined the economic evaluation of a project package that includes the following programs:

1) dredging of waterways and basin,
2) removal of 15 sunken ships,
3) repair of damaged facilities (fender, pavement of yards, sheds and buildings),
4) cargo handling equipment and marine equipment, and navigation aids (27 units).

(3) Port Sector Rehabilitation Project in the Republic of Iraq, JBIC ,2006

The project study consists of the following three components:

1) to identify bottle necks to be settled urgently at Umm Qasr and Khor Al Zubayr Ports (KZP),
2) to propose measures for rehabilitation and staged implementation plan, and
3) to prepare the implementation plan of the rehabilitation project Phase I and the preparation of Phase II.

(4) Iraq Port Sector Rehabilitation Project Phase I, JICA, 2011

This study is intended to examine further the rehabilitation project of ports in southern Iraq following the Phase II project. The study identified the project components of the rehabilitation of Khor Al Zubayr Port, evaluated the development potential of Umm Qasr and Khor Al Zubayr Ports and examined the functional allotment between the two ports to cope with short-term cargo traffic demands by settling the existing problems. The study also intended to propose development concepts of the two ports and the functional allotment between the two ports from the long-term viewpoint.

(5) Information collection survey for Iraq Port Sector Development, 2012, JICA

This survey is intended to collect information and data needed for the preparation of the implementation program of Phase II of the Iraqi Port Sector Rehabilitation Project. The survey covers not only UQP and KZP but also Al Maqil and Abu Flus Ports. The survey proposed an urgent implementation of the rehabilitation of KZP, dredging of waterways between UQP and KZP and the installation of navigation aids and cargo handling equipment.

(6) Implementation Program for Port Sector Rehabilitation Project Phase II, 2013, GCPI

This is the implementation program for the urgent rehabilitation of the Iraqi port sector proposed the above mentioned survey (5).

2.1.4 Development Plan of Al Faw Grand Port

(1) Feasibility Study of the New Basrah Grand Port, (C.I.I.T.I), 2008

The study developed the concept of a new offshore port, which was proposed in Iraq Transport Master Plan (see 2.1.2), into a concrete plan, and examined the feasibility of Al Faw Grand Port.

Traffic demand forecast

The study assumed that Al Faw Grand Port will handle container cargoes and dry bulk cargoes, which are the major commodity, and estimated the traffic volumes in 2018, 2028 and 2038 as shown in Table 2.1-16.

Table 2.1-16 Traffic demand forecast

Unit : Million ton

	2018	2029	2038
Container	24.0	40.0	70.0
Dry Bulk Total	24.0	32.0	44.0
Wheat	6.9	8.5	11.0
Other Dry Bulk	17.1	23.5	33.0

Source: Feasibility Study of the New Basrah Grand Port, C.I.I.T.I, 2008

Development Scenario

The following three development scenarios were proposed and examined to cope with the cargo volume estimated as shown in Table 2.1-16.

1) Scenario 1, Minimum investment
   Investment shall be made only on maintenance and repair of the existing ports. The functional allotments among the ports are as follows:
   a. UQP should play a role as an international container port. The capacity of the existing two container terminals should be enhanced to 1.0 to 1.1 million TEU per year by installing container handling equipment,
   b. The Khawr Abdallah Channel should be deepened to -13 m,
   c. KZP should focus on those cargoes related to local industries,
   d. Abu Flus and Al Maqil Ports should focus on the cargoes transported by small ships and barges within the region, and
   e. Excess cargoes that exceed the capacity of Iraqi ports should be handled at ports of nearby countries (Syria, Jordan, etc.) and hauled to Iraq overland.
2) Scenario 2, enhancement of the existing ports
   a. UQP should be enhanced to be an international container port having a 1,500 m long berth, which is comparative to six (6) berths. The port should accommodate container ships having a loading capacity of 2,500 TEU (length of 300m and draft of 12m). It should have an annual capacity of 1.0 to 1.5 million TEU.
   b. Khawr Abdallah Channel should be deepened to – 14.5 m, and
   c. The development scenarios of KZP, Abu Flus and Al Maqil Ports are the same as Scenario 1.
3) Scenario 3, Development of Al Faw Grand Port
   a. Construction of Al Faw Grand Port: Container terminal (total berth length is 7,000 m and the yard area is 300 ha) and Dry bulk terminal (total berth length is 3,500 m and yard area is 50 ha),
   b. Construction of a two lane navigation access channel (400 m wide and – 17.5 m deep), and
   c. Construction of road and railway access to the Al Faw Grand Port.

Project site

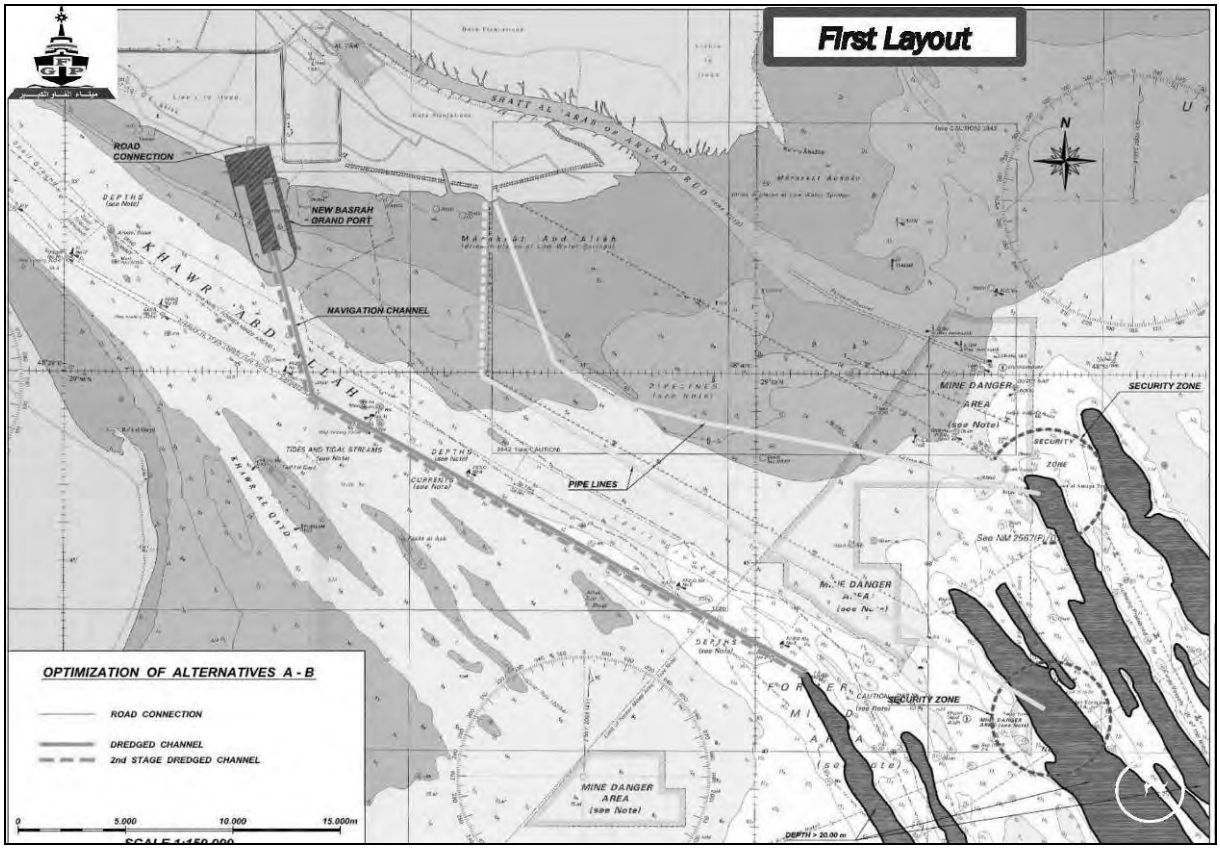
The advantages and disadvantages were examined from the various viewpoints at eight (8) alternative sites with off shore facing the Arabian Gulf (water area between the coast of Faw and

the existing offshore oil facility). The project site was chosen on the basis of a comprehensive evaluation of the following aspects: construction cost, security, siltation, influence on the offshore oil facilities, safety, maneuverability, dredging cost, connection to the land transport system and impact on environment.

It was concluded that the location on the coast of Faw area facing to Khawr Abdallah Channel is the best project site and that the port should be connected to the existing navigation channel via a new access channel.

Technical examinations were carried out for the chosen project site from the viewpoints of meteorological conditions, soil conditions, tide and tidal current, waves, siltation, structural style, road and railway conditions, and logistics aspects. On the basis of the technical examination, three alternative layout plans were elaborated for further evaluation.

The study finally proposed the layout plan shown in Figure 2.1-1. It also proposed the new Port should be developed in three stages.



Source: Presentation material in the Seminar "Iraq Infrastructure 2013", GCPI, edited by Study Team

Figure 2.1-1 Location of the project site and layout plan of Al Faw Grand Port (2038)

The components of infrastructure development of Al Faw Grand Port are as shown in Table 2.1-17.

Table 2.1-17 Components of stage-wise development of Al Faw Grand Port

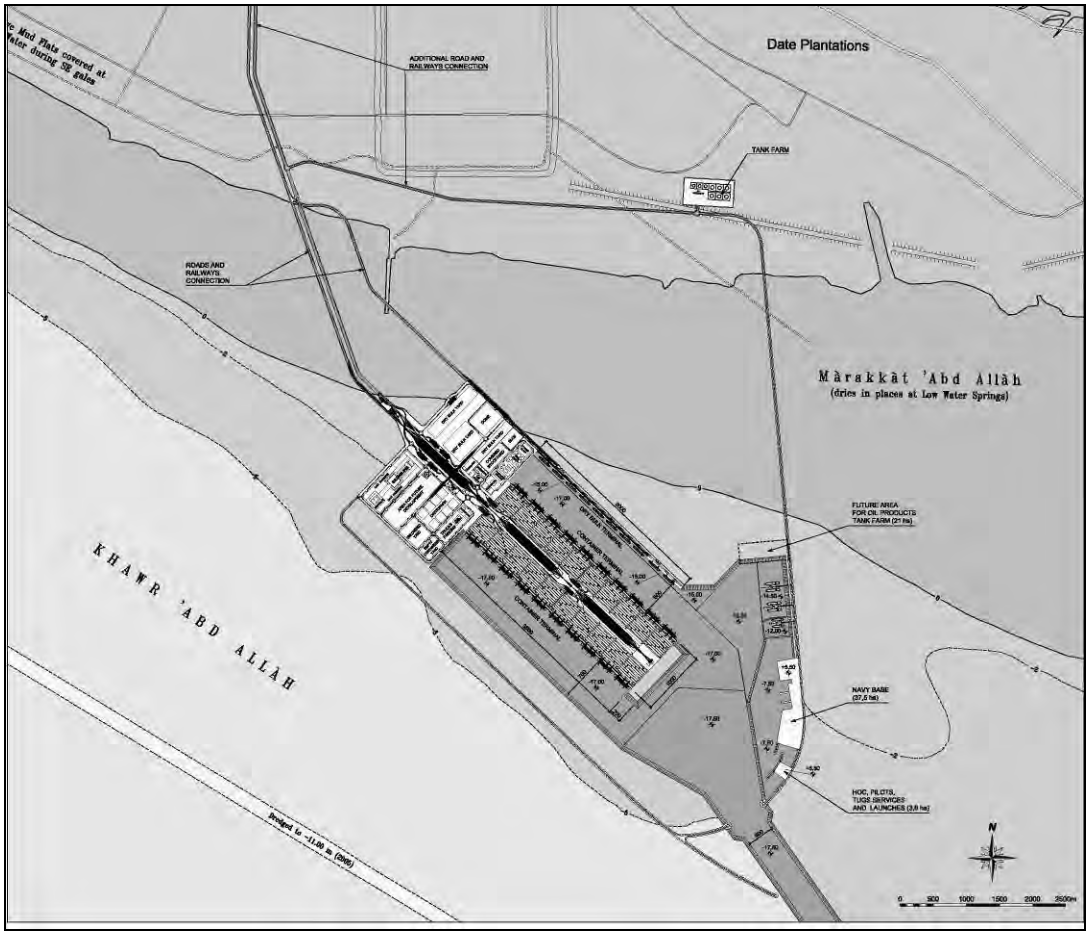
Item	Unit	Stage 1	Stage 2	Final
Quay for Container terminal	m	3,900	3,100	7,000
Quay for Bulk terminal	m	2,000	1,500	3,500
Container yard	ha	120	80	200
Yard for bulk	ha	40	20	60
Paved area Road, Railway, building	ha	60	40	100
Silo for wheat	1,000 m3	150	50	200

Source: Feasibility Study of the New Basrah Grand Port, (C.I.I.T.I), 2008

(2) Engineering Consultancy Services for the Al Faw Grand Port - Republic of Iraq, GCPI, Consortium IECAF (Italian Engineers & Consultants for Al Faw), 2012

This consultancy service was provided to prepare a concrete implementation plan of Al Faw Grand Port and detailed examinations were carried out on the following aspects:

1) General Report: confirmation of conditions and criteria for facility planning (meteorological conditions, oceanographic conditions, harbor disturbance and wave criteria for port operation, ship design, facility layout), 2) Container and dry bulk terminal, 3) Buildings, 4) Roads, 5) Railways and flyover, 6) Electric and mechanical works, 7) Breakwaters, 8) Wharves, and 9) dredging and reclamation.



Source: Engineering Consultancy Services for the Al Faw Grand Port, Port Master Plan Report on the port layout in the Final Stage for the Container Terminal and the Dry Bulk Terminal, General Report, 2012

Figure 2.1-2 Revised facility layout plan of Al Faw Grand Port (Final development stage)

During the consultancy services, the facility layout plan was modified further (see Figure 2.1-2).

The construction cost of the Port has been estimated to be US$6.1 billion. GCPI started the construction of the east breakwater, and dredging of the access navigation channel. The development plan of Al Faw Grand Port is further delineated in section 3.1.2.

2.1.5 IT Review of Iraqi Port

(1) IT Review for Umm Qasr Port, Iraq, Seaport Innovations, Apr. 2013

It is indispensable for restoration and efficient management of Iraqi ports not only to improve port facilities physically, for example repair of the damaged facility, development of a facility shortage or removal of obstacles, but also to raise an efficiency, improve and modernize the

management and operation system of ports. Especially lack of proper Information Technology (IT) Systems to Iraqi ports brings capacity constraints and major operational obstructions. Therefore, GCPI carried out the study to introduce IT systems to UQP North as a pilot scheme, aiming at improvement and modernization of the management and operation system in the port sector. The details are shown below:

a. A detailed description of a potential IT solution for port and cargo operation and description of functionalities and modules in the IT systems,
b. Budget for IT systems and IT hardware,
c. Implementation plan, that will include time schedule considering GCPI, UQP, terminal operators, as well as internal and external port users,
d. List of Port and Terminal IT system suppliers.

Followings are recommended for introducing the systems:

- Establishment of the efficient terminal and facility arrangement in accordance with a form of the cargo handling in UQP,
- A complete Port IT SYSTEM Solutions is seen as two separate IT solutions:
  - Port Operating IT Systems (POS)
  - Port Community IT Systems (PCS)
- Phasing introduction of IT Systems

1) Efficient Arrangement of the Terminal and Facility

The rapid growth for UQP is forecasted in the future. The port layout is seen as the most important component to respond to a future cargo demand as well as the efficient modernization of the system and equipment for management and operation in the port. As a result, it is highly recommended that the port layout and internal cargo/equipment logistics will be changed to meet the future needs.

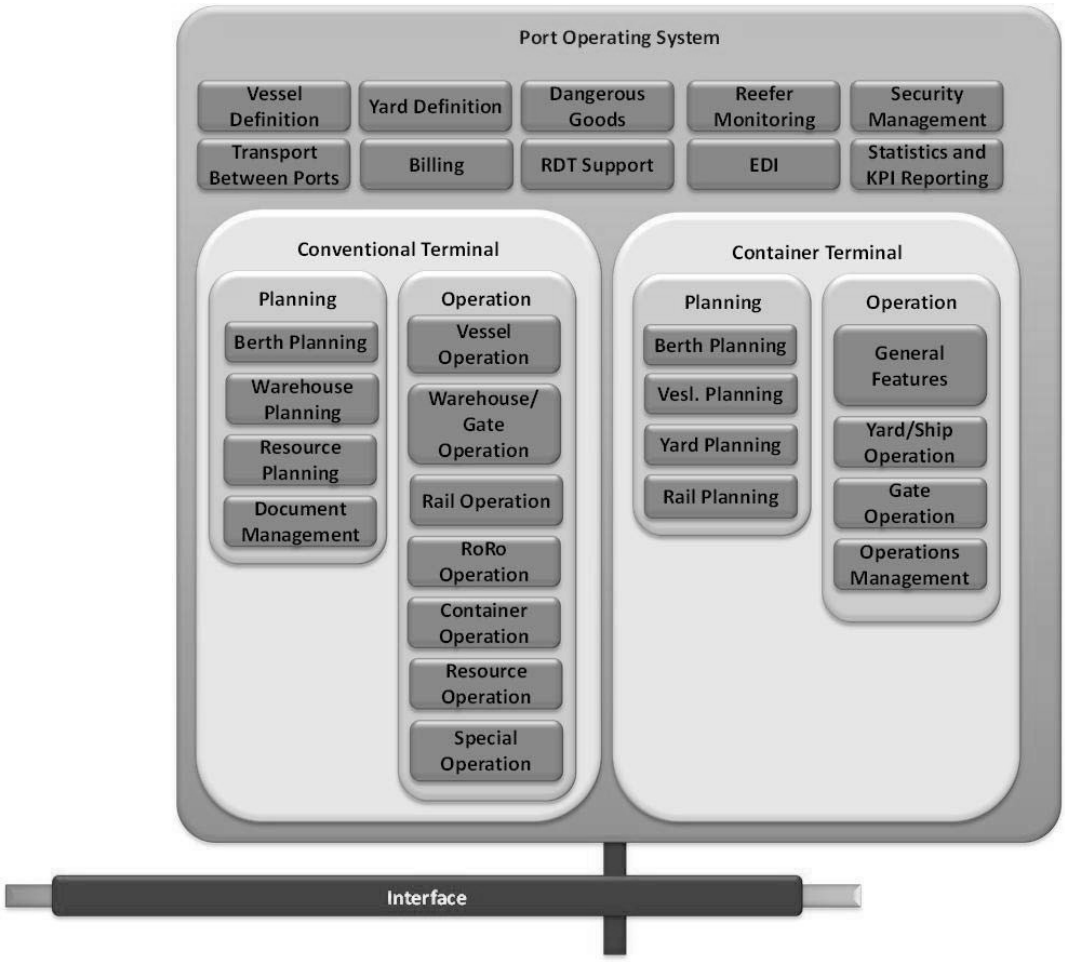
2) Introduction of IT Systems

The IT Systems introduced to UQP are composed of the aforementioned POS and PCS. A POS is a system for planning, optimization and controlling the cargo handling operation and composed of the functional software hierarchy which selects necessary functions properly according to a feature of the objective port, as shown in Figure 2.1-3.

Source: IT Review Report for Umm Qasr Port by Seaport Innovations ApS

Figure 2.1-3 POS's Functional Software Hierarchy

Modules/Software of the POS with the standard specification are required for UQP considering various conditions, as shown in Figure 2.1-4.



Source: IT Review Report for Umm Qasr Port by Seaport Innovations ApS

Figure 2.1-4 Required Modules/Software

3) Phasing Plan for System Introduction

It is important for the aforementioned system introduction to establish a working structure in UQP and an education/training system for the operation with a long term implementation. Therefore, it is suggested that a simple system is introduced initially and a full version later after having a training period for one year, for example that a standardized POS is implemented in two or three phases, and that possible future implementation of PCS and Enterprise Resource Planning (ERP) system are only initiated upon successful implementation of the POS.

Presently the IT system introduction is on the process of the supplier's selection, based on the procedure recommended by this paper.

2.2 Natural Conditions

2.2.1 Outline

A Natural Conditions Survey was carried out to obtain the information of natural conditions required for port planning and facility design of main ports and waterways in Iraq. The items of the survey are listed below.

- Meteorological Condition (Temperature, Precipitation, Humidity, Wind)
- Oceanographic Condition (Tide, Current, Wave)

- Topographic Condition (Land, River bed)
- Soil Condition
- Natural Disaster (Earthquake)

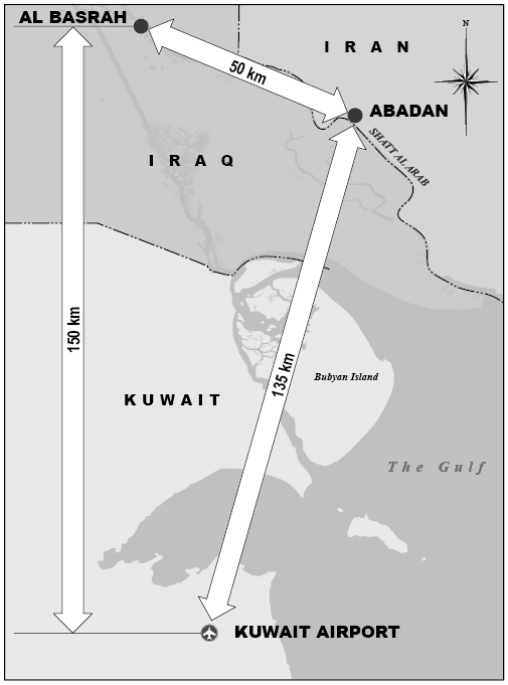
The basic policy of survey method is literature search, and hearing from relevant organizations. Bathymetric survey is carried out by JICA Study Team from upstream part of Al Maqil Port to the downstream part of Abu Flus Port.

Main ports and waterways in Iraq are located in east area of Basrah region. Hereinafter, surveyed area will be referred to as the Port Area.

2.2.2 Meteorological Conditions

The climate of Iraq is classified into three types; a desert climate, steppe climate and Mediterranean climate. Most of the country is classified desert climate. The Port Area belongs to a desert climate.

There are three meteorological stations (Abadan, Kuwait Airport, Al Basrah) shown in Figure 2.2-1 around the Port Area. Meteorological data obtained at three stations have been summarized in "Admiralty Sailing Directions - Persian Gulf Pilot –NP 63, United Kingdom Hydrographic Office". Outline of Meteorological Conditions are summarized below by referring mainly to the observations at Al Basrah station.

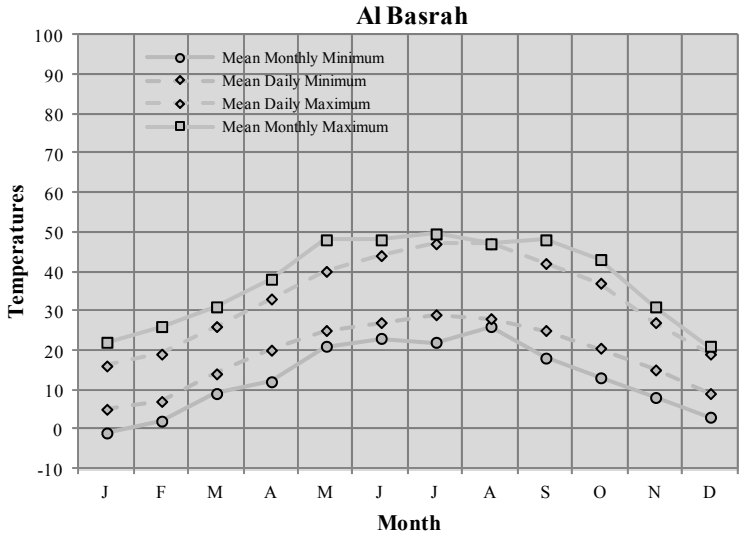


Source: GCPI

Figure 2.2-1 Location of Meteorological Stations

(1) Temperature

The Climate of Basrah in summer (April to October) is characterized as high temperature and dry, and the mean monthly maximum temperature is approximately 50 degrees. The winter (November to March) is generally mild in Basrah. The mean monthly minimum temperature in mid-winter (December to February) is 0 degrees-5 degrees. The mean monthly temperature from May to September is 30 degrees–40 degrees and is 10 degrees–20 degrees in other months. Mean monthly maximum and minimum temperature are shown in Figure 2.2-2.

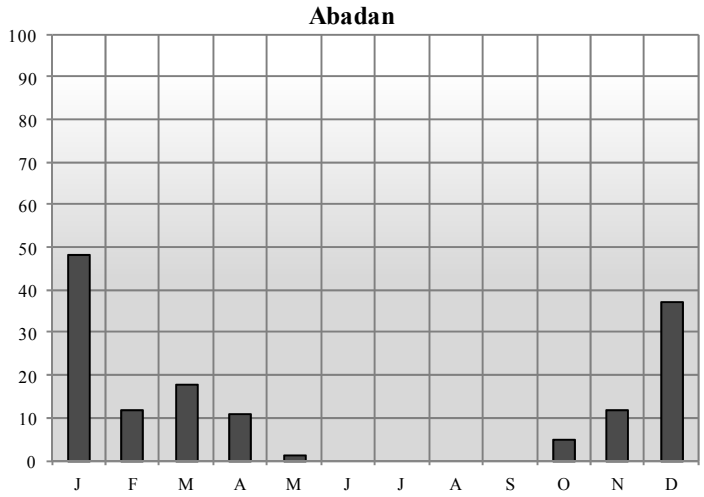


Source: Admiralty Sailing Directions - Persian Gulf Pilot –NP 63 / United Kingdom Hydrographic Office

Figure 2.2-2 Mean Monthly Maximum and Minimum Temperature (Al Basrah)

(2) Precipitation

Observations at Abadan station are referred and summarized because there is no precipitation data of Al Basrah station. It is rainless from June to September. Most of rainfall in the country occurs during the winter season (December to January) but the amount of precipitation is low (10 mm–50 mm). Torrential rains sometimes occur that may cause flooding. The mean monthly precipitation at Abadan station is shown in Figure 2.2-3.

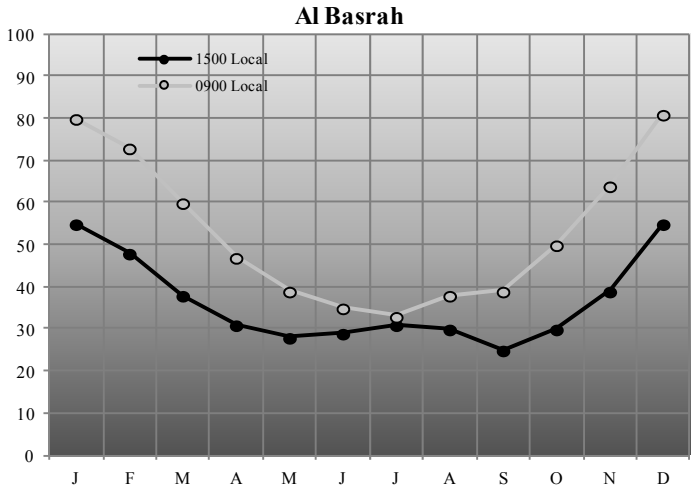


Source: Admiralty Sailing Directions - Persian Gulf Pilot –NP 63 / United Kingdom Hydrographic Office

Figure 2.2-3 Mean Monthly Precipitation (Abadan)

(3) Humidity

The mean monthly relative humidity is less than 40 % during the summer season (May to September) and is very dry. During winter season, The mean monthly relative humidity is in between 60% and 80%. Daily range of humidity in the summer season is smaller than that of winter season. The mean monthly relative humidity at Al Basrah station is shown in Figure 2.2-4.



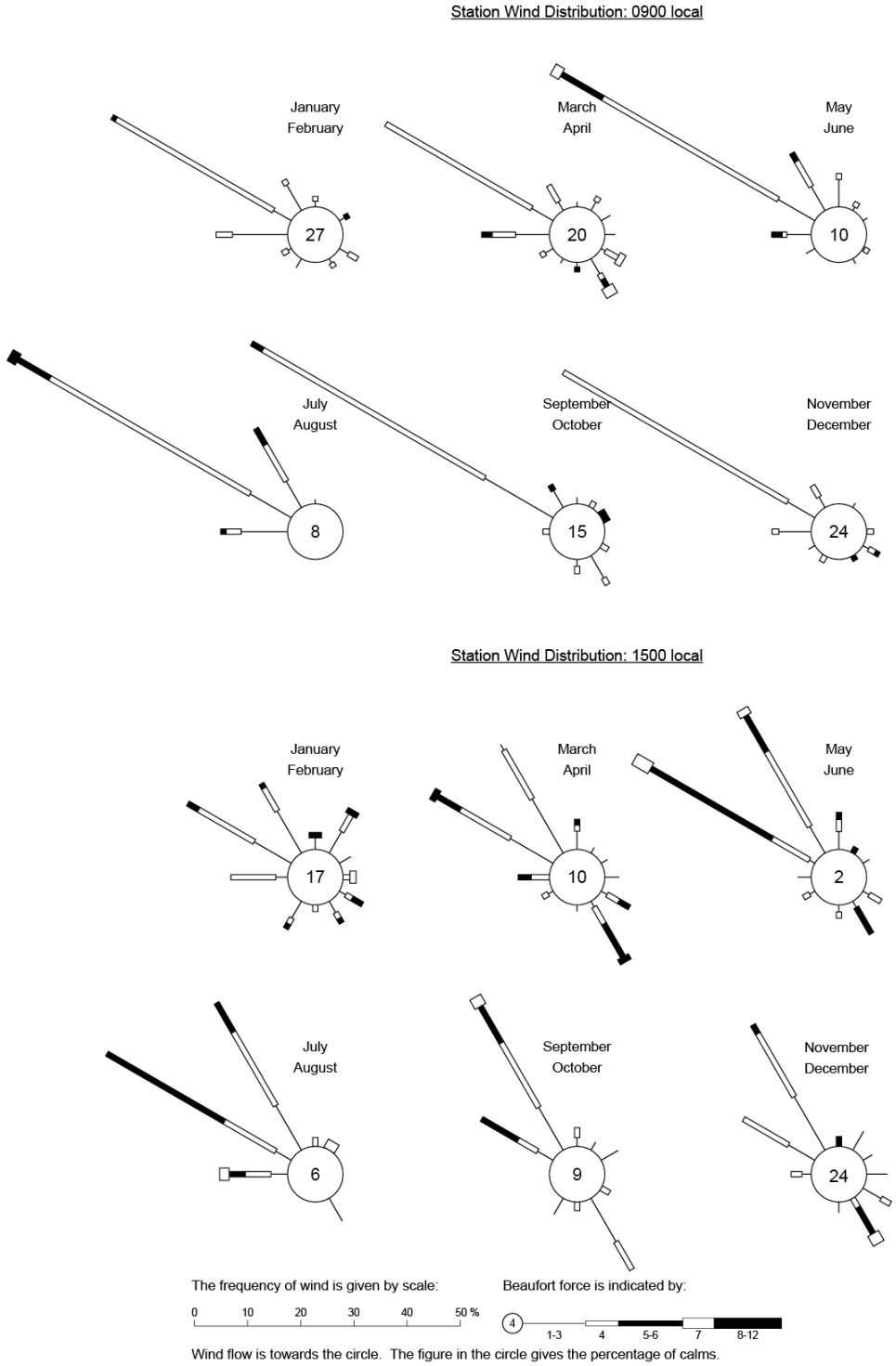
Source: Admiralty Sailing Directions - Persian Gulf Pilot –NP 63 / United Kingdom Hydrographic Office

Figure 2.2-4 Mean monthly Relative Humidity (Al Basrah)

(4) Wind

Figure 2.2-5 shows wind rose at Al Basrah station. Characteristics of wind condition in the Port Area are summarized below.

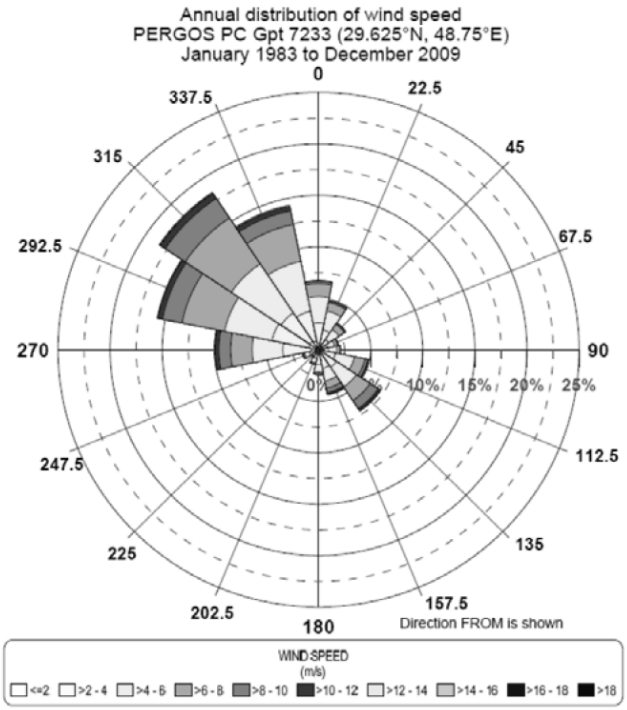
- Throughout the year, winds are predominantly from northwest.
- Winds of the Port Area are limited to from southeast and northwest direction.
- The predominantly winds from northwest are known as “Shamal”. Winds from southeast are known as “Kaus”.
- Shamal occurs more frequently in winter than in summer season.
- On average, wind force at Al Basrah station is force 4. It can be converted into 10 minutes average wind speed of 5.5 - 7.9 m/s. Wind becomes strong in the afternoon and wind force of force 5- 6 (average wind speed 8.8m/s – 13.9 m/s) is recorded more frequently.
- The winds of more than Force 8 (average wind speed 17.5m/s – 20.6 m/s) is observed.



Source: Admiralty Sailing Directions - Persian Gulf Pilot –NP 63 / United Kingdom Hydrographic Office

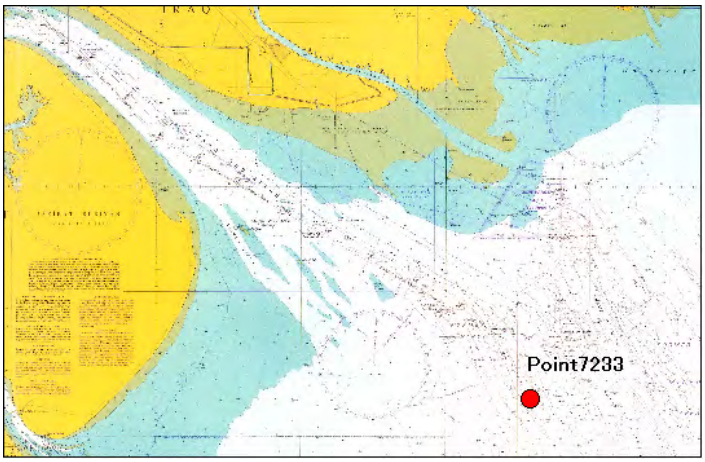
Figure 2.2-5 Wind Rose (Al Basrah)

Data of offshore wind in Arabian gulf is described in "Engineering Consultancy Service for New Al Faw Port Master Plan, Consortium IECAF" report. According to the wind rose at the offshore station shown in Figure 2.2-6, offshore wind are predominantly from northwest throughout the year. The mean monthly wind speed is 8 m/s and the maximum wind speed is 15m/s-18 m/s.



Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

Figure 2.2-6 Wind Rose (Offshore)



Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

Figure 2.2-7 Location of Offshore Station

2.2.3 Oceanographic Conditions

Tidal level and current at the location shown in Figure 2.2-8 are described in the Chart. Tidal level and current in the Port Area are summarized below.

Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

Figure 2.2-8 Location Map for Tidal level and Current

(1) Tide

1) Tidal levels

Tidal level in the Port Area are summarized in Table 2.2-1. Tidal level varies according to the locations. Tidal level at access channel to Umm Qasr Port and Khor Al Zubayr Port are higher than at the Shatt al Arab.

Table 2.2-1 Tidal Level in the Port Area

Location		Height in meters above datum (m)			
		M.H.H.W. (Mean Higher High Water)	M.L.H.W. (Mean Lower High Water)	M.H.L.W. (Mean Higher Low Water)	M.L.L.W. (Mean Lower Low Water)
Arabian Gulf	Ras al Barshah	3.4	2.9	1.8	0.8
	Shatt al Arab outer bar	3.0	2.4	1.3	0.4
Shatt Al Arab River	Al Basrah	2.0	1.6	1.2	1.1
	Al Faw	3.0	2.4	1.4	0.7
Khawr Abdallah, Khawr Umm Qasr, and Khor Al Zubayr	Umm Qasr	4.9	4.2	1.8	0.7
	Hadd Warbah	4.0	3.4	1.7	0.6
	Umm al Aseed	4.4	3.7	1.9	0.8

Source: Chart / Hydrographic Office Defense Support Agency

In addition to the tidal level shown in Table 2.2-1, tidal levels are mentioned in the drawings of berths of Umm Qasr and Khor Al Zubayr Ports which were drawn in the 1970s and

1980s. According to these drawings, HHWL is +5.5m, LLWL is -0.5m CDL at Umm Qasr Port and HWL is +5.35m, LWL is 0.0m CDL at Khor Al Zubayr.

2) Seasonal Variations

Seasonal variation of Tidal level occures in Shatt Al Arab River. Seasonal variations from Chart are summarized in Table 2.2-2.

Table 2.2-2 Seasonal Variations of Tidal Level

Location	Season	Difference of Tidal Level
Umm Qasr Port/ Khor Al Zubayr Port	Jan.-Apr.	-0.1m
	Jul.-Sep.	+0.1m
Al Maqil Port / Ab Flus Port	Jan.-Mar.	-0.1～-0.3m
	Apr.-Aug.	+0.1～0.7m
	Sep.-Dec.	-0.3～-0.4m
Shatt al Arab outer bar	Jun.-Sep.	+0.1m
	Jan.-Apr.	-0.1m

Source: Chart / Hydrographic Office Defense Support Agency

In addition, the direction of wind affects the tidal level. Winds from southeast (Kaus) heighten the tide level by +0.6m –+ 0.9 m and wind from northwest (Shamal) lower the tide level.

(2) Current

Current direction in Arabian gulf is in northwest or southeast. Largest current speeds occurs at ebb tide. Currrent velocity in the Port Area are summarized in Table 2.2-3.

Table 2.2-3Current velocity in the Port Area

Location	Tidal Stream	
	Out Going	In Going
Umm Qasr Port/ Khor Al Zubayr Port	4 kn-6kn	-
Haad Warbah (Kuwait)	3kn	-
Al Basrah / Abu Flus Port	4kn (Feb. –Jul.) 2-4kn (Sep.-Dec.)	1-2 kn (Sep.-Dec.)
Abadan (Iran)	3-5 kn	-
Shatt al Arab outer bar	3.5 kn	1-2 kn

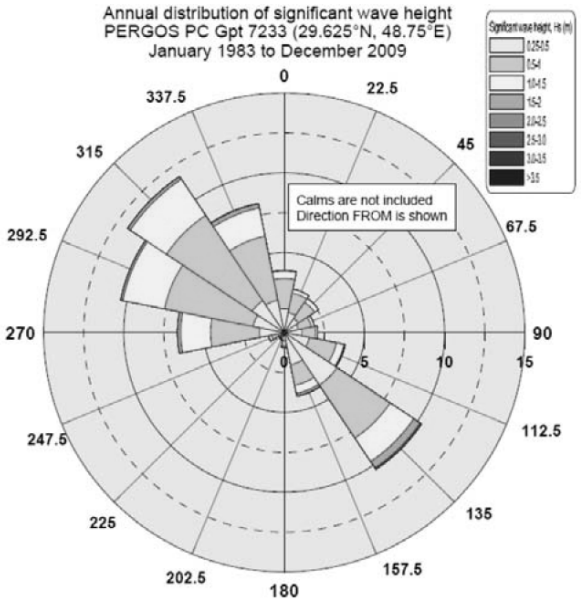
Source: Chart / Hydrographic Office Defense Support Agency

(3) Wave

Wave condition are summarized in “Engineering Consultancy Service for New Al Faw Pot Port Master Plan, Consortium IECAF” reports.

1) Principal Wave Direction

Appearance frequency of offshore wave direction and offshore wave height are shown in Figure 2.2-9. Principal wave direction are limited from the southeast or northwest same as the wind direction.



Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

Figure 2.2-9 Offshore Wave Rose

2) Wave Height

Table 2.2-4 shows the significant wave heights for each different return period. According to Table 2.2-4, significant wave height for 100 years return period is 3.7m. It is nearly equal to the significant wave height of 3.8 m mentioned in "Extreme Waves in the Arabian Gulf , S. Neelamani, K. Al-Salem, K. Rakhad" report.

Table 2.2-4 Significant Wave Heights

Tr (years)	Hs (m)	Tp (s)
1	2.3	6.2
5	2.7	6.9
10	2.9	7.4
25	3.2	8.0
50	3.5	8.5
75	3.6	8.7
100	3.7	8.9

Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

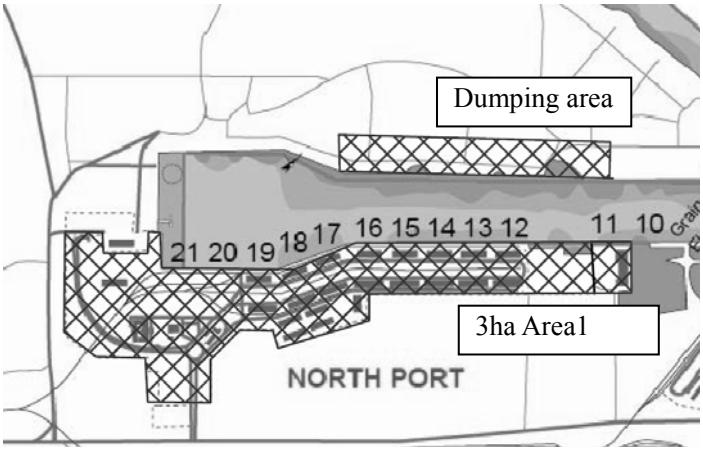
2.2.4 Topographic Conditions

(1) **Topographic Survey**

1) Umm Qasr Port, Khor Al Zubayr Port

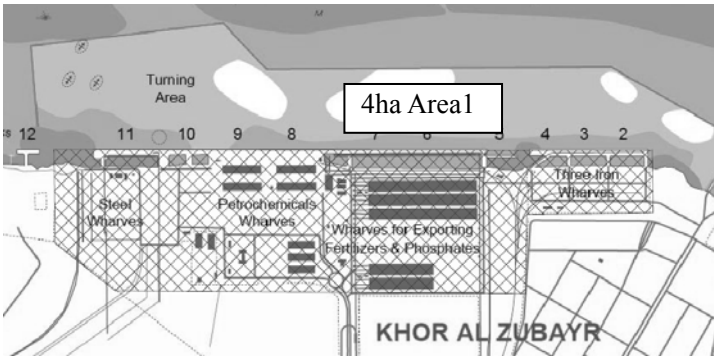
A topological survey was carried out at Umm Qasr Port and Khor Al Zubayr Port. The survey was performed by the Iraqi Port Sector Rehabilitation Project (Phase I) funded by Japan's ODA loan.

The survey areas are shown in Figure 2.2-10 and Figure 2.2-11.



Source: Topographic Survey Final Report (2009) /Port Sector Rehabilitation Project

Figure 2.2-10 Location Map of Topological Survey (Umm Qasr Port)



Source: Topographic Survey Final Report (2009) /Port Sector Rehabilitation Project

Figure 2.2-11 Location Map of Topological Survey (Khor Al Zubayr Port)

According to the result of the survey, the facility layout maps of both ports were provided. The ground at Umm Qasr Port is almost flat, and the average elevation is around 7.0 m except several points which were observed from 8.0m to 12.0m. The elevation of Barth line is around 7.0m. The topographic condition of Khor Al Zubayr is also similar. The average elevation of inside port is around 7.0m. The elevation is higher toward inland at dumping areas located on the opposite side of Umm Qasr Port Basin (River 1). The elevation is approximately 5.0m - 7.0m at the border of the basin, but inland is approximately 13m.

(2) **Bathymetric Survey**

Bathymetric surveys have been carried out in various periods and locations. JICA study team conducted data collection survey about the latest bathymetric survey. Collected data are listed in Table 2.2-5.

Table 2.2-5 Collected Bathymetric Survey Data

Implementing Agency	Location	Period
GCPI	Al Maqil Port, Abu Flus Port, Shatt Al Arab River, Umm Qasr Port, Khawr Abdallah Channel.	2011－2012
JICA	Al Maqil Port, Abu Flus Port, and Surrounding Channel	2014

Source: JICA Study Team

1) Bathymetric Survey by GCPI (2011-2012)

Bathymetric survey result were obtained from Dredging Department GCPI. Main survey area are Umm Qasr Port North and Khawr Abdallah Channel. The survey was also conducted in part of the Shatt al Arab River .

a) Umm Qasr Port

The planned water depth for the North Port is 12.5 m. According to the survey result by GCPI, depth of berth front and channel have been maintained more than 12 m. However, sedimentation at an entrance to Khawr Abdallah Channel have occurred. Bathymetry results at UQP South was not obtained.

b) Khawr Abdallah Channel

Khawr Abdallah Channel was originally designed to have a minimum width of 200 m and depth of 12.5 m. (Source: Data Collection Survey on Port Sector Development Plan in Iraq, JICA , 2012) According to the survey result by GCPI, depth of less than 11m exists at part of the section of buoy No. 22 from No. 25. Depth of 12 m is maintained at other sections.

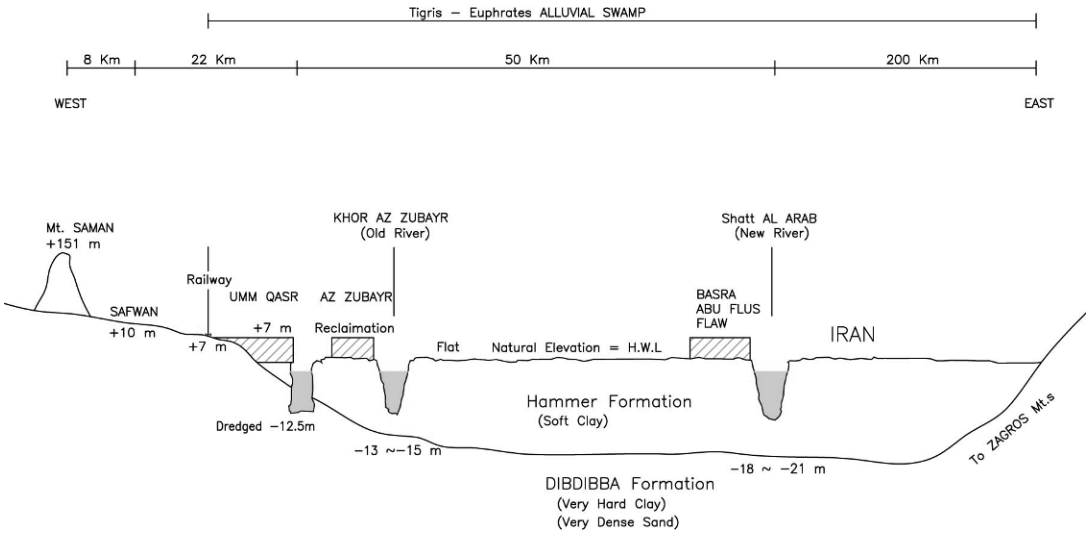
2) Bathymetric Survey by JICA (2014)

JICA study team carried out bathymetric survey at Al Maqil Port, Abu Flus Port and surrounding channel in 2014. The result of bathymetric survey is described in Section 2.7.2.

2.2.5 Geological Conditions

Port Area is located in the lower reach of the Mesopotamian basin. The geological formations were formed out of fluvial sediment which was carried by the Euphrates and Tigris rivers during the Pleistocene and Holocene ages.

Figure 2.2-12 shows the soil profile cross section of the Port Area. The Port Area originally consists of hard formation, but the hard formation has been covered by soft material transported by Euphrates and Tigris rivers. The top layer is soft material called Hammer formation. Below the hammer formation, there is hard formation called DIBDIBBA formation. Hereinafter the Hammer formation is referred to as layer A and layer B, and the DIBBDIBA formation is referred to as layer C. The Hammer formation mainly consists of layer A and intermittently by Layer B. Layer C is seen at the surface in the western of Umm Qasr Port. Layer C slopes gently down from west to east at end up under the layer A in the Port Area.



Source: GCPI

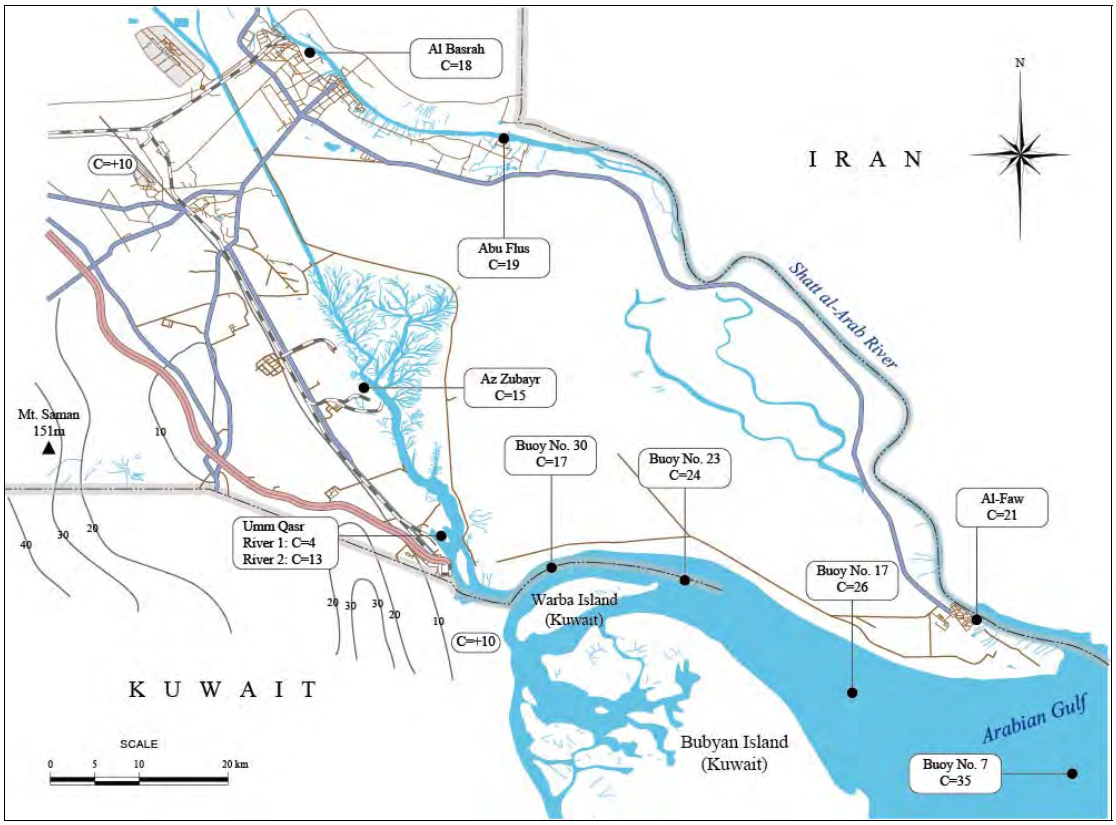
Figure 2.2-12 Cross Section of soil profile of the Port Area

Table 2.2-6 shows the features of Hammer formation and DIBDIBBA formation. Layer A consists of soft clay and silt with N values from 0 to 4. Layer B consists of sandy clay or clay with N values from 3 to 10. Layer C consists of hard clay and dense sand with N values of over 30. The elevation of layer C in the Port Area is shown in Figure 2.2-13. In Figure 2.2-13, "C=17" means that most shallow part of Layer C has appeared from -17m CDL.

Table 2.2-6 Features of Hammer Formation and DIBDIBBA Formation

Geological Features		**Soil Mechanical Features**							
Formation	Age	Stratum	Layer		Soil (Material)	Consistency Density	Color	N	Remarks
HAMMAR	Holocene	Alluvium	A		Clay	Very Soft ~ Soft	Dark Gray Brown Gray	0 ~ 4	With Silt, fine Sand and Shell fragment
	Late Pleistcene		B	B1	Sandy Clay Fine Sand	Soft Loose	Same as Layer A	3 ~ 5	With Organic Matter
				B2	Clay	Medium ~ Stiff		6 ~ 10	Include fine Sand Seams
DIBDIBBA	Miocene	Diluvium	C		Alternative Sand	Very Dense	Yellowish Brown to Brown	>30	
					Clay	Very Hard	Milky Brown to Brown		

Source: GCPI



Souce: GCPI

Figure 2.2-13 Elevation of DIBBDIBA Formation

Geological conditions at each port are summarized in the following section.

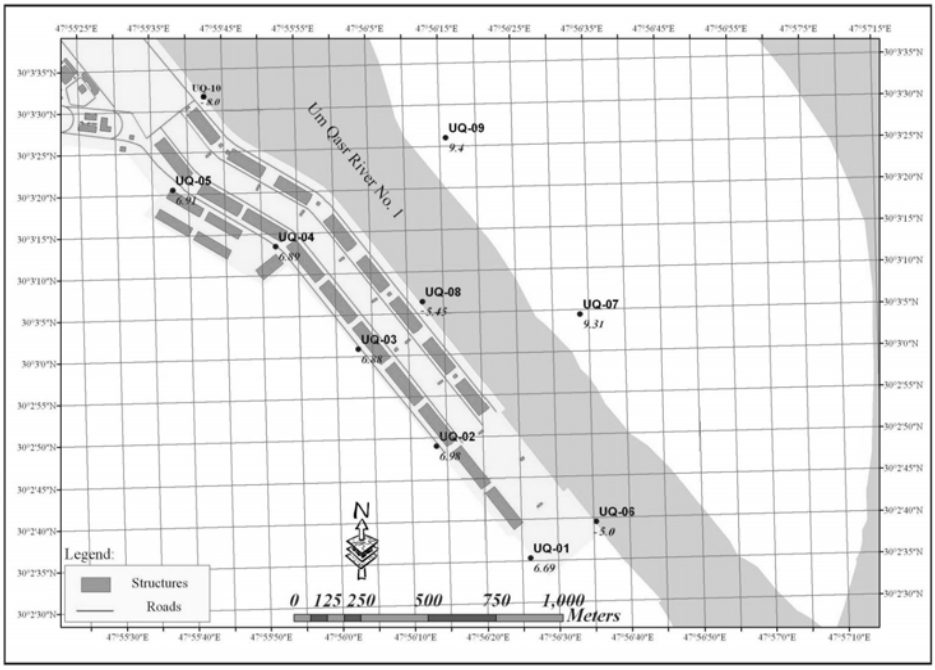
Umm Qasr Port and Khor Al Zubayr Port

Twenty boring surveys were carried out in both ports in 2009 by the Iraqi Port Sector Rehabilitation Project (Phase I). At Umm Qasr Port, the borings were performed onshore at 5 points inside the port area, 2 points at the dumping area located on the opposite side of Umm Qasr River and 3 points offshore near the berth line. At Khor Al Zubayr, the borings were performed onshore at 5 points inside the port area and 5 points offshore near the berth line.

The scope of survey is shown below.

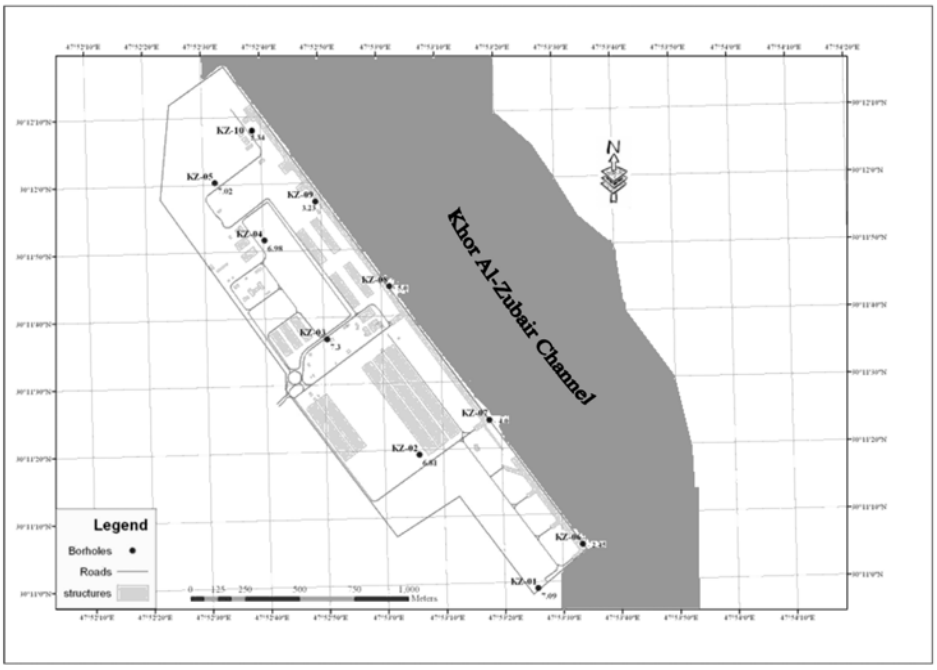
- Boring survey
- Standard penetration test (each 2 m depth)

The survey areas are shown in Figure 2.2-14 and Figure 2.2-15.



Source: Soil Investigations Survey Final Report (2009) /Port Sector Rehabilitation Project

Figure 2.2-14 Location Map of Boring Survey (Umm Qasr Port)



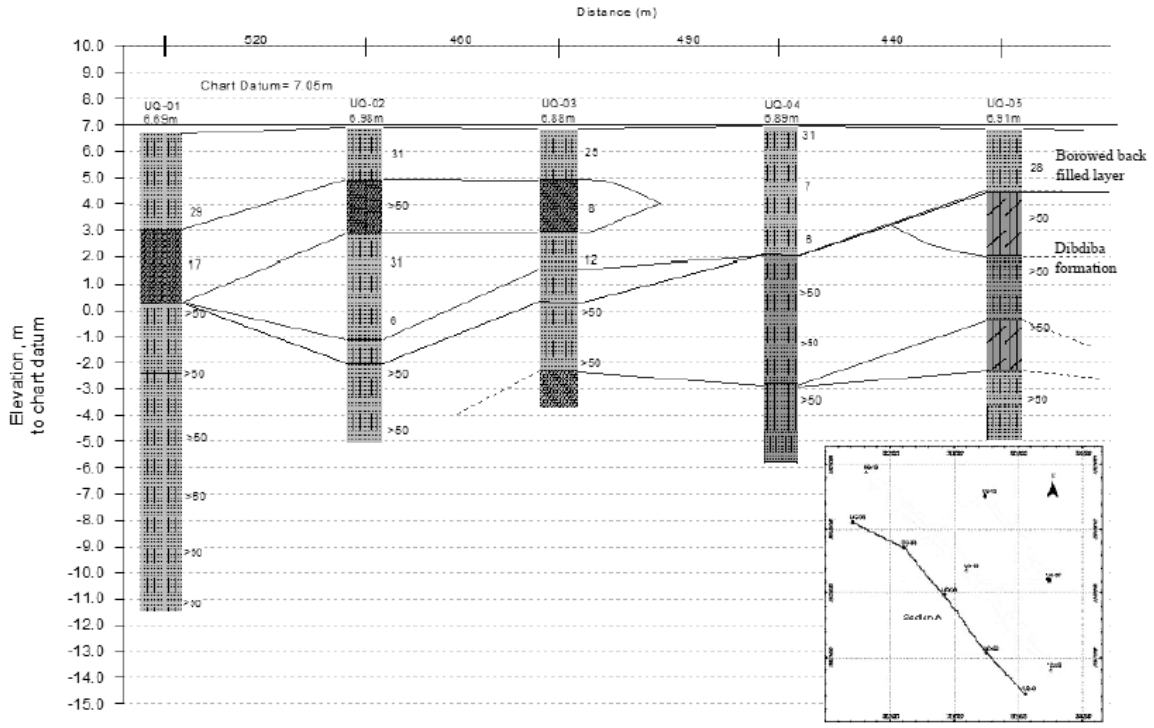
Source: Soil Investigations Survey Final Report (2009) /Port Sector Rehabilitation Project

Figure 2.2-15 Location Map of Boring Survey (Khor Al Zubayr Port)

1) Umm Qasr Port

The soil profile in Umm Qaser Port is complicated as shown in Figure 2.2-17.The first layer consists of silty sand with N-value ranging from 6 to 31. Its thickness tends to be thicker from the upstream to the downstream (from UQ5 to UQ1). Under the silty sand layer, sandy clay is deposited at UQ1- UQ3. The N-value ranges widely from 8 to 89. At UQ4, the silty sand is deposited with N-value ranging from 50 to 86. At UQ5, clayey silt and silty sand are deposited under the first layer with N-value from 56 to 80. The bearing stratum is shallowest at UQ5 with a

depth of 3m below the ground. The depth of bearing stratum becomes deeper toward downstream. At UQ1-UQ3, the layer is distributed from 7m to 9m from the ground.

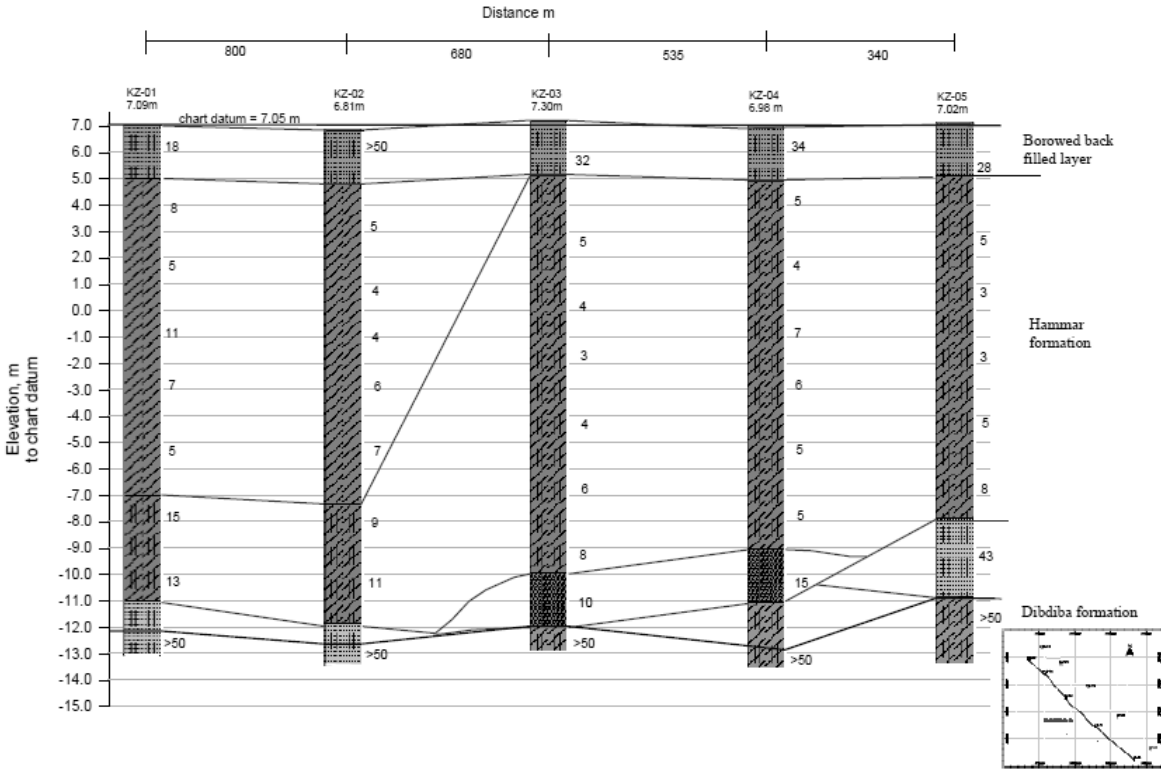


Source: Soil Investigations Survey Final Report (2009) /Port Sector Rehabilitation Project

Figure 2.2-16 Soil Profile of Umm Qasr Port (Onshore)

2) Khor Al Zubayr Port

The soil profile in Khor Al Zubayr port is shown Figure 2.2-17. The hard silty sand with N-value 18-50 lays almost horizontally to the top layer. Lower layer consists of mostly silty clay. However clay layer is confirmed at KZ01and KZ02 in the downstream areas. The bearing stratum is confirmed at a depth ranging from 18m to 19m.



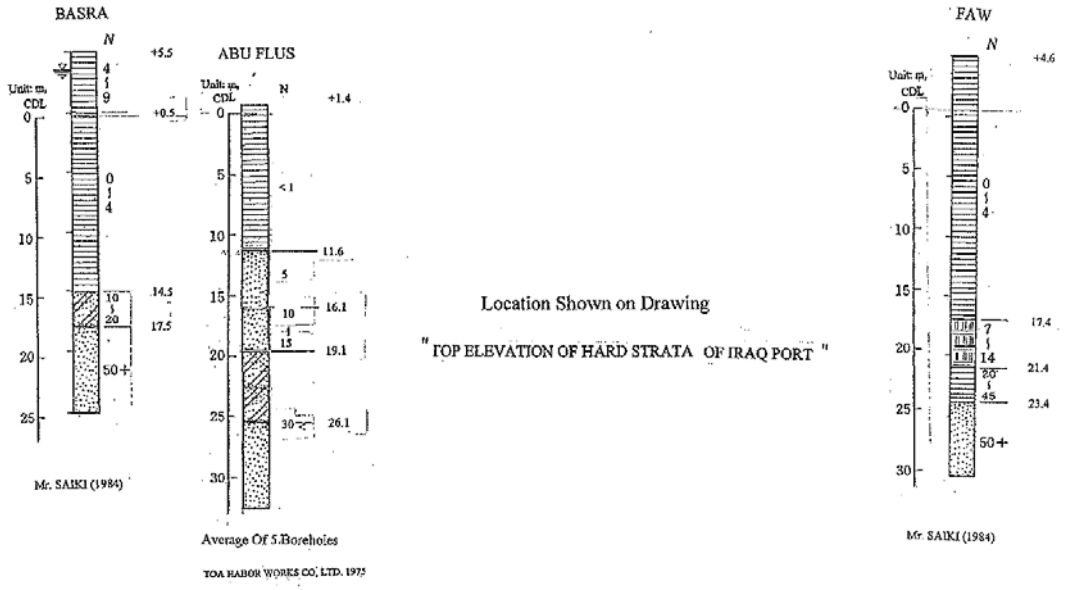
Source: Soil Investigations Survey Final Report (2009) /Port Sector Rehabilitation Project

Figure 2.2-17 Soil Profile of Khor Al Zubayr Port (Onshore)

(2) Al Maqil Port, Abu Flus Port and Al Faw Port

Boring surveys were carried out at Al Mail Port and Al Faw Port in 1984. At Al Maqil Port, Layer C has deposited from depth of 18 m with N-value of more than 50. At Al Faw Port, Layer C has deposited from depth of 21 m with N-value from 20 to 45. From depth of 25m, N-values are more than 50.

According to the results of borings surveys at Abu Flus Port carried out in 1974, Layer C has deposited from -19m CDL. The soil profile in Al Maqil Port, Abu Flus Port and Al Faw Port are shown Figure 2.2-18.



Source: TOA Harbor Works / Mr.Saiki

Figure 2.2-18 Soil Profile (Al Maqil/ Abu Flus / Faw)

(2) Al Faw Grand Port (AFGP)

Boring surveys at several locations were conducted at planned site of AFGP and its surrounding area. General cross section of planned site was made using these survey results. According to the general cross section, Layer C as a bearing stratum has disposed at a depth from 25m to 30m. Appendix 2.2-1 shows the location of soil investigation, and the general cross section of the soil profiles are shown in Appendix 2.2-2, 2.2-3 and 2.2-4.

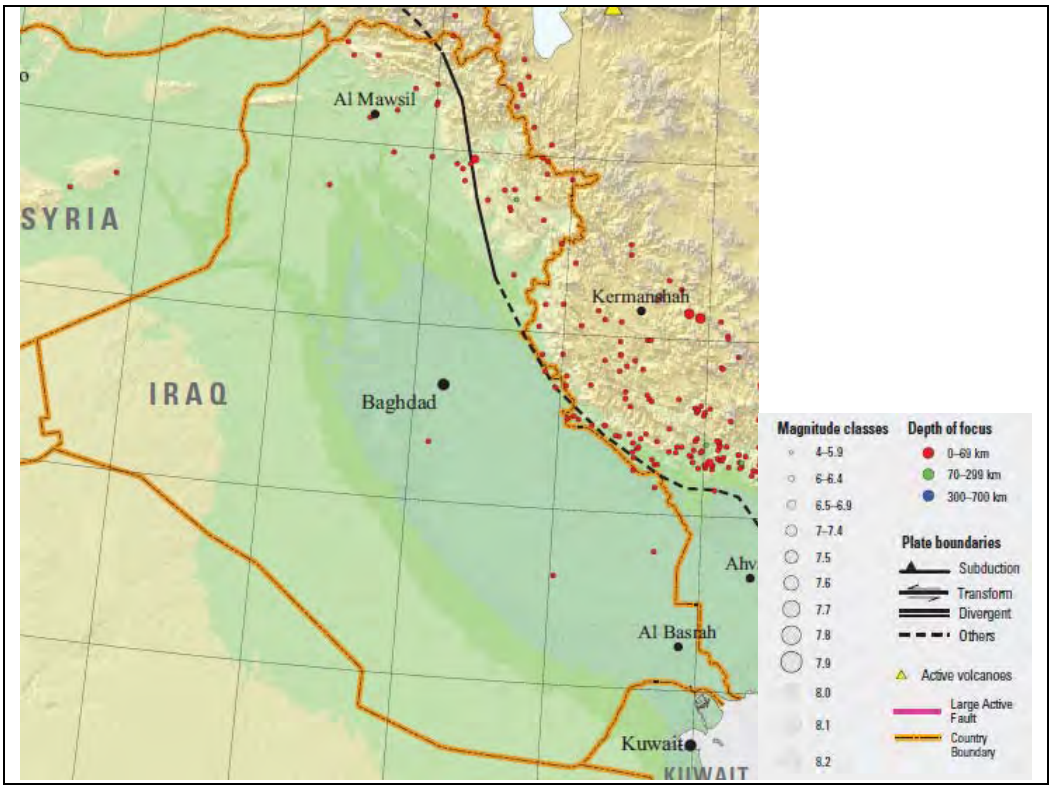
2.2.6 Natural Disasters

(1) Earthquake

Iraq is located on the Arabian Plate. Arabian Plate connects to the Eurasian Plate near the border with Iran in northwest part of Iraq. Seismic activity in Port Area is calm from the 2 reasons shown below;

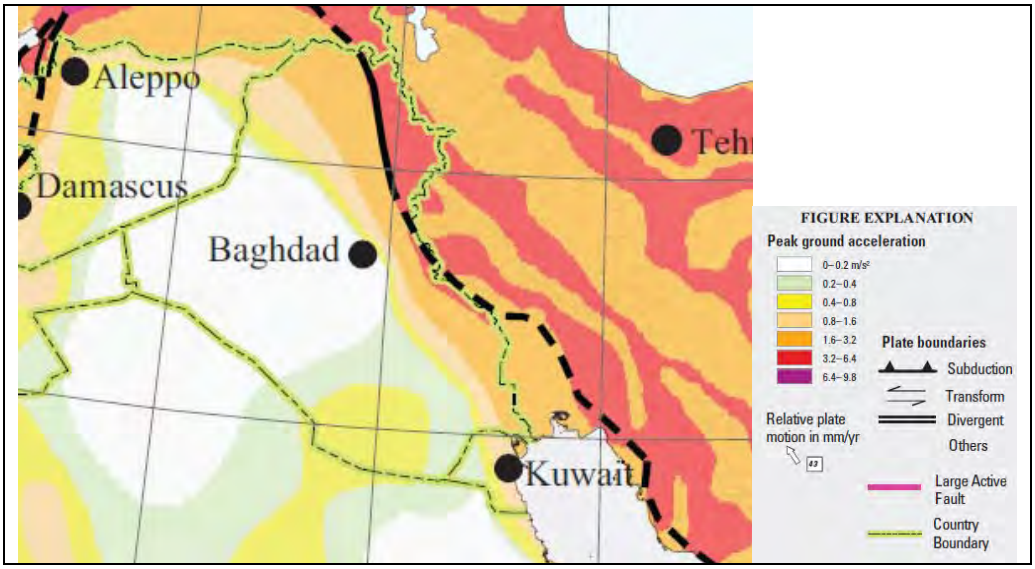
- The seismic activities are concentrated in a mountainous area of northwest part of Iraq.
- Magnitudes of recorded earthquake are less than 6.

Figure 2.2-19 shows the epicenter of earthquakes occurred between 1900 and 2010. According to the Seismic Map shown in Figure 2.2-20, Peak Ground Acceleration (PGA) in Port Area is 0.8 – 3.2 m/s^2 but another material (Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF) mentioned that PGA is 1.32 m/s^2.



Source: United States Geological Survey (USGS) Web Site

Figure 2.2-19 Seismicity Map (1900-2010)



Source: United States Geological Survey (USGS) Web Site

Figure 2.2-20 Seismic Map

2.3 Present Socioeconomic Conditions

2.3.1 Population

According to "World Population Prospects, The 2012 Revisions by United Nations", the total population in 2012 in Iraq is expected to be 32.88 million and the growth rate has been 2.68% for the last decade. The change of population in Iraq for the last decade is shown in Table 2.3-1.

Table 2.3-1 Change of the Population in Iraq for the Last Decade

(Unit: thousand)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Population	25,231	25,947	26,662	27,377	28,094	28,811	29,528	30,245	30,962	31,923	32,884

Source: World Population Prospects; The 2012 Revision by United Nations

The population by region and state is shown in Table 2.3-2, based on "Central Organization for Statistics and Information Technology (Web)".

Table 2.3-2 Population by Region and State (Year 2009)

Region	State	Area (km^2)	Population (x1000)	Ratio to Total Population (%)
North	Erbil	14,471	1,471,100	4.58
	Dahuk	6,553	968,900	3.02
	As-Sulaymaniyah	17,023	1,552,000	4.83
Central	Al Anbar	138,501	1,451,600	4.52
	At-Tamim(Kirkuk)	10,282	1,290,000	4.02
	Baghdad	734	7,180,900	22.37
	Diyala	19,076	1,370,500	4.27
	Ninawa	37,323	3,237,900	10.09
	Salah Ad-Din	24,751	1,259,300	3.92
South	Al-Basrah	19,070	2,555,500	8.00
	Al-Muthanna	51,740	719,800	2.24
	Al-Qadisiyah	8,153	1,121,800	3.49
	An-Najaf	28,824	1,180,700	3.68
	Babil	6,468	1,727,000	5.38
	Dhi Qar	12,900	1,846,800	5.75
	Karbala	5,034	1,003,500	3.13
	Maysan	16,072	1,009,600	3.14
	Wasit	17,153	1,158,000	3.61
Total		434.128	32,104,900	100.00

Source: Central Organization for Statistics and Information Technology/Central Statistical Organization IRAQ

2.3.2 Gross Domestic Product (GDP)

Table 2.3-3 shows GDP surveyed by the World Bank and International Monetary Fund (IMF). According to the World Bank data, GDP in 2012 in Iraq was about US $53 billion. And the average annual growth rates for the last decade and for the last five years were 2.12 %/year and 7.05 %/year, respectively.

Table 2.3-3 GDP and Growth Rate

	World Bank		IMF	
	GDP, Constant Price /Base Year 2005 (Million US$)	GDP Growth Rate (annual %)	GDP, Constant Price /Base Year 1988 (Billion Iraqi Dinar)	GDP Growth Rate (annual %)
2002	43,029	-7.80	-	-
2003	25,258	-41.30	26,048	-
2004	37,003	46.50	41,608	59.74
2005	36,744	-0.70	43,439	4.40
2006	37,250	1.38	47,851	10.16
2007	37,763	1.38	48,511	1.38
2008	40,259	6.61	51,717	6.61
2009	42,597	5.81	54,721	5.81
2010	45,092	5.86	57,926	5.86
2011	48,962	8.58	62,897	8.58
2012	53,089	8.43	68,198	8.43

Source: World Bank and IMF Data & Statistics

2.4 Present Situations for Trade and International Transport

2.4.1 Transportation Routes to Iraq

(1) Main Routes of the Imported Cargoes

Iraq has been historically and geographically connected with its neighboring countries through transport infrastructure. Goods have been traded and people have travelled among countries. The transport infrastructures such as roads and railways have been developed and formed network connections between Iraq and its neighboring countries.

The following three routes for transporting imported cargoes to Iraq are considered as the main routes to distribute them to corners of the entire nation:

Route 1: Mediterranean Route (Syria and Turkish Corridors)

Syria and Turkish corridors were one of main import routes to the central/northern regions. Since the Syrian civil war emerged, Turkish corridor is used for imports trough Mediterranean Route via Mersin Port.

Route 2: Red Sea Route (Aqaba Port in Jordan)

Red Sea route is used for cargo import to the northern part of Baghdad City and the central region of Iraq. Syrian corridor (Tartus or Latakia Port) was used for import to the region but not in use since the civil war emerged. Aqaba Port in Jordan is the gateway port of this route.

Route 3: Iraqi Ports Route (Umm Qasr and Kohr Al Zubayr Port)

UQP and KZP were used for cargo import to the southern and central region of Iraq. However, port facilities were severely damaged during the war, and import cargoes were transported by trucks through ports in Kuwait and Jordan. Then, as port facilities are restored in UQP and KZP in recent years, Iraqi ports route increases its share in total cargo import.

(2) Imported Cargo Volumes by Route

Figure 2.4-1 shows the transport route to Iraq in 2004 after the Iraq war in 2003. The transported cargo volumes from Jordan/Syria and Turkey were 10,000~12,000 tons/day and 6,000 tons/day respectively, while imported cargoes though the Iraqi ports were 14,000 tons/day.

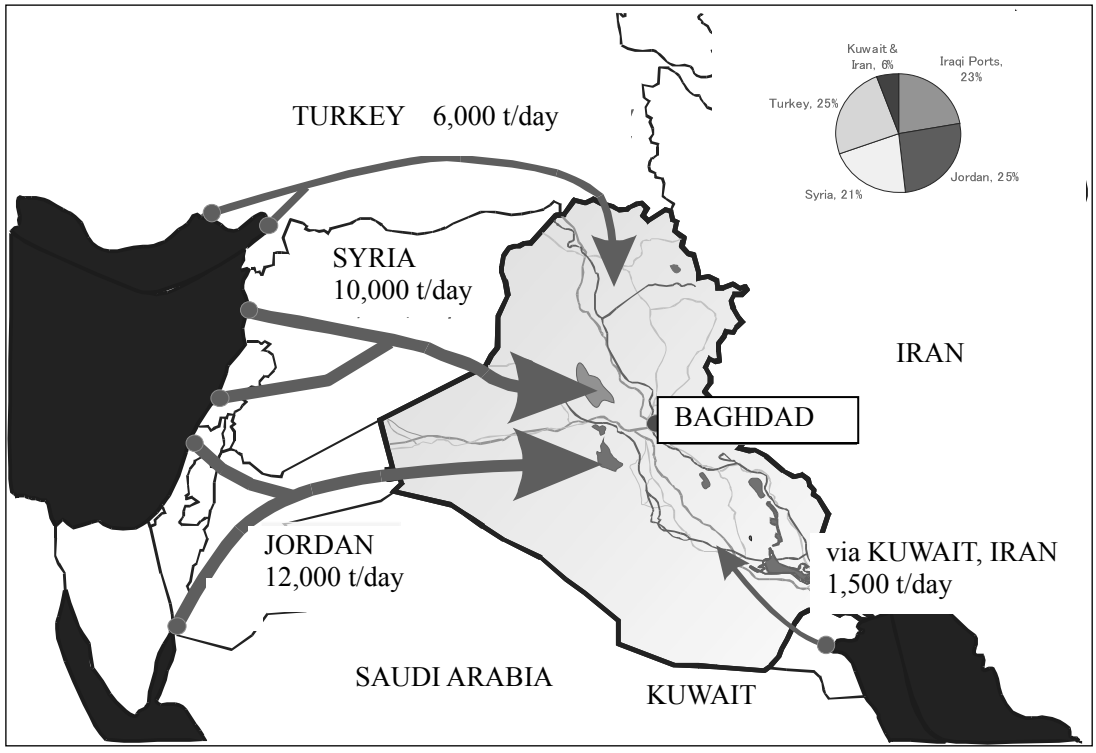
The intensification of battles in Syria and near collapse of the country's regime has had bad effects on the cargo volumes transported through the Syria route. The cargo transport from ports in Syria has been suspended and the majority of cargoes from Europe/South America to Iraq were unloaded at Mersin Port in Turkey and some cargoes at Aqaba Port in Jordan. Further it has been recorded that some cargoes which are equal to about US$10 million per month were unloaded at Haifa Port in Israel.

The interview results with shipping companies, forwarders and consultants in Jordan and Dubai are shown below:

- There are many cases where imported cargoes from Europe are unloaded at Mersin Port in Turkey instead of ports in Syria and cargoes from Asia at Umm Qasr Port in Iraq. The road conditions from Mersin Port to Iraq are quite good and the double container truck can travel without the trouble.
- Heavy cargoes for the power station, from Japan/Korea, are unloaded at the port in Kuwait and transported to Iraq by the Multi-wheel Trailer because there is no such equipment in Iraq.
- Presently there is no chance for cargoes to be transported from ports in Lebanon because of the political situation.
- Recently, truck numbers from Aqaba Port to Iraq have decreased, for example 6,000 /month in 2011, 5,000 /month in 2012 and 4,000~4,500 /month in 2013. Truck numbers from Kuwait have also decreased because the Iraq government lays a much higher toll than before so that

the use of ports in Iraq is promoted.

- There are some cargoes from the Saudi Arabian/Egyptian ports in the Red Sea to Iraq.
- There are 3,000 trucks/month from Iraq to Aqaba Port and 60% of the trucks transport container cargoes to Iraq. According to Aqaba Container Terminal (ATC), 20~30% of container cargoes unloaded at Aqaba Port are for Iraq, and recent handling volumes for Iraq have increased due to civil war in Syria.
- 15~20% of imported cargoes for Iraq were transported through ports in Syria before the civil war. The cargoes through Syria will recover after the end of the war because the relations between the Syrian and Iraqi government are quite good.



Source: Study for Development of Southern Ports in Iraq Post-Phase 1 Rehabilitation Project by GCPI

Figure 2.4-1 Transport Routes on Imported Cargoes for Iraq (2004)

Transport Routes on imported cargoes to Iraq are shown in Table 2.4-1, based on the above mentioned interview results. Figures in the table show the number of trucks and the ratio for the utilization of the routes is calculated using these figures.

Table 2.4-1 Traffic Volume of Import Routes for Iraq (2013)

(Unit: number of trucks)

	Jordan	Turkey	Iran	Kuwait	Iraqi Ports
Interview A	1,200/day	1,000~2,000/day	4,000~5,000/day	250~300/day	N.A.
Interview B	10~15 %	30~35 %	5~20 %		40~45 %
Assessment	15~20 %	30~35 %	N.A.	5 %	40~50 %

Source: Prepared by Study Team based on the interview result with shipping companies and forwarders

In the above table the transport route from Iran should be excluded from the object for assessment because it is considered that they are not cargoes through ports. According to the above table, it is estimated that the volume of cargoes from Turkey has not changed whereas those from Jordan has decreased. Further the imported cargoes through ports in Iraq account for a half of the total imported cargoes to Iraq.

Imported cargoes from Kuwait are being transported by trucks through the Kuwaiti border. According to the records of NAFITH, the total number of trucks from Kuwait was 194,156 in 2010

and 128,400 in 2011. The average number of trucks per day was 532 in 2010 and 352 in 2011. The reason why the number in 2011 was less than that in 2010 was due to the Iraqi government announcement of the sudden change of law in June 2011. For example a price hike of the toll at the border gate up to US $100/truck and quantitative restrictions on the trucks per day, only up to 60 (2,000 per day before) at the gate. After the fall in truck transporting to Iraq, the number of trucks recovered to 200 per day in October 2011.

(3) Red Sea Route

Table 2.4-2 shows container volumes transported from Jordan/Turkey and handled at ports in Iraq. The number of containers from Aqaba Port in Jordan to Iraq from 2009 to 2013 was referred to the transport survey data on trucks by NAFITH. NAFITH developed, and is presently operating, the truck control system (TCS) in Aqaba Port which consists of a regulatory framework, physical infrastructure, and IT systems to manage the movement of commercial trucks entering the Aqaba Special Economic Zone, and to provide a platform for coordinating such activities between freight agents, trucking companies, and truck drivers in a deregulated environment.

Table 2.4-2 Containers Transported from Jordan/Turkey and Handled at Ports in Iraq

Via	Unit	2004	2009	2010	2011	2012	2013
Jordan	Box	40,000	51,525	39,046	54,567	62,361	41,112
	%	35	24	16	21	21	13
Turkey	Box	57,000	71,168	74,399	77,777	87,695	96,558
	%	49	33	30	30	30	30
Ports in Iraq	Box	18,000	90,525	133,508	124,934	142,260	184,190
	%	16	43	54	49	49	57

Source: NAFITH and GCPI, (Row of Turkey 2011-2013 is estimated by JICA Study Team)

As the data on container cargoes via Turkey have not been obtained, it is assumed that its share in 2012 and 2013 would be 30%, similar to the figure in 2011. The above table indicates that the proportion of container cargo volume handled at ports compared to the total imported container volume in Iraq has increased from 16 % in 2004 to nearly 60% in 2013, while the proportion of container cargo volume from Jordan and Turkey has dropped sharply, from 35% in 2004 to 13% in 2013, and from 49% in 2004 to 30% in 2013, respectively.

Table 2.4-3 shows the average number of trucks per month by cargo type from Aqaba Port in Iraq between 2006 and 2011. It should be noted that the number of trucks shown in the table is only those registered in Iraq, and does not represent the total number of trucks transporting cargoes to Iraq.

Table 2.4-3 Average Truck number per Month from Aqaba Port to Iraq

(Unit: nos./month)

Cargo Type	2006	2007	2008	2009	2010	2011
Container Cargo	679	468	369	386	649	884
General Cargo	504	414	456	465	555	698
Others	340	506	615	820	1,269	1,492
Total	1,523	1,388	1,441	1,671	2,473	3,073

Source: “Data Collection Survey on Port Sector Development Plan in Iraq June 2012” by JICA

According to Table 2.4-3 the total number of trucks from Aqaba Port to Iraq increased sharply in 2011, and it was the highest at 3,073 trucks. The growth rate of containers and general cargoes are 5.4 % and 6.7 % per year, respectively. These rates are quite low compared to the growth rate of the total number of trucks which shows 15.1 % per year.

Considering the growth rate of container handling volumes at ports in Iraq, which was more than 35 % per year from 2006 to 2010, it is quite clear that the proportion of handling volume to the total import/export volume at ports in Iraq has grown remarkably, especially for container cargoes.

Transit container cargoes in Aqaba Port are shown in Table 2.4-4, based on the port statistics in Aqaba Port. The container volumes change within range between -5 % and -15 % compared to the NAFITH data shown in Table 2.4-2, on the assumption that all the container cargoes would be transported to Iraq.

Table 2.4-4 Transit Container Cargoes via Aqaba Port

	2009	2010	2011	2012
Container Cargo (Box)	47,966	33,753	54,005	57,939

Source: Port statistics of Aqaba Port

Further, the trend for the transit general cargo via Aqaba Port is shown in Table 2.4-5, based on the port statistics in Aqaba Port.

Table 2.4-5 Transit General Cargoes via Aqaba Port (Unit: ton)

Country	2010 (Jan~Oct)	2011 (Jan~Sep)	2012 (Jan~Dec)	2013 (Jan~Aug)
Iraq	88,619	99,882	198,124	124,414
Syria	46,769	25,079	23,208	19,659
Saudi Arabia	115,649	116,674	161,277	112,420
Lebanon	1,682	1,603	2,829	1,439
Kuwait	10,504	17,294	23,123	12,057
Yemen	273	0	0	0
UAE	3,054	4,883	7,200	7,603
Palestine	0	0	0	0
Israel	738	206	0	0
Others	232,116	205,695	257,843	180,765
Total	499,404	471,316	673,604	458,357

Source: Port statistics of Aqaba Port

According to Table 2.4-5, most general transit cargoes at Aqaba Port are transported to Iraq and Saudi Arabia, followed by Syria and Kuwait. As there are some data with a shorter period for collection, these data are converted into the data with one year for collection and shown in Table 2.4-5 because it is difficult to get hold of the trend data on the imported cargoes for Iraq.

Table 2.4-6 Converted Volumes for Transit General Cargoes via Aqaba Port and Share

	2010	2011	2012	2013
Cargo for Iraq (ton)	106,343	133,176	198,124	186,621
Share (%)	17.7	21.2	29.4	27.1

Source: Prepared by Study Team based on port statistics in Aqaba Port

According to Table 2.4-6, the general transit cargoes for Iraq has increased for the last four years and reached 200,000 tons in 2012. Further the proportion of the general transit cargoes for Iraq to the total general transit cargoes in Aqaba Port has increased, and reached nearly 30 % in 2012. The general transit cargoes for Iraq have increased with a growth rate of 80 % for the last four years, while the total general transit cargoes in Aqaba Port have increased with a growth rate of 15 % for the same period. It is noted that the general cargoes from Aqaba Port to Iraq have increased remarkably compared to the container cargoes.

2.4.2 Liner Services to Iraqi Ports

The liner service to Iraq is on the feeder service method. All the import containers are landed from the mother ships at one of the UAE ports, Jebel Ali or Khor Fakkan, and on-carried to Umm Qasr Port. (As an exceptional case, from December 2013, a Sharjah based company started container services from Sharjah/Jebel Ali to Abu Flus, using a gearless general cargo ship of 3,500 dwt.) The throughput was 283,236TEU for discharge of laden containers and almost the same number of returned empty containers.

Nine (9) carriers, namely, Maersk, CMA CGM, MSC, APL, Evergreen, Yang Ming, UASC, SIMATECH, MAG are providing dedicated feeder services for their own mother ships on a weekly basis. The service routes as of December 2013 are shown below.

Table 2.4-7 Liner Services to Iraqi Ports

Operators	Schedule
Maersk	Jebel Ali-Umm Saieed-Umm Qasr-Jebel Ali
CMA CGM	Khor Fakkan-Umm Qasr-Jebel Ali
MSC	Jebel Ali-Umm Qasr-Jebel Ali
APL	Jebel Ali-Doha-Umm Qasr-Bahrain-Jebel Ali
UASC	Jebel Ali-Umm Qasr-Jebel Ali
Yang Ming	Jebel Ali-Umm Qasr-Jebel Ali
Evergreen	Jebel Ali-Umm Qasr-Jebel Ali
SIMATECH	Jebel Ali-Umm Qasr-Jebel Ali
Mag Container Lines	Sharjah(Khalid)-Jebel Ali-Abu Flus-Sharjah(Khalid)

Source: JICA Study Team based on Umm Qasr Port operation report of 2012- 2013 and homepages of respective operators

The size of feeder ships are various. MSC deploys the largest 1700-2700TEU type, Evergreen, Yang Ming, CMA CGM 1600-1700TEU type, SIMATECH 1200-1700TEU type and Maersk, UASC uses the smallest 800TEU type. APL runs around the Gulf with 1500TEU type ships in the rotation of Shuwayk/Jebel Ali/Umm Qasr/Jebel Ali/Sharjah/Doha/Jebel Ali/Sharjah/Jebel Ali. Similarly, MSC operates the ships in the rotation of Jebel Ali/ Bandar Abbas/ Muscat/ Bandar Abbas/ Sharjah/ Fujaira/ Sharjah/ Jebel Ali/ Umm Qasr/ Jebel Ali.

UQP received 80 ship calls per month in 2012. The breakdown is 33 containerships, 3 panamax bulkers for wheat, 20 GC vessels and 3 bulkers for rice in bags. Cargo size was 52,500 metric tons for wheat, 680 TEUs for containers, 26,000 tons for cement in bags, 30,000 tons for rice and sugar and 40,000 tons for steel.

KZP is mainly used as the port for oil product carriers. The port handled 36 ships per month in 2012. The breakdown is 18 ships are product tankers, 8 for cement carriage and 10 for general cargo. The cargo size is 18,000 metric tons for the product tanker, 1,000-20,000 metric tons for bagged cement, others are small lots of sugar in bags, steel and general merchandise. Some numbers of dhow ships were listed in the record, however, they were excluded.

2.4.3 Shipping Network around the Gulf

As at the end of June, 2013, twenty one (21) loops out of 140 global major loops are calling at UAE and on-carrying to Gulf ports by feeders. Thirteen (13) loops are on their way from the West to Asia; from Europe/Mediterranean/East Coast of USA. Eight (8) loops are directly from Asia, but not on their way to Europe.

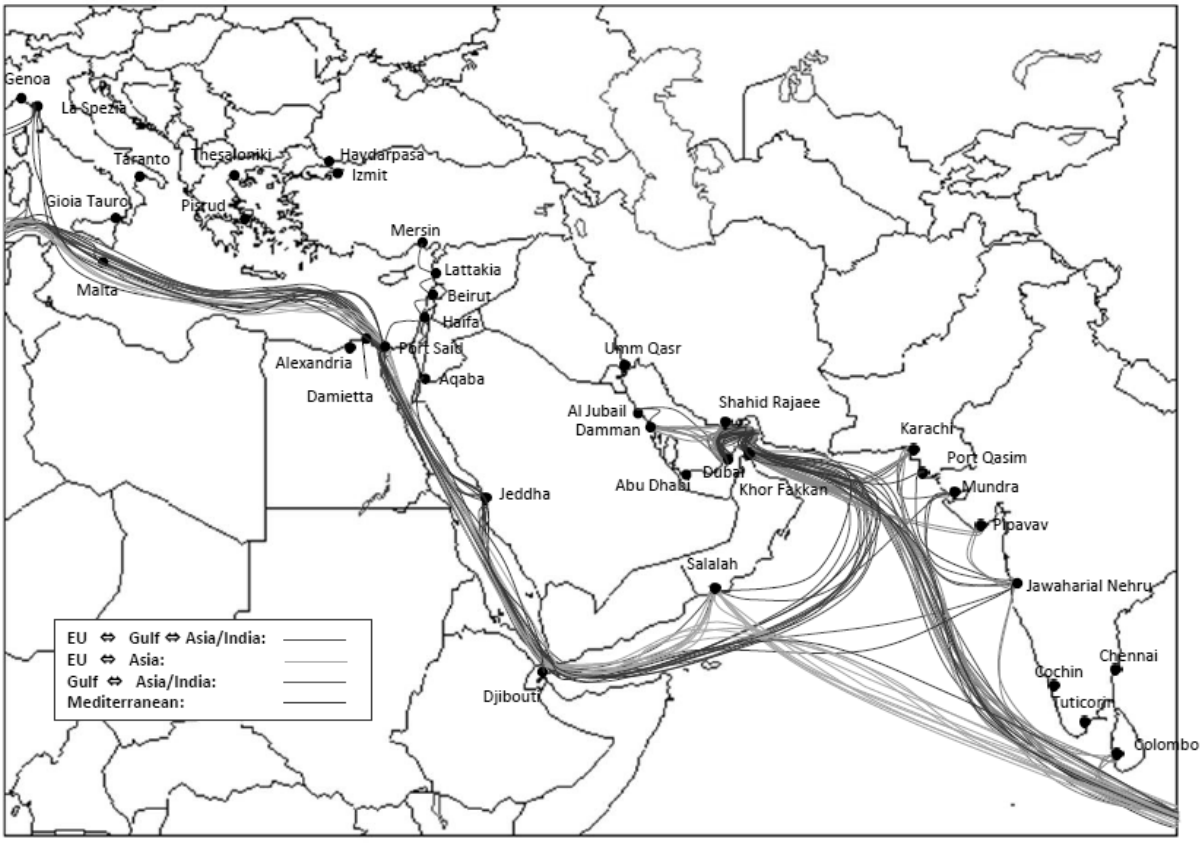
UAE is the primary destination from Asia. Two (2) loops out of eight (8) loops are by UASC using 13500TEU type and 7000TEU type respectively, with loading ports from Korea, China, Malaysia. 2 (two) loops by PIL using 4500TEU type, one (1) loop by RCL using 10000TEU type, one (1) loop by CSCL/UASC using 7250TEU type and 1(one) loop by CSAV using 2800TEU type having the similar rotation to UASC. Grand Alliance/Hanjin group using 6550TEU type is starts the voyage from the West Coast of USA, then, Asia, Dubai, Dammam and Bahrain.

The voyage origin is; 4 loops from US East Coast/Mediterranean, 5 loops from Northern Europe, 5 loops from Mediterranean/Black Sea, 5 loops from Asia and 1 loop from US West Coast.

Fourteen (14) loops of eastbound from the west call at UAE while they do not call on their return. There is abundant cargo from Asia to Europe, while insufficient cargo from Europe to Asia. Therefore, the carriers pay calls to UAE for their profitability. If cargo from Europe increased to

fill up their containerships, they would skip UAE. Primary container inflow to the Gulf in 2012 is estimated to reach 8 million TEUs. Consumer goods, intermediate goods and capital goods are in the containers.

Service providers are, as per the following table, 6 loops by Maersk, 3 loops by UASC, 2 loops by G6, 2 loops by CMA CGM, 2 loops by PIL, 1 loop each by GA/Hanjin, Hanjin/UASC, CSCL/UASC, CSAV, RCL and MSC. (21 loops in total) Apparently and naturally, UASC seemingly has the biggest interest in this area. The following Figure 2.4-2 and Table 2.4-8 is the image of major container loops which are calling at hub ports in UAE/Oman, and the list of service providers to UAE hub ports.



Source: JICA Study Team based on Containerization International 2012

Figure 2.4-2 Major container loops which call at the hub ports in UAE and Oman

Table 2.4-8 Major Liner Services calling at UAE Hub Ports

(as of December 2013)

Group of Service Providers	Average Ship Size in TEUs	Service Routes
GA/Hanjin	6550	US West Coast/Busan/China/Singapore/**UAE**/Bahrain/Saudi Arabia/Malaysia/Singapore/Thailand/China/US West Coast
G6	6650	US East Coast/Italy/Egypt/**UAE**/Singapore/Colombo/Singapore/Thailand/ Singapore/Colombo/Egypt/Italy/Canada East Coast/US East Coast
G6	8850	Hamburg/Rotterdam/**UAE**/Singapore/China/Kaohsiung/China/Hong Kong/ Singapore/Colombo/UK/Antwerp/Hamburg
MSC	14000	Gioia Tauro/Valencia/La Spezia/FOS/Barcelona/Gioia Tauro/Jeddah/Salalah/ **Jebel Ali**/Singapore/Hong Kong/China/Busan/China/Singapore/Gioia Tauro
CMA CGM/MSC	13400	Felixstowe/Rotterdam/Zeebrugge/Antwerp/Gioia Tauro/**UAE**/Singapore/ Hong Kong/China/Busan/Kwangyang/China/Singapore/Port Klang/UK
CMA CGM/MSC/UASC	14000	UK/Northern Europe/Malta/**UAE**/Port Klang/Hong Kong/China/Port Klang/ Tangier/Northern Europe/UK
CSCL/UASC	7250	China/Port Klang/Port Said/La Spezia/Genoa/FOS/Barcelona/Valencia/ Port Said/Jeddah/**Khor Fakkan**/Port Klang/China
Maersk	8400	UK/Bremerhaven/Gothenburg/Rotterdam/Salalah/**UAE**/China/ Tanjung Pelepas/Colombo/UK
Maersk	6200	Felixstowe/Antwerp/Bremerhaven/Rotterdam/Aqaba/Jeddah/**Jebel Ali**/Jawaharlal Nehru/Mundra/Salalah/Jeddah/Algeciras/Felixstowe
Maersk	5600	Algeciras/Valencia/Barcelona/Genoa/Port Said/Jeddah/Salalah/ UAE/Damman/Jubail/**UAE**/Jeddah/Port Said/Tangier/Algeciras
Maersk	3600	Novorossisk/Ambarli/Izmit/Izmir/Mersin/Jeddah/**Jebel Ali**/Pipavav/ Hazira/Jawaharlal Nehru/**Jebel Ali**/Salalah/Port Said/Turkey/Novorossisk
Maersk	6500	Savannah/Charleston/Norfolk/Newark/Algeciras/**Jebel Ali**/Port Qasim/ Pipavav/Jawaharlal Nehru/Salalah/Algeciras/Newark/Charleston/Savannah
Maersk	4600	Houston/Miami/Algeciras/Port Said/Djibouti/**Jebel Ali**/Colombo/Salalah/ Jeddah/Aqaba/Port Said/Algeciras/Newark/Savannah/Houston
Hanjin/UASC	3960	New York/Norfolk/Savannah/Spain/FOS/Genoa/La Spezia/Port Said/ Jeddah/**UAE**/Port Qasim/Nhava Sheva/Jeddah/Port Said/Med Ports/USA
UASC	13500	Busan/China/Port Klang/**UAE**/Port Klang/China/Busan
UASC	7000	Busan/Kwangyang/China/Singapore/Port Klang/**UAE**/Singapore/China/ Korea
UASC	4250	Turkey/Port Said/Yanbu/Jeddah/Sohar/**Khor Fakkan**/Mina Qaboos/Karachi/ Hazira/Mundra/Khalifa Bin Salman/Jubaill/UAE/Jeddah/Yanbu/P.Said/
CSAV/Norasia	2800	China/Port Klang/**Jebel Ali**/Dammam/Bandar Abbas/Port Klang
PIL	4500	China/Singapore/Port Klang/**Jebel Ali**/Karachi/Mundra/Port Klang/ Singapore/Taiwan/China
PIL	4500	China/Port Klang/**Jebel Ali**/Dammam/Port Klang/Singapore/Taiwan/China
RCL	10000	China/Singapore/**Jebel Ali**/Dammam/Port Klang/China

Source: Prepared and updated by JICA Study Team based on MDS data, DPW data of ships' call in 2012

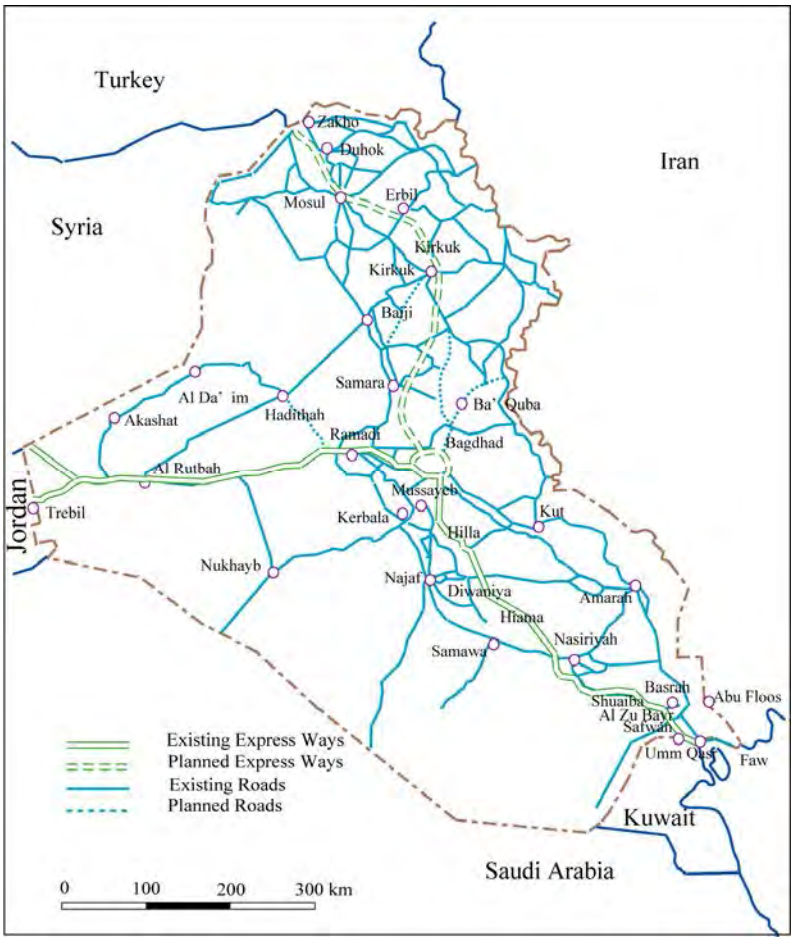
2.5 Current Situation of Transportation System in Iraq

"National Development Plan (NDP) 2013-2017" by Ministry of Planning is referred for the present situations of the transport sector in Iraq.

2.5.1 Road

(1) Present Situations

The back bone highway system of Iraq consists of the Freeway (border of Jordan via Baghdad to Basrah) and 12 routes of artery highways as shown in Figure 2.5-1. In the figure a planned route of a new express way from Basrah to Zakhu, which is on the Turkish border, is also indicated.



Source: Prepared by Study Team on the basis of the presentation material of "Iraq Infrastructure 2013" GCPI

Figure 2.5-1 Highway network of Iraq

The Ministry of Construction and Housing (MOCH) is a key agency for restoration, rehabilitation, and development of the road infrastructure along with the General Authority for Roads and Bridges in MOCH. The total length of the external road network (outside the borders of Baghdad's municipalities and mayoralty) is around 48,941 km, as follows:

Table 2.5-1 Road Network in Iraq

Category	Distance (km)
Expressways	1,084
Arterial roads	11,254
Rural roads	10,357
Border roads	11,000
Secondary roads	15,246

Source: NDP 2013-2017 by Ministry of Planning

With regard to bridges, there are 1,260 concrete and iron bridges and 52 floating bridges spread throughout all of the country's governorates. However, this network does not meet the country's need, especially for rural roads which are one of the pillars necessary for rural community development. According to international standards, for each 100inhabitants per km2 of population density, 1 km/km2 of roads are required. Road density in Iraq is around 0.19 km/km2 and is required to reach 0.75 km/km2, that is, the road network should be around 240,000 km, given that the population density in Iraq according to 2011 estimates is 79.5 inhabitants per km2. If the unpopulated desert area is excluded, the need for new roads is about 20,000 km, according to the standard mentioned.

Before 2003, Iraqi external road network was of relatively good quality in terms of efficiency and absorptive capacity but during the events of 2003 and afterwards it was exposed to great deterioration. Most of its sections were destroyed and damaged as a result of military operations and sabotage, and little and scarce emergency and periodic maintenance work. That led to a decrease in the level of road network efficiency to very low levels and a decrease in absorptive capacity. Aside from this, most of the traffic signs and the directional and warning signs on the international roads and expressways were damaged or lost, and hence repairing the current road network is one of the plan priorities in the area of road and bridge activity.

The subjects on restoration and rehabilitation for the present road network are as follows:

- Complete the remaining parts of the highways that were previously built, and finish linking these roads to the urban centers that have not yet been linked.
- Build highways, particularly Highway 2, to link urban centers, and finish linking Iraq with other neighboring countries that have not yet been linked by highways.
- Continue construction of secondary corridors for single arterial and main highways, especially those that have reached maximum carrying capacity.
- Expand construction of transverse roads between governorates, which greatly reduce transit time.
- Expand construction of ring roads, which help reduce traffic jams within cities and limit traffic penetration in urban centers.
- Continue implementation of the remaining stages of plans to replace floating bridges with fixed bridges.
- Continue to eliminate railroad crossings.
- Furnish external roads with indication signs, guide signs and warning signs.
- Protect the land road network from excessive loads by building vehicle weigh stations to save the road network from the impact of vehicle weights and axial loads that exceed the allowed limits.
- Continue programs to build rural roads, intensify these programs to cover the largeest possible percentage of rural villages and agricultural projects, in order to link agricultural production sites to markets.
- Guide investment in keeping with the importance of road and bridge activity and its social and economic role.
- Develop rail freight transportation in order to reduce road freight transportation.
- Pass new legislation or amend existing legislation to impose fees at certain rates for the use of main and arterial roads and bridges, in order to provide adequate amounts for periodic and sustainable maintenance of roads and bridges.

- Improve the performance of quality control activity on roads and bridges during execution of road and bridge projects by providing the necessary laboratories sufficient to conduct laboratory tests of road and bridge works, control vehicle loads and axial weights for existing road and bridge projects by setting up scales to control freight and axial loads of freight vehicles.

(2) Immediate Development Plan

According to `NDP 2013-2017", following targets on the new road construction will be aimed at for the development plans up to Year 2017.

Table 2.5-2 Development Plan for Road from 2013 to 2017

Year	2012	2013	2014	2015	2016	2017	Total
Highways (km)							800
Arterial Roads (km)	75	93	146	291	161	175	941
Main Roads (km)	485	807	775	541	788	1,108	4,504
Secondary Roads (km)	115	246	104	273	225	185	1,148
Concrete Bridge (no.)	8	25	20	16	11	13	93
Overpasses (no.)	-	8	6	7	4	4	29
Steel Bridges (no.)	-	-	-	-	-	2	2

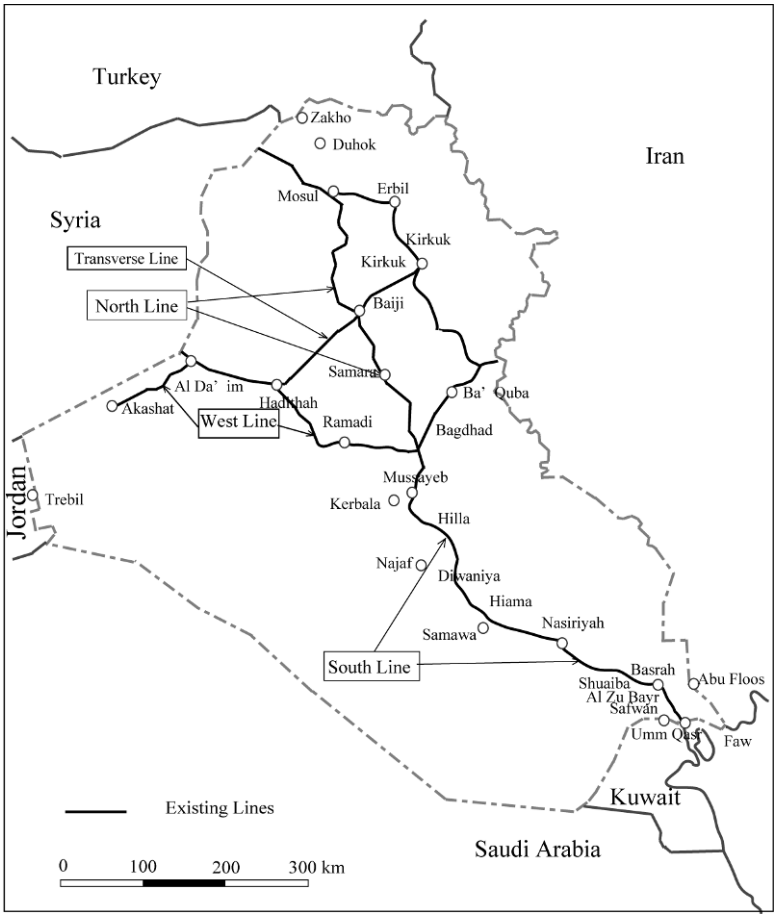
Source: NDP 2013-2017 by Ministry of Planning

2.5.2 Railway

(1) Present Situations

The Iraqi Railway Company (IRC), which is responsible for planning, managing and operating railway services in Iraq, was established in 1998 as an independent entity under the Ministry of Transport (MOT).

The railway system in Iraq consists of four lines, i.e., North Line, South Line, West Line and Transverse Line (see Figure 2.5-2).



Source: Prepared by Study Team based on the presentation at "Iraq Infrastructure 2013", IRC

Figure 2.5-2 Railway network of Iraq

Railways of Iraq are operated by IRC. The routes of the lines are as follows:

- North Line: Baghdad-Baiji-Mosul-Rabia'a (Syrian border),
- South Line: Baghdad-Hilla-Diwaniya-Samawah-Nasiryah-Basrah-Umm Qasr,
- West Line: Baghdad-Ramadi-Haqlaniya-Qaim-Akashat, and
- Transverse Line: Haditha on West Line) – via Biji on North Line – Kirkuk.

The characteristic features of the lines are listed in Table 2.5-3.

Table 2.5-3 Characteristic features of Iraqi railways

Line	Constructed	Length	Speed	Rail	Track	Axil Load	Stations	Bridges
North Line	1912-1940	524 km	40-70 km/h	BS 90 / UIC 60	Jointed	18-20 ton	27	59
South Line	1967	610 km	70-80 km/h	R 43 / UIC 60	Jointed	20 tons	44	34
West Line	1978-1987	520 km	140-250 km/h	UIC 60	Continuous welding	25 tons	25	54
Transverse line	1982-1987	252 km	140-250 km/h	UIC 60	Continuous welding	25 tons	14	27

Source: Prepared by Study Team based on the presentation at "Iraq Infrastructure 2013", IRC

The North and the South Lines are currently under rehabilitation with a total investment of US$ three (3) billion. The rehabilitation work will be completed by the end of 2014. As of September 2013, the rate of progress of the rehabilitation was 45%. When completed, the total length of the North and the South Lines will be 2,288 km and the design speed is 120 km/hour and the axle load will be 25 tons throughout the lines.

Table 2.5-4 Rolling stocks of IRC

Type	Units	
	Total	In service
Main line Locomotives	283	62
Shunting Locomotives	131	35
Passenger coaches	307	46
Freight wagons	9315	2490

Source: Presentation Material of "Iraq Infrastructure 2013", IRC

The operation schedule of IRC as of 2013 as shown in Table 2.5-5. The South, the North and the West Lines are operational for 24 hours a day, while the Transverse Line is only 12 hours a day between Hadithah and Baji on the North Line and the operation is suspended along the section between Baji and Kirkuk due to the destruction of a bridge.

Table 2.5-5 Operational schedule of IRC

South Line	Baghdad- Basrah - Umm Qasr	24 hrs
North Line	Baghdad - Mosul - Rabia'a	24 hrs
West Line	Baghdad - Al Qaim - Akashat	24 hrs
Transverse Line	Baji - Haditha	12 hrs per day
Transverse Line	Kirkuk - Baji	Out of service due to a danmage of Al Fat-ha Bridge

Source: Prepared by Study Team based on the presentation Material at "Iraq Infrastructure 2013, IRC

Meanwhile, the number of travelers in 2011 reached a total of 271,299 and the volume of freight transported reached 703,000 tons. Table 2.5-6 shows total Iraqi railway activity for the period 1979-2011 and notes that despite the increase in length of rail lines over the above period, rail activity went into a major decline, from millions of travelers and tons of freight annually to hundreds of thousands by 2007. Then 2011 appeared to show an increase.

Table 2.5-6 Iraqi Railway Activity

Year	Distance (km)	Passenger (thousand)	Freight (thousand tons)	Revenue (million ID)	
				Passenger	Freight
1979	1,645	3,351	6,493	2,286	20,609
1988	2,389	3,865	6,109	8,124	18,990
2002	2,272	1,248	5,227	1,131	22,687
2004	2,272	63	439	57	4,977
2007	2,272	4	165	15	1,049
2008	2,295	107	257	740	4,318
2011	2,627	271	703	1,974	9,766

Source: NDP 2013-2017

Large parts of the current rail network in Iraq were obsolete and suffered from outdated designs and malfunctioning signal and communication systems, and some lines were in bad condition. These factors caused operating speeds to drop to low levels and exposes passengers and freight to danger. Thus these lines have been rehabilitated to boost performance, increase operating speeds and improve their specifications. Work is also underway to convert single-track lines to double track lines in order to increase capacity and provide a higher level of safety.

Work has also taken place on a new communication system for control between stations and trains by using wireless devices to link stations and trains. This system replaces the old wire system with a global positioning system (GPS) to track train movement and their locations.

Most working rail lines operate on the standard system, and the lines currently operating are Baghdad-Samarra/Mosul Rabia and Baghdad-Falluja. It is hoped that the other remaining parts of the above lines will come into operation gradually as they are rehabilitated and along with the improvement in the security situation. Work is ongoing to double the Baghdad-Basrah, Baghdad-

Mosul, Hammman al alil-Sabouniya, Sabouniya-Rabia, as well as to modernize and rehabilitate lines currently in place in order to boost the efficiency of these lines, increase operating speeds and improve their specifications. The subjects for improvement are as follows, regarding restoration and rehabilitation of the present railway network:

- Road transportation competes with rail transport in the areas of both travelers and freight, especially now that highways and arterial roads have been developed in Iraq.
- The rail network in Iraq is incomplete and important hubs are not covered by this very essential infrastructure.
- Large parts of the current network and cars are incomplete, and signal and communication system are inoperative.
- Operating speeds are much lower than needed to compete for traveler and freight transportation.
- Rail activity requires massive investments to build lines, provide them with signals and communications, supply trains, passenger cars and freight cars.
- The Project Department of the Iraq Railways Company has limited capabilities incommensurate with the responsibilities that have been placed on the company to implement current and future projects.

(2) Immediate Development Plan

According to NDP 2013-2017, the following targets on the new railway construction will be aimed at the development plans up to Year 2017.

Table 2.5-7 Railway Development Plan 2013－2017

Year	Railway Hub lines (km)		Main and Secondary Rail Lines (km)		Passenger (million)		Freight (million tons)	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
2012	-	1,931	-	2,915	-	1.0	-	4
2013	-	1,931	369	3,284	0.5	1.5	1	5
2014	-	1,931	200	3,484	1.0	2.5	1	6
2015	400	2,331	1,400	4,884	4.2	6.7	38	44
2016	1,000	3,331	2,400	7,284	23.0	29.7	58	102
2017	1,500	4,831	3,375	10,659	35.0	64.7	233	335

Source: NDP 2013-2017

2.5.3 Inland Waterway

The number of employees in the General Company of Maritime Transport, which is responsible for managing and operating this activity, is at 2,420. Although the General Company of Maritime Transport's work has halted along with the work of its personnel, there are still many employees, including redundant ones, who were hired after 2003, and they represent a burden on the company's budget.

There is the inland waterway of 1,015 km in length in Iraq and the Shatt al Arab River has a section of about 130 km possible for regular navigation. Vessels with a shallow draft are navigable in the Tigris and Euphrates river because the waterway has been dredged up to 3 meters in depth. And small vessels were navigable in the Shatt al Basrah waterway before closing.

In the field of river transportation, activity has almost come to a halt due to the security situation, water scarcity, lack of pumps in the rivers and need for dredging, in addition to river current obstructions such as the remains of bridges damaged in previous wars or because temporary, floating or service bridges were built. The revitalization of this activity will involve eliminating the above causes.

River terminals exist with various capacities, ranging from 30,000~500,000 tons in Baghdad, Kut, Amarah, Basrah and 14 river sluices of varying capacities.

2.5.4 Civil Aviation

Civil aviation agency consists of the General Establishment of Civil Aviation and Iraqi Airways. The activity of the General Establishment of Civil Aviation covers aircrafts all over Iraq, while the activity of Iraqi Airways covers air transportation on planes belonging to this country.

Iraq currently has six international airports (Baghdad, Mosul, Basrah, Erbil, Sulaymaniyah and Najaf) and work is currently underway to rehabilitate and modernize the airports of Baghdad, Mosul and Basrah. Summary of the airports are shown below.

- Baghdad International Airport: Baghdad International Airport is currently composed of three buildings, each with capacity for 2.5 million travelers annually and each building contains 6 air bridges for planes to dock. The airport contains two runways for takeoff and landing, the first 4 km long and 60 meters wide and the second 3.3 km long and 45 meters wide with two tracks for taxying, the first 4 km long and 45 meters wide and the second 3.3 km long and 30 meters wide, and tarmac. The airport also has buildings for air traffic control, communications, firefighting, switch board, warehouses and parking garages. The airport is provided with all equipment to guarantee air traffic safety and offer services to travelers.
- International Airport: Basrah International Airport is currently composed of one building, with capacity for 2.0 million travelers annually and each building contains 5 air bridges for planes to dock. The airport contains one runway for takeoff and landing, 4 km long and 60 meters wide. The airport also has buildings for air traffic control and communications.
- International Airport: Mosul International Airport is currently composed of one building, with capacity for 500 thousand travelers annually. The airport contains one runway for takeoff and landing, 2,800 m long and 45 meters wide. The airport also has buildings for air traffic control and communications.
- International Airport: Sulaymaniyah International Airport is currently composed of one building, with capacity for 350 thousand travelers annually. The airport contains one runway for takeoff and landing, 3,500 m long and 45 meters wide. The airport also has buildings for parking garages where three aircrafts can be accommodated and a fuel depot.
- International Airport: Erbil International Airport is currently composed of one building, with capacity for 150 thousand travelers annually. The airport contains one runway for takeoff and landing, 2,800 m long and 30 meters wide. The airport also has buildings for parking garages where five aircraft can be accommodated, a fuel depot, firefighting and switch board.
- International Airport: Najaf International Airport is currently composed of one building, with capacity for 300 thousand travelers annually. The airport contains one runway for takeoff and landing, 3,000 m long and 45 meters wide. The airport also has a building for parking where four aircraft can be accommodated.

Founded in 1988, Iraq Airways is the flag carrier for air transportation. Air transportation, which was established in 1946, was administratively linked to Iraq Republic Railways. The present situations for Iraq Airways are shown in Table 2.5-8.

Table 2.5-8 Passenger and Freight Traffic

Year	2010			2011		
	Planned	Actual	Percent Realized (%)	Planned	Actual	Percent Realized (%)
International	367,680	361,606	99	514,752	445,912	86
Domestic	79,037	52,648	66	102,748	43,381	42
Incoming (t)	39,513	8,272	21	55,318	7,916	14
Outgoing (t)	252	128	51	353	400	113

Source: NDP 2013-2017

Table 2.5-9 Number of Flight and Travelers

Year	2011			As of 31 May 2012		
	Planned	Actual	Percent Realized (%)	Planned	Actual	Percent Realized (%)
Inbound Flight	12,310	11,589	94	5,323	6,477	118
Outbound Flight	12,310	11,625	94	5,491	6,477	118
Inbound Traveler	899,629	855,423	95	366,530	521,040	142
Outbound Traveler	900,783	862,372	96	372,449	509,653	137

Source: NDP 2013-2017

Subjects which Iraq Airways have are as follows:

- Slow implementation of current airport rehabilitation works.
- The company does not possess a complete air fleet, has a limited number of planes owned and leased and these planes are antiquated.
- Swollen numbers of non-specialist personnel, which has an impact on the company's performance and financial results.
- Some of Iraqi Airlines management and operation methods do not meet international standards.

2.6 Present Situations of Ports

2.6.1 Latest Cargo Statistics in Ports in Iraq

(1) Trend of Cargo Throughput in Iraqi Ports

As shown in Table 2.6-1, the total cargo volume in Iraqi ports reached 10.12 million tons in 2001. After that, the total cargo decreased in volume until 2003 with a handling volume of 1.81 million tons. The total cargo volume then increased after making the lowest volume in 2003 and recorded 12.63 million tons in 2006. The latest cargo handling volume was 15.87 million tons in 2014.

Table 2.6-1 Trend of Cargo Volumes and Ship Calls in Iraqi Ports

Year	Umm Qasr Port		Khor Al Zubayr Port		Abu Flus Port		Al Maqil Port		Total		
	Cargo Volume (1,000t)	Ship Calls	Cargo Volume (1,000t)	Ship Calls	Cargo Volume (1,000t)	Ship Calls	Cargo Volume (1,000t)	Ship Calls	Cargo Volume (1,000t)	Container Volume (TEU)	Ship Calls
2001	7,001	533	3,114	4,319	-	-	-	-	10,115	-	4,852
2002	6,083	512	1,804	4,258	-	-	-	-	7,887	-	4,770
2003	1,682	512	129	44	-	-	-	-	1,811	-	556
2004	2,105	894	1,737	780	-	-	-	-	3,842	-	1,674
2005	4,362	763	1,200	1,262	480	2,025	44	108	6,087	-	4,158
2006	7,659	883	4,301	1,307	565	1,552	103	124	12,627	137,081	3,866
2007	5,984	1,028	4,416	1,069	693	3,020	42	47	11,135	146,262	5,164
2008	7,219	898	4,049	1,006	550	2,345	10	13	11,828	293,114	4,262
2009	7,445	1,146	3,297	900	551	2,469	47	66	11,340	329,184	4,581
2010	7,413	1,106	2,817	735	571	364	242	263	11,044	465,945	2,468
2011	8,622	992	3,513	516	497	194	644	618	13,276	455,240	2,320
2012	9,335	922	4,265	531	467	150	877	743	14,944	589,295	2,346
2013	10,058	945	4,273	632	530	198	908	795	15,769	753,341	2,570
2014	9,367	948	5,060	670	460	180	983	808	15,869	778,563	2,606

Source: Prepared by JICA Study Team based on GCPI's statistics data

(2) Cargo Throughput of Umm Qasr Port

Cargo throughput of UQP is summarized in Table 2.6-2 from 2006 and 2014. The container cargo volume and the conventional cargo volume have changed in the range between 134,000 TEUs and 736,000 TEUs, and between 4.64 million tons and 6.84 million tons, respectively. The container cargo increased annually from 2006 to 2014. The conventional cargo decreased from 2006 to 2010 and after that began to increase but dropped in 2014.

It is noted that the handling volume of container cargoes has increased more than 5 times from 2006 to 2014. The container cargoes in UQP are almost all imported and the export cargoes have not been recorded for the last nine years.

Table 2.6-2 Cargo Handling Volumes in UQP

(Unit: ton)

Cargo／Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Imported Cargo									
1. Container (TEU)	67,087	69,323	128,132	146,215	211,213	198,283	265,634	352,899	367,893
2. Conventional Cargo									
(1) Grain (Wheat)	2,858,509	2,324,035	3,279,105	2,898,591	1,800,999	2,748,557	2,637,732	2,294,273	1,580,553
(2) Rice	917,806	668,736	960,670	954,342	947,383	1,049,057	1,092,684	1,110,879	640,628
(3) Sugar	393,850	734,920	568,310	260,327	455,656	783,413	714,794	624,783	676,226
(4) Cement	1,959,179	749,341	444,850	889,980	456,734	425,391	129,008	90,843	1,971
(5) Steel & Pipes	67,875	62,692	183,832	121,967	347,461	232,553	514,862	929,707	1,040,005
(6) Vehicles	40,051	3,417	44,326	94,636	100,136	58,376	88,784	39,406	76,615
(7) Others	601,969	617,177	326,302	446,883	528,659	662,628	681,959	917,346	831,483
Sub-total	6,839,239	5,160,318	5,807,395	5,666,726	4,637,028	5,959,975	5,859,823	6,007,237	4,847,481
Exported Cargo									
1. Container (TEU)	67,087	69,323	128,132	146,215	211,213	198,283	265,634	352,899	367,893
2. Conventional Cargo	0	0	0	0	0	0	0	0	0
Total									
Container (TEU)	134,174	138,645	256,265	292,431	422,426	396,566	531,267	705,798	735,786
Conventional Cargo	6,839,239	5,160,318	5,807,395	5,666,726	4,637,028	5,959,975	5,859,823	6,007,237	4,847,481

Source: Prepared by JICA Study Team based on GCPI's statistics data

(3) Cargo Throughput of Khor Al Zubayr Port

Table 2.6-3 shows cargo handling volumes between 2006 and 2014 in KZP. The import cargoes have increased gradually for the last nine years because imported oil products (Gasoline, kerosene, benzene, diesel) have increased sharply. The imported conventional cargoes except liquid bulk have fluctuated and decreased for the last six years. Though a marked decrease of exported cargoes was caused by a decrease in fuel oil export in 2009/2010, fuel oil export increased in large quantities in 2014.

Table 2.6-3 Cargo Handling Volumes in KZP

(Unit: ton)

Cargo／Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Imported Cargo									
1. Container (TEU)	1,454	3,976	4,204	1,780	2,456	1,611	725	0	96
2.Conventional Cargo									
(1) Grain (Wheat etc.)	2,400	6,800	14,043	14,770	10,307	13,004	7,051	6,061	1,660
(2) Rice	38,978	19,590	7,903	350	0	0	0	0	0
(3) Sugar	25,482	109,464	133,727	86,578	91,325	42,308	27,445	42,829	27,602
(4) Cement	912,417	745,449	585,862	981,981	1,202,455	1,081,756	731,793	294,751	188,251
(5) Steel & Pipes	0	147,425	178,805	328,947	146,251	94,798	219,267	201,277	113,768
(6) Vehicles	1,435	0	0	0	0	0	0	0	0
(7) Others	486,636	340,028	357,107	400,680	174,228	84,297	90,072	456,625	319,075
Sub-total	1,467,349	1,368,756	1,277,446	1,813,306	1,624,566	1,316,163	1,075,628	1,001,543	650,356
3. Liquid Bulk	649,025	934,276	735,239	574,049	866,252	1,767,324	2,731,572	2,707,788	3,076,753
Exported Cargo									
1. Container (TEU)	1,454	3,522	5,425	2,581	2,280	1,619	720	0	96
2.Conventional Cargo									
(1) Dates	42,358	37,063	172,937	227,793	206,816	112,069	82,510	46,885	95,997
(2) Others	134,142	139,418	0	0	0	0	0	0	2,788
Sub-total	176,500	176,481	172,937	227,793	206,816	112,069	82,510	46,885	98,785
3. Liquid Bulk	1,990,300	1,888,447	1,812,521	660,090	88,077	296,946	365,772	516,452	1,232,931
Total									
Container (TEU)	2,907	7,499	9,629	4,361	4,736	3,230	1,445	0	192
Conventional Cargo	4,283,174	4,367,960	3998,143	3,275,238	2,785,711	3,492,502	4,255,482	4,272,668	5,058,825

Source: Prepared by Study Team based on GCPI's statistics data

(4) Cargo Throughput of Abu Flus Port

Cargo handling volumes in Abu Flus Port are shown in Table 2.6-4. The conventional cargoes handled at the port were 500,000~600,000 tons from 2006 to 2007 and after that decreased to nearly zero in 2012, while in 2013 and 2014 conventional cargo volumes increased up to 150,000 tons and 120,000 tons respectively. Further container cargoes started to be handled in 2007 and reached nearly 60,000 TEU in 2012 with an annual increase.

Table 2.6-4 Cargo Handling Volumes in Abu Flus Port

(Unit: ton)

Cargo／Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Imported Cargo									
1. Container (TEU)	0	39	13,610	16,196	19,391	27,722	28,291	23,771	20,405
2.Conventional Cargo									
(1) Cement	0	0	2,265	21,317	7,688	4,512	0	110,910	65,537
(2) Others	564,668	692,310	321,919	262,487	243,389	29,355	51	42,427	57,670
Sub-total	564,668	692,310	324,184	283,804	251,077	33,867	51	153,337	123,207
Exported Cargo									
1. Container (TEU)	0	39	13,610	16,196	19,391	27,722	28,291	23,771	20,405
2.Conventional Cargo	0	0	987	0	23	2,000	0	0	0
Total									
Container (TEU)	0	79	27,220	32,392	38,782	55,443	56,582	47,542	40,810
Conventional Cargo	564,668	692,310	325,171	283,804	251,100	35,867	51	153,337	123,207

Source: Prepared by Study Team based on GCPI's statistics data

(5) Cargo Throughput of Al Maqil Port

Cargo handling volumes at the port are shown in Table 2.6-5. The imported cement volumes handled at the port increased remarkably after 2010 and the imported conventional cargoes reached nearly 1,000,000 tons in 2014. The cement import accounted for nearly 90 % of the total imported conventional cargoes in 2014. Further container cargo handling started in 2014.

Table 2.6-5 Cargo Handling Volumes in Al Maqil Port

(Unit: ton)

Cargo／Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Imported Cargo									
1. Container (TEU)	0	0	0	0	0	0	0	0	888
2. Conventional Cargo									
(1) Cement	0	0	0	0	181,626	521,136	726,468	736,972	870,875
(2) Others	103,054	42,065	10,055	47,096	58,923	121,566	150,395	169,737	101,109
Subtotal	103,054	42,065	10,055	47,096	240,549	642,702	876,863	906,709	971,984
Exported Cargo									
1. Container (TEU)	0	0	0	0	0	0	0	0	888
2. Conventional Cargo									
(1) Dates	0	0	0	0	1,452	1,309	0	1,382	0
Total									
Container (TEU)	0	0	0	0	0	0	0	0	1,887
Conventional Cargo	103,054	42,065	10,055	47,096	242,001	644,011	876,863	908,091	971,984

Source: Prepared by Study Team based on GCPI's statistics data

2.6.2 Number of Arrival and Departure of Ships

The number of arrival of ships in UQP and KZP was 900 and 358 respectively in 2011 and 834 and 416 respectively in 2012. The total number of arrival in port was 1,258 and 1,250 in 2011 and in 2012 respectively. The number of arrival of dhow ships has been decreasing remarkably from 147 in 2011 to 101 in 2012. The total number of arrival and departure of ships are double, 2,516 in 2011 and 2,500 in 2012, because the number of departure of ships is the same with the number of arrival. The average ships per day in port are 6.9 and 6.8 in 2011 and 2012 respectively. The details are shown in Table 2.6-6 and Table 2.6-7.

Table 2.6-6 Number of Shipcalls at UQP

(Year 2011) Unit: number of ships

Ship size (DWT)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
0~9,999	22	32	26	27	29	23	18	8	12	11	13	9	230
10,000~19,999	24	29	21	21	21	32	23	27	23	28	26	26	301
20,000~29,999	20	19	16	17	22	11	17	18	22	13	19	19	213
30,000~49,999	7	2	5	12	8	11	9	7	11	10	5	9	96
50,000~80,000	1	5	6	8	7	7	8	7	5	3	1	2	60
Total	74	87	74	85	87	84	75	67	73	65	64	65	900

(Year 2012)

Ship size (DWT)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
0~9,999	13	17	11	9	14	12	8	8	16	12	15	14	149
10,000~19,999	30	28	23	21	19	28	21	25	29	24	22	30	300
20,000~29,999	21	14	21	21	24	19	19	22	20	25	20	18	244
30,000~49,999	8	5	5	7	3	6	7	5	11	7	7	12	83
50,000~80,000	4	4	4	1	7	8	5	6	6	7	5	1	58
Total	76	68	64	59	67	73	60	66	82	75	69	75	834

Source: Prepared by Study Team based on GCPI's statistics data

According to data in 2012 calling at UQP, the number of arrival of container ships is 347 with a share of 41.6 % to the total number of arrival of ships. The number of RoRo and PCTV ships is 87 with a share of 10.4 % and 44 with a share of 5.3 % respectively. The remainders are bulk and general cargo ships and the number is 356. It is difficult to identify ships as bulk or general cargo because the majority of bulk ships are equipped with ship gears. Further container ships with ship gears in UQP are originally general cargo ships into which container cargoes can be loaded as cargoes for developing countries. These ships are generally used at ports without container cranes.

MSC gives a feeder service using a 35,000~46,000 DWT container ship without a ship gear. An average load is about 600 TEUs while the loading capacity of the ship is 3,000~4,000 TEUs. Other seven shipping companies use container ships with ship gears. Maersk Line shipping uses a small container ship with 13,700 DWT. Other shipping companies use container ships with 20,000~24,000 DWT. The majority of container ships are under load because container ships are surplus in the world and ships which cannot be scrapped or chartered for a long term are being used.

The number of arrival of tankers and general cargo ships in KZP was 215 and 201 in 2012 with a share of 52 % and 48 % to the total number of arrival of ships 416 respectively. Small ships under 10,000 DWT was 193 with a share of 46 %.

Small ships under 10,000 DWT in port (UQP and KZP) was 329 with a share of 26.3 % to the total number of arrival of ships. Details of ship size distribution are shown in Appendix 2.6-1 to 2.6-4 by ship types and by ports.

Table 2.6-7 Number of Shipcalls at KZP

(Year 2011) Unit: number of ships

Ship Size (DWT)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
0~9,999	17	14	11	19	13	12	13	10	16	15	19	20	179
10,000~19,999	11	5	7	7	8	9	4	6	4	10	7	5	83
20,000~29,999	1	3	1	0	3	0	0	1	0	2	0	0	11
30,000~39,999	1	1	3	2	2	2	5	5	3	2	2	1	29
40,000~49,999	1	2	1	2	1	5	2	3	4	3	5	5	34
50,000~59,999	0	0	1	1	2	1	2	1	3	4	2	3	20
60,000~90,000	1	1	0	0	0	0	0	0	0	0	0	0	2
Dhow ships	28	27	7	16	7	3	1	0	3	21	24	10	147
Total	32	26	24	31	29	29	26	26	30	36	35	34	358

(Year 2012)

Ship Size (DWT)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
0~9,999	13	12	17	18	14	16	12	13	17	13	18	17	180
10,000~19,999	6	10	9	9	8	5	6	7	6	9	6	8	89
20,000~29,999	0	0	0	2	0	1	0	0	0	1	0	0	4
30,000~39,999	2	2	2	3	0	0	2	3	4	3	4	3	28
40,000~49,999	3	4	7	7	8	10	4	6	8	9	6	6	78
50,000~59,999	5	4	3	0	2	3	5	4	3	3	2	3	37
60,000~90,000	0	0	0	0	0	0	0	0	0	0	0	0	0
Dhow ships	9	14	7	5	2	5	0	0	3	22	16	18	101
Total	29	32	38	39	32	35	29	33	38	38	36	37	416

Source: Prepared by Study Team based on GCPI's statistics data

The maximum ships of arrival by cargo type from 2011 to 2012 are shown in Table 2.6-8.

Table 2.6-8 Maximum Ships of Arrival by Cargo Type from 2011 to 2012

Ship type	Name	Dead weight tonnage	Loaded weight	Remark
（UQP）				
Container Ship	MSC JASMINEN	41,771 DWT	825 TEU	Loaded container: about 3,000 TEU
Bulk ship	IRON BRADYN	82,769 DWT	52,500 ton	Loaded tonnage: about 75,000 t/Wheat
（KZP）				
Tanker	SILVA	83,651 DWT	9,435 ton	Loaded tonnage: about 75,000 t/Benzene

Source: Prepared by Study Team based on GCPI's statistics data

According to the above table, Container ships and tankers are calling at ports with a small load to the possible loading capacity, while bulk and general cargo ships are with a nearly full load. It is considered that there is no availability of a small ship for the former and ships with a nearly full draft are selected to call at ports of Iraq for the latter.

2.7 Present Situations of Approach Channel

2.7.1 Outline of Approach Channel

(1) General Description of Channels

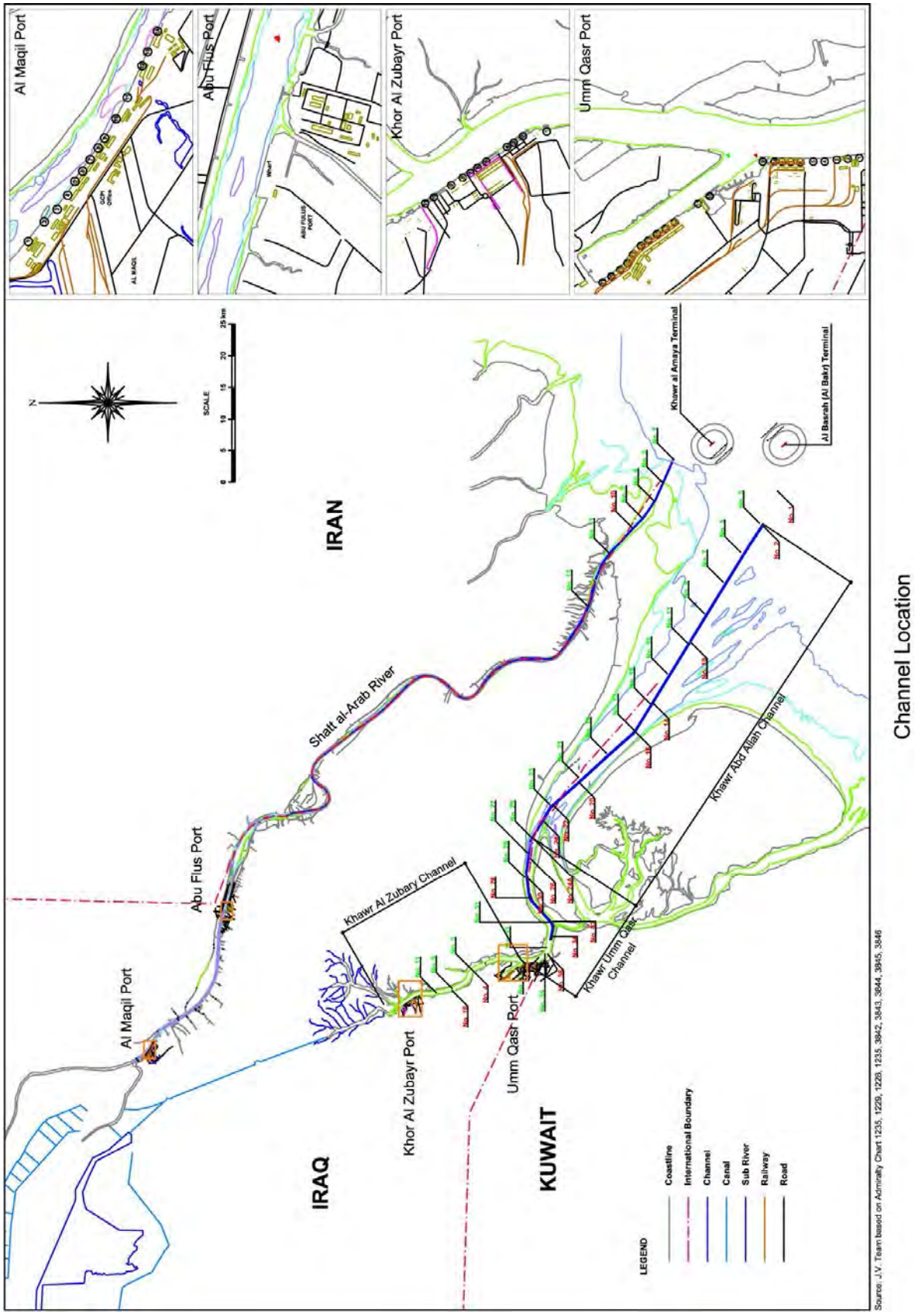
The existing channel system is composed of 2 routes as shown in Figure 2.7-1.

One route is Shatt al Arab Channel being established along Shatt al Arab River that leads to Abu Flus Port and Al Maqil Port. The other route is an approach to Umm Qasr Port and Khor Al Zubayr Port, and called as Khawr Abdallah Channel (a name of Khor Al Zubayr Channel is also used).

In Iraq, the long lasted war condition such as Iraq-Iran War (1980-1988) and followed by other wars, has caused considerably little maintenance works of navigation channels, by which both channels have been suffered from insufficient water depths due to serious siltation along the channels. Further, a large number of dredgers which were necessary for channel maintenance works were sunk and have become long time obstacles in the channels. Under such circumstances, the restorations of the existing channels as well as ports rehabilitation have taken place since year 2003, just after the war ending, and especially the Khawr Abdallah Channel were the first priority of the rehabilitation/restoration, as this is leading to the Country's primary port, Umm Qasr Port, in order to enable such transportation of necessary supporting materials for the restoration/ reconstruction of the Country.

By the above, the ships of the originally planned sizes for the Port capacity have, through the Channel, become navigable to the Port with a use of tidal windows by the end of year 2005. It is however not sufficient enough to fully accept the designed sizes of ships to pass through the Channel, as the following issues should be solved to become a fully functional channel of the intended capacity;

- Restoration of the necessary sections in depth and width throughout the respective channels. (Except for the route to the Umm Qasr Port in the Khawr Abdallah Channel, the restoration works has been not yet well progressed by which some restricted ship draft is required in many places. It is therefore far from the expected ship calls of maximum designed to the existing ports.)
- Removal of shipwrecks obstructing safe ship navigation along the channels
- Restoration and installation of necessary Navigation Aids throughout both channels
- Border issues settlement with the neighboring countries where the channels are passing or shared to use.
- (Most part of Shatt al Arab Channel route are forming a border with Iran and shared with, whilst a part of Khawr Abdallah Channel is passing through the territory of Kuwait.)
- Continued maintenance dredging works in order to maintain sufficient water depths.
- (Maintenance dredging is done by GCPI. To do so however, sufficient number of dredgers are yet required.)



Source: JICA Study Team

Figure 2.7-1 Location of Channels

(2) Shatt al Arab Channel

As an approach channel from the Gulf to Umm Qasr Port that was the first major port in Iraq, Shatt al Arab Channel has been utilized since around year 1919, during the World War I, having its total length (to the Port) approximately 144 km. The Channel is of a naturally made waterway by utilizing well the natural features created by Shatt al Arab River being formed from the joining of two major rivers, Tiglis and Euphrates.

As such, the Channel faces at many places with severe bends, narrow spaces or very shallow areas, especially at the river mouth stretch (between Buoy No.1 to Buoy No.7) where very significant sedimentation are observed caused from a sand-bar forming action and as a result the water depth over the stretch is in average about CD-3.0m.

Along the approaching route to Al Maqil Port, by passing Al Faw Port (at present no more functional) and Abu Flus Port, the Channel forms around 110 km long Border between Iraq and Iran starting from the Entrance up to so called Border Post, about 7 km downstream of Abu Flus Port, and shared in the use of the Channel. In spite of the shared use of the Channel and even quite a long time has lapsed, the border issue along the Channel has not yet been settled between both governments, and requires an agreement before the implementation of any development in the Channel of the area in question.

In consideration of above situation, it would be appropriate to divide the Channel into three parts (sections); namely River mouth part (between Buoy No.1 and No.7), Shared use part (From the Buoy No.7 up to Border Post) and the Post near Abu Flus Port until Al Maqil Port.

a) Channel Depth and Width

There have been very few recent data of the Channel depths, it is only way to refer the latest Sea Chart (Admiralty Chart No.1235, surveyed in 2003 is thus referred to), by which it is noted that most of the Channel areas are maintaining its natural water depths, other than the River Mouth Stretch part. Although the Channel was planned with CD.-8.0 m depth and 150 m width, some places have, according to the Chart, less water depths and/or widths less than 120 m. In the Study therefore, a Bathymetric Survey to assess the recent changes of the Channel water depths was conducted, but within a limited section of the Channel, that is from the Border Post to an upstream point of Al Maqil Port. The scope and the results of the Survey are to be discussed in the Section 2.7.2. As a further useful data, it has been noted that only small ships or barges are able to call the Maqil Port by use of high tides, which account max. level 4.0 m above CD at the Port, due to a severe restriction of ship draft at the River Mouth.

The water depth conditions of the Channel from the Entrance up to the Border Post location are shown in Appendix 2.7-1(1) through 2.7-1(8) with colored remarks of the depths (i.e. Yellow indicates depth over -8.0m, and Blue is between -8.0~-6.0m) for easy evaluation of the Channel Depth conditions. The water depth conditions up to Al Maqil Port thereafter are shown in Sub-chapter 2.7.2 as the results of the conducted bathymetric survey.

Table 2.7-1 Summary of Water Depth and Width of Each Channel Section

Channel Section	Length (km)	Water Depth (CDm)	Width (m)	Remarks
River Mouth	12.0	-2.5~-4.0	150	Buoy No.1~No.7
Shared use with Iran	94.5	-4.5~-16.0	100～200	Buoy No.10～Border Post
Border Post near Abu Flus Port ~ Al Maqil Port	37.4	-5.0~-16.0	Unknown	Water depth survey done under the Study

Source: JICA Study Team

b) Shipwrecks

As the result of the wars, more than 70 shipwrecks had been left in the Channel until shipwrecks removal works began, for the sake of its functional recovery, in year 2003 just after the

war ended. From the continued efforts of shipwrecks removal, 33 shipwrecks only exist in the channel as shown in Table 2.7-2.

c) Navigation Aids

- Navigation Aids of Light Buoys are provided only around 20 km distance from the Channel Entrance (Buoy No.1) indicating the approach line, although no navigation aids or are insufficiently provided upstream thereafter. It is therefore a risk for a safe navigation of the calling ships.
- No Traffic Management/ Control System such as AIS (Automatic Identification System) /VTS (Vessel Traffic Service) systems generally required for a modernized port is provided as is yet under study stage. It may however be possible to introduce AIS at Al Maqil Port being located nearby GCPI H/Q, since AIS is in an implementation stage at Khawr Abdallah Channel as described hereinafter.

d) Other hazards (existing or broken bridges)

- At downstream areas of Shatt al Arab River (near old Al Faw Port), a few wrecked bridges, destroyed during the Iraq-Iran War time, still exist in Iraqi sides, which has been caused by insufficient retrieval works. Even though the ship passing area is minimum cleared from such danger, it must be a risk to calling ships in future, as expected to increase.
- Two (2) movable bridges, one is a Vertically Swinging Type and the other is a (floating) Pontoon Type, also exist at downstream of Al Maqil Port. These bridges open only 2-3 days a week with a few hours of duration in order to pass the calling ships to the Port. It is therefore, also foreseen as a risk in future.

(3) Khawr Abdallah Channel

Khawr Abdallah Channel is a channel of its total length approximately 113 km being established by using so called Khor Al Zubayr River (which was formed from the remnant of old Tigris/Euphrates Rivers, and ended at nearby Khor Al Zubayr Port). The Channel can also be divided into three parts, as the First part is Khawr Abdallah Waterway covering from the channel entrance in the Gulf (in this Study, Buoy No.3 is used as the entering point having water depth of around CD-12.5m or more) to Buoy No.25, the Second part is Umm Qasr Waterway covering from the Buoy No.25 up to the Umm Qasr Port at the entrance of North Port, and the last part as Khor Al Zubayr Waterway from Umm Qasr Port up to Khor Al Zubayr Port.

The current Channel's alignment and water depths were established from the channel construction project namely "Dredging of the Approach Channel from the Gulf to the Umm Qasr Port" carried out in 2005 by UNDP as a part of Iraq Reconstruction Scheme. However, due to the restrictions of MDA(Mine Danger Area)a part of the Channel had to pass through within Kwait Territory with its length about 40 km, as well as design sections changes of the channel for some places.

The General Plan of the above works and the summarized changes of the Channel Sections are indicated in Figure 2.7-2 and Table 2.7-3 respectively.

Table 2.7-2 List of Shipwrecks in Shatt Al Arab Channel

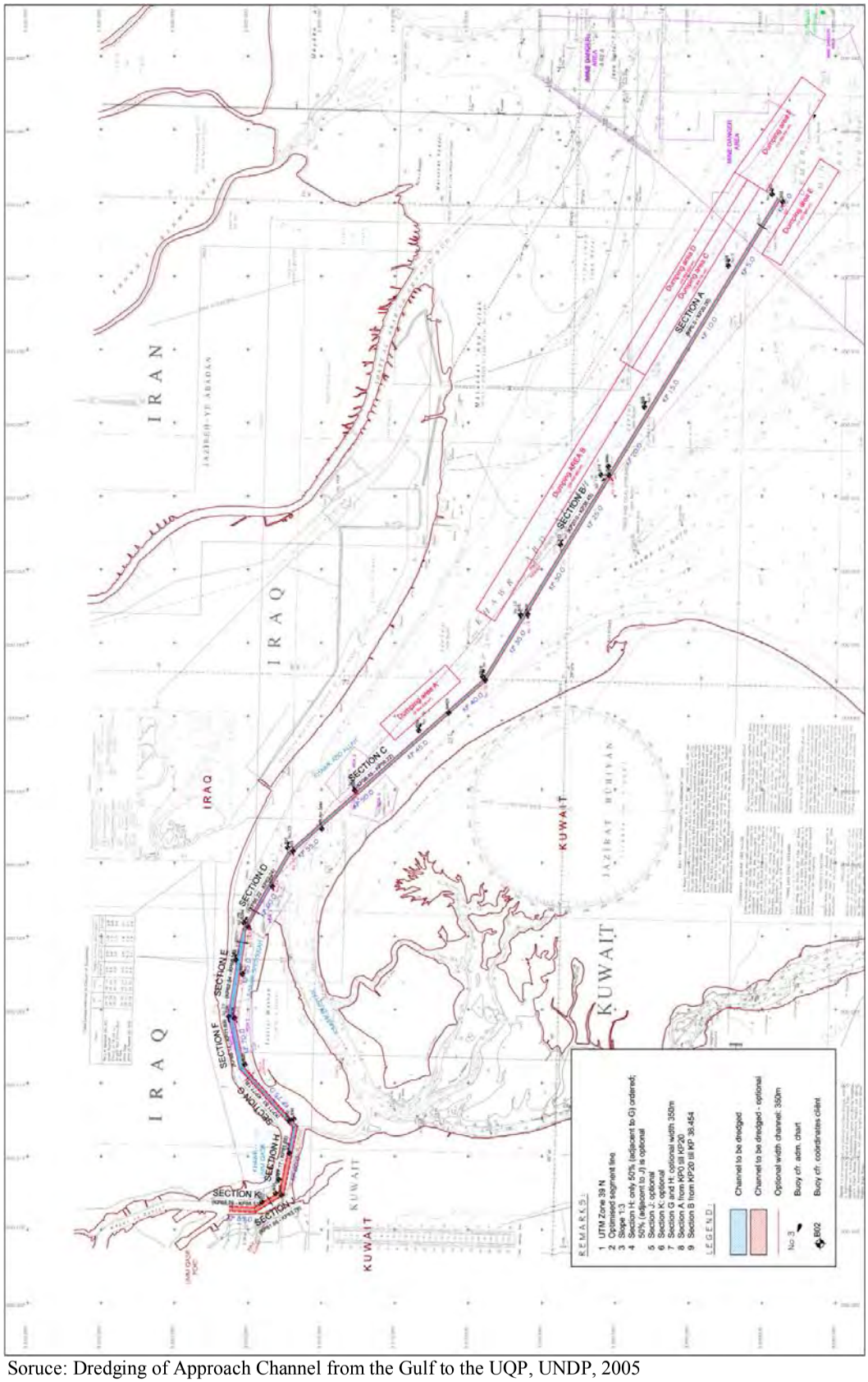
Wrecks in Shat Al-Arab River
First Section/ from Khalid Bridge to the South of AFP

Item	Wreck name	Length (m)	Width (m)	Depth (m)	Weight (tones)	Type	Location	Position		Condition	Origin	Date of sink
								North	East			
1	Al Baker	85.40	12.00	4.50	900	Lighting vessel	South of Khalid bridge	30 34 50	047 34 00	Laying at stb'd side	Iraq	2003
2	Sheren	55.00	12.00	5.00	1000	Tug boat	South of Khalid bridge	30 34 50	047 48 90	Laying at port side	Iranian	2003
3	Al Thowra	60.00	8.00	4.00	600	yacht	Maqal port berth 3	30 34 90	047 46 90	Laying at stb'd side	Iraq	2003
4	Golf Heron	150.36	18.68	8.60	4877	Cargo Vessel	Maqal port berth 4	30 34 90	047 46 26	Up right	Iraq	1980
5	Torpedo Boat	35.00	3.50	1.50	250	Torpedo boat	Basrah port berth 11	30 00 50	047 46 90	Up right	Iraq	2003
6	Ibn Majed	65.00	8.00	5.00	850	Military vessel	Basrah port berth 12	30 00 39	047 48 30	Laying at port side	Iraq	2003
7	Tug Boat	35.00	6.00	3.50	350	Tug Boat	Basrah port berth 15	30 00 30	047 48 40	Up right	Iraq	2003
8	Al Khansa	85.00	14.00	6.00	2000	Cargo vessel	South of Basrah port	30 00 28	047 48 50	Up right	Iraq	2003
9	Heet	38.00	6.00	3.50	350	Tug Boat	North of navy berth	30 00 15	047 48 80	Up right	Iraq	2003
10	Boliver	154.11	19.82	12.53	5499	Cargo vessel	Shatt Al Arab channel	30 32 53	074 49 60	Laying at stb'd	Cuba	1980
11	Al Anbar	35.00	4.00	3.50	250	Tug Boat	Shatt Al Arab channel	30 32 10	074 49 90	Up right	Iraq	2003
12	Demesqes	40.00	6.00	4.00	275	Tug Boat	Shatt Al Arab Dakier	30 32 00	047 50 09	Up right	Iraq	2003
13	Al mansoor	95.00	14.50	5.00	1800	Yacht	Shatt Al Arab Dakier	30 31 50	047 50 40	Laying at stb'd	Iraq	2003
14	Pontoon Baghdad	54.00	15.00	2.70	500	Barge	Shatt Al Arab Dakier	30 31 50	047 50 40	Up right	Iraq	2003
15	Karbala,a	80.00	16.40	5.50	150	Dredger	Al- Sarraji	-	-	Up right	Iraq	1980
16	Low Sveel	154.82	20.10	12.2	5594	Cargo vessel	Al- Sarraji	30 28 36	047 54 45	Laying at port side	Singapore	1980
17	Rose Wood	113.9	15.83	0.19	1772	Cargo vessel	Al Sarraji	30 28 31	047 54 57	Laying at port side	British	1980
18	Indian Ocean	138.25	18 .34	11.43	4397	Cargo vessel	Hamdan	30 28 23	047 54 83	Up right	Greece	1980
19	Oriental Star	138.25	18.85	12.35	5381	Cargo vessel	Al Sanger	30 28 04	047 56 33	Laying at port side	Panama	1980
20	Bonties Prince	122.84	16.21	10.06	2003	Cargo vessel	Al Sanger	30 28 08	047 56 61	Laying at port side	Panama	1980
21	AL Khalij Al Arabi	89.00	14.00	7.50	1980	Dredger	Al Sanger	30 27 69	047 59 35	Laying at port side	Iraq	2003
22	Gow Venia	138.97	57.84	7.50	2973	Cargo vessel	Al Sanger	30 28 13	074 56 67	Up right	Greece	2003
23	Al Najaf	89.00	14.00	7.50	1980	Dredger	Al Sanger	30 28 13	074 56 67	Up right	Iraq	1980

Shat Al-Arab River wrecks
Second section : unremoved wrecks from SAFP to external dike

Item	Wreck name	Length (m)	Width (m)	Depth (m)	Weight (tones)	Type	Location	Position		Condition	Origin	Date of sink
								North	East			
1	Iranian Ship	136.00	18.20	8.50	5210	Cargo	Part of shahinia Island	30 23 20	48 10 48	Up right	Iranian	1980
2	Media	128.00	17.90	7.70	4520	Cargo	Opposite of Abadan port	30 23 20	48 10 48	Capsized	-	
3	Aria Sara	152.00	24.60	10.60	6150	Cargo	Sihan	30 20 00	28 11 33	Up right	Iranian	1980
4	Nooh	82.00	16.00	6.50	1800	tanker	Opposite of Abadan port	30 23 20	48 10 48	Capsized	Iranian	1980
5	Saronic Sea	144.90	18.90	9.15	5700	Cargo	Ma,amer berth	30 01 00	48 26 43	Laying at port side	Greece	1980
6	Modon Jiang	147.90	21.60	12.25	6300	Cargo	South Ma,amer berth	30 00 42	28 46 47	Laying at port side	China	1980
7	Al Teneen	182.89	32.31	15.17	8600	tanker	South of fao city	27 56 36	48 30 53	Up right	British	1980
8	Skeam Nose	151.30	19.28	12.65	6200	Cargo	South of fao city	29 56 40	48 34 26	Up right	Caprice	1980
9	Antra	33.00	21.00	3.50	694	Floating Crane	Outer bar	29 53 00	48 41 50	Up right	Iraq	1996
10	Shakeba	105.00	19.00	5.60	2800	Cargo	Outer bar	29 49 07	48 47 37	Laying at Port side	Iranian	2006

Source: JICA Study Team



Soruce: Dredging of Approach Channel from the Gulf to the UQP, UNDP, 2005

Figure 2.7-2 General Plan of Approach Channel

Table 2.7-3 Summary of Channel Section Changes

SECTION	PLAN		ACTUAL	
	Depth (CD m)	Width (CD m)	Depth (CD m)	Width (CD m)
A	11.00	200	11.00	200
B	11.00	200	11.00	200
C	12.50	200	12.50	200
D	12.50	200	12.30	125/152/200
E	13.20	350	12.30	200/252
F	13.20	350	12.30	200
G	13.20	350	12.30	200/250
H	13.20	350	12.30	200/250
J	13.20	250	13.20	250
K	13.20	250	13.20	250

Note: CD m: meters under Chart Datum
Source：Final Report for Dredging of the Approach Channel from Gulf to Umm Qasr Port, UNDP, 2005

a) Channel Depth and Width

The present conditions of Channel depth and width of each section are indicated in Table 2.7-4.

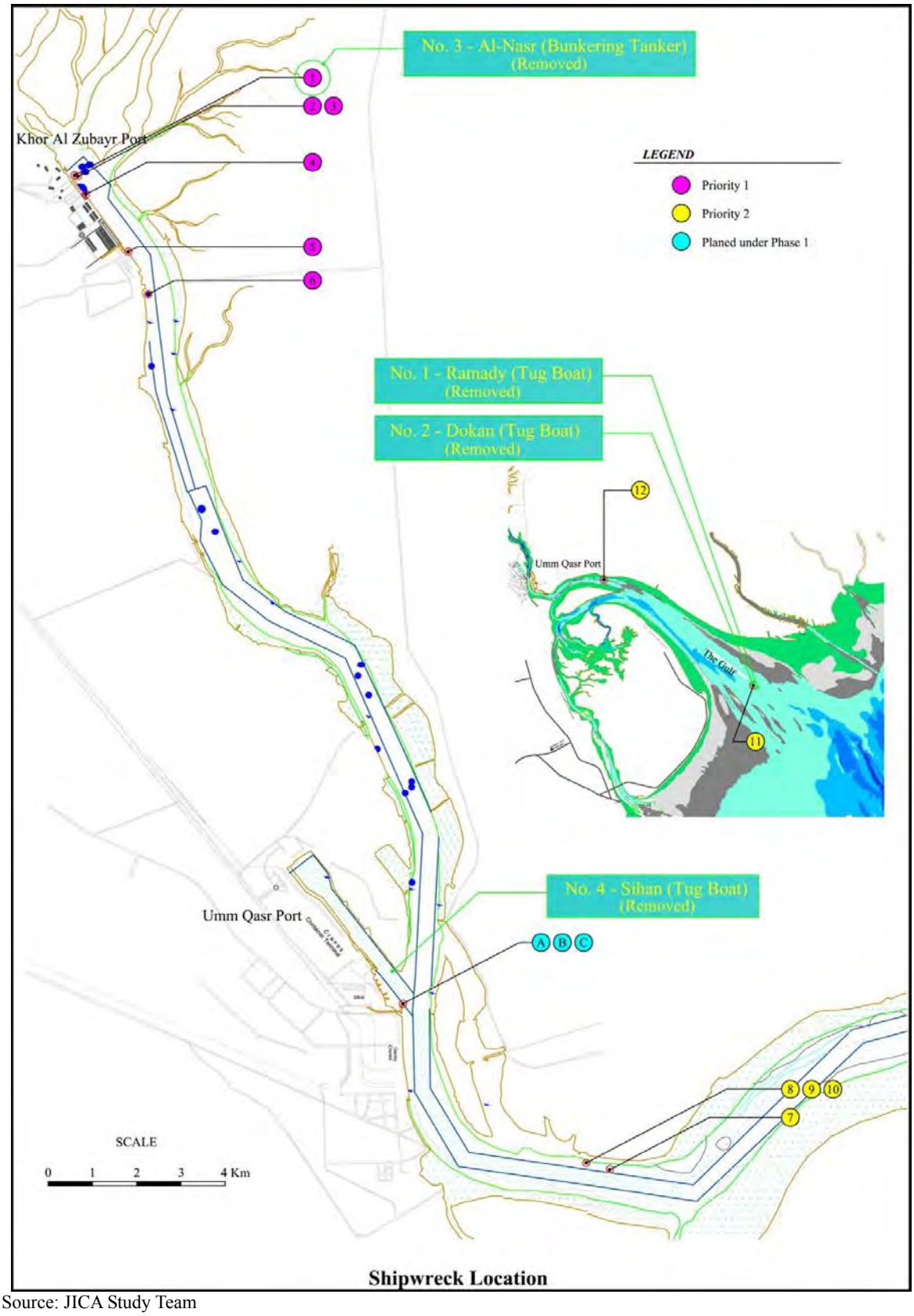
Table 2.7-4 Summary of Channel Depth and Width

Channel Segment	Length (km)	Depth (CD m)	Width (m)	Remarks
Khawr Abdallah Sec.	60.7	11.0~12.5	200	Buoy No.3~No.25
Khawr Umm Qasr Sec.	25.1	12.0~13.2	125~250	Buoy No.25~UQP
Khor Al Zubayr Sec.	17.6	9.0~15.0	150~400	UQP~KZP

Source: JICA Study Team

b) Shipwrecks

At the war ending, a considerable shipwrecks (over 50 wrecks) existed along the channel and ports basin. However, the shipwrecks were effectively reduced to around 35 by the end of 2008, where the Port Sector Rehabilitation Project (Phase 1) under Japan's ODA were commenced, by the efforts of Multi-nations Force, US Military Force and GCPI, and at present 14 shipwrecks only remain along the channel and ports basin. Further, a second phase Port Sector Rehabilitation Project following to the Phase 1 Port Rehabilitation Project has included in its scope to remove aother 4 wrecks located in Khor Al Zubayr Channel and Port Basin of KZP. Figure 2.7-3 indicates the locations of the shipwrecks currently identified.



Source: JICA Study Team

Figure 2.7-3 Shipwrecks Location along Khawr Abdallah Channel

c) Navigation Aids

Navigation Aids in the Khawr Abdallah Channel are relatively well provided to the extent from the channel entrance in the Gulf up to the Umm Qasr Port having been provided with sufficient numbers of lighted buoys. In contrary, no proper nor sufficient navigation aids, except for the locations where some hazardous matter is identified such as shipwrecks or shallow river bed, have been installed along Khor Al Zubayr Waterway causing a risk in the safe navigation of calling ships.

To this end, an improvement measure for the safe navigation in the waterway area by providing proper navigation aids such as light buoys and leading lights is to be included in the aforementioned Port Sector Rehabilitation Project Phase 2

Further GCPI is currently planning to introduce AIS/VTS System along the Khawr Abdallah Channel throughout in order to meet the requirements of ISPS Code having been provided with necessary studies and procurement assistance by Danish Government, and at present in a process of implementation stage for the procurement of AIS System by use of the Government own budget. More details as to the planned AIS System are described in Section 3.2.

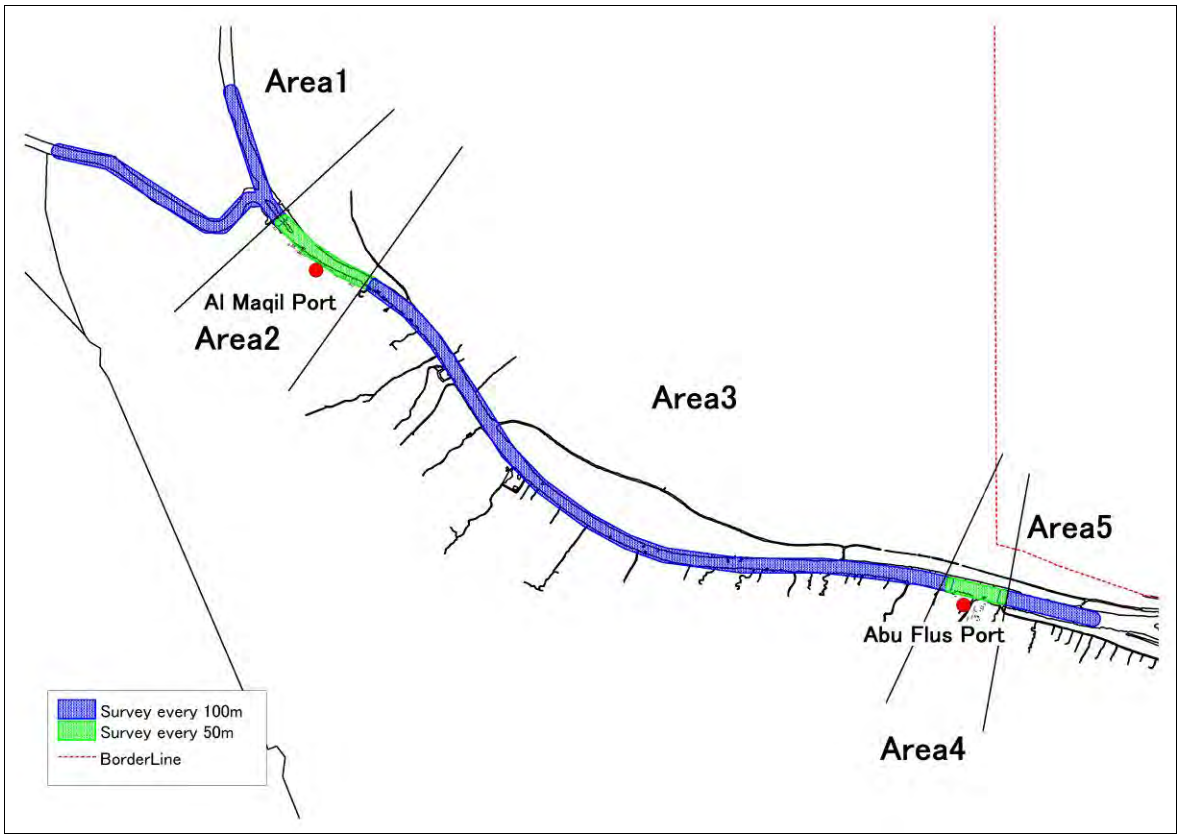
2.7.2 Result of Bathymetric Survey (Shatt al Arab)

(1) Objective

Any recent survey records are not available regarding the geographical feature of the river bed along the Shalt al Arab River. JICA Study Team carried out a bathymetric survey in order to grasp change of topographic conditions of river bed.

(2) Location

The survey location is shown in Figure 2.7-4. The survey area is classified Chanel area and Port area. The intervals of each survey line are 100m at Chanel area and 50m at Port area in order to obtain more detail data.



Source: JICA Study Team

Figure 2.7-4 Survey Location map of Bathymetric survey

(3) Quantity of Survey

Quantity of the survey is shown in Table 2.7-5 Quantity of survey.

Table 2.7-5 Quantity of survey

	Line Spacing Line Number	Survey Area	Total Length or Area Surveyed
Area1	100m Line Number:3	8km x 0.3km 5km x 0.3km	39km
Area2	50m Line Number:7	4km x 0.4km	28km
Area3	100m Line Number:3	23km x 0.4km	69km
Area4	50m Line Number:7	2km x 0.4km	14km
Area5	100m Line Number:3	4km x 0.4km	12km
Total		**17.1 km^2**	**162 km**

Source: JICA Study Team

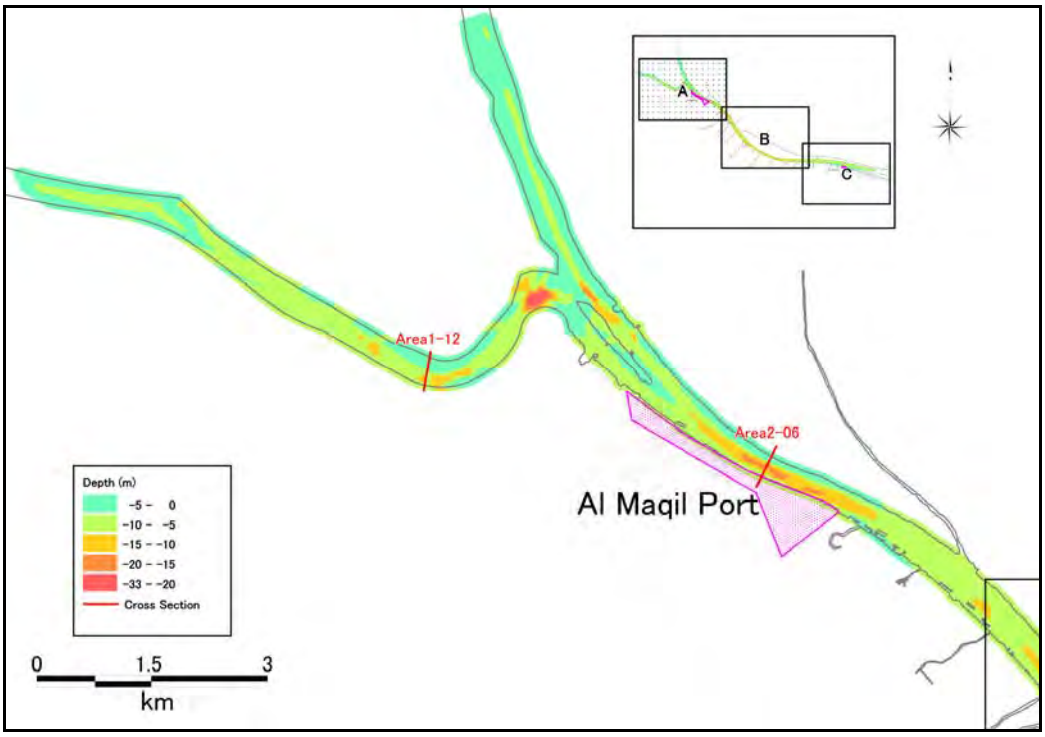
(4) Survey Period

Site works were carried out in the period from February 8, 2014 to February 19, 2014.

(5) Survey Result

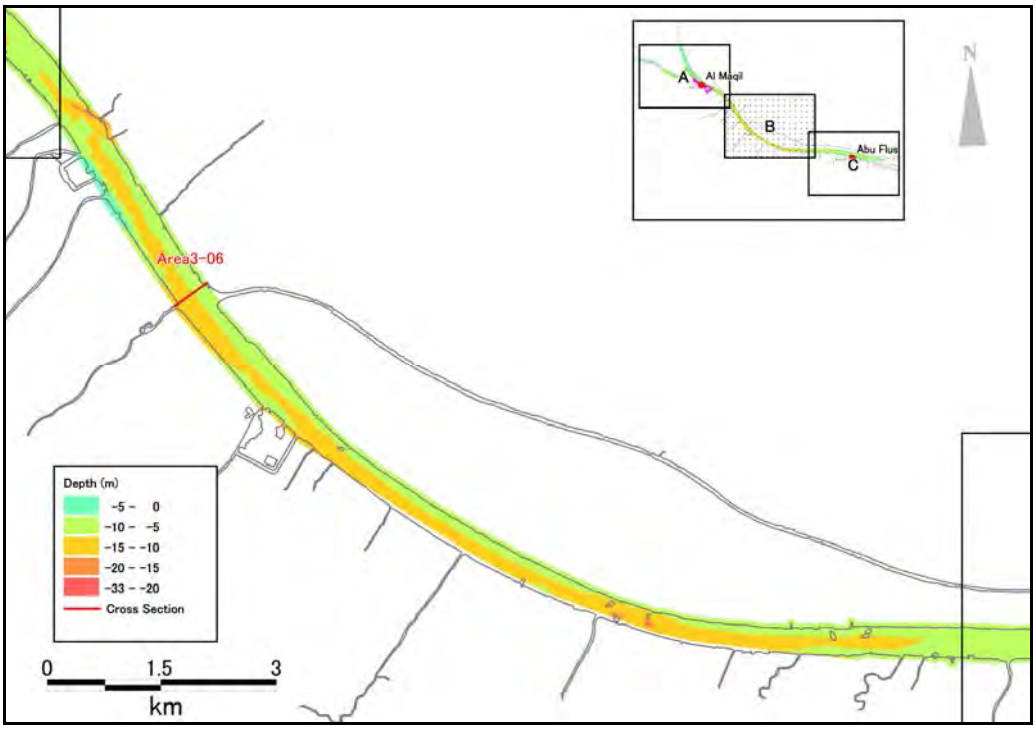
Bathymetric charts created based on the survey data are shown in Figure 2.7-5, Figure 2.7-6 and Figure 2.7-7.

Features of riverbed at each area are described below by referring to bathymetric charts and cross-section representative of each area.



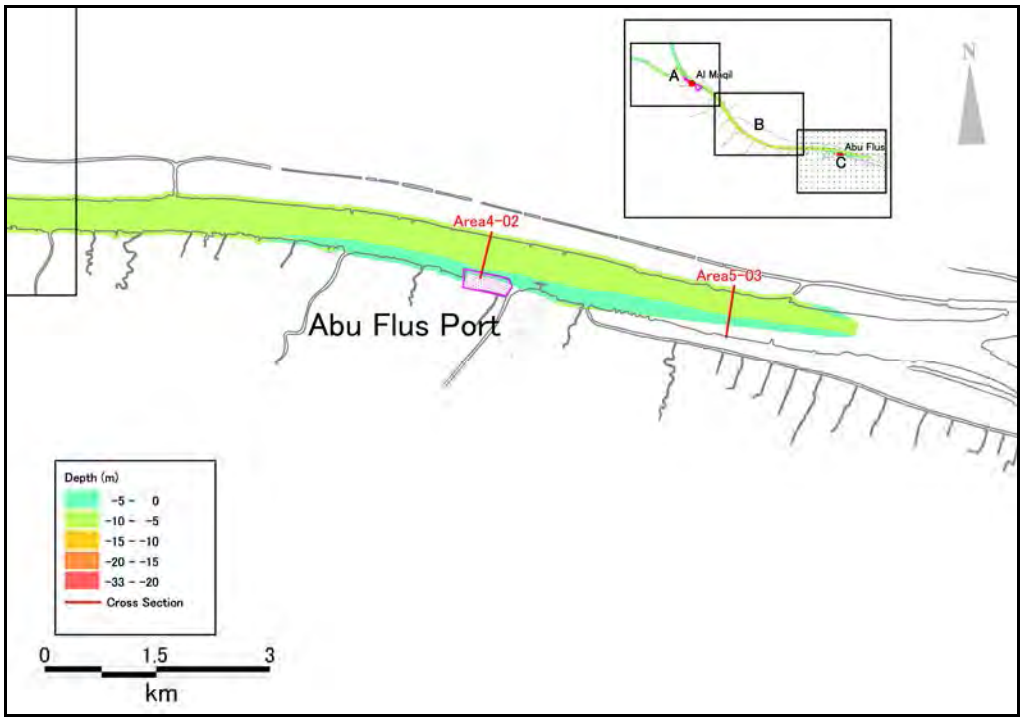
Source: JICA Study Team

Figure 2.7-5 Bathymetric Chart - A



Source: JICA Study Team

Figure 2.7-6 Bathymetric Chart - B

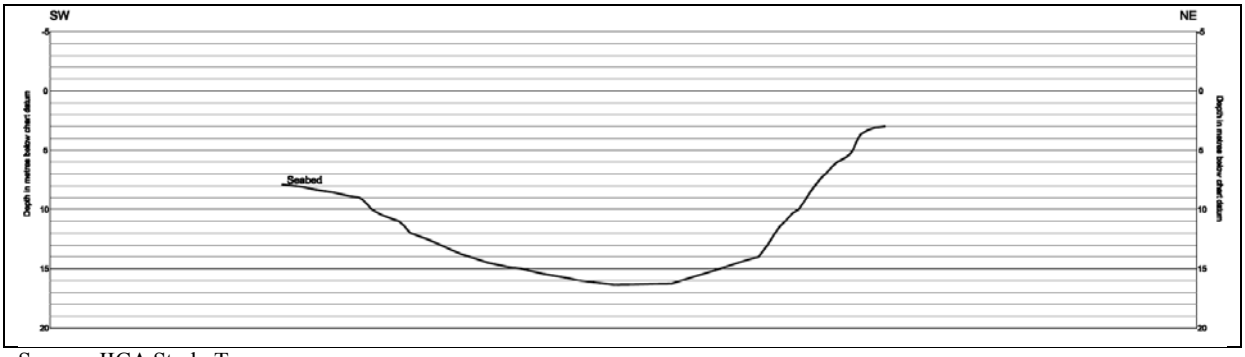


Source: JICA Study Team

Figure 2.7-7 Bathymetric Chart – C

1) Al Maqil Port (Area2)

According to the "Data Collection Survey on Port Sector Development Plan in Iraq, JICA, 2012" report, water depth at the berth front is around 9 m. From the new survey it is observed that the water depth at the berth front varies from 6m to 9m. The depth of channel has been maintained to more than 10 m. Where the river becomes narrow in front of berth No.8 to No.10 the water depth is 16m to17m.

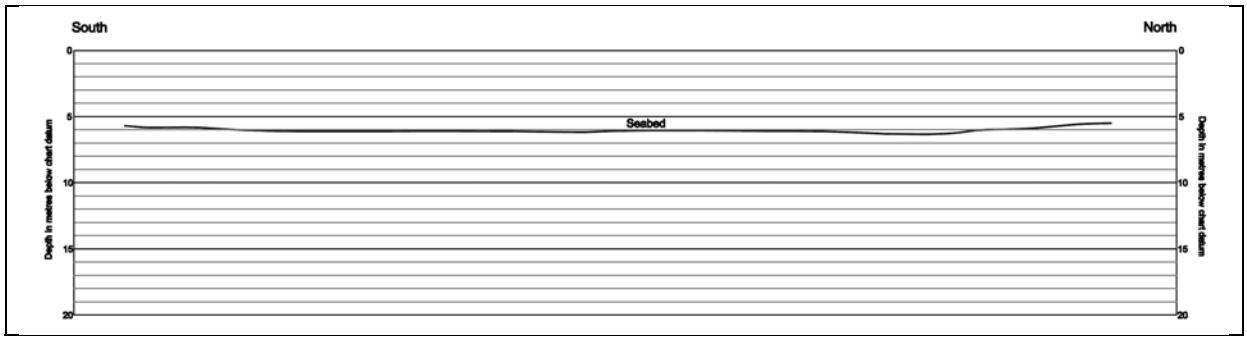


Source: JICA Study Team

Figure 2.7-8 Cross Section (Area2-06)

2) Abu Flus Port (Area4)

Water depth of the channel at Abu Flus Port is shallow around 6m depth. There is shallow area at Downstream of the port there is an even more shallow area with 5m to 6m depth on average.

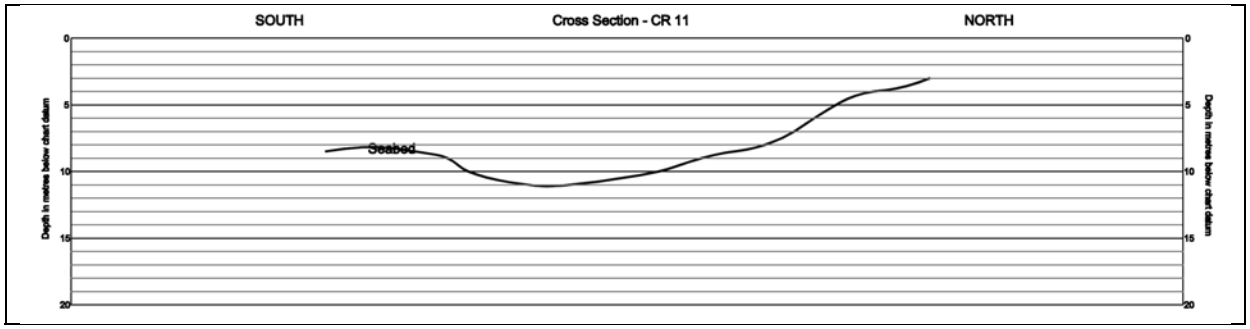


Source: JICA Study Team

Figure 2.7-9 Cross Section (Area4-02)

3) Channel Area (Area 1, Area 3 and Area 5)

Area 1 is upstream of Al Maqil Port. A dominating characteristic of this area is the merging Qamat Ali Canal and Shatt al Arab. At this area the river is very deep. Deep depth area by scour also exist at a meandering of a river.



Source: JICA Study Team

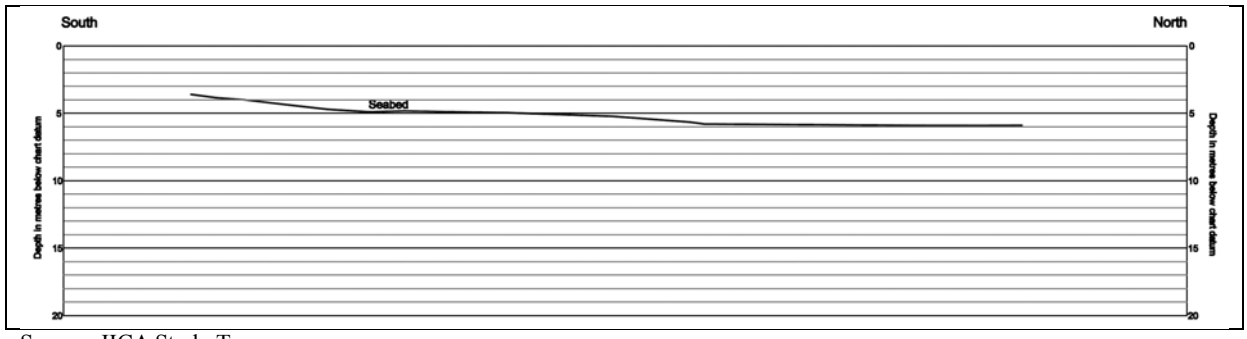
Figure 2.7-10 Cross Section (Area1-12)

Area 3 is the channel between Al Maqil Port and Abu Flus Port where the depth is between 9m to 14m. At locations where the river at this stretch is narrow, the water depth exceeds 15m. There are areas shallower than 7m depth upstream of Abu Flus Port.

Source: JICA Study Team

Figure 2.7-11 Cross Section (Area3-06)

Water depth is very shallow in the downstream of Abu Flus Port with 5m to 6m.



Source: JICA Study Team

Figure 2.7-12 Cross Section (Area5-03)

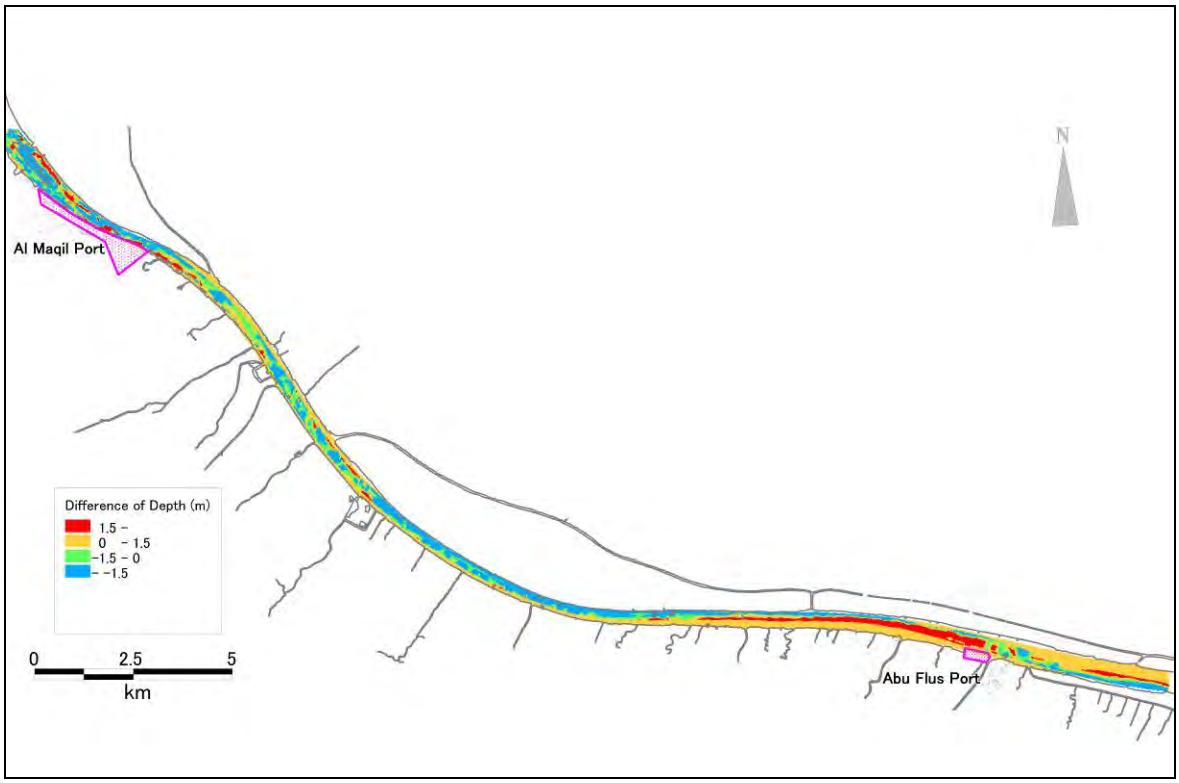
(6) Changes of Water Depth (1965-2014)

To assess the changes of water depth over time, the JICA Study Team made a comparison between water depth from survey data by JICA Study Team and water depth described in Chart No.3846 (Updated 2003,Hydrographic Office Defence Support Agency). Chart No.3846 is based on survey carried out from 1964 to 1965. Therefore, the comparison period is 49 years.

Figure 2.7-13 shows result of comparison of the water depth. Red color and yellow color mean soil sedimentation. Green color and blue color mean scouring of the river bed. The information described in the chart is coarser than the actual observed data. Therefore, as the comparison result is rough it is recommended to use Figure 2.7-13 only as an indication of the depth changes.

Features of water depth changes can be summarized as follows:

- Soil sedimentation have occurred in wide areas of upstream and downstream of Abu Flus Port.
- In other areas, there is no sediment over a wide area.



Source: JICA Study Team

Figure 2.7-13 Changes of Water Depth (1965-2014)

2.8 Development Plans in Iraq and Neighboring Countries

2.8.1 Industrial and Agricultural Development Plans

(1) Industry

1) Oil and Gas

According to NDP 2013-2017 by Ministry of Planning, Republic of Iraq, the following targets on the crude oil production and export will be aimed at the development plans up to Year 2017 as shown in Table 2.8-1.

Table 2.8-1 Crude Oil Production and Export up to Year 2017

(Unit: million barrels/day)

	2012	2013	2014	2015	2016	2017
Production	3.2	-	-	-	-	9.5
Export	2.6	2.9	3.5	3.75	5.0	6.0
Storage Capacity	10.987	-	-	-	-	30.357

Source: Prepared by JICA Study Team based on "NDP 2013-2017" by Ministry of Planning

There are studies to increase export capacity by extending a new line with a capacity of 1.25 million barrels per day through Syria to transport conventional oil and increase capacity of the Turkish line to one million barrels per day and extend another line through Syria with a capacity of 1.5 million barrels per day to transport heavy crude oil from the Najma and al-Qayara fields. The details are shown in Table 2.8-2.

Table 2.8-2 Export Capacity after restoring Current Systems

System	Capacity (million barrels/day)
Iraq-Turkey Line	1.6
Basrah Port	3.2
Al-Anaya Port	0.5
Export Capacity Project (Yen Loan)	3.2
Conventional Oil Transport System through Syria	1.25
Conventional Oil Transport System through Turkey	1.0
Heavy Oil Transport System through Syria	1.5
計	12.25

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

Oil product production is planned in Table 2.8-3. In the field of distillation and refining, the plan does not aim just to effect a large change in oil products but also to improve the quantity of products and their production according to international environmental requirements, especially improving the quality of gasoline and working to produce unleaded gasoline by the introduction of isomer units.

Table 2.8-3 Development of Oil Product Production 2013-2017

Unit: x1,000 tons/year)

Year	2012	2013	2014	2015	2016	2017
Refined Oil	27,200	36,200	37,600	37,600	37,600	43,000
Liquid Gas	321	445	584	584	767	949
Gasoline	3,900	5,200	5,400	5,400	7,800	9,900
Kerosene	3,400	4,500	4,600	4,600	5,500	5,600
Gas Oil	6,200	7,400	7,700	7,700	9,300	9,600
Black Oil	13,300	17,700	18,400	18,400	19,700	13,100

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

The main obstacle to distillation and refining activity in Iraq is the foreign investor's aversion to entering into these activities because of the great investments they require and the investment risks involved, which requires national efforts be made.

With regard to gas activity in Iraq, requisite importance has historically not been given to this activity and great quantities of gas were wasted in fires without economic benefit and which resulted in environmental pollution. Prospective undiscovered reserves are very large and estimated to be around 332 trillion. Iraq's fixed reserves can be categorized as follows: 70 % for associated gas, 20 % for free gas and 10 % for dome gas. According to NDP 2013-2017, it is expected that associated gas production will be raised from 1,574 tons per day in 2012 to 2,600 tons per day in 2017. Further the quantity of gas burned will be reduced to 100 MM cubic feet per day in 2017 instead of 800 MM cubic feet per day in 2011.

2) Electricity

Production capacity of electricity increased from 4,529 megawatts in 2008 to around 6,150 megawatts in 2012, which is below the level of need at about 14,000 megawatts. The per capita consumption rate increased from 1,100 kWh to 1,800 kWh. With regards to new projects underway, for most projects the implementation delay was due to technical or contractual reasons. With regards to existing projects, there was a clear decline in the utilization of productive capacities for a number of reasons including the lack or failure of fuels or oil derivatives to reach most of the electrical power generating projects, the qualitative decline in the fuels that reached the power stations, the difficulty in obtaining the alternative tools necessary for sustaining old generator stations, and the lack of skilled capabilities for generating, transporting, and distributing power, which is reflected in the electrical system's performance efficiency. The production of 6,150 megawatts realized in 2012 was achieved through various types of gas, steam, water and diesel stations. The details are shown in Table 2.8-4.

Table 2.8-4 Distribution of Energy Production by Generation Method in 2012

Station Type	Number of Station	Production (megawatts)	Share (%)
Gas	26	3,802	62.25
Steam	8	1,730	28.32
Diesel	6	103	1.69
Hydroelectric	10	473	7.74
Total	50	6,108	100

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

To meet a portion of the energy production shortage, around 1,200 megawatts are imported from Iran, and starting on July 2012, electrical power was imported from Syria after completion of the link at a rate of 100-150 megawatts for a short period. Currently there are procedures underway to import power from Turkey and there are also contracts for purchasing electrical power from barges. To meet the current limited production capacity as compared to the need, there are 17,750 megawatts under Implementation through a collection of steam, gas and diesel generator stations slated for completion in stages during 2013-2015.

According to NDP 2013-2017, it is planned that the electrical production capacity will be increased to cover the full increasing demand for power by reaching 25,000 megawatts. This will exceed the anticipated demand for 2017 by approximately 5,000 megawatts. Anticipated electricity demand from 2012 to 2017 is shown in

Table 2.8-5.

Table 2.8-5 Anticipated Electricity Demand 2012-2017

Demand	2012	2013	2014	2015	2016	2017
megawatts	14,020	15,183	16,298	17,494	18,628	19,823

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

It is expected that the Iraqi per capita consumption of electrical power will increase from current rate of around 1,800 kWh to 3,300 kWh in 2017.

3) Industries related to Energy

"Integrated National Energy Strategy (INES) by Iraq Prime Minister Advisory Commission" is referred to.

Six industries fall into this category: petrochemicals, fertilizers, steel, aluminum, cement and bricks. Each of these industries consumes large quantities of energy in the form of power or heating fuel for its production processes, and two of these industries (petrochemicals and fertilizers) require large quantities of natural gas components as feedstock for their products. Each of them provides a foundation for multiple secondary industries. Today these six industries are underdeveloped and in various states of disrepair and disuse. Chronic shortages of power and feedstock severely limit their operation. Iraq's needs for the products of these industries are met largely through imports. Yet each of these industries, if built to sufficient capacity, and if provided a sufficient supply of energy resources, has the potential to develop into a significant and profitable produces, meeting all of Iraq's needs and in some cases establishing also a material export presence.

a) Petrochemicals

In short, Iraq today has virtually no petrochemical production. Domestic demand of 188 KTPA is met almost entirely through imports. The Ministry of Industry and Minerals (MoIM) plans to rehabilitate Iraq' existing capacity and restore it to an effective capacity of 150 KTPA. The opportunity presented by petrochemicals, however, is likely far greater than that. Iraq's gas resources are abundant, and they are rich in ethane and other compounds used as feedstock in petrochemical conversion processes. Iraq therefore has a natural advantage in this industry. With expected growth in global demand of more than 4 percent per year, petrochemicals present a significant export opportunity.

In addition to ethane-based petrochemicals, Iraq's gas supply will support propane-based and methanol petrochemicals as well. To take advantage of this export potential, world scale petrochemical facilities should be located with other export-oriented industries in an industrial park.

b) Fertilizer

Iraq in 2010 had two fertilizer plants, established in 1975 and 1987, with a combined design capacity of 1.6 MTPA. Due to age and disrepair, the available capacity is only 700 KTPA, and because of shortage of power and natural gas the utilized capacity in 2010 was approximately 210 KTPA. This capacity supplies half of Iraq's domestic demand for fertilizers; the remainder is imported. The MoIM currently plans to rehabilitate existing capacity, which would make Iraq self-sufficient in fertilizer at present consumption levels.

The future availability of greatly increased quantities of natural gas provides the opportunity for a more expansive position. Fertilizer production uses methane as its primary feedstock, and as with petrochemicals, Iraq's abundance of natural gas provides a potential cost advantage in world markets. Global demand for fertilizer is expected to grow at an annual rate of 5 percent over the next twenty years as population increases and as demands on agricultural productivity rise. Rates of demand growth in South Asia, which already today is the world's largest net importing region, are expected to be even higher. South Asia's proximity and accessibility via the Arabian Gulf make the region a promising market for Iraq fertilizer production.

Fertilizer capacity is planned to satisfy domestic demand by 2017. In the short term, plants should be built near domestic demand centers. Once domestic demand is met, around 2017, new capacity should be built primary to serve export markets and should be located with other export-oriented industries in an industrial park.

c) Cement

Iraq in 2010 had 20 cement plants with a combined design capacity of 23 MTPA. Some of these plants are in disrepair, leaving an 's domestic cement consumption of 13.5 MTPA; the remaining demand is supplied through imports. The MoIM plans to rehabilitate existing capacity

available capacity of 18 MTPA. Power shortage and operational losses reduced the utilized capacity in 2010 to approximately 7 MTPA. This capacity supplies half of Iraq.

Although Iraq cement production enjoys no inherent advantage over production elsewhere, a large portion of total cement cost is attributable to transportation. Iraqi cement manufacture therefore has a price advantage in domestic markets relative to imports simply because of its proximity to customers. Domestic demand for cement is expected to grow rapidly due to reconstruction of Iraqi physical infrastructure, rising from 13.5 MTPA today to 27 MTPA by 2015 and 59 MTPA by 2030.

d) Steel

Iraq today has no steel capacity and must meet its 2 MTPA of domestic demand entirely through import. The MoIM proposes to rehabilitate a state-owned plant that is currently inoperative, providing capacity of 1 MTPA. The locational cost advantage of domestic steel manufacture, combined with Iraq's relatively low cost of energy inputs, will make domestic steel production competitive with imports with respect to long steel products. As economic reconstruction gears up, domestic demand for long steel is expected to increase substantially, rising to nearly 9 MTPA by 2030.

e) Aluminum

Iraq currently has no aluminum capacity, but the high energy intensity of aluminum manufacture gives Iraq a natural cost advantage that would likely place it in the most cost-efficient quartile of world aluminum producers. World demand for aluminum is expected to grow over the next decade at an annual rate of 6 to 7 percent as Asian countries continue to industrialize and as global rates of automobile ownership continue to rise. Iraq's potential cost advantage would position it as a strong competitor in this market.

INES calls for aluminum capacity to be developed in the medium term, and in moderate 500 KTPA increments. Under this plan, domestic demand will be met in 2022, and thereafter the aluminum industry will serve primary export markets, expanding as permitted by world market conditions. This industry, which imports alumina as well exporting aluminum, should be located close to import and export facilities along with other export-oriented industries in an industrial park.

f) Bricks

At the end of 2012, Iraq will have 29 MTPA of capacity for brick manufacture. Domestic demand exists currently for 43 MTPA, and is expected to grow rapidly with reconstruction, rising to 65 MTPA in 2030. Because of high transportation costs, domestically manufactured bricks would be in a position to displace imports if capacity were increased sufficiently.

(2) Agriculture

Despite the historical heritage of agricultural activity in Iraq, the agricultural sector, as clearly diagnosed by the situation analysis, has suffered and continues to suffer from great problems and challenges, the most prominent of which can be summarized in the following:

- A large deficit in the country's food security drawn from local production, especially the main crops and products and a weak competitive ability for plant and livestock production across the external and internal zones. Local production activity coverage of wheat needs reached 67 %, rice 15 % and vegetables 40 % in 2011.
- Limited amount of agricultural land actually utilized, which does not exceed 25 % of the total cultivatable land.
- Fragmentation of owner ship and small agricultural holdings to the degree that utilizing them is uneconomic, which also results in leaving broad areas unexploited by agricultural production.

- Increased desertification and spread of sand dunes and land erosion.
- A large decline in land unit productivity and farm animal productivity.
- Weak skills and human resources abilities in the agricultural sector and the failure of Iraq's cultivators to keep pace with technological developments and adopt improved new strains.
- Limited investment in the agricultural sector especially in land reclamation and water storage and the aversion of private investors, Iraqi and foreign, from entering into this activity despite the improvement in the country's investment environment and availability of the basic components of agricultural production including the main components of agro-industrial integration.

According to NDP 2013-2017, in the field of food production, the plan's first priority in plant production is to focus on the production of winter wheat and summer potatoes and to develop date and fruit production, and as a second priority, to produce rice, tomatoes, onions, white and yellow corn, feed legumes and clovers.

Table 2.8-6 Quantitative indicators for Plant Production

(Unit: Area 1,000 dunams, Harvest kg/dunam, Production 1,000 tons)

(Wheat)

	2011	2013	2014	2015	2016	2017
Area	6,543	6,787	6,953	7,119	7,303	7,451
Harvest	429	558	627	675	719	765
Production	2,809	3,784	4,360	4,806	5,252	5,697

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Rice)

	2011	2013	2014	2015	2016	2017
Area	220	220	220	220	220	220
Harvest	788	800	1,000	1,065	1,130	1,195
Production	173	176	220	234	249	263

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Barley)

	2011	2013	2014	2015	2016	2017
Area	3,651	3,923	4,043	4,162	4,281	4,400
Harvest	225	243	253	263	272	281
Production	820	953	1,024	1,094	1,166	1,236

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Corn)

	2011	2013	2014	2015	2016	2017
Area	288	785	850	915	981	1,046
Harvest	587	1,011	1,133	1,255	1,378	1,502
Production	288	794	963	1,148	1,352	1,571

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Tomato)

	2011	2013	2014	2015	2016	2017
Area	218	390	400	410	420	430
Harvest	4,182	4,500	5,000	5,800	6,728	7,804
Production	913	1,638	2,000	2,378	2,826	3,356

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Potatoes)

	2011	2013	2014	2015	2016	2017
Area	-	230	260	290	320	350
Harvest	-	4,596	5,346	6,124	7,034	8,103
Production	-	1,057	1,390	1,776	2,251	2,836

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Onion)

	2009	2013	2014	2015	2016	2017
Area	79	77	80	83	86	89
Harvest	3,897	2,735	3,000	3,000	3,000	3,000
Production	308	211	240	249	258	267

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Dates)

	2009	2013	2014	2015	2016	2017
Area	-	508	556	604	652	700
Harvest	60	68	70	75	74	76
Production	507	679	770	857	952	1,050

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

Dunam: 2,500 m^2 in Iraq

Quantity indicators for animal products are shown in Table 2.8-7

Table 2.8-7 Quantity Indicators for Animal Products

(Meat)

	Production (1,000 tons)	
	2013	2017
Sheep & Goat	104	137
Cows	101	113
Buffalo & Camels	26	30
Chicken	90	130
Fish	39	43
Total	360	453

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

(Milk)

	Production (1,000 tons)	
	2013	2017
Sheep & Goat	302	349
Cows	931	1,047
Buffalo & Camels	73	81
Total	1,306	1,477

Source: Prepared by Study Team based on "NDP 2013-2017" by Ministry of Planning

Following measures are proposed to achieve the above targets:

- Increase agricultural land and boost production and productivity
- Integrated land reclamation
- Fighting desertification and sand dune spread
- Optimal exploitation of water resources
- Supporting development in Iraq's countryside
- Sustaining national development programs and projects
- Foreign and domestic sector support for agricultural sector investment
- Adopting policies and programs for agricultural guidance and awareness
- Comparative advantage
- Interest in post-harvest operations
- Biological and environmental diversity
- Legal reform and the required legislative environment

2.8.2 Transport Sector

(1) Road

The following major projects with target years are listed up in the road sector according to the Iraq Transport Master Plan:

- Target Year 2010: Rehabilitation of existing roads, Development of Expressway No. 1 and FTP (Hila/Daura-Yousifiya), Improvement of national safety and road traffic signs, Road cadastre projects
- Target Year 2015: Construction of No. 2 ring road, Construction of No. 4 city diversion, Construction of No. 11 bridge, Improvement of national safety and road traffic signs
- Target Year 2020: Construction of Baghdad freeway ring road, Construction of Expressway No. 2, Improvement of local secondary carriageway

- Target Year 2035: Construction of No. 6 ring road and city diversion, Construction of new connecting road

According to "IRAQ Infrastructure Conference 2013 by MEED (Middle East Economic Digest)", the following road and bridge projects are planned from 2013 to 2017. Each project is shown in Table 2.8-9.

Table 2.8-8 Road and Bridge Projects

	New Construction		Maintenance	
	Length or Number (km or no.)	Budget (million US$)	Length or Number (km or no.)	Budget (million US$)
Expressway	800	3,800	1,200	1,065
Arterial Road	4,510	2,060	1,600	400
Bridge	97	1,100	20	100
Weight Station	78	130	-	-

Source: "IRAQ Infrastructure Conference 2013 by MEED (Middle East Economic Digest)"

Table 2.8-9 Road and Bridge Projects from 2013 to 2017

Project	Summary
1. Doura-Yousifiya Expressway /Baghdad	Length 15 km
2. Rehabilitation on Expressway No. 1	
A. Baghdad-Hila (R4)	Length 105 km
B. Hila-Diwania (R5)	Length 86 km
C. Abo Ghraib Expressway	Length 23 km
D. Nasria-Basrah (R7) (R8)	Length 250 km
3. Expressway No. 2 (Part-1) Baghdad-Samara	Length 90 km
4. Phase 2 on Hajj Road in AL-Najaf	Length 50 km
5. Primary Roads	Length 200 km
6. Rehabilitation	Length 800 km
7. Griaat Bridge (Cable Stay Bridge)	1
8. Hilia Bridge in Babylon (Cleaver Leaf Junction)	1
9. Darajy Bridge (Samawa)	1
10. Replacing Small Bridges in Dewaniya	9

Source: "IRAQ Infrastructure Conference 2013 by MEED (Middle East Economic Digest)"

(2) Railway

According to NDP 2013-2017, development targets in the railway sector are as follows:

- Increase rail transportation capacity for travelers and freight according to the quantitative indicators.
- Complete the conversion of single-track to double track lines.
- Implement new nodes with high specifications.
- Eliminate all rail crossings.
- Equip the rail network with modern trains and new cars and trucks for transporting travelers and freight so as to meet the needs of the population and the national economy, and rehabilitate the current stock.
- Modernize communication and signal system in the current rail network and the network that will be implemented in coming years. This includes the communication system with satellite dishes that is currently being implemented that pinpoints the location of the dishes at any time for the purpose of preventing accidents and train crashes.
- Allocate the necessary investments to develop and modernize rail transportation activity and build new projects.

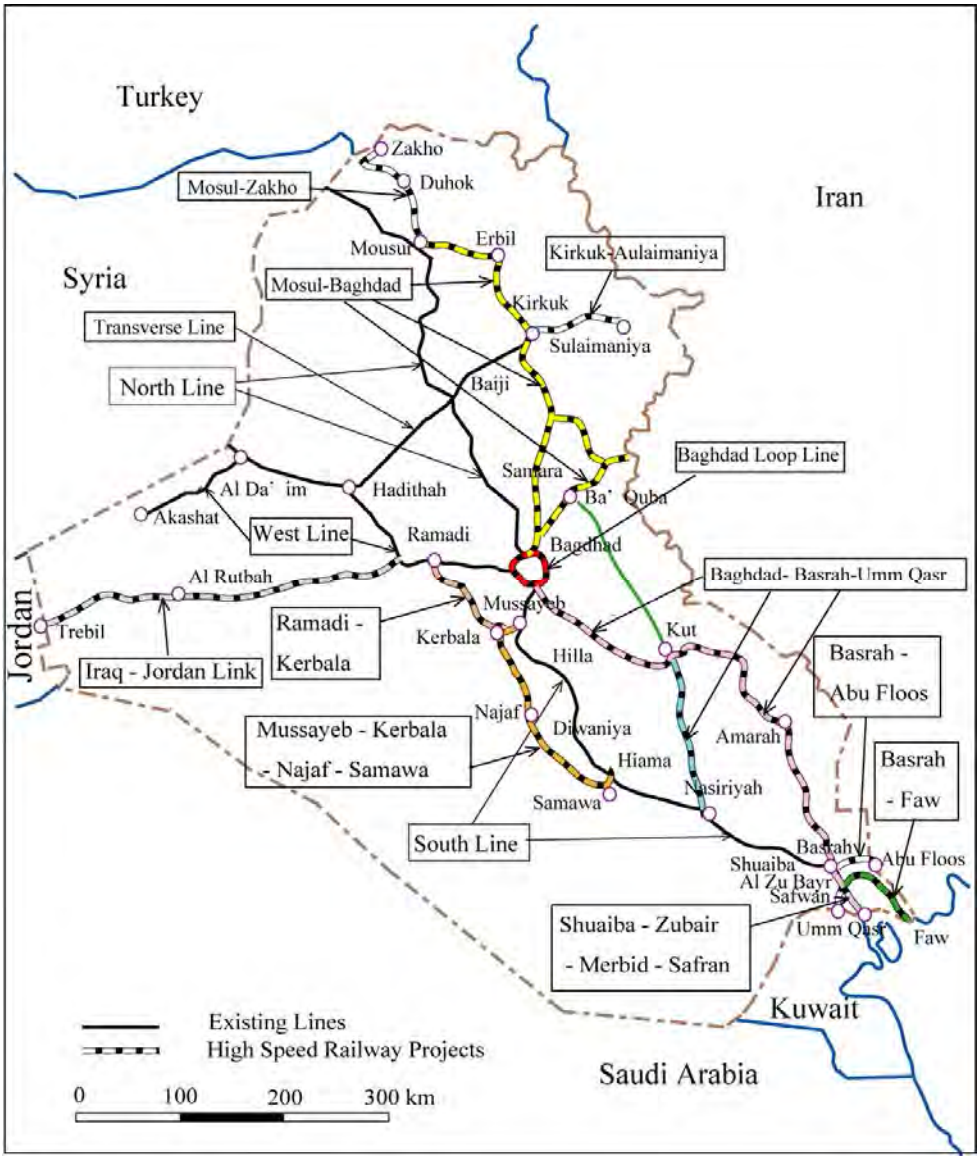
- Reconstitute the General Authority for Implementing Railway Projects to relieve it of responsibility for implementing projects and shifting them to companies specialized in this field, or rehabilitate the State Company for implementing Transportation Projects (currently in existence) to be specialized in implementing railways works only.
- Develop engineering and technical teams for implementing and constructing railway projects using national capabilities, and providing the specialized requirements and railway construction equipment so as to create high-quality national teams specialized in this field.
- Develop and modernize the Railway Institute and improve its work methods.
- Further the second targets related to the above are as follows:
- Increase passenger train speed to 140 km/hr in the first stage and 250 km/hr in the second stage.
- Convert railway system to electric.
- Eliminate all rail crossings.
- Strengthen the rail link with neighboring countries to serve national interests.
- The following targets are aimed at promoting investments by the private sector:
- Propose strategic rail projects for domestic and foreign private investment according to the BOT system, payment on credit after approval, or any other investment formula that satisfies the national interest.
- Strengthen the role of the private sector in operation and management processes and offer railway activity services.
- Authorize the private sector to open rail transportation agencies to draw transportation requests toward this means.

According to "IRAQ Infrastructure Conference 2013 by MEED (Middle East Economic Digest)", New High Speed Railway Projects are planned by Iraqi Republic Railways (IRR). These projects consist of two main routes, the Eastern Route from south to north and the Western Route from south to west. It is planned that all the projects will be electrified. (See Table 2.8-10 and Figure 2.8-1)

Table 2.8-10 New High speed Railway Projects

	Length (km)	Speed (km/hr)	Design Axle Load (t)	Transport Capacity	Cost (MUS$)	Current Stage
Mosul-Duhok-Zakho (Link with Turkey)	167 (Double -track)	200-Passenger 140-Freight	25	1M-Passenger 55Mt-Freight	2,157	Design
Baghdad-Ba'qoba-Kirkuk-Erbi-Mosul	555 (Double -track)	250-Passenger 140-Freight	25	6M-Passenger 20Mt-Freight	7,000	Design
Baghdad Loop Railway Line	140 (Double -track)	200-Passenger 140-Freight	25	23M-Passenger 46Mt-Freight	2,000	Design
Baghdad-Kut-Amara-Basrah	504 (Double -track)	250-Passenger 140-Freight	25	9M-Passenger 20Mt-Freight	6,100	Design
Basrah-Faw (Link with New Al Faw Port)	101 (Double -track)	140-Passenger 100-Freight	25	1M-Passenger 70Mt-Freight	1,200	Detail Design
Basrah-Shalamja	35 (Single -track)	120	25	2M-Passenger 10Mt-Freight	400	Pre. Design
Kut-Ba'qoba	250 (Double -track)	250-Passenger 140-Freight	25	6M-Passenger 20Mt-Freight	3,000	Propose
Kirkuk-Sulaimaniya	118 (Single -track)	200-Passenger 140-Freight	25	1.5M-Passenger 6Mt-Freight	1,500	Detail Design
Baghdad-Mussaeb-Karbala-Najaf-Basrah-UQP	663	275-Passenger	18	12M-Passenger	10,000	Pre. Design
Karbala-Ramadi	132 (Single -track)	250-Passenger 140-Freight	25	3M-Passenger 36Mt-Freight	1,500	Design
Ramadi-Terebil (Link with Jordan)	420 (Single -track)	250-Passenger 120-Freight	25	2.5M-Passenger 12Mt-Freight	2,300	Pre. Design

Source: "IRAQ Infrastructure Conference 2013 by MEED (Middle East Economic Digest)"



Source: Prepared by JICA Study Team based on Presentation Material of "Iraq Infrastructure 2013", IRC

Figure 2.8-1 Railway development plan

Following projects are also planned without detailed information:

- Baghdad-Mussaeb
- Mussaeb-Karbala-Najaf-Samawa
- Samawa-Nasiriya-Basrah-Umqasr
- Railway Network in Basrah
- Basrah-Safwan (Link wth Kuwait)

(3) Civil Aviation

According to NDP 2013-2017, development targets in the airport sector are as follows:

- Rehabilitate currently existing airports.
- Build new airports in high-demand regions and regions that attract tourism, particularly religious tourism, such as Middle Euphrates Airport.
- Rebuild the Iraqi air fleet with modern airplanes.

- Rehabilitate and develop current personnel and assist the company with new, young personnel.
- Develop and modernize the Civil Aviation Institute.
- Guarantee safety and security on the flag carrier.
- Adhere to international conditions and requirements for safety and security standards and regulate take-off and landing times.

Future plans for strengthening transport capacity on travelers, number of planes etc. are shown in Table 2.8-11~Table 2.8-13.

Table 2.8-11 Number of Planes and Travelers in 2012-2017

Year	Airplanes		Travelers	
	Landing	Departing	Inbound	Outbound
2012	13,906	13,906	992,301	1,008,847
2013	16,223	16,223	1,129,170	1,155,431
2014	18,540	18,540	1,266,039	1,302,015
2015	20,857	20,857	1,402,908	1,448,599
2016	23,174	23,174	1,539,777	1,595,183
2017	25,491	25,491	1,676,646	1,741,767

Source: NDP 2013-2017

Table 2.8-12 Number of Planes Projected to be Added in 2012-2017

Type	2013	2014	2015	2016	2017	Total
Long-range	3	2	2	5	3	15
Middle-range	5	4	3	5	2	19
Cargo	-	-	2	2	2	6
Total	8	6	7	12	7	40

Source: NDP 2013-2017

Table 2.8-13 Planned International and Domestic Transportation in 2012-2017

Year	2012	2013	2014	2015	2016	2017
International Traveler	500,940	1,083,252	1,516,552	1,971,517	2,464,397	2,710,836
Domestic Traveler	48,036	173,643	225,735	293,455	366,819	403,500
Inbound Cargo (t)	47,436	108,423	151,792	346,085	795,997	1,034,796
Outbound Cargo (t)	924	692	969	1,259	1,574	1,732

Source: NDP 2013-2017

It is noted that the final target up to 2017 is to open the field for the private sector to manage and operate service facilities in airports on an investment basis.

2.8.3 Development Plans in the Middle East Counties

(1) Transport Sector

1) Kuwait

The border gate between Iraq and Kuwait is located in Safwan. Transportation of cargo loads between Kuwait City and Basrah are exchanged at the border point of both countries. Kuwaiti trucks and Iraqi trucks are currently not permitted to enter each other countries, and therefore there is an additional charge for the transfer of cargo loads at the border. According to the "New High Speed Railway Projects" by Iraqi Republic Railways, the railway line between Basrah and Safwan is planned on the premise that Kuwait and Iraq would be linked by railways, but no detail is shown.

"Kuwait Mega Projects 2010-2014", which includes a total of 1,100 projects and among them lots of Mega Projects, was approved with estimated KD 37 billion (US$ 125 billion) of spending focusing on both oil and non oil economic sectors. Kuwait announced spending in the 2010/2011 fiscal year about KD 16 billion (US$ 55.6 billion), and it will base its 2010/2011 budget on an oil price of US$ 4 a barrel. The plan aims at decreasing the country's dependence on oil but also to include investment on raising oil and natural gas production, and it also aims to turn Kuwait into a regional trade and financial hub through sustaining economic development, economic diversification and GDP growth. Private sector will be involved in such projects mainly through BOT schemes.

The project summary is shown below:

- The new business hub (Silk City) with estimated cost US$ 77 billion
- A major container harbor and a 25 km causeway
- Railway and metro system
- Additional spending on new cities, infrastructure and services; particularly health and education
- Around KD 25 billion of oil sector investments to raise production capacity and modernize current facilities

Main infrastructural projects are as follows:

a) Air Access

The most significant infrastructural development consists of the ongoing expansion of the Kuwait International Airport. The expansion project involves the construction of a new terminal building, an extension of the two existing runways with a length of 600 meters and the construction of a third runway. The airport capacity will be increased to 20 million passengers upon the project's completion. These projects are carried out by the Kuwait Directorate-General of Civil Aviation.

- Kuwait International Airport Expansion Plan:

Estimated value is KD 212 million. The expansion project involves the construction of a new terminal building that will be connected to the existing terminal building via a tunnel, an extension of the two existing runways and the construction of a third runway. Tender for the main contract is expected to be issued in May 2012 and completion to be in 2016.

- Kuwait International Airport Expansion (Infrastructure):

Estimated value is KD 150 million. The project calls for design and construction of infrastructure work for the Kuwait International Airport, including approach roads leading to the airport, runway and aircraft hangars. The main contract started in 2009.

b) Ground Access

Another key infrastructure development is the expansion of highways system and road networks including the ring roads, the implementation of a mass transport system, and the implementation of a smart parking system. An underground network and a railway system will link Kuwait to the other members of the GCC, Central Asia, Europe, India Subcontinent and the Middle East. The railway project is planned to be 265 km long and will cover almost all parts of Kuwait. Also, the Jaber Al-Ahmad expressway will link the Silk City and the satellite cities to be built in the northern area of Kuwait city.

- National Rail Network and a Metro System:

Estimated value is KD 4 million. The Kuwait Metropolitan Rapid Transit calls for construction of a 171 km Kuwait Metro. The Metro will be built across the inner city of Kuwait and will include 4 lines. 60 km of the metro will be built underground, and will cover the country. Main contract is expected to start in 2011 and completed in 2016. National Railway System will be 518 km long and is planned to link a proposed 2,000 km Gulf railway line with Iraq, Iran and beyond. It will link the Saudi border in the south with the Iraqi border in the north, besides linking the east and west points in the country. The project is estimated to cost around KD 1.8 billion and will be implemented by the private sector.

- Jaber al-Ahmad Al Sabah Bridge:

Estimated value is KD 750 million. The Jaber Al-Ahmad expressway will link the Silk City and the satellite cities to be built in the northern area of Kuwait city. The project includes the construction of a Jaber Al-Ahmad Al-Sabah bridge and is expected to start in 2010.

c) Development of Kuwait's Islands (Bubiyan and Failaka)

- Bubiyan Island Development: Estimated value is KD 345 million including the Bubiyan Harbor development project. The MPA (Mega Projects Agency) plans to build Bubiyan Island Port to serve the export and import requirements for the reconstruction of Iraq for 20 years. Upon its completion, the port will have a total handling capacity of 2.5 million containers per year. It has four stages, the first of which is divided into three chapters. The first chapter (2007-2011) envisaged building the new railway and the new road and treating the soil there. The second (2009-2013) aims to deepen the draught of the harbor to 30 meters in order to be able to receive larger ships in line with the world's latest standards. The third (2009-2014) aims to launch nine docks at the harbor in order to expand the harbor's handling capacity to 2.5 million containers a year. The second stage of the project (2016-2021) envisages adding seven docks while the third stage (2023-2028) will add eight docks and the fourth stage will add 36 docks by 2033, thus pushing the total number of docks to 60.
- Bubiyan Island Development Project: The project envisages initiating nature reserves and tourist resorts and a residential area along the coast line, building a modern road network between Al-Sibiyah and Al-Jahra cities and Sheikh Jaber Al-Ahmada Bridge, with a total length of 36 km to link the island and the harbor on one hand to Kuwait city and Al-Sibiyah city on the other.
- Failaka Island Development: Estimated value is KD 120 million. The MPA is also developing the Failaka Island, which is one of the country's major islands located some 20 km off the coast of Kuwait city in the Persian Gulf. The island has a historical significance as it dates back to thousands of years and is known of many Greek antiquities. Its development project aims to launch a world-class tourist resort, 20 hotels, chalets, a golf course, housing units, a marine park, four marinas, and entertainment facilities in an environment-friendly atmosphere. It is to be developed on a BOT basis and the initial completion deadline set for 2015 is unlikely to be met.
- Jaber Al Ahmad Al Sabah Hospital: Estimated value is KD 304 million. The project involves the construction and maintenance of Jaber Al Ahmad Al Sabah Hospital in Surra, comprising five buildings (1,268 beds) and a car parking area with capacity of 4,000 vehicles. The construction works have already commenced on this development and are expected to be completed by the end of 2012.
- Renovation and Beautification of Downtown Kuwait: Estimated value is KD 20 million.
- Development and Beatification of Sulaibikhat Beach: Estimated value is KD 35 million.

2) Jordan

The western point of entry into Iraq is Trebil, on the Iraqi/Jordanian border, and all kinds of cargoes are transited from Aqaba Port in Jordan.

A railway plan connecting Baghdad with Aqaba Port was discussed by both countries' officials in 2011. In August 2011, Jordanian government approved the construction of the railway from Aqaba to the Iraqi border (near Trebil). Once built, the Jordanian project would allow for the transport of more than 6 million tons of goods and cargoes, and more than 1 million passengers a year. In addition, Iraq would gain an outlet to the Red Sea from which it could export limited quantities of crude oil. The railway plan, which officials hope will be operational by 2016, would extend about 1,120 km, with 420 km inside Iraqi borders and 700 km inside Jordan.

The above project is included in the "New High Speed Railway Projects" by Iraq Republic Railways, and the railway line between Aqaba and Ramadi is planned on the premise that Jordan and Iraq would be linked by railways. And it is planned that the length is 420 km with single track, annual design transport capacity is 2.5 million for passengers and 12 million tons for freights, and design speed is 160~250 km/hr for passenger transport and 120 km/hr for freight transport. The project cost is US$ 2,300 million and its progress is under preliminary design. The Iraqi side in the meantime started the construction of the line from the border to their current railhead at Ramadi.

3) Syria

The other western point of entry into Iraq receiving cargoes is the Iraqi/Syrian border and cargoes are transited from Beirut Port in Lebanon and Ports of Latakia and Tartus in Syria.

Syrian Railways had been extending a rail route from Deirez-Zor Junction towards the modern Husaibah branch terminus on the Iraqi side of the border, which was built as a through station. This route would be more direct than the existing one via the border station at Tall Kushik.

4) Turkey

The northern point of entry into Iraq is Zakho on the Iraqi/Turkish border and cargoes are transited from Mersin Port in Turkey. This entry point is important since it services all shipments destined to the northern cities of Iraq such as Dahooq/Erbil/Sulaimaniya/Al Mosul and Kirkuk.

Iraq has conducted intermittent negotiations over the years with Turkey, Kuwait, and Saudi Arabia concerning the establishment of rail links to complete a continuous Europe-Persian Gulf railroad route.

Iraq Republic Railways signed a contract with the Turkish government last week to establish a joint railway company in June 2011. The joint company will focus on improving mobile units, such as train locomotives, wagons, and haulers as well as developing the technical units to raise the level of Iraqi factories to reach world standards in railway transport. The company will implement a direct rail line linking the two countries without passing through Syria. The company will also transfer Turkish maintenance expertise to Iraq, bypassing red tape in the import of spare parts in addition to increasing the volume of transport traffic between Iraq and Turkey, in both cargo and passengers, by providing modern train cars.

The above project is included in the "New High Speed Railway Projects" by Iraq Republic Railways and the railway line between Mosul, Duhok and Zakho is planned on the premise that Turkey and Iraq would be linked by railways. And it is planned that the length is 167 km with double track, annual design transport capacity is 1 million for passengers and 55 million tons for freights, and design speed is 200 km/hr for passenger transport and 140 km/hr for freight transport. The project cost is US$ 2,157 million and its progress is under design review.

5) Iran

According to the "New High Speed Railway Projects" by Iraq Republic Railways, the railway line between Basrah and Shalamja is planned on the premise that Iran and Iraq would be linked by railways. And it is planned that the length is 35 km with single track, annual design transport capacity is 2 million for passengers and 10 million tons for freights, and design speed is 120 km/hr. The project cost is US$ 400 million and its progress is under preliminary design.

Further, new railway lines from Kermanshah to Qasr-e Sirin have been constructed in Iran and these will be connected to the Kurdistan Region in the near future.

Iran has the road network with a 210,000km length and there are 7 border gates in Khosravi, Mahran, Bashmagh, Chazzabe, Tamarchin, Parvizkhan and Shalamcheh with Iraq.

Iran, Iraq and Syria have signed a memorandum of understanding to expand their trade cooperation and boost the transit of goods through their border. Once the Project which is the railway line between Iraq port city of Basrah and Shalamja is completed, the railway link will stretch to the Syrian port city of Latakia from ports of Iran through ports of Iraq.

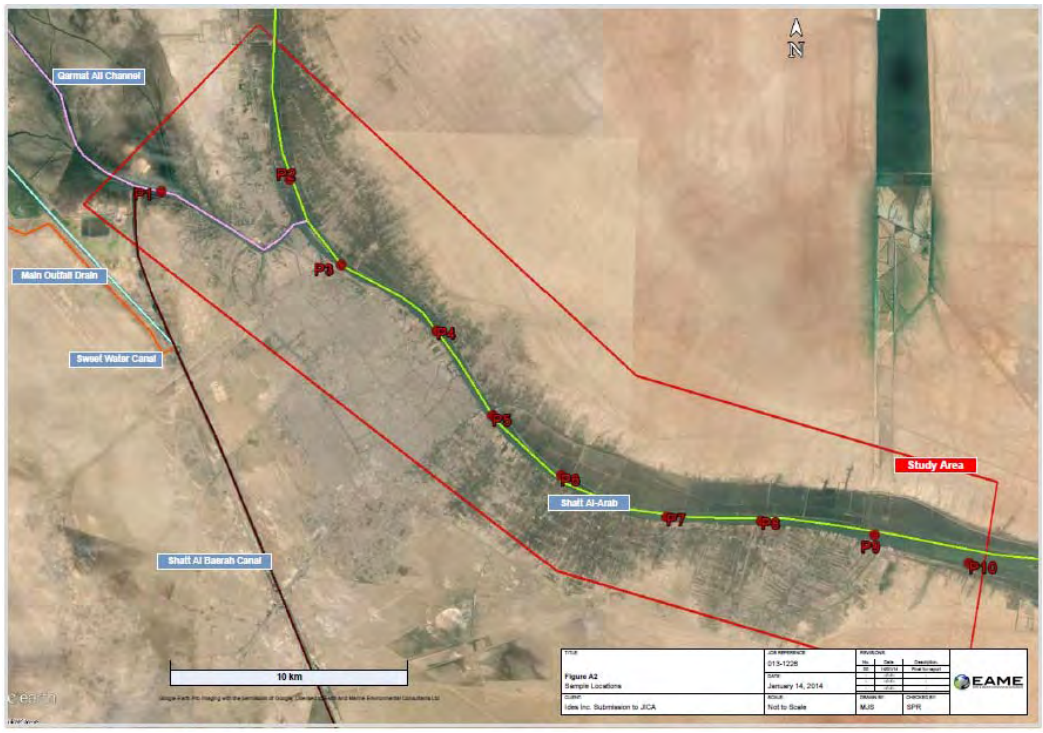
2.9 Environmental and Social Conditions

2.9.1 Environmental Condition Survey

While baseline surveys on water and sediment qualities have been carried out at UQP and KZP, and results are available from the survey reports, and an environmental study has been done for AFGP Project, it is expected that no baseline survey has been done for Al Maqil or Abu Fuls Port and therefore, no information is available. Hence, the Study Team conducted surveys of water and sediment qualities at these two ports and their vicinities to examine environmental impact from dredging and the removal of ship wrecks. In addition, literature survey and interviews were carried out with a purpose to collect general information related to natural and social environmental situation on the main ports.

The water and sediment quality surveys were conducted on 11 December 2013 (Low tide, only water quality) and 17 January 2014 (High tide, both water quality and sediments) by subcontractor EAME. The locations for sampling water quality and sediments are shown in Figure 2.9-1, and the survey items are listed in Table 2.9-1.

Results of environmental and social survey are shown in Sections 2.9.2 and 2.9.3.



Source: Prepared by EAME based on Google Earth Pro Imaging with the permission of Google Licensed to Earth and Marine Environmental Consultants Ltd.

Figure 2.9-1 Water and sediment quality sampling location in Shatt al Arab River

Table 2.9-1 Social and environmental surveys

Content	Items	Locations and quantity
Water Quality	Water Temperature, Salinity, SS, pH , DO, BOD, T-N, T-P, Oil & Grease, Coliform Bacteria, Cyanide (CN), Arsenic (Ar), Cadmium (Cd), Chromium (Cr)+6, Lead (Pb), Mercury (Hg), Total PCBs	Between Al Maqil Port and Abu Flus Port, 10 locations x 2 layers x 2 tide cycles
Sediment Quality	Specific gravity, Water content, Particle size distribution, Total organic carbon (TOC), Oil & Grease (total petroleum hydrocarbon), Phenol, Total nitrogen(T-N), Total Phosphorus(T-P), Total sulfur (T-S), Cyanide (CN), Arsenic (Ar), Tin (Sn), Iron (Fe), Manganese (Mn), Cadmium (Cd), Chromium (Cr)+6, Lead (Pb), Mercury (Hg), Copper (Cu), Nickel (Ni), Zinc (Zn), Total PCBs, Total DDT, Dioxins, Tributyltin (TBT)	Between Al Maqil Port and Abu Flus Port, 10 locations x 1 layers
Literature survey and Interview	Natural environment (fauna & flora, protected area, endangered species etc.)	Vicinity of main ports
	Socioeconomic situation (land use, livelihood, fishery, cultural heritage etc.)	Vicinity of main ports

Source: JICA Study Team

2.9.2 Natural Environmental Conditions

(1) Hydrology

Al Maqil and Abu Flus Ports are located in the Shatt al Arab River, KZP and UQP are located in the Khor Al Zubayr Waterway and AFGP faces the Arabian Gulf.

The Shatt al Arab River is formed by the confluence of the Euphrates and the Tigris Rivers in the north of Basrah Govenorate. The Qarmat Ali Canal whose water source is an upper marsh flows into the Shatt al Arab River in the north of Al Maqil Port and connects to the Khor Al Zubayr Waterway via the Shatt al Basrah Canal. The Shatt al Basrah Canal is an artificial water way constructed in the early 1970s as a flood relief channel to protect the west of Basrah city and to provide a more direct navigation than the Shatt al Arab from the Gulf. Khor Al Zubayr could be descrived as an elongated marine lagoon environment, an ancient extension of the River Euphrates, as a result of tectonic disturbances caused the uplift of the surrounding lands and propagation of sealevel disconnected the river course and thus become a marine lagoon. In the lower of Abu Flus Port, the Karun River flows in from Iran.

Source: Prepared by EAME based on Google Earth Pro Imaging with the permission of Google Licensed to Earth and Marine Environmental Consultants Ltd.

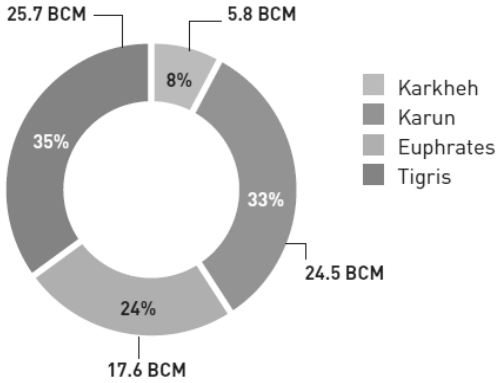
Figure 2.9-2 Rivers and waterways in or around project area

A maximum tidal range is about 5m and current speed can reach 3-5 knots in Khor Al Zubayr Waterway. The volume of suspended sediment within the channel is noted to be approximately 157 tons per hour[1].

The UN has estimated the potential long-term mean annual discharge of the Shatt al Arab into the Gulf as 73.6 billion m^3 (BCM) or approximately 2,340 m^3/s. The total flow volume is calculated as the sum of the long-term mean annual flow estimates of the main four Shatt al Arab tributaries (Figure 2.9-3). At the confluence of the Shatt al Arab with the Gulf, the Shatt al Arab has a total sediment transport rate of 4,700-7,000 kg/sec[2]. However, it should be noted that this figure will be an overestimation due to the influence of the development of upstream dams, reservoirs and other infrastructure.

[1] Dawood J. Al-Rubaiay (1984), Irrigation and Drainage Systems in Basrah Province, Iraq, University of Durham Thesis for the Dgree of Doctor of Philosophy

[2] An Approach to the Sediment Transport Problem form General Physics, Bagnold R.A., US Geological Survey Professional Paper Bulletin, Volume 422, 1966



Source: UN(2013), Inventory of Shared Water Resources in Western Asia, Chapter 5 Shatt al Arab, Karkheh and Karun Rivers

Figure 2.9-3 Potential mean annual flow contributions to the Shatt al Arab

(2) Air Quality

The overall air quality in Basrah has been deteriorating as development, population, traffic and industrial activity have increased.

MOEn has conducted air quality monitoring on trial basis. Minimum monthly total suspended particulate (TSP) monitored by MOEn from May to December 2009 in Basrah ranged between 202 - 2,181μg/m^3 and exceeded EU and WHO guideline value of 300μg/m^3 and 150-230μg/m^3 respectively. While SO_2, NO_2 and CO from the Basrah and Zubair monitoring stations on 31 March and 4 April 2013 were below IFC guideline values.

EAME conducted air quality monitoring for such as Particulate Matter (PM1, PM2.5 and PM10), NO2, Hydrogen Sulphide (H_2S), and Volatile Organic Compounds (VOC) at two locations around Faw area four times over 12 months from 2010 to 2011. The results were well below thh published IFC or UK standards apart from a few exceptions of Particulate Matter or others. The measured high levels of Particulate Matter are likely to be attributable to windblown dusts and sands which are typical for this region rather than from industrial sources.

(3) **Water Quality**

1) Shatt al Arab River

The survey result of Water quality taken in December 2013 (low tide) and January 2014 (high tide) is shown in Table 2.9-2 (refer to Figure 2.9-1 for the location). The results are compared with environmental standard in Iraq for fresh water and EU standard for bathing water quality for the result of coliform bacteria.

- Electrical Conductivity (EC) ranged between 2,066 - >3,999 μS/cm (equivalent to Salinity of ca. 1-2 ‰) during low tide and 2,380 – 4,360 μS/cm (equivalent to Salinity of ca. 2-3 ‰). The effect of the Arabian Gulf is noticeable at high tide. No stratification was evident with the EC measurements.
- Dissolved Oxygen (DO) was generally high value above 5 mg/L apart from some locations where DO is below Iraqi standard.
- BOD, indicator of organic pollution, was below 1.2 mg/L at all stations.
- Total Petroleum Hydrocarbons (TPH), indicator of oil and grease, were not detected at all stations.
- Coliform count ranged between 70,000 and 510,000 cfu/100mL and exceeds EU standard for bathing water quality.

- Cyanide (CN), Arsenic (As), Cadmium (Cd), Lead (Pb) and Mercury (Hg) were below Iraqi environmental standard.

There is little evidence of significant pollution of the water quality in Shatt al Arab River except coliform perspective. It is considered that poor sewage or waste water treatment causes high coliform counts in the Shatt al Arab River. So proper treatment of sewage and waste water is suggested.

Table 2.9-2 Water Quality in Shatt al Arab River

Stn	Tide	Depth		Temp.	EC	SS	pH	DO	BOD	TN	TP	TPH	Coli.	CN	As	Cd	Cr(VI)	Pb	Hg	PCBs
		m		°C	µS/cm	mg/L	-	mg/L	mg/L	mg/L	mg/L	µg/L	cfu/100ml	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
S01	Low	S	0	15.3	3,081	<2.0	8.23	7.4	<1.0	1.1	<0.02	<10	242,000	<10	3.1	<0.08	<5.0	<1.0	<0.5	<0.4
		B	8.3	14.9	>3,999	20.0	8.22	7.1	<1.0	1.1	<0.02	<10	174,000	<10	3.7	<0.08	<5.0	1.8	<0.5	<0.4
	High	S	0	16.6	4,250	<2.0	8.56	4.0	<1.0	1.1	<0.02	<10	125,000	<10	5.9	<0.08	<5.0	1.9	<0.5	<0.4
		B	11.0	15.9	4,210	3.0	8.52	4.2	<1.0	0.9	<0.02	<10	70,000	<10	5.7	<0.08	<5.0	1.6	<0.5	<0.4
S02	Low	S	0	15.7	2,066	6.0	8.30	6.4	<1.0	0.6	<0.02	<10	165,000	<10	2.7	<0.08	<5.0	1.1	<0.5	<0.4
		B	8.4	15.9	2,189	8.0	8.25	6.1	<1.0	0.6	<0.02	<10	202,000	<10	3.4	<0.08	<5.0	2.1	<0.5	<0.4
	High	S	0	14.7	2,380	2.0	8.55	3.9	<1.0	1.1	<0.02	<10	142,000	<10	3.6	<0.08	<5.0	3.7	<0.5	<0.4
		B	6.7	14.5	2,330	4.0	8.51	4.0	<1.0	0.6	<0.02	<10	210,000	<10	5.1	<0.08	<5.0	<1.0	<0.5	<0.4
S03	Low	S	0	15.9	2,850	8.0	8.27	6.2	<1.0	0.6	<0.02	<10	123,000	<10	1.8	<0.08	<5.0	2	<0.5	<0.4
		B	13.6	15.2	3,054	4.0	8.23	6.5	<1.0	0.9	<0.02	<10	179,000	<10	3.6	<0.08	<5.0	<1.0	<0.5	<0.4
	High	S	0	15.3	3,130	4.0	8.52	3.7	<1.0	0.6	<0.02	<10	270,000	<10	5.7	<0.08	<5.0	2	<0.5	<0.4
		B	14.5	15.2	3,910	2.0	8.55	3.9	1.2	0.7	<0.02	<10	134,000	<10	3.8	<0.08	<5.0	1.6	<0.5	<0.4
S04	Low	S	0	16.5	2,510	2.0	8.18	7.3	<1.0	0.7	<0.02	<10	207,000	<10	4.1	<0.08	<5.0	<1.0	<0.5	<0.4
		B	9.2	16.6	2,572	14.0	8.14	6.9	<1.0	0.4	<0.02	<10	381,000	<10	2.7	<0.08	<5.0	2.7	<0.5	<0.4
	High	S	0	15.9	3,650	5.0	8.19	6.3	<1.0	0.5	<0.02	<10	130,000	<10	4.2	<0.08	<5.0	<1.0	<0.5	<0.4
		B	9.2	15.6	3,620	4.0	8.33	5.8	1.2	0.5	<0.02	<10	203,000	<10	4.8	<0.08	<5.0	1.9	<0.5	<0.4
S05	Low	S	0	16.5	2,424	<2.0	8.20	7.5	<1.0	0.5	<0.02	<10	163,000	<10	4.4	<0.08	<5.0	1	<0.5	<0.4
		B	9.0	16.6	2,456	4.0	8.16	7.5	<1.0	0.4	<0.02	<10	121,000	<10	2.4	<0.08	<5.0	1.3	<0.5	<0.4
	High	S	0	16.2	3,650	5.0	7.87	6.1	<1.0	0.6	<0.02	<10	161,000	<10	5.0	<0.08	<5.0	<1.0	<0.5	<0.4
		B	10.3	16.1	3,590	3.0	8.01	6.2	1.2	0.6	<0.02	<10	240,000	<10	4.8	<0.08	<5.0	1.6	<0.5	<0.4
S06	Low	S	0	17.4	2,491	2.0	8.18	7.1	<1.0	0.3	<0.02	<10	178,000	<10	2.9	<0.08	<5.0	1.1	<0.5	<0.4
		B	9.4	17	2,564	8.0	8.17	6.9	<1.0	0.3	0.023	<10	179,000	<10	1.8	<0.08	<5.0	1.5	<0.5	<0.4
	High	S	0	15.8	3,570	2.0	8.27	5.8	1.2	0.7	<0.02	<10	210,000	<10	3.7	<0.08	<5.0	<1.0	<0.5	<0.4
		B	10.8	16.1	3,540	4.0	8.27	5.8	<1.0	0.5	<0.02	<10	172,000	<10	5.9	<0.08	<5.0	2.2	<0.5	<0.4
S07	Low	S	0	16.8	2,683	4.0	8.21	6.6	<1.0	0.3	0.026	<10	141,000	<10	3.3	<0.08	<5.0	1	<0.5	<0.4
		B	13.9	17.2	2,705	<2.0	8.14	6.4	<1.0	0.4	0.024	<10	213,000	<10	2.9	<0.08	<5.0	1.4	<0.5	<0.4
	High	S	0	16	3,670	5.0	8.25	4.4	1.2	0.4	<0.02	<10	221,000	<10	6.1	<0.08	<5.0	2.3	<0.5	<0.4
		B	13.8	16.8	3,620	3.0	7.82	4.2	1.0	0.6	<0.02	<10	202,000	<10	5.0	<0.08	<5.0	1.3	<0.5	<0.4
S08	Low	S	0	16.9	2,820	<2.0	8.34	6.7	<1.0	0.2	0.023	<10	207,000	<10	3.5	<0.08	<5.0	1.8	<0.5	<0.4
		B	12.1	17.1	2,860	2.0	8.24	7.4	<1.0	0.3	<0.02	<10	187,000	<10	4.3	<0.08	<5.0	<1.0	<0.5	<0.4
	High	S	0	15.1	3,740	4.0	8.28	6.9	<1.0	0.9	<0.02	<10	165,000	<10	5.4	<0.08	<5.0	<1.0	<0.5	<0.4
		B	12.5	15.2	3,640	4.0	8.35	6.6	1.2	0.9	<0.02	<10	185,000	<10	4.3	<0.08	<5.0	3.8	<0.5	<0.4
S09	Low	S	0	16.4	3,050	<2.0	8.32	6.5	<1.0	0.4	<0.02	<10	181,000	<10	2.7	<0.08	<5.0	<1.0	<0.5	<0.4
		B	6.1	16.5	3,087	4.0	8.18	6.4	<1.0	0.4	<0.02	<10	233,000	<10	3.7	<0.08	<5.0	2.1	<0.5	<0.4
	High	S	0	15.3	3,630	7.0	8.19	6.8	2.1	1.3	<0.02	<10	169,000	<10	4.1	<0.08	<5.0	2.1	<0.5	<0.4
		B	6.8	15.6	3,590	68.0	8.20	6.5	<1.0	0.6	<0.02	<10	145,000	<10	4.9	<0.08	<5.0	<1.0	<0.5	<0.4
S10	Low	S	0	16.2	2,646	12.0	8.17	7.1	<1.0	0.4	<0.02	<10	189,000	<10	3.0	<0.08	<5.0	1.3	<0.5	<0.4
		B	5.6	15.9	3,025	2.0	8.21	7.3	<1.0	0.4	0.025	<10	169,000	<10	2.1	<0.08	<5.0	1.4	<0.5	<0.4
	High	S	0	15.2	4,360	8.0	8.28	7.2	1.2	0.7	<0.02	<10	131,000	<10	7.2	<0.08	<5.0	1.3	<0.5	<0.4
		B	5.0	15.2	3,640	1600	8.26	6.4	<1.0	0.8	<0.02	<10	510,000	<10	3.8	<0.08	<5.0	2.3	<0.5	<0.4
Standard																				
Iraqi *		-		-	-	-	6.5-8.5	>5	<3	-	-	-	-	20	50	5	-	50	1	-
EU **		Coliform : Excellent (200 cfu/100ml), Good (400 cfu/100ml), Sufficient (330 cfu/100ml)																		

* New determinants for the prevention of pollution of rivers (No.25, 1967)

** EU Directive 2006/7/EC concerning the management of bathing water quality

Source: JICA Study Team

2) Khor Al Zubayr Waterway

The survey result of Water quality taken in March 2012 is summarized in Table 2.9-3 and the sampling location is shown in Figure 2.9-4. The results are compared with environmental standard in Iraq for fresh water and EU standard for bathing water quality for the result of coliform bacteria.

- Electrical Conductivity (EC) was extremely high value ranging between 59,000 - 77,000 μS/cm (equivalent to Salinity of ca. 50 -70 ‰) with the effect of the Arabian Gulf
- Dissolved Oxygen (DO) was generally high value above 5 mg/L apart from some locations where DO is below Iraqi standard.
- BOD, indicator of organic pollution, was above Iraqi standard of 3mg/L but ranged between <3.0 – 6.6 mg/L. This is not so much high as significant organic pollution.
- Total Petroleum Hydrocarbons (TPH), indicator of oil and grease, were not detected at all stations.
- Coliform count was Too Numerous To Count (TNTC) at all stations.
- Cyanide (CN), Arsenic (As), Cadmium (Cd), Lead (Pb) and Mercury (Hg) were below Iraqi environmental standard.

There is little evidence of significant pollution of the water quality in Khor al Zubayr, however the Coliform count was TNTC at all stations. It is considered that poor sewage or waste water treatment causes high coliform counts in the Khor al Zubayr Waterway. So proper treatment of sewage and waste water is suggested.

Table 2.9-3 Water Quality in Khor Al Zubayr Waterway

Stn	Tide	Depth		Temp.	EC	SS	pH	DO	BOD	TN	TP	TPH	Coli.	CN	As	Cd	Cr(VI)	Pb	Hg	PCBs
		m		°C	µS/cm	mg/L	-	mg/L	mg/L	mg/L	mg/L	µg/L	cfu/100ml	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
K01	Low	S	0	14.9	66,000	330	8.47	7.4	3.6	1.3	0.140	<10	TNTC	<10	2.5	<0.1	<5	<1.0	<0.5	<7.0
		B	2.9	14.9	67,000	610	8.48	7.1	3.4	1.9	0.064	<10	TNTC	<10	3.8	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.4	64,000	610	8.45	6.9	4.0	0.8	0.330	<10	TNTC	<10	<1.1	<0.1	<5	2.1	<0.5	<7.0
		B	7.7	14.6	67,000	590	8.46	6.6	6.6	0.7	0.120	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
K02	Low	S	0	14.9	65,000	700	8.45	6.7	3.4	1.4	0.120	<10	TNTC	<10	3.2	<0.1	<5	<1.0	0.9	<7.0
		B	3.1	15.1	65,000	630	8.44	6.4	<3.0	0.7	0.088	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.3	63,000	450	8.49	6.8	<3.0	0.8	0.054	<10	TNTC	<10	2.6	<0.1	<5	<1.0	<0.5	<7.0
		B	7.8	14.2	65,000	550	8.46	6.5	3.2	0.9	0.380	<10	TNTC	<10	2.2	<0.1	<5	<1.0	<0.5	<7.0
K03	Low	S	0	14.8	65,000	610	8.51	6.0	3.5	1.1	0.096	<10	TNTC	<10	3.2	<0.1	<5	<1.0	<0.5	<7.0
		B	3.4	15.2	68,000	690	8.55	7.3	3.3	1.2	0.180	<10	TNTC	<10	1.7	<0.1	<5	<1.0	0.6	<7.0
	High	S	0	14.6	63,000	460	8.36	7.0	<3.0	0.8	0.057	<10	TNTC	<10	3.0	<0.1	<5	<1.0	<0.5	<7.0
		B	8.4	14.9	64,000	470	8.40	6.6	3.5	0.8	0.110	<10	TNTC	<10	3.1	<0.1	<5	<1.0	<0.5	<7.0
K04	Low	S	0	14.8	72,000	620	8.50	7.3	<3.0	0.7	0.120	<10	TNTC	<10	2.8	<0.1	<5	<1.0	<0.5	<7.0
		B	2.8	15.2	72,000	640	8.49	6.2	3.2	1.0	0.180	<10	TNTC	<10	3.9	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.4	63,000	430	8.38	6.3	<3.0	0.6	0.074	<10	TNTC	<10	1.7	<0.1	<5	<1.0	<0.5	<7.0
		B	7.6	14.3	66,000	450	8.39	5.8	<3.0	0.5	0.095	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
K05	Low	S	0	14.7	65,000	440	8.43	7.5	3.1	0.5	0.068	<10	TNTC	<10	4.9	<0.1	<5	<1.0	<0.5	<7.0
		B	3.3	15.0	70,000	670	8.42	7.5	3.4	0.5	0.220	<10	TNTC	<10	4.2	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.4	59,000	410	8.44	6.1	<3.0	1.0	0.070	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
		B	8.1	14.1	65,000	440	8.39	6.2	<3.0	1.0	0.120	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
K06	Low	S	0	15.0	67,000	610	8.43	7.1	3.2	0.7	0.120	<10	TNTC	<10	2.4	<0.1	<5	<1.0	<0.5	<7.0
		B	2.9	15.4	67,000	640	8.43	6.9	3.7	0.7	0.220	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.2	63,000	410	8.38	5.7	<3.0	7.0	0.091	<10	TNTC	<10	4.1	<0.1	<5	<1.0	<0.5	<7.0
		B	7.7	14.1	65,000	460	8.38	5.7	<3.0	1.6	0.150	<10	TNTC	<10	2.3	<0.1	<5	<1.0	<0.5	<7.0
K07	Low	S	0	15.1	65,000	590	8.42	6.8	4.9	0.5	0.066	<10	TNTC	<10	2.9	<0.1	<5	<1.0	<0.5	<7.0
		B	3.3	15.1	64,000	640	8.42	6.6	4.8	0.7	0.250	<10	TNTC	<10	3.7	<0.1	<5	<1.0	0.6	<7.0
	High	S	0	14.2	63,000	400	8.37	4.2	<3.0	4.1	0.077	<10	TNTC	<10	1.6	<0.1	<5	<1.0	<0.5	<7.0
		B	8.3	14.2	64,000	390	8.37	4.0	<3.0	4.4	0.075	<10	TNTC	<10	1.1	<0.1	<5	1.5	<0.5	<7.0
K08	Low	S	0	14.6	66,000	620	8.43	6.7	<3.0	0.5	0.150	<10	TNTC	<10	4.4	<0.1	<5	<1.0	<0.5	<7.0
		B	4.1	14.0	64,000	890	8.43	7.4	5.4	0.6	0.300	<10	TNTC	<10	3.0	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.4	64,000	420	8.36	3.8	<3.0	2.6	0.130	<10	TNTC	<10	2.9	<0.1	<5	1.0	<0.5	<7.0
		B	9.3	14.1	77,000	470	8.36	4.0	<3.0	2.9	0.070	<10	TNTC	<10	2.1	<0.1	<5	<1.0	<0.5	<7.0
K09	Low	S	0	14.5	68,000	700	8.43	6.5	4.7	0.6	0.150	<10	TNTC	<10	3.7	<0.1	<5	<1.0	<0.5	<7.0
		B	3.6	15.4	67,000	650	8.41	6.4	6.1	0.9	0.250	<10	TNTC	<10	1.4	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.1	66,000	140	8.36	3.8	<3.0	1.5	<0.03	<10	TNTC	<10	3.9	<0.1	<5	<1.0	<0.5	<7.0
		B	8.4	14.0	64,000	440	8.36	3.9	<3.0	0.8	0.068	<10	TNTC	<10	2.3	<0.1	<5	<1.0	<0.5	<0.40
K10	Low	S	0	14.4	67,000	590	8.49	6.5	5.1	0.6	0.120	<10	TNTC	<10	2.3	<0.1	<5	<1.0	<0.5	<7.0
		B	3.8	14.8	69,000	610	8.46	7.3	5.3	0.7	0.120	<10	TNTC	<10	4.1	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.1	63,000	420	8.30	3.7	<3.0	1.4	0.120	<10	TNTC	<10	3.5	<0.1	<5	1.9	<0.5	<7.0
		B	8.6	14.1	64,000	360	8.39	3.9	<3.0	1.2	0.170	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
K11	Low	S	0	15.1	66,000	590	8.41	7.4	5.3	0.6	0.110	<10	TNTC	<10	3.9	<0.1	<5	<1.0	<0.5	<7.0
		B	4.9	15.2	70,000	600	8.46	6.5	5.5	0.8	0.130	<10	TNTC	<10	1.8	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.0	64,000	340	8.37	4.0	<3.0	1.8	<0.03	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
		B	9.9	14.1	64,000	490	8.36	4.0	<3.0	1.2	0.070	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
K12	Low	S	0	15.0	62,000	540	8.34	7.0	3.4	0.7	0.110	<10	TNTC	<10	3.5	<0.1	<5	<1.0	<0.5	<7.0
		B	3.5	15.4	65,000	650	8.39	6.5	4.2	0.9	0.190	<10	TNTC	<10	2.0	<0.1	<5	<1.0	<0.5	<7.0
	High	S	0	14.0	66,000	520	8.36	3.4	<3.0	1.9	<0.03	<10	TNTC	<10	<1.1	<0.1	<5	<1.0	<0.5	<7.0
		B	8.5	14.0	63,000	360	8.36	3.5	<3.0	1.5	0.039	<10	TNTC	<10	1.6	<0.1	<5	1.8	<0.5	<7.0
Standard																				
Iraqi *		-		-	-	-	6.5-8.5	>5	<3	-	-	-	-	20	50	5	-	50	1	-
EU **		Coliform : Excellent (200 cfu/100ml), Good (400 cfu/100ml), Sufficient (330 cfu/100ml)																		

* New determinants for the prevention of pollution of rivers (No.25, 1967)

** EU Directive 2006/7/EC concerning the management of bathing water quality

*** TNTC : Too Numerous To Count

Source: Data collection survey on port sector development plan in Iraq, June 2012, JICA

Source: Data collection survey on port sector development plan in Iraq, June 2012, JICA

Figure 2.9-4 Water and sediment quality sampling location in Khor Al Zubayr Waterway

(4) Sediment Quality

1) Shatt al Arab River

The survey result of Sediment quality taken in January 2014 is summarized in Table 2.9-4 and the sampling location is shown in Figure 2.9-1. The results are compared with the Canadian Sediment Quality Guideline Values for the Protection of Aquatic Life (fresh water) because there are no environmental standard in Iraq and neighbour countries. In the Canadian Guideline, ISQG corresponds to the threshold level below which adverse biological effects are not expected while PEL defines the level above which adverse effects are expected to occur frequently.

- Total Organic Carbon (TOC) was below 1% hence it is assumed that organic pollution does not progress.
- Total Petroleum Hydrocarbons (TPH), indicator of oil and grease, were not detected at all stations.
- Cadmium (Cd), Lead (Pb), Mercury (Hg), PCB and DDT were not detected or below ISQG.
- Arsenic (As) and Copper (Cu) were above ISQG at some stations but below PEL.
- Dioxins, High Values (concentration of non-detected congeners at detection limit) were above ISQG but below PEL while Low Values were above ISQG (concentration of non-detected congeners at zero) at only four stations.

There is little evidence of significant pollution of the sediment quality in Shatt al Arab River even though some parameters are above ISQG at some stations. Generally sediment pollution occurs subsequent to water pollution. It is suggested that high river discharge volume and strong current are preventing degradation in water quality hence sediment pollution does not progress.

Table 2.9-4 Sediment Quality in Shatt al Arab River

Item	Unit	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	ISQG*	PEL*
Depth	m	12.0	7.7	15.5	10.2	11.3	11.8	14.8	13.5	7.8	6.0	-	-
Specific gravity	kN/m^3	13.15	13.71	14.03	14.44	15.23	13.46	13.61	16.97	14.40	14.35	-	-
Water Content	%	61	53	49	46	47	54	60	46	43	35	-	-
TOC	%	1	0.8	1	0.4	0.4	1	0.7	1	0.2	0.4	-	-
TPH(C10-C40)	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Total Phenol	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.7	<1.0	<1.0	-	-
TN	mg/kg	1,700	1,400	1,400	820	560	770	850	1,800	580	600	-	-
TP	mg/kg	1,100	920	960	830	850	960	1,000	810	790	760	-	-
TS	mg/kg	3,700	3,500	5,200	2,800	5,400	4,900	2,400	2,800	1,000	1,500	-	-
Cyanide	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-
As	mg/kg	4.8	4.5	6.2	7.3	5.1	5.1	5.4	4.1	5.5	4.1	5.9	17.0
Sn	mg/kg	1.0	<1.0	1.1	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	-	-
Fe	mg/kg	37,000	32,000	41,000	38,000	35,000	36,000	38,000	23,000	35,000	27,000	-	-
Mn	mg/kg	590	600	630	640	530	570	550	510	470	450	-	-
Cd	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.2	0.6	3.5
Cr(VI)	mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	-	-
Pb	mg/kg	9.7	27	10	8.9	9.2	10	9.5	6.2	7.5	6.7	35	91.3
Hg	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.17	0.486
Cu	mg/kg	41	34	37	31	29	33	30	21	25	21	35.7	197
Ni	mg/kg	110	94	120	120	99	110	98	62	77	63	-	-
Zn	mg/kg	70	58	73	64	60	72	70	49	55	46	123	315
PCBs	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.034	0.277
DDT	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00119	0.00477
TBT	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Dioxins (high)**	ngTEQ/kg	2.190	1.715	2.183	2.590	2.410	2.845	1.997	1.078	1.017	1.480	0.85	21.5
Dioxins (low)**	ngTEQ/kg	1.697	0.977	1.043	1.389	0.120	0.135	0.843	0.184	0.242	0.353		

* ISQG - Interim Sediment Quality Guidelines correspond to threshold level below which adverse biological effects ate not expeted
PEL - Probable Effect Level defines the level above which adverse effects are expected to occur frequently
ISQG and PEL developed by Task Group of the Canadian Council of Ministers of the Environment
** High value - concentration of Non Detected congeners at detection limit
Law value - concentration of Non Detected congeners at zero
Toxic Equivalent (TEQ) was calculated based on WHO 1998 TEF values for fish

Source: JICA Study Team

2) Khor Al Zubayr Waterway

The survey result of Sediment quality taken in Khor Al Zubayr in March 2012 is summarized in Table 2.9-5 and the sampling location is shown in Figure 2.9-4. The results are compared with the Canadian Sediment Quality Guideline Values for the Protection of Aquatic Life (fresh water) because there are no environmental standard in Iraq and neighbour countries. In the Canadian Guideline, ISQG corresponds to the threshold level below which adverse biological effects are not expected while PEL defines the level above which adverse effects are expected to occur frequently.

- Total Organic Carbon (TOC) was below 1.1% hence it is assumed that organic pollution does not progress.
- Total Petroleum Hydrocarbons (TPH), indicator of oil and grease, were not detected at all stations.
- Arsenic (As), Cadmium (Cd), Lead (Pb), Mercury (Hg), PCB and DDT were not detected or below ISQG.
- Dioxins, even High Values (concentration of non-detected congeners at detection limit), were below PEL.

There is little evidence of significant pollution of the sediment quality in Khor Al Zubayr River

Table 2.9-5 Sediment Quality in Khor Al Zubayr Waterway

Item	Unit	K01	K02	K03	K04	K05	K06	K07	K08	K09	K10	K11	K12	ISQG*	PEL*
Depth	m	8.7	8.8	9.4	8.6	9.1	8.7	9.3	10.3	9.4	9.6	10.9	9.5	-	-
Water Content	%	31	39	35	29	38	33	32	28	32	35	30	36	-	-
TOC	%	0.5	0.6	0.6	0.5	0.7	0.7	0.6	0.6	1.1	0.6	0.6	<0.1	-	-
TPH(C10-C40)	mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	-
Total Phenol	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-
TN	mg/kg	1.1	1.0	1.5	1.3	1.1	0.9	1.1	280.0	1.0	1.1	190	1.0	-	-
TP	mg/kg	450	480	490	430	460	450	420	410	460	430	410	450	-	-
TS	mg/kg	2,600	2,300	2,700	3,500	2,900	2,900	3,400	3,400	4,800	3,700	4,300	3,400	-	-
Cyanide	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
As	mg/kg	3.7	4.1	3.7	3.0	2.3	3.3	4.2	4.9	2.7	3.4	3.5	3.5	5.9	17.0
Sn	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Fe	mg/kg	28,000	29,000	30,000	28,000	28,000	28,000	27,000	24,000	27,000	29,000	29,000	27,000	-	-
Mn	mg/kg	410	430	420	390	410	410	390	370	420	430	440	400	-	-
Cd	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.6	3.5
Cr(VI)	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	-
Pb	mg/kg	2.2	3.2	4.1	3.6	3.8	2.6	2.5	3.4	3.2	2.1	3.4	3.0	35	91.3
Hg	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.17	0.486
Cu	mg/kg	23	23	24	21	22	24	21	21	24	23	23	23	35.7	197
Ni	mg/kg	89	88	90	78	86	86	79	72	88	87	89	82	-	-
Zn	mg/kg	38	42	43	35	40	38	36	33	40	39	40	38	123	315
PCBs	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0.034	0.277
DDT	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00119	0.00477
TBT	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Dioxins (high)**	ngTEQ/kg	0.758	0.749	0.714	0.680	0.721	0.606	0.779	0.645	0.566	0.677	0.595	0.644	0.85	21.5
Dioxins (low)**	ngTEQ/kg	0.0185	ND	0.0002	ND	0.0007	0.0051	0.327	0.0043	ND	ND	ND	0.0002		

* ISQG - Interim Sediment Quality Guidelines correspond to threshold level below which adverse biological effects ate not expeted
PEL - Probable Effect Level defines the level above which adverse effects are expected to occur frequently
ISQG and PEL developed by Task Group of the Canadian Council of Ministers of the Environment
** High value - concentration of Non Detected congeners at detection limit
Law value - concentration of Non Detected congeners at zero
Toxic Equivalent (TEQ) was calculated based on WHO 1998 TEF values for fish
ND: Not Detected

Source: Data collection survey on port sector development plan in Iraq, June 2012, JICA

(5) Mesopotamian Marsh

The Mesopotamian Marshes are a wetland area located in southern Iraq and extend into southwestern Iran. Three major marshes which compose the Mesopotamian Marshes are Central, Hawizeh and Hammar Marshes. The Mesopotamian Marshlands were once the third largest wetlands in the world, originally extending between 12,000 and 15,000km^2. A rare aquatic landscape in the desert, the Marshlands provides a habitat for important populations of wildlife, including endemic and endangered species. The Hawizeh Marsh was registered under the Ramsar Convention on October 17, 2007 with the area of 1,377km^2 (Figure 2.9-5).

A water volume of the Euphrates river had decreased due to constructions of dams in the upper stream Turkey and Syria since 1970. Following the end of the first Gulf War, the Marsh Arabs rebelled against Saddam Hussein's regime and as a punishment; Hussein implemented an intensive system of drainage and water diversion structures that desiccated over 90% of the marshes. It is estimated that more than 500,000 Marsh Arabs were displaced and by January 2003, the majority of the marshes were desertified.

In May 2003, water began to return to the marshlands through the actions of the Marsh Arabs, Coalition Forces and the Ministry of Water Resources, which involved demolishing the dikes and canals draining the marshes. In addition, the Marsh Arabs also started to return to their traditional lifestyles within the re-flooded areas. In July 2013, a 1,000km^2 section of the marshland was declared the Iraq's first national park.

The drainage of the Mesopotamian Marshes has had several negative impacts on environment. According to a study of sediment quality in Kuwait's northern coastal zones, the drainage of the marshes resulted in a rise in toxic sediments between 2001 and 2003[3].

The impacts of marshland desiccation on wildlife were devastating and several endemic species of mammals, birds, and fishes may have become extinct. The disappearances of habitats for birds and fishes also have had negative impact on Fisheries in the marshlands and Gulf fisheries, dependent on the marshland habitat for spawning migrations and nursery grounds. Furthermore, the systematic draining of these marshes has affected the overall hydrodynamic regime in the area by significantly increasing the rate of sedimentation in the river system and hence the northern Arabian Gulf. Additionally, the draining of the marshes resulted in the drying of the land, and during times of high winds dust storms are generated, with much of the dust being deposited in the river system.

The building of upstream dams and reservoirs has disrupted the traditional water cycle of the marshes. The spring floods that used to flush out accumulated salt deposits and replenish the marshland with nutrients no longer occur. As a result the marshes are becoming more saline, affecting the ecology of the area. Furthermore, the draining of the marshes and construction of dams and reservoirs and resultant effect on the marshes has led to an increase in the salinity of the Shatt Al-Arab as well as allowing saline water to intrude further up the Shatt al-Arab.

Source: Prepared by JICA Study Team and Earth and Marine Environmental Consultants Ltd.

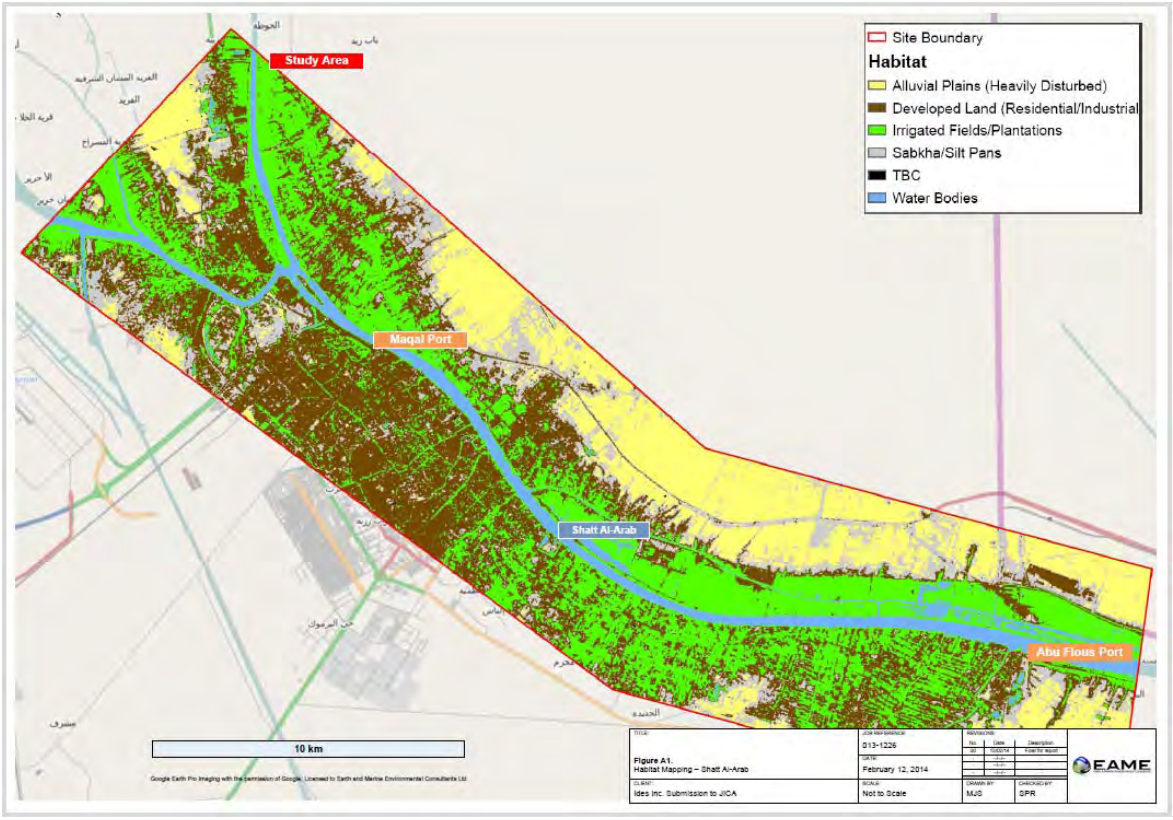
Figure 2.9-5 Mesopotamia Marshes

(6) Habitat

1) Al Maqil Port - Abu Flus Port

A habitat map around the study area made from satellite image analysis is shown in Figure 2.9-6. The study area has been significantly affected by anthropogenic impacts, in particular the Iraq war and comprises of irrigated fields/plantations, alluvial plains, developed land (residential/industrial) and Sabkha.

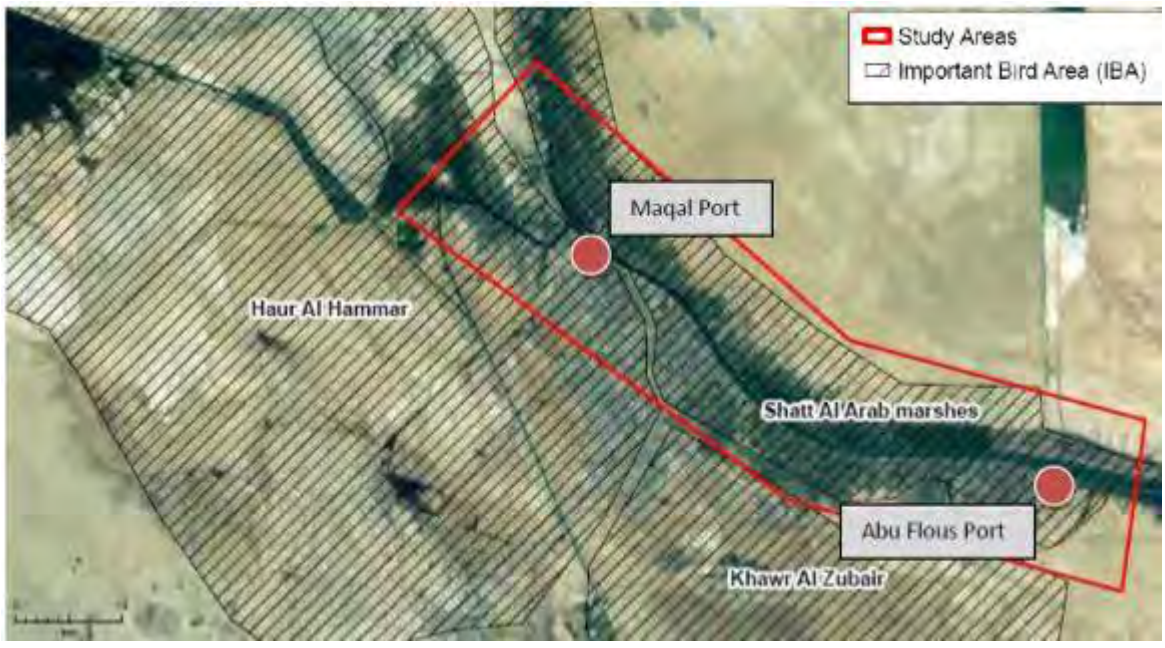
[3] Impact of draining of Iraqi marshes on sediment quality of Kuwait's northern marine area. Beg M., Al-Ghadban A., Bulletin of Environmental Contamination and Toxicology, 71:60-67, 2003



Source: EAME

Figure 2.9-6 Habitat Map around Al Maqil and Abu Flus Port

Also the study area is included in Mesopotamian Marshlands Endemic Bird Area (EBA), Haur Al Hammar Important Bird Area (IBA) and Shatt al Arab Marshes IBA identified by BirdLife International (Figure 2.9-7).



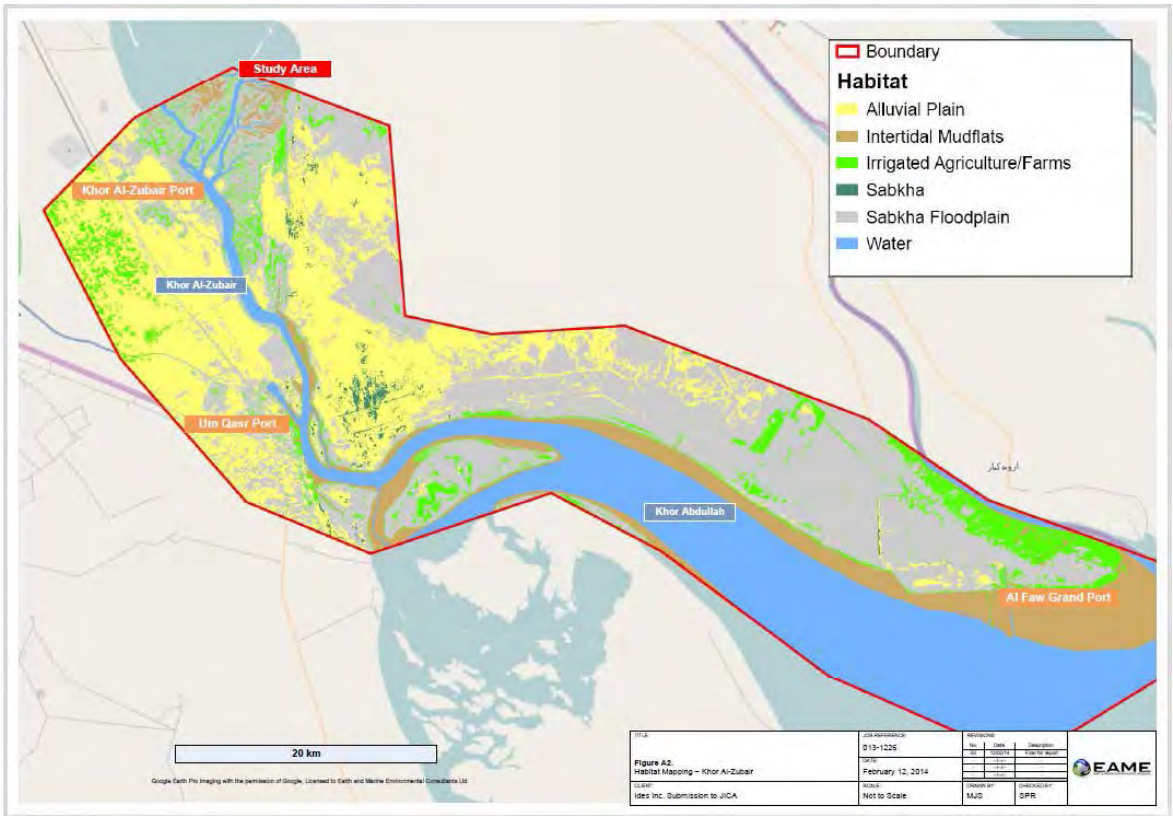
Source: EAME

Figure 2.9-7 IBA around Al Maqil and Abu Flus Ports

2) Khorl Al Zubayr – Al Faw Ground Port

A habitat map around the study area made from satellite image analysis is shown in Figure 2.9-8.

Alluvial plains extend primarily around Khor Al Zubayr Waterway. Irrigated fields and plantations are located along road sides. Around Khawr Abdallah waterway, the land area generally comprises Sabkha and extensive tidal flat extends along the coast.



Source: EAME

Figure 2.9-8 Habitat Map around KZP - AFGP

Also the study area is included in Khor Al Zubayr IBA and Khawr Abdallah IBA identified by Bird Life International (Figure 2.9-9).

Source: EAME

Figure 2.9-9 IBA around KZP - AFGP

(7) Ecosystem

1) Al Maqil - Abu Flus Port

a) Flora

Available information on the distribution of floristic species throughout the study area is limited. Known publications focus on the IBA and EBA, indicating that the dominant species of flora includes the tall grass *Phragmites australis* accompanied by Typha along the edges of the waterways[4]. Plant life throughout the irrigated agricultural areas comprises of date palm (*Phoenix dactylifera*). At present, no other information is available regarding the diversity of plant species throughout the study area. However, given the habitat types it is highly probable that species of the families *Boraginaceae*, *Chenopodiaceae* and *Zygophyllaceae* would be present. The species recorded during a site visit to the area by Nature Iraq are listed as common and of no conservation importance.

b) Mammal

The nature of the site and associated high anthropogenic activity potentially limits the number of native mammal species likely to be present. Species expected to occur is Red Fox (*Vulpes vulpes*) in addition to small mammals such as rodents. Red Fox is regularly associated with agricultural, urban and rural environs. Golden Jackal (*Canis lupus*), Grey Wolf (*Canis aureus*) have been recorded throughout the Mesopotamian Marshland EBA. These species are listed as Least Concern on the IUCN Red List.

Eurasian Otter (*Lutra lutra*) and Smooth Coated Otter (*Lutra perspicillata*) are found throughout the Hammar marsh and surrounding waterways. The IUCN Redlist has Eurasian Otter classified as Near Threatened and Smooth Coated Otter as Vulnerable. Inhabiting situations of both species in or around the study area are unknown.

The agricultural areas and alluvial plains are likely to support small mammal species such as rodents and jerboas. These species are commonly found throughout Iraq. Cheesman's Gerbil (*Gerbillus cheesmani*) and Lesser Jerboa (*Jaculus jaculus*) are likely to be present and they are listed as Least Concern on the IUCN Red List. Euphrates Jerboa (*Allactaga euphratica*), listed as

[4] Burnham, D and Bachman, A. 2009. Key Biodiversity Survey of Southern Iraq, 2009 Site Review. Nature Iraq

Near Threatened on the IUCN Red List , possibly exists in Iraq, however there have been no recent confirmations.

c) Bird

According to BirdLife International, three Critically Endangered (CR), four Endangered (EN), eleven Near Threatened (NT) and eight Vulnerable (VU) species of bird have been recorded in Iraq. In addition to the list below, a further 350 species are considered as Least Concern (LC).

As part of a biodiversity study undertaken by Nature Iraq in 2009 along the Shatt Al Arab IBA, a total of 21 species were recorded during summer and winter surveys including species listed in Table 2.9-6. The survey also highlighted the importance of the area for supporting Black-headed Gull (*Larus ridibundus*), where approximately 1% or more of the world population is found over winter.

Table 2.9-6 Result of Bird Surveys in Shatt al Arab IBA

Common Name	Latin Name	IUCN
<Winter Survey>		
Dalmatian Pelican	*Pelecanuscrispus*	VU
Marbled Duck	*Marmaronetta angustirostris*	VU
Eastern Imperial Eagle	*Aquilaheliaca heliaca*	VU
Basra Reed Warbler	*Acrocephalus griseldis*	EN
Black-headed Gull	*Larus ridibundus*	LC
Slender-billed Gull	*Larus genei*	LC
Caspian Tern	*Hydroprogne [Sterna] caspia*	LC
Red-wattled lapwing	*Vanellus (Hoplopterus) indicus*	LC
Common Swift	*Apus apus*	LC
White-cheeked Bulbul	*Pycnonotus leucogenys*	LC
Iraq Babbler	*Turdoides altirostris*	LC
Hooded Crow	*Corvus [corone] cornix*	Not Listed
Little Egret	*Egretta garzetta*	LC
Little Grebe	*Tachybaptus ruficloosi*	LC
<Summer Survey>		
Common Tern	*Sterna hirundo*	LC
Eurasian Collared Dove	*Streptopelia decaocto*	LC
Common Woodpigeon	*Columba palumbus*	LC
Sand Martin	*Riparia riparia*	LC
Barn Swallow	*Hirundo rustica*	LC
Slender-billed Gull	*Larus genei*	LC

Source: Prepared by JICA Study Team based on the survey results of Nature Iraq 2009

d) Fish

Available information on the distribution of fish species throughout the study area is limited. The total of 106 species of fishes in fresh waters have been found in the inland waters of Iraq, including 43 freshwater, 10 exotic and 53 species of marine origin5.

Jawad (2013) 6 attempted to identify and categorize 20 fresh water fish species as the threatened species. In this list, only the Gatten (Luciobarbus xanthopterus) is commonly found within Shatt al Arab River. All the other listed species have now been reduced in distribution to a few select water bodies, mainly in north Iraq or the Marshes.

[5] Rubec CDA, Coad BW (2007) Economic Importance and Proposed Conservation Priority for Iraq Fish Species.

[6] Jaward, L. (2013) Threatened Freshwater Fishes of Iraq with Remarks on thir Conservation Status Natural Sciences, Water Reserch and Management, Vol.3, No.2;27-36.

2) Khorl Al Zubayr – Al Faw Ground Port

a) Flora

Plant life throughout the site is limited due to the high saline levels in the soil and associated disturbance from anthropogenic activities. Species inclusive of *Phragmites australis*, *Salicornia herpatia* and *Suaeda* sp. were all recorded during a site visit by Nature Iraq in 2008[7]. Additional flora likely to be present will predominantly include halophytes such as species of the families *Boraginaceae*, *Chenopodiaceae* and *Zygophyllaceae*. The species recorded during a site visit to the area by Nature Iraq are listed as common and of no conservation importance.

b) Mammal

The nature of the site and associated high anthropogenic activity potentially limits the number of native mammal species likely to be present.

Sabkha and alluvial plains are likely to support small mammal species such as rodents and jerboas. These species are commonly found throughout Iraq. Cheesman's Gerbil (*Gerbillus cheesmani*) and Lesser Jerboa (*Jaculus jaculus*) are likely to be present and they are listed as Least Concern on the IUCN Red List. Euphrates Jerboa (*Allactaga euphratica*), listed as Near Threatened on the IUCN Red List , possibly exists in Iraq, however there have been no recent confirmations. Recordings of possible Fox tracks during a site visit (January 2012) by EAME staff indicate a presence in the area south of KZP. The highly disturbed nature of the site and close proximity to human activity indicates that the species most likely to occur is that of Arabian Red Fox (*Vulpes vulpes*). Studies completed by EAME in 2011 identified the presence of wild boar (*Sus scrofa*) near Faw on the south eastern border. Both of them are listed as Least Concern on the IUCN Red List.

c) Bird

As part of a biodiversity study undertaken by Nature Iraq in 2009 for the Khor Al Zubayr area, a total of 27 species of bird were recorded (Table 2.9-7). With the exception of two species, Greater Spotted Eagle (*Aquila clanga*) listed as VU and Eurasian Curlew (*Numenius arquata*) listed as NT, all birds recorded within the survey area are considered as species of Least Concern. BirdLife International currently estimates that the global population of Greater Spotted Eagle ranges between 5,000 to 13,000 mature birds.

[7] Abdulhasan N.A & Salim, M.A, 2008. Key Biodiversity Survey of Southern Iraq Site Review: Winter & Summer 08 Survey . Nature Iraq.

Table 2.9-7 Bird Species Recorded by Nature Iraq at Khor Al Zubayr

Common Name	Latin Name	IUCN
Black-crowned Night Heron	*Nycticorax nycticorax*	LC
Squacco Heron	*Ardeola ralloides*	LC
Grey Heron	*Ardea cinerea*	LC
Purple Heron	*Ardea purpurea*	LC
Little Egret	*Egretta garzetta*	LC
Western Reef Heron	*Egretta gularis*	LC
Great Cormorant	*Phalacrocorax carbo*	LC
Marsh Harrier	*Circus aeruginosus*	LC
Hen Harrier	*Circus cyaneus*	LC
Greater Spotted Eagle	*Aquila clanga*	VU
Little Ringed Plover	*Charadrius dubius*	LC
Kentish Plover	*Charadrius alexandrinus*	LC
Eurasian Curlew	*Numenius arquata*	NT
Ruff	*Philomachus pugnax*	LC
Armenian Gull	*Larus armenicus*	Not Listed
Black headed Gull	*Larus ridibundus*	LC
Gull billed Tern	*Gelochelidon [Sterna] nilotica*	LC
Caspian Tern	*Hydroprogne [Sterna] caspia*	LC
Collared Dove	*Streptopelia decaocto*	LC
White-throated Kingfisher	*Halcyon smyrnensis*	LC
Grey Shrike	*Lanius sp.*	LC
Rook	*Corvus frugilegus*	LC
Crested Lark	*Galerida cristata*	LC
Graceful Prinia	*Prinia gracilis*	LC
House Sparrow	*Passer domesticus*	LC
Spanish Sparrow	*Passer hispaniolensis*	LC
Dead Sea Sparrow	*Passer moabiticus*	LC

Source: Prepared by JICA Study Team based on the survey results of Nature Iraq 2009

d) Fish

The freshwater species according to Coad [8], Goldfish (*Carassius auratus*) and Greenbacked Mullet (*Liza subviridis*) are species of economic importance; whilst Yellow-finned Seabream (*Acanthopagrus Latus*), Abu mullet (*Liza abu*), Klunzingers Mullet (*Liza klunzingeri*) and Hilsa Shad (*Tenualosa ilisha*) are of conservation concern and also economically important. The following saltwater fish species observed at the site: Malabar Trevally (*Caranx malabaricus*), Dorab Wolf-herring (*Chirocentrus dorab*), Large-scale Tonguesole (*Cynoglossus arel*) and Four Finger Thredfin (*Eleutheronema tetradactylum*).

Survey findings identified the presence of two resident Anchovy species, *Thryssa mystax and T. hamiltonii,* within the waters of Khor Al Zubayr indicating that they are both feeding and spawning in this area[9].

In addition, a unique species found only in this area of Iraq is Waltons Mudskipper (*Periophthalmus waltoni*). It is an amphibious air-breather and can be found in the soft mud within the tidal range.

A survey conducted by Al-Daham and Yousif (1990) [10] collected a total of 47 species over a 12 month period. None of the fish species found within Khor Al Zubayr, Umm Qasr and Khawr Abdallha are included on the IUCN Red List of Threatened Species.

[8] Coad,B.W.2010. Freshwater Fishes of Iraq. Journal of Fish Biology Vol.77, 4, 1041-1042

[9] Hussain, N.A., Ali,T.S. (2011) Some biological aspects of Thryssa hamiltonii and Thryssa mystax in Khor Al Zubayr, Northwest Arabian Gulf. Indian Journal of Fisheries, 34(2), 152-162

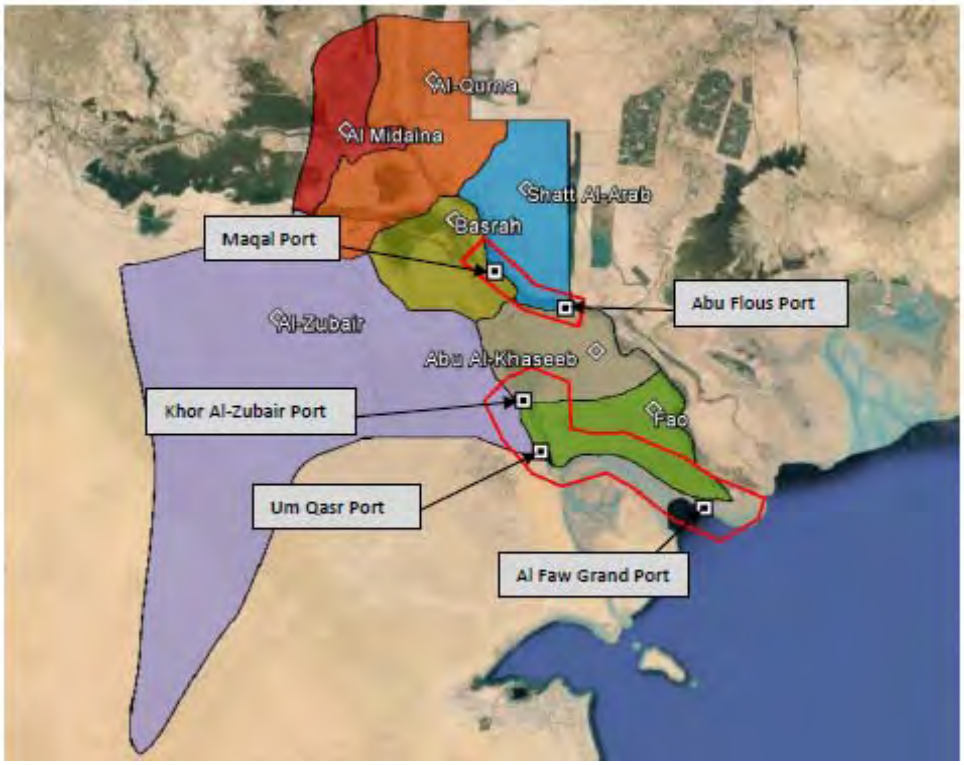
[10] Al-Daham.N.K.and Yousif. A.Y. (1990) Composition, seasonality and abundance of fishes in the Shatt Al Basrah Canal, an estuary in Southern Iraq; Estuarine, Coastal and Shelf Science; Vol. 31,4, 411-421

2.9.3 Basrah Province - Socio Economic Conditions

(1) Population in Basrah Governorate

The project area lies within the Basrah Governorate which consists of seven districts. Al Maqil Port is located in Basrah District, Abu Flus in Abu al Khaseeb District, KZP and UQP in Al Zubayr District, and AFGP in Faw District.

According to the census survey in 2013, the population of the Basrah Governorate was about 2.7million and half of them lived in the Basrah District.



Source: Prepared by JICA Study Team based on Google Earth Pro Imaging with the permission of Google Licensed to Earth and Marine Environmental Consultants Ltd.

Figure 2.9-10 District Boundaries of Basrah Governorate

Table 2.9-8 Population in Basrah Governorate (2013)

Districct	Subdistrict (Adminstrative Unit)	Urban Areas			Rural Areas			Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Basra	Basra Disrtict Center	553,733	557,490	1,111,223	24,924	23,597	48,521	578,657	581,087	1,159,744
	Hartha	53,204	53,565	106,769	22,330	21,141	43,470	75,534	74,706	150,240
	Sub-Total	**606,937**	**611,055**	**1,217,992**	**47,254**	**44,738**	**91,991**	**654,191**	**655,793**	**1,309,984**
Abo Al-Khasib	Abo Al-Khasib Disrtict Center	93,463	94,098	187,561	8,517	8,063	16,580	101,980	102,161	204,141
	Sub-Total	**93,463**	**94,098**	**187,561**	**8,517**	**8,063**	**16,580**	**101,980**	**102,161**	**204,141**
Zubair	Zubair Disrtict Center	136,138	137,061	273,199	46,081	43,628	89,709	182,219	180,689	362,908
	Safwan	11,673	11,752	23,425	15,511	14,685	30,196	27,184	26,437	53,621
	Umm Qasr	22,535	22,688	45,223	5,209	4,932	10,141	27,744	27,620	55,364
	Sub-Total	**170,346**	**171,501**	**341,847**	**66,801**	**63,245**	**130,046**	**237,147**	**234,746**	**471,893**
Qurna	Qurna Disrtict Center	57,232	57,620	114,852	7,730	7,319	15,049	64,963	64,939	129,901
	Al-Dair	14,121	14,217	28,338	37,095	35,199	72,214	51,216	49,336	100,552
	Al-Thaghur	1,529	1,539	3,068	17,106	16,195	33,301	18,635	17,734	36,369
	Sub-Total	**72,882**	**73,376**	**146,258**	**61,931**	**58,713**	**120,564**	**134,814**	**132,009**	**266,822**
Faw	Faw Disrtict Center	16,222	16,332	32,553	3,177	3,008	6,185	19,399	19,340	38,738
	Sub-Total	**16,222**	**16,332**	**32,553**	**3,177**	**3,008**	**6,185**	**19,399**	**19,340**	**38,738**
Shat Al-Arab	Shat Al-Arab Disrtict Center	60,201	60,610	120,811	4,143	3,922	8,066	64,344	64,032	128,877
	Al-Nashwa	1,423	1,432	2,855	14,790	14,003	28,793	16,213	15,435	31,648
	Sub-Total	**61,624**	**62,042**	**123,666**	**18,933**	**17,925**	**36,859**	**80,557**	**79,967**	**160,525**
Al-Mdaina	Al-Mdaina Disrtict Center	14,208	14,304	28,512	23,320	22,079	45,399	37,528	36,383	73,911
	Ez-AdDien Saleem	12,900	12,988	25,888	19,706	18,657	38,363	32,606	31,645	64,251
	Talha (Al-Sadeq)	20,653	20,794	41,447	20,913	19,800	40,713	41,567	40,593	82,160
	Sub-Total	**47,761**	**48,086**	**95,847**	**63,939**	**60,536**	**124,475**	**111,701**	**108,621**	**220,322**
Total		**1,069,235**	**1,076,490**	**2,145,724**	**270,552**	**256,228**	**526,700**	**1,339,789**	**1,332,637**	**2,672,425**

Source: Ministry of Planning/Basra Office

(2) Employment Conditions in Basrah District

Iraq's Gross Domestic Product (GDP) is 95% derived from oil revenues and Iraq's economy is vulnerable to oil price.

Employment profile and income quintile are shown in Table 2.9-9, Table 2.9-10 according to WHP survey. The survey data shows that agricultural activity is of limited importance in the survey area. There is a heavy reliance on state employment, with around a half of the workforce being employed as public servants in general. In Faw District, Non skilled laborer is highest proportion, and Farming and Agriculture are also higher than the other districts. The proportion of households in the lowest per capita expenditure quintile is lowest in Al Zubayr District and higher in Faw District.

Female participation in the labor force is low in Iraq and only 17% of women participate in in the labor force in 2007[11]. This is a low proportion compared to most of Iraq's neighbors such as: Iran, 42%; Jordan, 29%; Kuwate, 52%; Saudi Arabia, 18%; Syria, 40%; Turkey, 28%.

Table 2.9-9 Employment profile for Basrah Governorate (2007)

Head of household working as:	Basrah	Abu Al-Khaseeb	Al Zubayr	Al-Qurna	Faw	Shatt al Arab	Al Midaina
Farming/ self employed	0.0 %	1.5 %	0 %	2.4 %	5.8 %	4.9 %	1.8 %
Agricultural laborer	0.0 %	0.9 %	0 %	1.2 %	2.7 %	1.8 %	0.9 %
Skilled laborer	9.4 %	4.5 %	18.6 %	17.7 %	2.7 %	10.5 %	19.6 %
Non-skilled laborer	13.7 %	24 %	10.3 %	19.2 %	38.6 %	33.5 %	24.1 %
Public servant	56.4 %	38.9 %	35 %	41.3 %	21.8 %	34.8 %	27.1 %
Self-employed (non-farm)	20.5 %	29.9 %	36 %	18.3 %	28 %	14.5 %	26.5 %
Other	0 %	0.3 %	0 %	0 %	0.3 %	0 %	0 %

Source: United Nations World Food Programme (2008). VAM WHP Food Security Analysis, Comprehensive Food Security and Vulnerability Analysis in Iraq Report.

Table 2.9-10 Households per Income Quintile for Basrah Governorate (2007)

Households per income quintile	Basrah	Abu Al-Khaseeb	Al Zubayr	Al-Qurna	Faw	Shatt al Arab	Al Midaina
Lowest	12.0%	12.0%	1.0%	15.0%	22.0%	7.0%	19.0%
Second	23.0%	35.0%	4.0%	29.0%	46.0%	28.0%	33.0%
Third	16.0%	28.0%	17.0%	23.0%	15.0%	24.0%	23.0%
Fourh	23.0%	16.0%	34.0%	17.0%	13.0%	21.0%	12.0%
Highest	27.0%	9.0%	44.0%	16.0%	4.0%	21.0%	14.0%

Source: United Nations World Food Programme (2008). VAM WHP Food Security Analysis, Comprehensive Food Security and Vulnerability Analysis in Iraq Report.

(3) Solid Waste

UNEP implemented a survey on solid waste management in the Southern Governorates of Iraq[12]. The survey covered nine cities and towns, representing large, medium and small cities and towns in Thi-Qar, Basrah and Missan governorates. These nine cities and towns included Basrah Central, Al Zubayr, and Al-Deyr in the Basrah governorate. The fieldwork was conducted during June to September 2007.

[11] The Central Organisation for Statistics and Information Technology (COSIT) Labour Force Survey for 2007

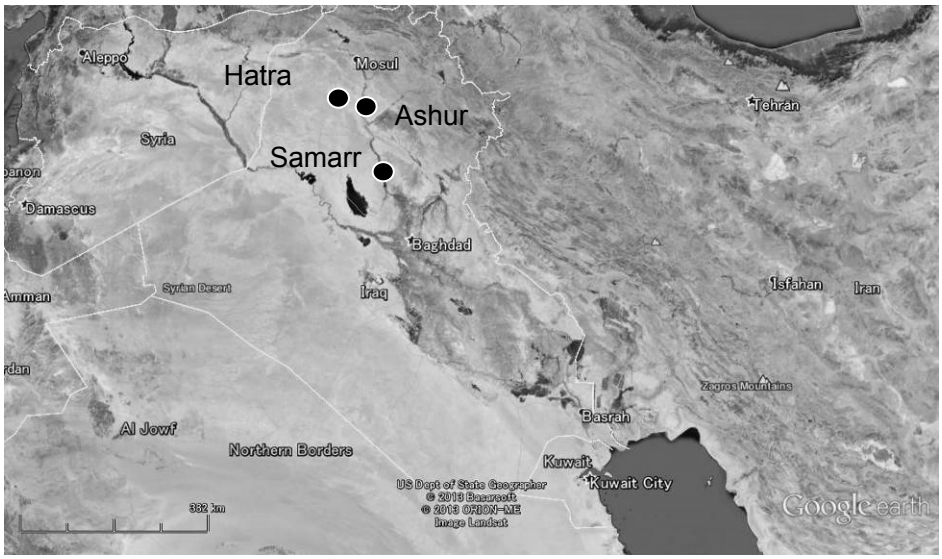
[12] United Nations Environment Programme (UNEP). Support for the Environmental Management of the Iraqi Marshlands, 2004-2009

- In the Basrah Governorate, solid waste has traditionally been collected by local authorities. Recently, the local authorities have entrusted some of the collection tasks to private contractors. Limited facilities were found to be available for solid waste collection and transport, and were situated mostly in major centers. Outskirt areas did not have such services and tended to dump their waste on the nearest available land.
- Most industrial waste generated came from small or medium-scale industrial operations, and these were usually disposed of along with the municipal waste. For larger industries located outside the city center, and the responsibility for disposing of solid waste rested primarily with the industries themselves. Most solid waste generated by industry contained a significant amount of valuable materials such as steel, aluminum, copper and other metals, some of which were recovered and reused by the industry or sold as scrap. The remainder was disposed of at the municipal dump.
- The majority of waste collected by municipalities or by private contractors was disposed of in open dumps and often burned. Large heaps to small mountains of refuse were observed on the outskirts of the major cities.

It is estimated that the Basrah governorate generates over 3,100 tons of solid waste on a daily basis (based on a per capita waste generation rate of 1.25 kg/capita/day). The National Solid Waste Master Plan (NSWMP) for Iraq 2007 indicates that there are 15 landfills in the Basrah governorate area that largely operate as dumping sites. These sites are not engineered (i.e. there is no containment system) and there is no control over what wastes are deposited (for reference; Figure 2.9-16).

(4) Cultural Heritage

Iraq has three UNESCO World Heritage sites, Hatra, Ashur and Samarra Archaeological City (Figure 2.9-11). There are no cultural heritages in or around the study area.



Source: Earth and Marine Environmental Consultants Ltd.

Figure 2.9-11 World Heritages in Iraq

2.9.4 Environmental and Social Conditions in and around the Ports

Environmental and social conditions in or around the ports are stated below based on the field reconnaissance and interview surveys by JICA Study Team.

(1) Dredging and Dumping Sites

JICA Study Team conducted interview surveys to Dredging department of GCPI. Dredging activities are conducted in Khor Al Zubayr Waterway and Umm Qasr Waterway. There are no dredging activities in the Shatt al Arab River. Planned dredging volume was eight million m^3/year and actual volume was 6.9million m^3/year in 2012. Latest dredging volume was about 150,000 m^3/week; 14,000m^3/week of total volume was done in Khor Al Zubayr Waterway and remaining in or around UQP (North and South). There are three dumping areas; river dumping site around LPG terminal located south of KZP (depth; ca. 15m), land dumping site around north of UQP North and river dumping site located south of Hajiam island (depth ca. 15m). Dumping volumes are 14,000m^3/week, 20,000m^3/week and 116,000m^3/week respectively.

It was confirmed that GCPI doesn't have permission for the dredging and dumping activity from MOEn because there are no related laws and regulation.

(2) Water Usage

Al Maqil Port and Abu Flus Port use water treated in nearby water treatment facilities and the water is collected from the Shatt al Arab River. A water treatment plan is also installed in Al Maqil Port. KZP treat the water taken from the Shatt al Arab River in Abu Al Khaseeb District by their own water treatment facility installed at the port area. The water is transported from Abu Al Khaseeb to KZP via a steel factory located in north of KZP. The capacity of the facility is 1500m^3/day. The current treatment volume is 300m^3/day and it will reach 600m^3/day in the future (for reference; Figure 2.9-16).

UQP ,both North and South Port, use ground water after desalination by their own treatment facilities. Ten wells are installed in UQP-S. The capacities of the treatment facilities are 1,500 m^3/day respectively while the actual treatment volume is between 150-200m^3/day. In addition to them, UQP has a desalination facility with the capacity of 25 m^3/hour for washing port facilities and watering the plants.

AFGP is planning to use a seawater after desalination.

(3) Electric Supply

Electricity of the ports generally is supplied through national network system. Electricity in Iraq however is not stable so private generators are installed in each port. In order to meet the electricity demands of Basra, three power station ships have been installed on the lower of Abu Flus Port, KZP and UQP (for reference; Figure 2.9-16).

(4) Waste Water Treatment

Generally, rain water is discharged directly to the adjacent water course through drainage without treatment. Sewage water is stored in a sewage tank or a septic tank, and collected by a truck regularly and dumped to a dumping site outside of the port area. Septic tanks are installed in KZP and UQP (Berth No.6-8) etc. but they don't function well.

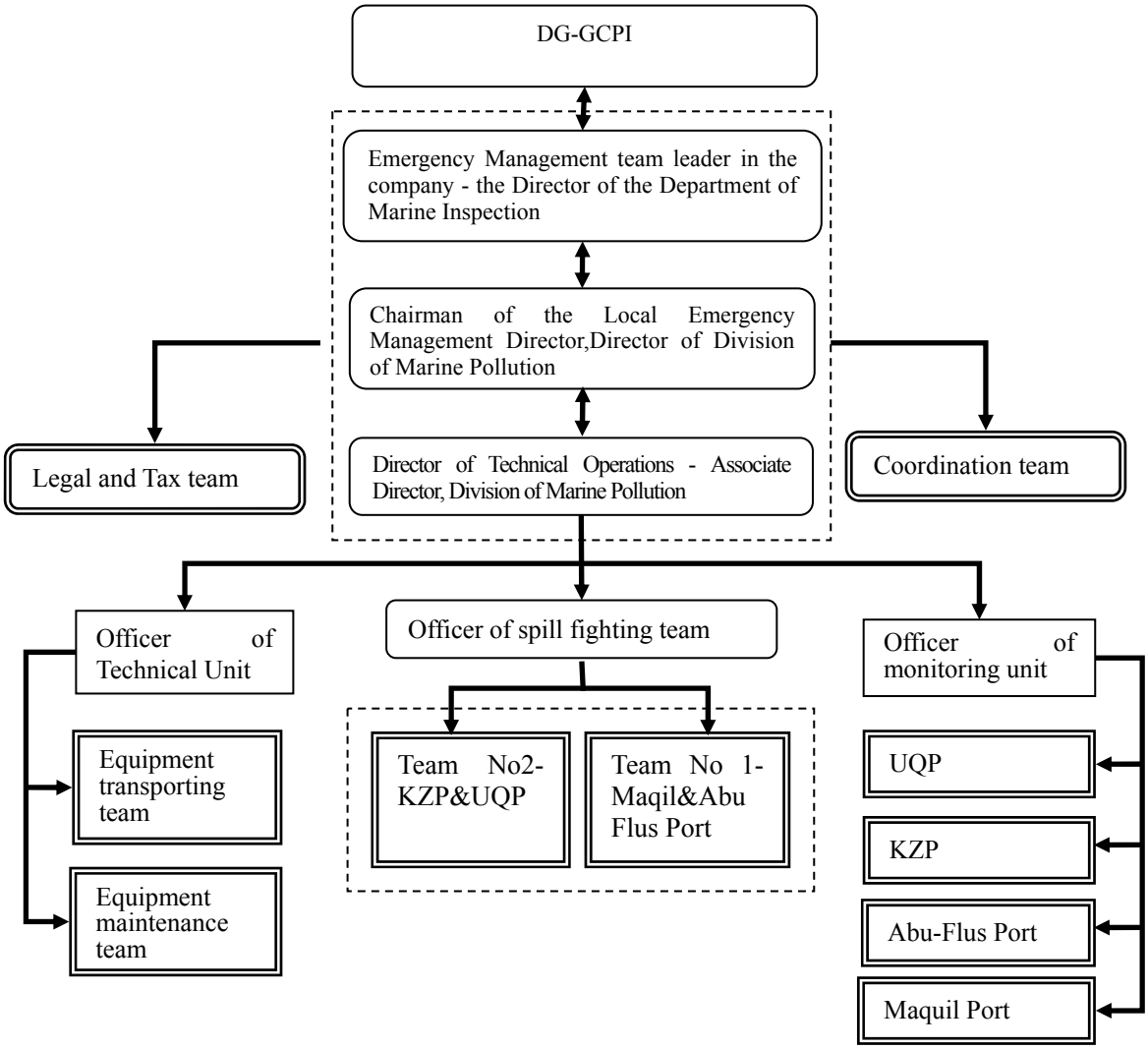
A leaked oil during pumping or oil waste generated at a maintenance shop are collected into a barrel and handed over to MOO (for reference; Figure 2.9-16).

(5) Solid Waste

Solid wastes generated from port activities or ships are generally collected and dumped into outside dumping site. KZP has two 5 ton trucks and collect the wastes two times a week by them and dumped into the dumping area 3km away from the port. The volume of the waste generated in a week is about 20m^3. UQP-North has four 5 ton trucks and collect the wastes every day. The volume of the daily waste is about 20m^3. They also collect the wastes from the ship on request and its volume is 3m^3 a week. UQP-South has two trucks and conducts same activity as the North Port(for reference; Figure 2.9-16).

(6) Environmental Management and Monitoring

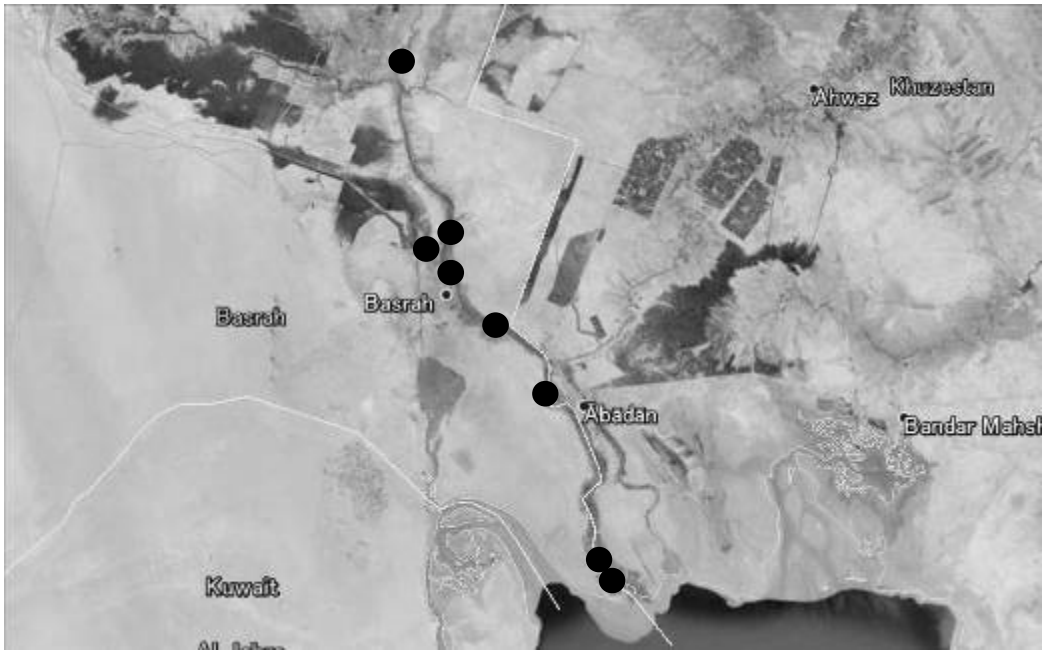
Water, Sediment and Air Quality Monitoring are not conducted by GCPI. Department of Marine Inspection, GCPI is conducting visual check for oil spills. The Monitoring Unit is set up at each port and the Spill Fighting Team deal with counter measures for oil spills. In the event of oil spills, a report will be submit from the Monitoring Unit and the Spill Fighting Team to Director of GCPI via Division of Marine Pollution etc. to take the necessary action.



Source: GCPI

Figure 2.9-12 GCPI Oil Spill Response Flow Chart

Ministry of Environment (MOEn) has been conducting monthly water quality monitoring at 11 locations in the Shatt al Arab River since around 2011. The monitoring items are alkalinity, pH, turbidity, dissolved oxygen, conductivity, nitrate, phosphate and so on. Also MOEn has been conducting trial air quality monitoring in Basrah city and the items are NOx, CO, oxon, suspended matter(PM10, PM2.5) etc. The water quality monitoring locations by MOEn in 2011 are shown in Figure 2.9-13.



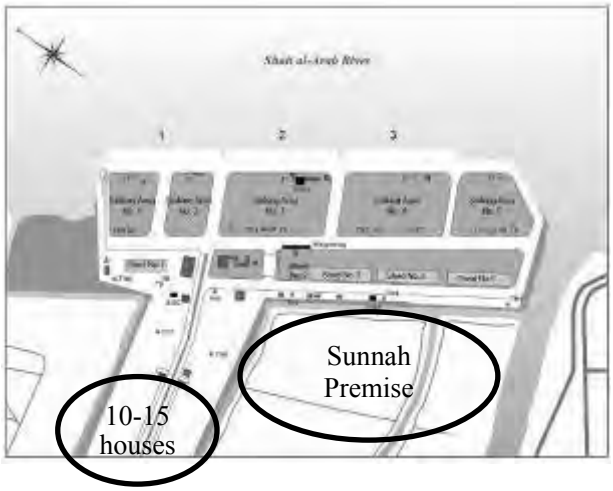
Source: Earth and Marine Environmental Consultants Ltd.

Figure 2.9-13 Water Monitoring Locations by Ministry of Environment

(7) Residential Area

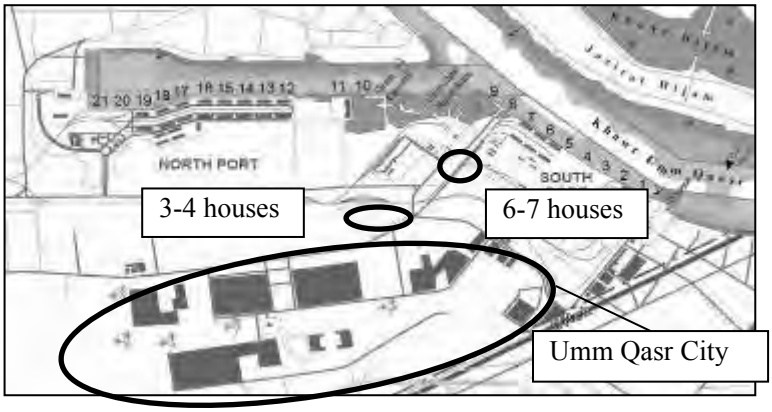
According to the field reconnaissance and interview surveys to the ports conducted by JICA Study Team, residential areas are located in or around the port premises as follows.

- Al Maqil Port: There are fifty to sixty illegal houses on and behind the berth No.15. They have allegedly immigrated there since 2003. Basrah city is located behind the Al Maqil Port and the population is about 1.1 million according to statistics of Ministry of Planning (MOP, 2013).
- Abu Flus Port: There are ten to fifteen illegal or legal houses along the access road located south of the port. A land located south western of the port is owned by Sunnah organization.
- KZP: Administrative districts called Zubayr City is located in 25km north east of the port and Umm Qasr City is located in 17km south of the port. The populations are about 270,000 and 45,000 respectively according to the statistics of MOP (2013).
- UQP: There are six or seven illegal houses around the berth No.8 which is nominated as future expansion area of the port. They have allegedly immigrated there since 2003. A land planned to be used by NAFIZ has three or four illegal houses. An administrative district called Umm Qasr City is located in south of the port (Figure 2.9-15).
- Al Faw Grand Port: An administrative district called Faw City is located in 8km north of the port and the population is about 33,000 according to the statistics of MOP (2013)



Source: JICA Study Team

Figure 2.9-14 Residential Areas around Abu Flus Port



Source: JICA Study Team

Figure 2.9-15 Residential Areas around UQP

(8) Fishery

Fishery is conducted throughout the Shatt al Arab River, Khor Al Zubayr and Khawr Abdallah Waterway. Extensive commercial fishing is not conducted and most of fishermen conduct their works using small boats (Figure 2.9-15). There are few studies on fishery around the study area.

Around KZP, fishermen activities are seasonal, their efforts increase from April to August. They make no more than 200 dollars in winter periods where activities are extremely limited due to weather and safety conditions and the available fish species. This value raises to an average of 800-1,000 dollars in high seasons[13]. A list of the fish species found at KZP is shown in Table 2.9-11

[13]Draft IEE on KZP Development, Data Collection Survey on Port Sector Development Plan In Iraq, 2012, JICA

Table 2.9-11 List of the Fish Species Found around KZP

Family	Species	Local Name
Mugilidae	*Liza* spp.	Byah
Sparidae	*Acanthopagrus latus*	Shanak
Stromateidae	*Pompus argenteus*	Zbady
Scinedae	*Otolithes ruber*	Nuaby
Scinedae	*Johnius belengerii*	Tataoo
Clupeidae	*Tenualosa ilisha*	Sobor
Clupeidae	*Ilisha elongata*	Abo Uena
Serranidae	*Epinephelus tuvina (Forskal)*	Hamur zaetony
Siliagonidae	*Siliago sihama*	hasum

Source: Draft IEE on KZP Development, Data Collection Survey on Port Sector Development Plan In Iraq, 2012, JICA

a) Garbage Outside A Residential Area of Basra

b) Water treatment facility at KZP

c) Power Station Ship at KZP

d) Oil collector at KZP

e) Garbage collection at KZP

f) Fishery in the Shatt al Arab River

Source: a), f), EAME, b), c), d), e) JICA Study Team

Figure 2.9-16 Photos of Environmental and Social Conditions

CHAPTER 3

Chapter 3. Port Development, Administration and Operations

3.1 Port Development Plans

3.1.1 Goals of Port Development in National Development Plan 2013-2017

Goals that indicate the quantity of the berths and the capacity to be fulfilled within the five-year period by the four major existing ports are published in NDP 2013-2017 as shown in Table 3.1-1. The development goals, i.e., those figures appearing under the column of 2017 in the Table are the same as those published in NDP 2010-2013. Except for Al Maqil Port, figures appear under the column of 2013 that indicate the status of existing ports as of the start of the Plan, are the same as those published in NDP 2010-2013. The number of berths and the capacity of Al Maqil Port printed in Bold in the Table are larger than those shown in NDP 2010-2014: The number of berths of Al Maqil Port in 2013 is three (3) berths more than that the port had in 2010. Al Maqil Port has a 3,000 m long quay, divided into 15 berths. It is therefore supposed that the number of usable berths of the port has been increased by the removal of sunken ships at three berths during the period of 2010-2012 and , accordingly, the capacity of the port has increased to 2.25 million tons/year from 1.5 million tons/year in 2010.

Table 3.1-1 Goals of the development of existing ports NDP 2013-2017

Name of Port	2013		Berth Required 2013-17	2017	
	Number of Berths	Capacity 1,000 t/yr		Number of Berths	Capacity 1,000 t/yr
Umm Qasr	22	7,500	19	41	14,000
Khor Al Zubayr	12	6,400	13	25	10,650
Al Maqil	9	2,250	5	14	3,600
Abu Flus	3	500	-	3	750
Total	46	16,650		83	29,000

Source: NDP 2013-2017

While NDP 2013-2017 shows the development goals up to 2017 as indicated in Table 3.1-1, it does not show physical plans or layout plans. The following are the assumptions of the Study Team.

(1) Umm Qasr Port (UQP)

General Company of Port of Iraq (GCPI) has been developing UQP, the dredging and the removal of sunken ships along waterways between the Arabian Gulf and UQP under 'Port Sector Rehabilitation Project in the Republic of Iraqi Phase I'. The Gulftainer Company Limited, a private container terminal operator at UQP, has been developing its own terminal at Berth No. 11a under a concession contract with GCPI. GCPI is further taking steps to expand container terminals in the South Harbor with investment by private operators under joint venture contract. As of end of 2013, GCPI is in the process of evaluating the proposals.

The current attempt of the re-development of UQP focuses on the existing port area. The vast land and water area at the northeast side of the basin still remains undeveloped, except for a plan to develop a new container terminal by private operator at the north coast of the basin across Berth No. 19-21.

To cope with the growth of traffic demand, GCPI has intentions to keep developing the un-exploited spaces to cope with the growth of traffic demand by attracting private investment. Northeast side has only 3,300 m long water shore line. It is not long enough to develop 19 additional berths within the basin. Thus, to fulfill the goal, it is indispensable to find other space

outside the current port area of UQP. Possible sites are the incomplete basin located upstream of UQP or along the waterways.

(2) Khor Al Zubayr Port (KZP)

The Port Sector Rehabilitation Project Phase II is about to start. The project includes the construction of a new 300 m long additional wharf, rehabilitation of the existing wharves, dredging of basin, cargo handling equipment, and dredging of waterways between UQP and KZP. KZP has a 3,600 m long water shoreline, which includes 13 berths. Of the 13 berths, currently 12 berths are operational. Including the new berth planned in the above mentioned Project Phase II, the existing KZP has only space to develop just three or four more berths. It is impossible to develop 13 additional berths within the current port area. New project site should be found somewhere else.

(3) Al Maqil Port

Al Maqil Port has a total of 15 berths. By rehabilitating the existing wharves and removing sunken ships in the basin as well as the renovation of the backup area, it is possible to ensure the operation of 14 berths by 2017. Taking into consideration the fact that the main commodity handled at the port is cement, the improvement of the cargo handling capacity of the port can be achieved by specializing berths for specific major commodities such as cement. It is also expected that, by the start of the operation of a container terminal by Nawah Port Management at Berth No. 13 and 14, the general cargo will be brought to the port in the form of containers in the coming years, and this trend will increase the capacity of the port.

The goal of Al Maqil Port is to achieve by 2017 3.6 million tons per year. This target might have been calculated with the assumption that the cargo handling capacity for general cargo should be 1,000 ton per year for every meter of berths. However, taking into consideration the following situation that allows only small ships to call on the port, it is assessed to be difficult for the port to achieve the target 3.6 million tons per year with 14 berths:

- a shallow water area near the mouth of Shatt al Arab River restricts size of calling vessels, and
- the two bridges located downstream of access waterways to the port restrict the passage of the calling ships, .

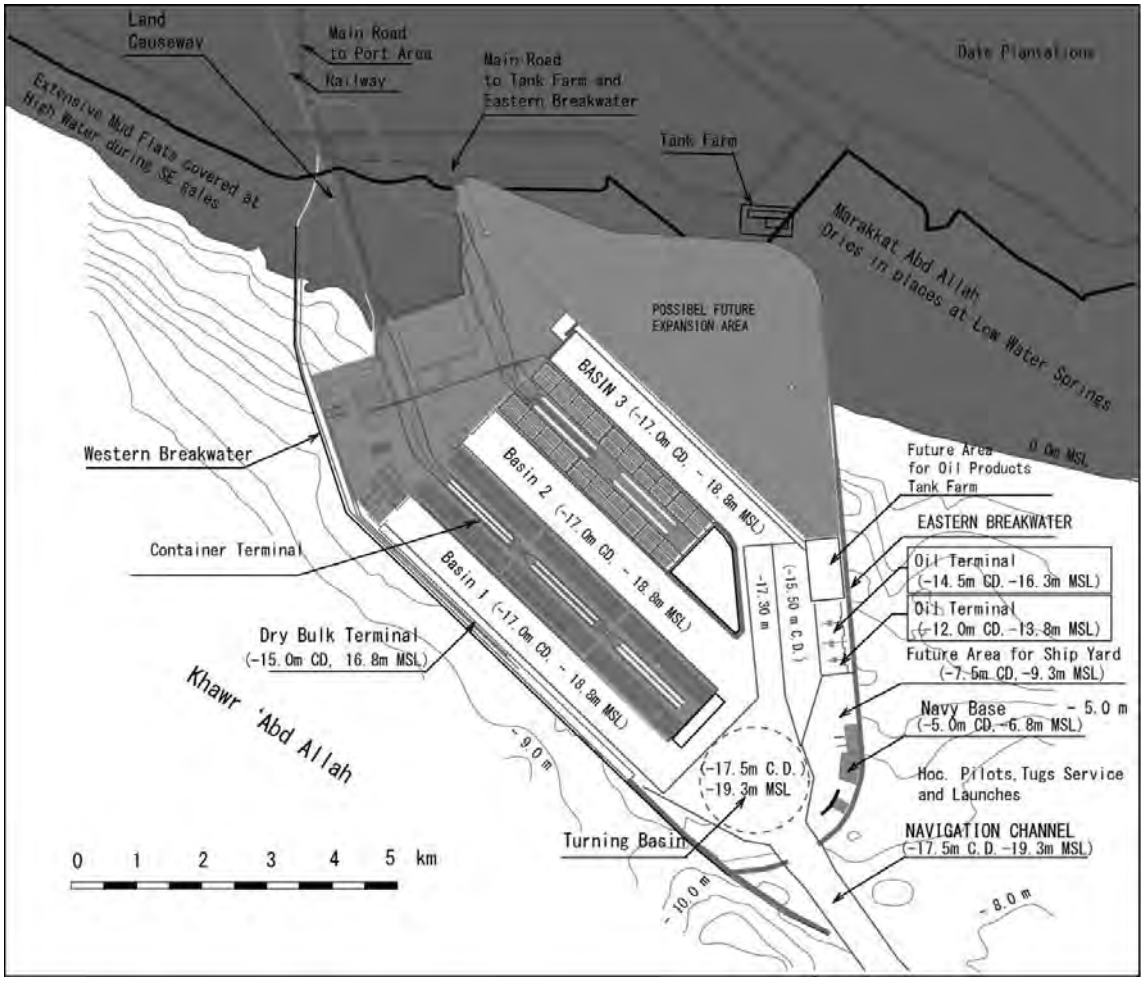
(4) Abu Flus Port

Abu Flus Port already has three berths though some part of them needs repair, and no expansion is planned in NDP 2013-2017. The major cargo of the port is containers. It is possible to increase the capacity of the port by renovating No. 3 Berth, which is severely damaged, to a specialized container terminal equipped with suitable equipment.

3.1.2 Al Faw Grand Port Development Plan

Several study reports have been published for the development of the Al Faw Grand Port. The key elements of some of these reports are briefly explained in Section 2.1.4. Since the proposal of the concept of developing a new port on the coast of the Arabian Gulf in the Transport Master Plan 2005, the plan of the port has been modified and elaborated. The plan shown in Figure 3.1-1 is the most updated plan that was presented in a seminar “Iraq Infrastructure 2013 in Dubai”.

The Al Faw Grand Port Development Plan aims at completion in 2038 and three-step development is proposed: the first step is up to 2018, the second step is up to 2028 and the final step is up to 2038.The layout plans at the end of the first and second steps are shown in Figure 3.1-1, while facilities to be developed are listed in Table 3.1-2.



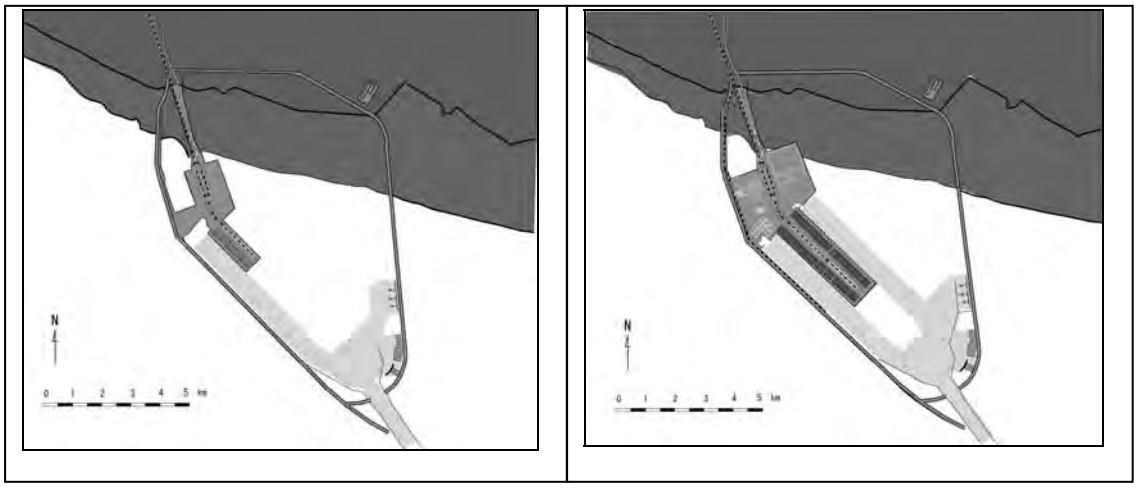
Source: Al Faw Grand Port Development (Drawing), GCPI and the presentation material of GCPI at "Iraq Infrastructure 2013, Edited by the Study Team

Figure 3.1-1 Al Faw Grand Port Development Layout Plan (As of August 2013)

Table 3.1-2 Facilities planned in respective development stages of Al Faw Port

Item	Unit	Stage 1	Stage 2	Final
Quay for Container terminal	m	3,900	3,100	7,000
Quay for Bulk terminal	m	2,000	1,500	3,500
Container yard	ha	120	80	200
Yard for bulk	ha	40	20	60
Paved area Road, Railway, building	ha	60	40	100
Silo for wheat	1,000 m3	150	50	200

Source: Feasibility Study of the New Basrah Grand Port Vol. 0. 2008

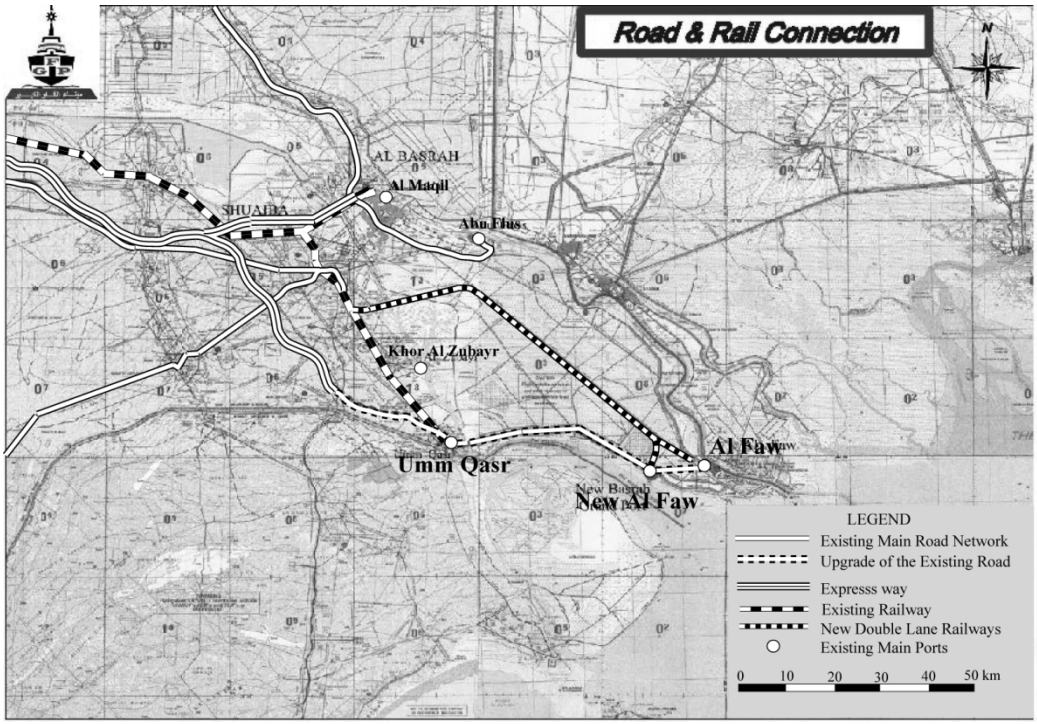


First stage (2018) **Second Stage (2028)**

Source: Al Faw Grand Port Development (Drawing), GCPI and the presentation material of GCPI at "Iraq Infrastructure 2013, Edited by the Study Team

Figure 3.1-2 Staged development plan of Al Faw Grand Port (1st and 2nd stages)

The access road and railways to Al Faw Grand Port are proposed by GCPI as shown in Figure 3.1-3**.**



Source: Presentation material of GCPI at "Iraq Infrastructure 2013, Edited by the Study Team

Figure 3.1-3 Access road and railway to Al Faw Grand Port proposed by GCPI

3.2 Development Plan of Water Ways

3.2.1 Strategy for Introduction of Navigation Aid System in Iraq

GCPI has been introducing Navigation Aid System based on "Draft Strategy for Introduction of AIS and VTS in Iraq 2009 (AIS-VTS 2009)". The outline of the strategy is as follows,

(1) Background

It is recognized that the lack of effective traffic monitoring in the fairways and 168 nautical miles of navigable channels leading to the offshore oil terminals and to the main ports of UQP and KZP (from KZP to UQP about 11 nautical miles in Khor Al Zubair channel, from UQP to the offshore oil terminals about 54 nautical miles in Khawr abd Allah channel, from Al Basrah oil terminal "BOT" to the Fairway buoy about 25 nautical miles in Khor Al Kafka channel and from Al Amayah oil terminal through Abu Flus port till Al Maqil Port in Basrah about 76 nautical miles in Shatt Al Arab channel).

It is acknowledged that introduction of systems for AIS (Automated Identification Systems) and VTS (Vessel Traffic Services) would be effective means to mitigate these threats and improve safety of navigation in Iraq.

One of the principal objectives of the Iraq government is to fulfill its international obligations regarding safety of navigation and protection of the marine environment and being a proactive member of the maritime community.

(2) Coastal State Obligations

SOLAS 74 (Safety Of Life At Sea) is the IMO international convention that deals with safety of human life at sea. Some 159 IMO member states have ratified this convention. The Republic of Iraq is a Party to SOLAS 74. Therefore, Iraq has an international obligation to fulfill the requirements defined by SOLAS 74.

Chapter V of SOLAS 74 deals with the safety of navigation by identifying certain navigation safety services which should be provided by contracting governments.

The main requirements are the provision of:

- Navigational Warnings (Regulation 4)
- Meteorological Services and Warnings (Regulation 5)
- Search and Rescue Services (Regulation 7)
- Life Saving Signals (Regulation 8)
- Hydrographic Services (Regulation 9)
- Ships Routing (Regulation 10)
- Ship Reporting Systems (Regulation 11)
- Vessel Traffic Services (Regulation 12)
- Aids to Navigation Services (Regulation 13)
- Long Range, Identification and Tracking (Regulation 19.1)

Chapter IV Regulation 5, Provision of Radio Communication Services, should also be taken into account.

Of particular relevance to this paper are Iraq's compliance with regulations 4, 7, 10, 11, 12 and 13. The remaining regulations should also be addressed by Iraq, but are for the time being considered to be outside the scope of Draft Strategy for Introduction of AIS-VTS 2009.

(3) Development in Iraq national waters

The majority of Iraq's crude oil exports are shipped out through two offshore oil terminals located in the outer reaches of the Khawr Abdallah estuary; the Al Basrah Terminal, with 4 berths for VLCC tankers with a draught of 21 m, and the Al Amayah Terminal, also with 4 VLCC berths, of which two are presently in operation. The offshore terminals are fed by three sub-sea pipelines from the shore. Also there are three new pipelines which are presently under establishment, partly to increase the output of the terminals and partly to feed four SBMs (Single Buoy Moorings), which are presently under establishment for loading of additional VLCC tankers.

Kuwait is at an advanced planning stage for the establishment of a major new container port on the eastern shores of Boubyan Island. Ships heading for this port will use a part of the Khawr abdallah channel, which is also used by ships heading for UQP and KZP.

Actions proposed by "Draft Strategy for Introduction of AIS and VTS 2009" are shown in Table 3.2-1.

Table 3.2-1 Action List for Introduction of AIS-VTS

Perform Initial Studies	1. Establish two or more AIS receivers to ensure preliminary coverage 2. Procure AIS Display Software with good charts 3. Perform risk analysis using the IALA Risk Toolbox in order to assess the need for improved Aids to Navigation and routing measures
SOLAS Compliance Analysis	4. Request IALA to perform an initial SOLAS Chapter Ⅴ compliance analysis and develop strategy for full compliance
Establish Shorebased AIS	5. Develop Tender Specification for Iraq shore based AIS system 6. Procure and install a complete AIS system with transmission capabilities including supplier training of GCPI staff
Improve Visual Aids	7. Improve Aids to Navigation in accordance with results from initial studies and SOLAS compliance analysis 8. Establish leading lines in the approaches to UQP and KZP 9. Procurement of new buoys to replace old buoys
Strengthen Maritime Operation Centre	10. Maritime Safety Information – improve procedures for dissemination of Navigational Warnings and Notices to Mariners. Consider relevant channels for distributing MSI-VHF, MF, NAVTEX, SAFENET, AIS. 11. Formalize cooperation with neighboring countries with NAVTEX transmitters 12. Consider formalizing cooperation with Bahrain with regard to MET/OC warnings 13. Revise SAR procedures to comply with IAMSAR manual 14. Formalize SAR Liaison with other SAR resources in Iraq 15. Formalize SAR Liaison with neighboring countries 16. Consider revising ships routing measures, based on risk assessment and planned port development
Establish Vessel Traffic Service	17. VTS Phase 1－Perform VTS operator training of Maritime Operation Centre personnel, according to IALA recommendations and establish AIS display in Maritime Operation Centre 18. Perform full scale risk analysis for Iraq waters in accordance with the IMO Formal Safety Assessment (FSA) procedure, in order to assess the need for higher levels of VTS 19. VTS Phase 2－In accordance with the results of the FSA analysis, procure and implement full scale VTS – Navigational Assistance Service in the approaches to UQP and KZP 20. VTS Phase 3－When desirable, consider, in accordance with the results of the FSA analysis, procure and implement full scale VTS-Navigational Assistance Service in the approaches to Shatt al Arab and along the river to Maqil Port in Basrah 21. VTS Phase 4－If desirable, procure and implement full scale VTMIS-Vessel Traffic Management Information System for all areas

Source: Draft Strategy for Introduction of AIS and VTS in Iraq, GCPI

3.2.2 Introduction of the VTS System

(1) Purpose and Scope of Works

GCPI is in the process of establishing the Vessel Traffic Service (VTS), which in the first phase will include the approaches to the main ports, UQP and KZP, as well as the approaches to the two offshore crude oil loading facilities, Al Basrah Terminal and Al Amayah Terminal. The second phase of the project will cover the Shatt al Arab river from Maqil Port in Basrah to the Al Amayah Terminal.

Phase 1 of the project will include the establishment of the VTS control centre and construction of 6 radar sites. It is presently expected that Phase 2 will include the establishment of 1 radar site near Al Maqil Port in Basrah, but the number of radar sites may be increased.

It is intended to implement Phase 1 over a 3-year period according to the following tentative schedule:

- Year 1: Establishment of the VTS control centre and the radar site No.1
- Year 2: Establish of the radar site No.2, No.3 and No.4
- Year 3: Establishment of the radar site No.5 and No.6

Presently it is intended that Phase 2 will be implemented in Year 3 of the project in parallel with the establishment of the radar site No.5 and No.6 of Phase 1. Iraq VTS is intended to operate as an information processing and decision support service for vessel traffic in Iraqi national waters. The purpose of the works is to establish the main part of the technical infrastructure of the VTS in Iraq.

Timely and relevant data obtained by the system shall provide accurate information to VTS operators for forwarding to mariners to support their decision making. The VTS system is also intended to provide traffic and safety information to mariners not obliged to participate in the VTS.

The VTS control centre (VTSCC) will be located in a purpose built facility in UQP. The VTSCC will receive and process surveillance data from the Iraqi radar sites, from the existing Iraqi AIS network as well as the Iraqi maritime radio system.

(2) Details of the VTS Equipment

It is planned in the project for the following items to be delivered from the supplier:

- A complete VTS system including central processing equipment, 5 central work stations within the VTSCC (3 operator WS, 1 analysis WS and 1 technical WS), 3 remote work stations and 7 radar sites (Type A for 5 radar sites and Type B for 2 radar sites)
- Three complete VHF radio systems, one for each operator work station
- Six remote operation VHF receivers connected through microwave links, operated at the VTSCC
- Three daytime and night time CCTV cameras including the monitoring system
- AIS integration covering the whole Iraq VTS area
- Installation, setting to work (commissioning) and acceptance for testing
- Training of VTS operators and technical staff
- Documentation
- Service and maintenance support
- The following deliverables are to be optional:
- Additional service and maintenance support
- Additional training of operators
- Additional training of technical staff
- Two VHF direction finder complete including software in VTSCC
- Radar site Type A (one antenna)
- Radar site Type B (two antenna)
- Additional work stations (full with 3 monitors)
- Additional work stations (simple with 1 monitor)

3.3 Port Development of Neighboring Countries and Transshipment

3.3.1 The United Arab Emirates (UAE)

(1) Dubai Port

The construction of Dubai port started in the 1970's at Jebel Ali area in the Emirates of Dubai. The Dubai Port World (DP World) plays the role of port authority and the port operator. The port is the largest port in the Middle East and 50 % of the cargoes to and from the Middle East are handled at the port. The port provides transshipment services for not only containers but also dry bulk cargoes, such as wheat and sugar, as well as vehicles. Figure 3.3-1 is a general view of the port.

Source: Pamphlet of DP World

Figure 3.3-1 General view of Dubai（Jebel Ali） Port

The numbers shown in the Figure denoted the facilities as indicated in Table 3.3-1 Port related facilities of the DP World.

Table 3.3-1 Port related facilities of the DP World

No.	Facilities	No.	Facilities
1	Gate No. 4	13	T2 Technical Building
2	DP World Building	14	Ship-to-Shore Quay Cranes
3	Cargo Gate No. 3	15	Gate automatic potals
4	Gate No. 3 Complex	16	Petroleum Storage
5	DP world Documentation and HR	17	Sugar storage
6	T1 Technical Building	18	Control Tower
7	Wmpties Yard	19	General Cargo
8	T1 Container Terminal	20	RoRo (Vehicle Handling)
9	Gate No.2	21	Cool store
10	CFS (Container Freight Station)	22	T1 Operations Building
11	Gate No. 1		(Including wheelhouse)
12	T2 Operations Building	23	Cold Store

Source: Pamphlet of DP World

DP World was established by capital investment by the government (80%) and private sector (20%). The DP World covers a wide range of roles including the development, administration, operation, maintenance and repair of Jebel Ali Port. Two terminals are presently operational: Terminal 1 is a container terminal, while Terminal 2 handles containers and dry bulk. There are two excavated basins. There is a RoRo berth at the end of the landside basin, while oil berths are located at the end of the seaside basin. A total of 15 km-long container berths are equipped with 50 units of container quay cranes. Those container quay cranes on Terminal 2 are tandem type and are capable to lift two 40' containers at a time.

At present, Terminal 3, which will be another container terminal, is being developed. DP world has a future plan to develop the breakwater located offshore of Terminal 2 into to Terminal 4. There is a LNG terminal between terminal 2 and the breakwater. When Terminal 4 is developed, the LNG terminal will be demolished. Post Panamax container ships, having a carrying capacity of 15,000 TEU, are currently calling on the port. DP world is adopting a paperless system and all is done through web sites. The gates of the container terminal are automated.

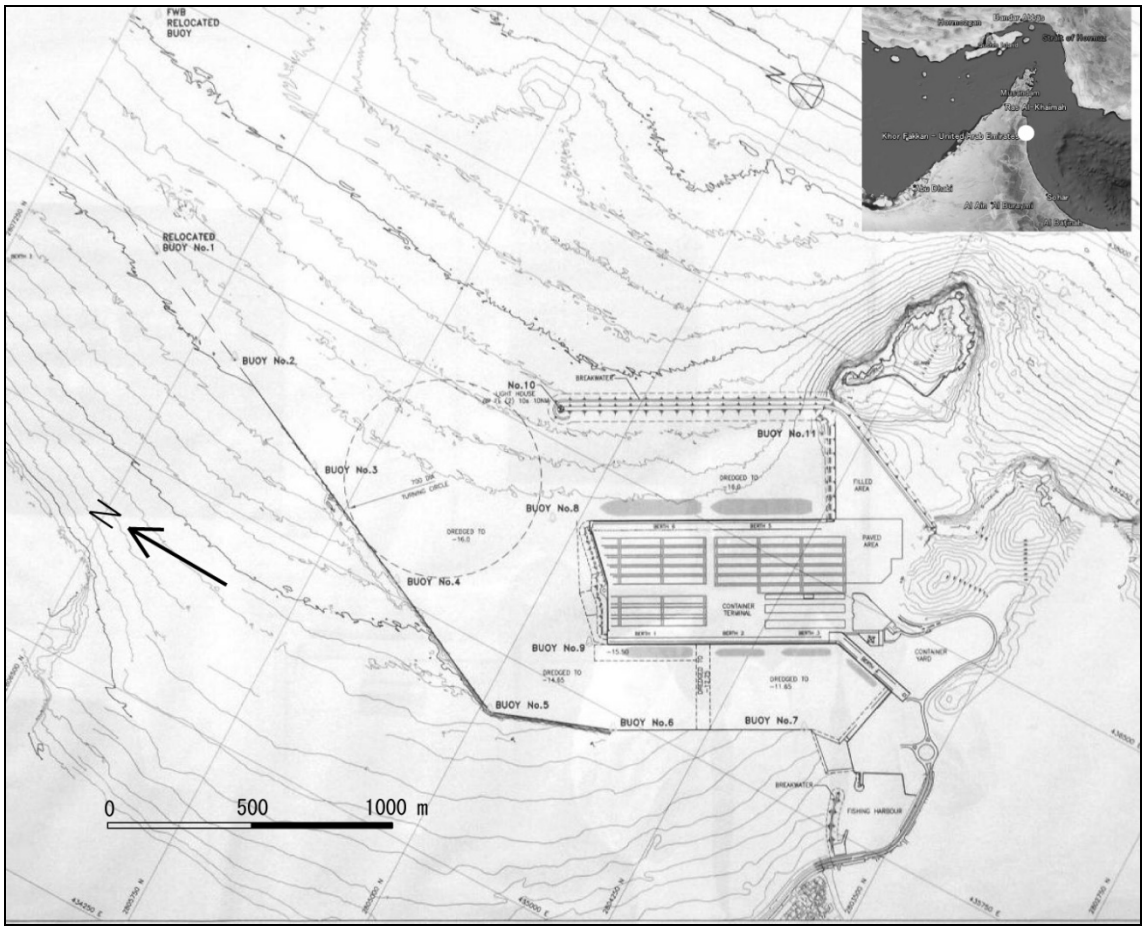
DP World is carrying out container terminal operation at 65 ports over the world. The total number of employees of DP world at Jebel Ali is 8,000, while grand total of the whole DP World employees is 28,000.

An international airport is about to start operation near Jebel Ali Port. When it starts operation, Sea-and-air multimodal transport will come into service.

(2) Khor Fakkan Port

A container port located on the east coast of UAE. The Port Authority of Kohrfakkan is the government of the Emirate of Fujairah. Whole stocks of the Gulftainer Company are shared between the Emir of Fujairah and an Iraqi investor. Gulftainer is the operator of a container terminal at Berth No. 11a in UQP. Khor Fakkan Port is called by container carriers plying along the world main liner service routes. Compagnie Maritime D'affrètement - Compagnie Générale Maritime (CMA CGM), United Arab Shipping (USAC), Maersk, Hanjin Shipping Line, China Shipping Container Lines (CSCL) and CSAV are the current users of Khor Fakkan Port as their transshipment hub. The port is called by the world's largest container carriers. Practically, all the containers unloaded at the port are for transshipment.

The facility layout of the port is shown in Figure 3.3-2, and the characteristic dimensions of facilities and equipment are listed, in Table 3.3-2.



Source: Gulftainer, Khor Fakkan Port, Edited by Study Team

Figure 3.3-2 Khor Fakkan facility layout

Table 3.3-2 Dimensions of Khor Fakkan port facilities

Item	Dimension
Total berth length	1,880 m
Number of berths	Total: 6, (Post Panamax 2, others: 4)
Maximum water depth	- 16m
Yard area	200,000 m2
Capacity of container yard	50,000TEU
Equipment	Container quay crane 20、RTG 22、RGM 4 Reach Stacker 2, Top Loader 9, Side Lifter 13 Forklift 12, Tractor Chssis 85

Source: Pamphlet of Khor Fakkan Container Terminal, Gulftainer company limited

3.3.2 Kuwait

(1) Development of Mubarak Port

At present, Shuaiba Port and Shuwaikh Port are the major ports of Kuwait. While Shuwaikh Port plays a role as a commercial port having facilities for containers, vehicles, general cargoes. Shuaiba port also plays roles of commercial and industrial port having container terminals and oil terminals.

Kuwait is now constructing Mubarak Port, a new container port, on the coast of Khawar Abdallah Channel in Bubyan Island. The port is located just across the Khawar Abdallah Channel facing to Al Faw Grand Port in Iraq (see Figure 3.1-1). Mubarak Port, when its final development stage is completed, will have a 8,700 m long quay. As the first stage of the plan, a 1,250m long and -14 m deep quay is being constructed (see Figure 3.3-3).

Figure 3.3-4 was drawn by JICA Study Team based on a photo of a drawing of conceptual design of Mubarak Port, and therefore, the location of the port structures are not precise. The development of Mubarak Port may influence the passage of ships along the existing navigation channel, which is indicated in the Figure in double broken line. It is necessary to reconfirm the exact location of Mubarak Port and ensure the operation of Mubarak Port will not interfere with the navigation along the Khawar Abdallah Channel.

According to ”Kuwait Mega Project 2010-2014, ANNEX A”, which was published by Mega Project Agency (MPA), Ministry of Public Works of Kuwait government, the development plan of Mubarak Port aims to cope with the imports and exports of Kuwait over the coming 20 years. When the plan is completed, the port will have an annual container handling capacity of 2.5 million TEU.

Mubarak Port will be developed in four stages. The first stage of the plan will be implemented in the following three steps:

Step 1 (2007-2011): Construction of road and railways and soil improvement,

Step 2 (2009-2013): Dredging basins and waterways of the port, and

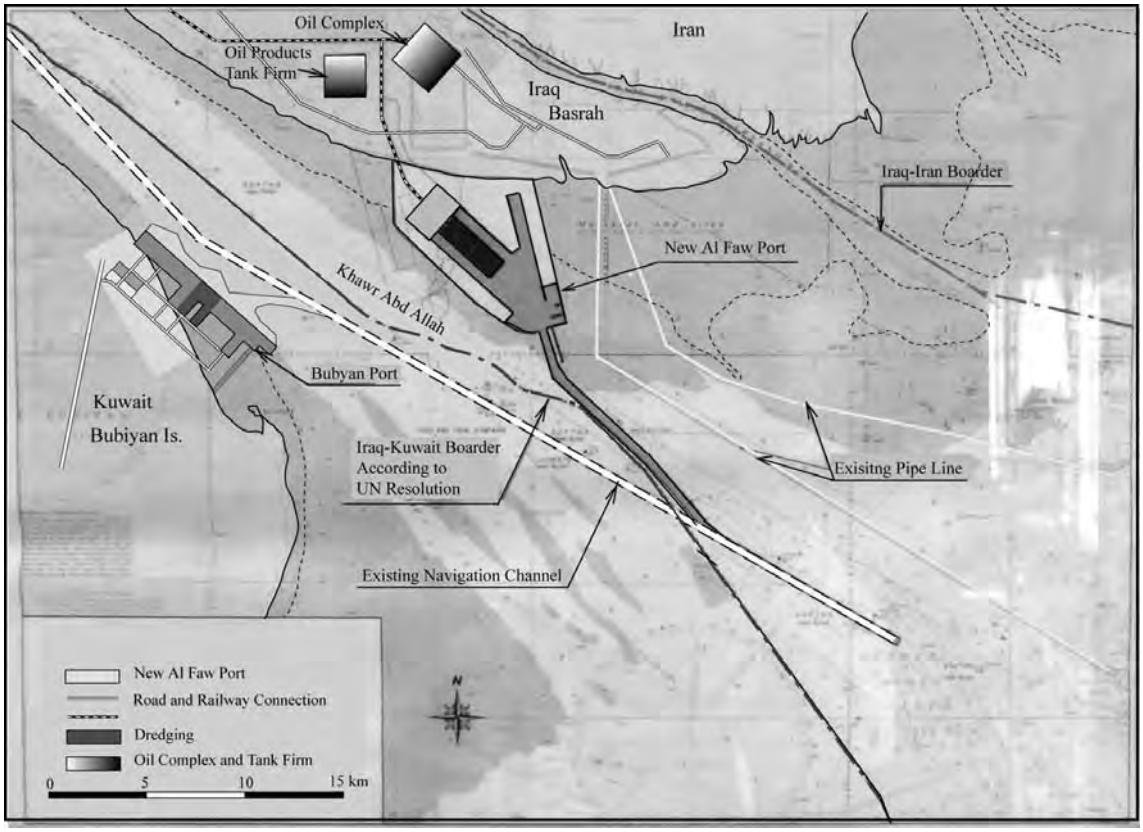
Step 3 (2009-2014): Completion of a container terminal having an annual handling capacity of 2.5 million TEU with nine (9) berths.

“Kuwait Mega Project 2010-2014, ANNEX A” announced that the project components of the further stages of the plan are as follows:

The Second Stage (2016-2021): seven (7) additional berths

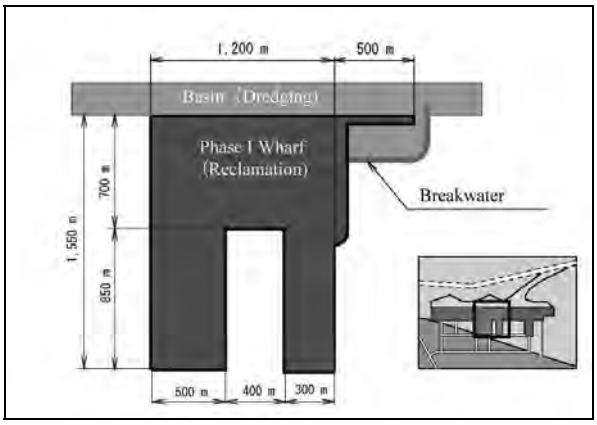
The third Stage (2022-2028): eight (8) additional berths,

The fourth Stage (2029-2033): additional 36 berths (a total of 60 berths at the end of the final stage)



Source: Drawing of GCPI and Mubarak Port Project Office, edited by Study Team

Figure 3.3-3 Locations of Mubarak Port in Kuwait and AFGP in Iraq



Source: Drawing, Mubarak Port Project Office, edited by Study Team

Figure 3.3-4 Mubarak Port Development Plan (Stage 1)

(2) Field Survey in Kuwait

There is a buffer zone several kilometers wide in the Abdaly border with Iraq and trucks registered with Kuwait transgress the border to transfer goods to trucks registered with Iraq. Iraqi trucks cannot enter the Kuwait border. Construction materials, steel & pipes and daily commodities are transported to Iraq. Cold and frozen goods are transported to Iraq after transferring goods to refrigerator trucks at Shuwaikh Port. Traffic surveys on trucks from Kuwait City to the Abdaly border were conducted and the result is shown in Table 3.3-3.

Table 3.3-3 Traffic Survey on Trucks at the Border

(Border to Kuwait City/13:30~14:30 p.m.)

Trucks (Large&small)	Container (Cold&frozen	Water&Oil Truck	Dump Truck
73 nos.	12 nos.	27 nos.	20 nos.

(Kuwait City to Border/15:00~16:00 p.m.)

Truck (Large)	Truck (Small)	Container (Cold&frozen)	Water&Oil Truck	Dump Truck	Mixer Truck
38 nos.	49 nos.	11 nos.	17 nos.	2 nos.	12 nos.

Source: JICA Study Team

Following points on the above table are taken notice:

- It is considered that large trucks transport goods to Iraq while small trucks are in domestic use,
- Eighty to ninety percent of containers are trucks with cold and frozen goods and there are few trucks with container cargoes. For example 2~3 numbers were observed for around 2 hours,
- Water & oil trucks, dump trucks and mixer trucks are in domestic use.
- The result of the interview with the shipping company CMA-CGM is as follows regarding the cargoes for Iraq:
- Forty percent of imported cargoes in Kuwait are cargoes for Iraq in 2008. After that cargoes for Iraq have reduced and it is expected that they were 5~10% in 2013. For example imported container cargoes in Kuwait in 2012 was about 400,000 TEUs and cargoes for Iraq may be around 20,000~40,000 TEUs. It is expected that cargoes for Iraq will be gone in the near future,
- CMA-CGM stopped to transport container cargoes from Kuwait to Iraq. At present container cargoes are transported from Khor Fakkan Port by container vessels,
- There is no reefer containers in ports of Iraq due to a power shortage,
- Cold and frozen goods are transported to Iraq after transferring goods to refrigerator trucks at Shuwaikh Port.

3.3.3 Perspective of Feeder Services in the Gulf

In the field of container shipping, the method of 'Hub and Spoke' shall apply in the future because of its geographical location of the Gulf. The population and the Economy is respectively 3.1% and 3.4% of the world. Therefore, large containerships call on the way of their East-West trades. Feeder service method is inevitable as long as large vessels are employed.

For the carriers, calls to the Gulf ports are less profitable due to import/export balance of cargo. Apart from this, the carriers aim for marginal costs by having larger vessels. Presently, Jebel Ali is the most efficient feeder base to other Gulf ports. However, Bandar Abbas may have a similar function as it is situated at the mouth of the Gulf and will have more primary import cargo in the future.

(Note; It is most important for the container carriers to minimize operational expenses as well as capital cost of the vessel. The determinant whether a carrier pays a direct call to a certain port, or a carrier selects transshipment is almost simply a cost comparison. If the cost of the mother boat to deviate surpasses the cost of the feeder cost, a carrier will select feeder system. The advantage of feeder service is not only the cost, but also is the reasonable transit time compared with direct deviation to pleural destinations on average.)

The cheaper the cost becomes, the lower the consignees pay the ocean freight charges in the long run. That means, it contributes to the national economy by paying less service imports.

Ultra-large containerships sometimes pay calls to ports of some emerging countries when the ports are located on the way of their loops.

(Note: a 'loop' is a new fashioned way of saying a 'line', which means one turnaround of ship route)

However, it is more likely to temporarily fill in the empty space due to sudden space enlargement by deploying ultra-large vessels. When the cargo volume of main target destination port reaches to the planned quantity, the vessels will no more call such small ports. Even, Dubai cannot be an exception, as AE11/MEX loop of CMA CGM/Maersk with 12600 Twenty-foot Equivalent Units (TEU) ships, as well as Tiger service of MSC with 13400TEU ships skipped UAE from their services recently.

In the ship charter market, middle or small type of containerships under the Panamax size can be time-chartered at very low charter rate, far below the cost which owners are bearing. (this means the original owners are having huge loss) It is because such smaller ships surplus is brought by the recent shipbuilding boom which caused a large scale of cascading*. (*cascading; like clothes handed down to one's younger brothers, the largest vessels expel the second largest ones, and the second largest ones expel the third, and so forth. The last may be without employment.)

Whereas, the ship cost for the ultra-large containerships are borne by the carriers as those ships are actually owned by the carriers (ship operators). Therefore, the ultra-large ship operators cannot enjoy the lowest market environment. The reason why the carriers are using UAE ports is because the transshipment cost is exceptionally low. For easier understanding of the feeder system, a sample is shown below.

This is a comparison of 'A)-large ship's deviation cost' with 'B)-feeder cost'. The sample is provided that the deviation is 500 nautical miles away from the hub port to carry 1,000TEU containers. That means 2 days steaming and 1 day cargo operation. The extra costs incurred by both methods are;

a) for 10000TEU mother ship: 2 day fuel cost plus 3 days ship cost which is approximately estimated at US$120,000 + US$240,000/day=US$360,000

b) for feeder ship of 2500TEU type: 2 day fuel cost plus 3 days ship cost plus transshipment cost at the hub port which is approximately estimated at US$36,000 + US$20,000 + US$150,000= US$71,000. Containers to the hub are carried from various loading ports, therefore, the on-carriage is effectively done by consolidating until it reaches the capacity limit of the feeder ship. In this case, 1 feeder can save 2.5 mother ships' call. Therefore, we should compare A) 2.5 x US$360,000= US$900,000 with B) US$71,000.

3.4 Port Authority's Situation

GCPI is a state owned company established under the Law on State-owned Companies (No.22, 1997) and manages ports based on the Law of Ports and harbors (No.21, 1995). GCPI's organizational structure is as shown in Figure 3.4-1. Total number of GCPI's staff is 9,791 in 2012, which has slightly decreased from 10,208 in 2010, as shown in Table 3.4-1, including breakdowns into job types and the distinction of sex.

Table 3.4-1 GCPI's Staff by Job Types and Sex

Job Type	Male	Female	Total
Administration	981	511	1,492
Engineers	276	87	363
Technicians	7,513	423	7,936
Total	8,770	1,021	9,791

Source: GCPI Annual Report 2012

(1) Maritime Affairs Department
Maritime navigation section: Pilotage (including offshore oil terminal)

Marine service section: Berthing, unberthing, mooring, tug boat service
Faw/Fishing jetty unit: Construction of fishing jetty in Faw Port

(2) Marine Dredging Department
Marine survey section: Bathymetric survey of navigation channels and anchorage basin
Marine dredging section: Channel/Basin dredging of 5-6 million m3
Marine lighting section: Maintenance of buoys and navigational lights

(3) Marine Salvage Department
Operations section: Rescue, salvage, recovery of flotsam
Technical section: Maintenance of dredgers and equipment

(4) Engineering Affairs Department
Communication section: Installation and maintenance of information devices including AIS (Automatic Identification System) and GMDSS (Global Maritime Distress and Safety System)
Electrical-Air condition section: Installation and Maintenance of electric facilities and cold system (Refrigerating equipment)
Civil engineering section: Construction and maintenance of port infrastructures, roads, yards and others
Machinery maintenance section: Maintenance of machinery, cars, and other equipment

(5) Dry Docks and Marine Industry Department
Responsible for maintenance and repair work of tug boats, survey boats, dredgers, and other crafts of GCPI. This department has sections of Marine dockyard, Marine slipway, Marine maintenance, and Marine industry.

(6) Planning and Follow-up Department
Responsible for coordinating the implementation of each department, monitoring the progress of each project, making annual reports, monthly reports, other periodical reports, statistics reports, financial reports and personnel reports, and coping with problems identified in port affairs. Research and studies department implements seminars and training courses for improving productivity of port operations as well as studies on port activities.

(7) IT Department
Responsible for development, maintenance and management of information systems of GCPI, and staff training on information technology for port operations.

(8) Department of Legal Affairs
Responsible for coping with lawsuits, legal affairs related to contract, drawing a plan of regulations on port management and operations, and other legal matters.

(9) Human Resources Department
Responsible for general affairs of staff management of GCPI, safety and security of port operations, fire fighting, insurance on cars and other miscellaneous matters of GCPI. H.R. department consists of Housing Services Division, Administrative Services Division, Safety and Firefighting Division, and Division of Athletics.

(10) Maritime Inspection Department
Responsible for inspecting ships and seafarers following rules and regulations on ship navigation, safety of ships, ship registration, certificate of seafarers, and other international regulations. Seafarers certificate is also issued by the department.

(11) Port Training Center
Responsible for staff training on handling of port equipment, stevedoring, cargo handling, vessel steering, pilotage, navigation, dredging operations, seafarers activities and other matters necessary for the work of GCPI.

(12) Contract Department
Responsible for inviting bids, making contract with bidders, and supervising the implementation of contracts.

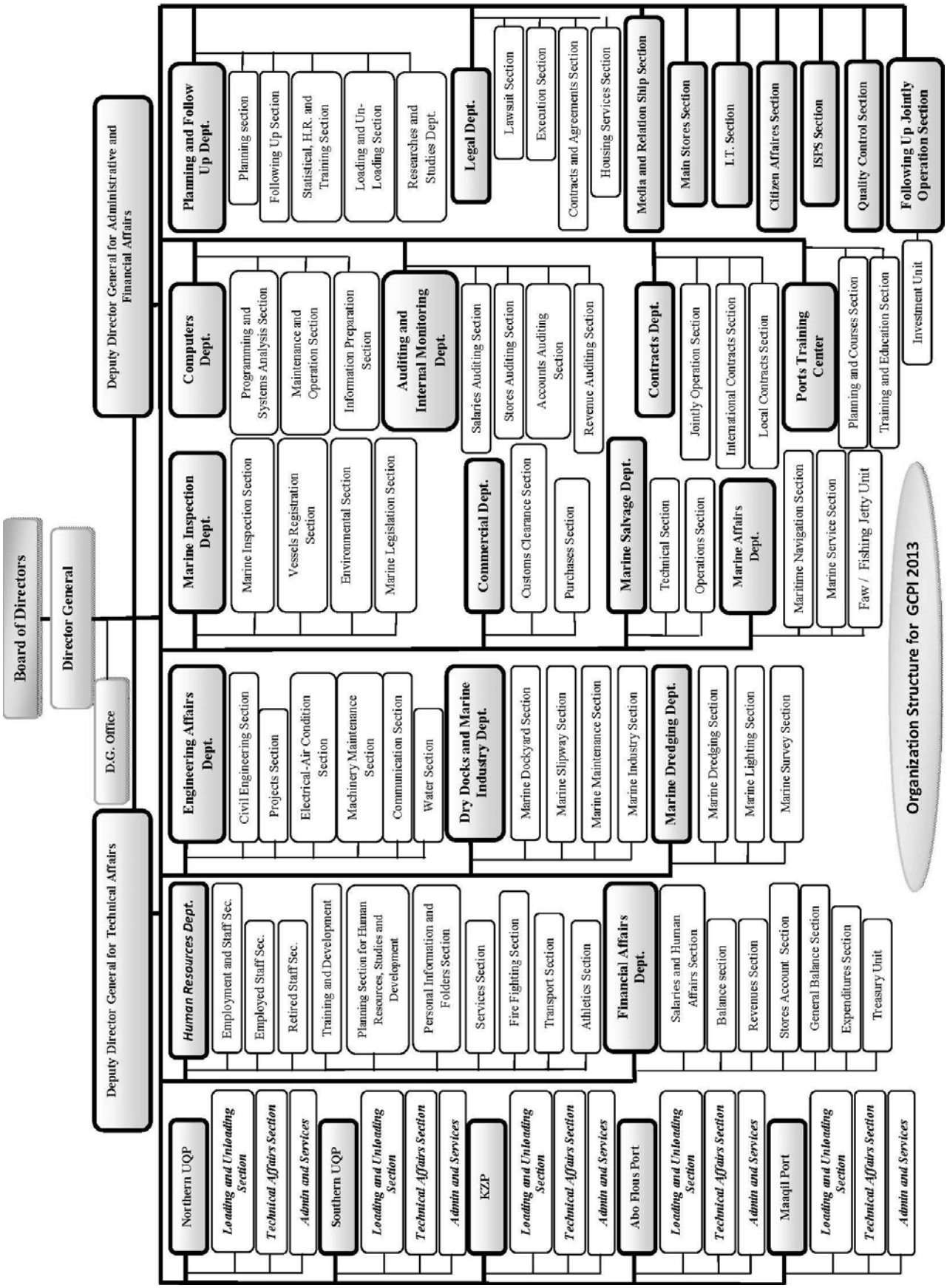
Number of staff members of each department of GCPI is shown in Table 3.4-2, which shall be consistent with Table 3.4-1, however, some people are not included in Table 3.4-2. Total number of GCPI employees was about 9,800 in 2012.

Keeping ports secure in Iraq; considerable numbers of people engage in gate operations, inspection and watch-keeping in ports.

Table 3.4-2 Number of Staff in Department of GCPI

	GCPI Dept.	Number		GCPI Dept.	Number
1	Top Executives	10	13	Marine (Inspection)	215
2	Secretary	7	14	Commercial	44
3	North UQP	1,234	15	Marine Salvage	281
4	South UQP	750	16	Marine Affairs (Service)	902
5	KZP	605	17	Computer	98
6	Al Maqil	886	18	Internal Auditing	65
7	Abu Flus	353	19	GCPI training	96
8	Human Resources	813	20	Planning and Follow	71
9	Financial Affairs	128	21	Legal	49
10	Engineering Affairs	?	22	Media and Public	123
11	Marine Dry Docks and Marine Industry	717	23	Contracts	34
12	Marine (Dredging)	551	24	IT Dept.	15
	Sub Total (1-12)	6,054		Sub Total(13-24)	1,993
	Grand Total (A+B)	8,047			

Source: Data Collection Survey on Port Sector Development Plan in Iraq, 2012



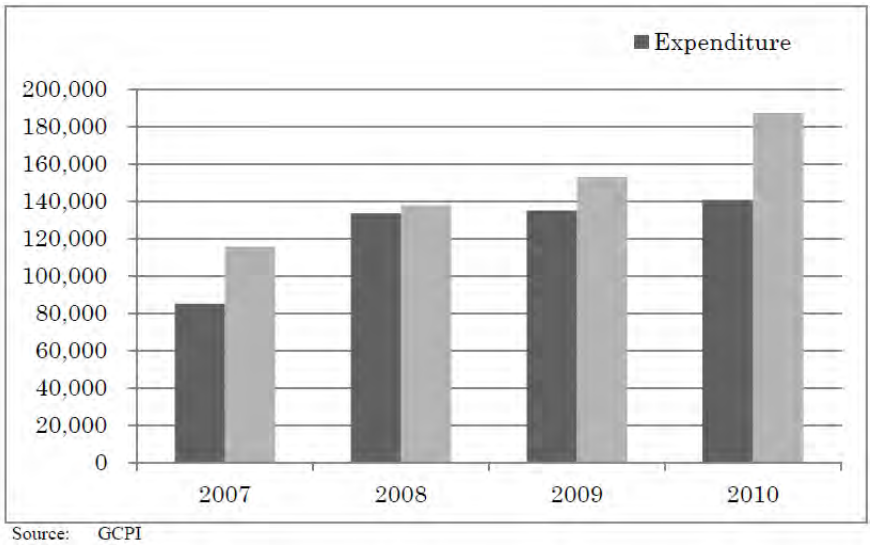
Source: GCPI

Figure 3.4-1 GCPI Organization

3.5 Financial Situation of GCPI

3.5.1 Outline of GCPI's Revenue and Expenditure

The Final Report of "Data Collection Survey on Port Sector Development Plan in Iraq" mentioned revenue and expenditure of GCPI from 2007 to 2010 and breakdown of revenue and expenditure in January 2012. The revenue increased steadily year by year through the 4 year period and the expenditure remained the same for 3 years between 2008 and 2010. The figure is shown below.



Source: Final Report of Data Collection Survey on Port Sector Development in Iraq

Figure 3.5-1 Revenues and Expenditure of GCPI

The Study Team received some financial data and information of GCPI, viz. annual report in 2011 and 2012 and financial statements from 2010 to 2012. Summary of such financial situation and status of GCPI is described on the basis of collected data and information as of December 2013 in the next section.

3.5.2 Financial Statements of GCPI

(1) Profit and Loss Statement

The following tables show main financial figures of revenues and expenditures for four years through 2009 to 2012 of GCPI. The financial situation of GCPI for the period can be generally said as positive and stable.

Table 3.5-1 Revenues of GCPI

Unit: Mill IQD

	2012	2011	2010	2009
Commodity Activity	334	257	82	13
Service Activity	317,339	232,007	186,022	152,032
Manufacturing	380	83	275	71
Others	1,114	787	1,003	1,137
Total Revenues	319,166	233,134	187,382	153,253
Growth Rate	36.90%	24.42%	22.27%	

Source: Prepared by JICA Study Team based on GCPI Financial Statements

The revenue of service activity had the largest share in GCPI revenues which accounted for around 99% from 2009 to 2012. And growth rate of revenue of service activity was the same percentage as that of the total. Thus, JICA Study Team supposes that the revenue of service activity comes from collecting port dues, cargo handling charges and concession/lease fees of each port although contents of the revenue of service activity is not stated at all in the financial statement of GCPI. On the other hand, the growth rate of total cargo volume was only 15% in 2012/2011 and ship call was almost the same between both years.

The revenues of commodity activity, manufacturing and others had a small share, only 1% in total, but the revenue of commodity activity in 2012 grew at 25 times the rate of that in 2009.

Table 3.5-2 Expenditures of GCPI

Unit: Mill IQD

	2012	2011	2010	2009
Wage and Salaries	139,364	110,822	111,613	106,966
Commodity Supply	14,587	12,496	10,623	12,576
Service Supply	4,463	4,234	3,703	3,487
Construction and service	9,072	14,705	10,279	6,723
Depreciation	6,759	5,911	5,485	4,757
Taxes and Fees	8	0	0	0
Manufacturing	4,008	2,398	316	562
Others	14,612	12,583	2,220	1,680
Total Expenditures	192,871	163,149	144,239	136,751
Growth Rate	18.22%	13.11%	5.48%	

Source: Prepared by JICA Study Team based on GCPI Financial Statements

As shown in the table above the GCPI expenditures of running Iraqi ports constantly increased during the past 4 years. The development of expenditures did not uniformly follow the development of the revenues/volume of cargo handled in the ports. The largest share of expenditure was wages and salaries which accounted for 77% in 2009 and 2010, sharply decreased to 67% in 2011 but increased a little to 72% in 2012. The second share was commodity supply such as gas, fuel, water and other utilities cost which was around 7%.

Table 3.5-3 Profit of GCPI

Unit: Mill IQD

	2012	2011	2010	2009
Revenues	319,384	232,902	187,453	153,150
Expenditures	189,871	161,772	140,923	135,104
Total Profit	129,513	71,130	46,530	18,046
Profit Margin	41%	31%	25%	12%

Source: Prepared by JICA Study Team based on GCPI annual report in 2012

The above table was cited from annual report of GCPI in 2012 and JICA Study Team calculated the profit margin. A sharp increase of GCPI's profits can be observed between 2009 and 2012 (more than 50% increase in profit from the previous year). The profit margin of GCPI increased approximately 10% year by year. This increase of profit margin was caused by high revenue, not costs down.

GCPI distributed over 30% of profit to Ministry of Finance every year, the amount was 84.9 billion IQD (66%) in 2012, 39.0 billion IQD (55%) in 2011, 14.6 billion IQD (31%) in 2010 and 5.6 billion IQD (31%) in 2009.

(2) Balance Sheet

The following table shows main financial figures of balance sheet from 2009 to 2012 of GCPI. The financial position of GCPI for the period can be generally said as positive and stable.

Table 3.5-4 Balance Sheet of GCPI

Unit: Mill IQD

Unit: Mill IQD	**2012**	**2011**	**2010**	**2009**
Assets	415,166	295,095	242,423	200,965
Current Assets	*331,594*	*243,409*	*195,274*	*153,669*
Fixed Assets	*83,572*	*51,686*	*47,149*	*47,296*
Liabilities and Equity	415,166	295,095	242,423	200,965
Liabilities	*323,842*	*226,380*	*194,049*	*155,970*
Shareholder's Equity	*91,324*	*68,715*	*48,374*	*44,995*

Source: Prepared by JICA Study Team based on GCPI Financial Statements

Assets increased year by year and assets in 2012 increased at twice the rate of that in 2009, especially over 120 billion IQD value plus between the beginning and the end of the year 2012. The main amount and items were 30 billion IQD from debtor and 60 billion IQD from cash on current assets, on the other hand fixed assets increased 30 billion IQD which came from "project under construction" according to the financial statements of GCPI in 2012. It is, however, unclear whether the "project under construction" is included the Iraq Project No.1 (IQ-P1) or not.

Liabilities increased around 100 billion IQD and the main items were accounts payable and doubtful accounts receivable. The shareholders' equity increased 20 billion IQD.

Item of account of liabilities in GCPI financial statement was not separated between current liabilities and long-term liabilities but GCPI is supposed to maintain its solvency margin because the major share of assets is current assets (cash and cash equivalent has around 50% share of current assets).

(3) Cash-flow Statement

The following table shows cash flow statement in 2010 of GCPI, other years' cash flow was not attached in financial statements.

Cash in and out was not stated except in year 2010 but cash ending was mentioned in the financial statements. Increased rate of cash ending was 35% in 2011/2010 and 21% in 2012/2011. Cash flow statement provides valuable information to assess liquidity and solvency, and to appraise quantity- quality of the profit of entity so it should be prepared every year to assess the value by themselves.

Table 3.5-5 Cash Flow Statement of GCPI

Unit: Mill IQD

Unit: Mill IQD	2012	2011	2010	2009
Operating Activity	na	na	46,201	na
Cash from Operating act	na	na	190,619	na
Cash to Operating act	na	na	(144,418)	na
Investment Activity	na	na	(5,263)	na
Financing Activity	na	na	(5,304)	na
Cash to contribution	na	na	(300)	na
Cash to dividends	na	na	(5,004)	na
Extraordinary Cash-in	na	na	385	na
Cash Ending	58,551	48,530	36,019	na

Source: Prepared by JICA Study Team based on GCPI Financial Statements

(4) Financial Indices

The following table shows Return on Asset (ROA) and Return of Equity (ROE) of GCPI to check the financial performance. ROA is a ratio of the net profit and total assets of an entity and indicates performance of the total assets. Total assets used for ROA are an average of the assets at the beginning and the end of a certain year. ROE is a ratio of net profit and the capital of an entity. The capital used for ROE is also an average of the capital at the beginning and the end of a certain year.

Table 3.5-6 ROE and ROA of GCPI

Unit: Mill IQD

	2012	2011	2010	2009
ROA	36.5%	26.5%	21.0%	na
Return (profit)	129,513	71,130	46,530	18,046
Average Assets	355,131	268,759	221,694	na
ROE	161.9%	121.5%	99.7%	na
Return (profit)	129,513	71,130	46,530	18,046
Average Equity	80,020	58,545	46,685	na

Source: Prepared by JICA Study Team based on GCPI Financial Statements

Both indices show high ratio compared with an ordinary commercial company (5% ~ 10% of ROA). Regarding high percentage of ROE, it is considered to have the effect of financial leverage (leverage effect of debt) because of debt to equity ratio of GCPI is high (3.55 in the year 2012).

Profit and Loss Statement, Balance Sheet and Cash Flow Statement from 2009 to 2012 are attached in the next three pages for reference.

Note: GCPI financial statements which were mentioned in Arabic were translated into English by a staff of the Study Team. In the English version, paid in capital and reserves were categorized in Long-Term Liabilities, so the Study Team deemed these accounts to be in Shareholders' Equity and Current Liabilities to be Total Liabilities, not only Current Liabilities and but also Long-Term Liabilities in this section.

Table 3.5-7 Income Statement 2010-2012

Ministry of Transportation
General Company For Ports In Iraq
Revenues and expenses Accounts for the Fiscal Year

Index No.	Accounting Manual No.	Account Name	Financial Statements in 2012		Financial Statements in 2011		Financial Statements in 2010	
			2012 Dinar	2011 Dinar	Year 2011	Year 2010	Year 2010	Year 2009
		Revenues						
13	41	Revenue of Commodity Activity	333,618,875	256,700,913	256,700,913	82,190,606	82,190,606	12,684,552
13	43	Revenue of Service Activity	317,339,178,368	232,006,866,957	232,006,866,957	186,022,144,758	186,022,144,758	152,031,840,913
14	48	Manufacturing Revenues	379,935,827	83,321,177	83,321,177	275,306,014	275,306,014	71,404,499
14	49	Other Revenues	1,113,523,647	786,830,587	786,830,587	1,002,615,282	1,002,615,282	1,136,892,201
	41- 45	**Total Revenues**	319,166,256,717	233,133,719,634	233,133,719,634	187,382,256,660	187,382,256,660	153,252,822,165
		Deduct Expenses						
9	31	Wages And Salaries	139,363,991,820	110,821,970,338	110,821,970,338	111,612,502,087	111,612,502,087	106,966,313,356
10	32	Commodity Supplies	14,586,887,448	12,495,643,942	12,495,643,942	10,623,374,106	10,623,374,106	12,576,164,694
11	33	Service Supplies	4,462,691,798	4,234,432,316	4,234,432,316	3,703,328,506	3,703,328,506	3,486,689,728
12	34	Construction And Services	9,071,671,843	14,705,046,807	14,705,046,807	10,278,530,314	10,278,530,314	6,722,750,633
1	37	Depreciation	6,758,512,082	5,910,741,225	5,910,741,225	5,484,663,268	5,484,663,268	4,757,124,809
12	384	Taxes And Fees	7,609,000	-	0	0	0	0
12	38	Manufacturing Expenses (Except Account No. 384)	4,007,510,460	2,398,497,000	2,398,497,000	316,362,000	316,362,000	562,344,112
12	39	Other Expenses	14,612,478,928	12,582,737,272	12,582,737,272	2,220,343,639	2,220,343,639	1,679,735,882
		Total expenses	192,871,353,379	163,149,068,900	163,149,068,900	144,239,103,920	144,239,103,920	136,751,123,214
		Surplus Of Continuing Operations	**126,294,903,338**	**69,984,650,734**	**69,984,650,734**	**43,143,152,740**	**43,143,152,740**	**16,501,698,951**
		deduct 25% from net profit to loss amortizahon 2008	0	(4,378,189,598)	(4,378,189,598)	(10,785,788,185)	(10,785,788,185)	(4,125,424,738)
		expected profit after deducting losses	**126,294,903,338**	**65,606,461,136**	**65,606,461,136**	**32,357,364,555**	**32,357,364,555**	**12,376,274,213**
		Distributed As Follows:-						
		Has Increased 30% From Activity Cost	74,019,494,141	21,156,110,748	21,156,110,748	0	0	0
		Deduct: 10% Expansions Reserve	12,629,490,334	2,115,611,075	6,998,465,073	0	0	0
		The First Phase To Ministry Of Finance	61,390,003,807	19,040,499,673	14,157,645,675	0	0	0
		45% Treasury Share (The Second Share)	23,523,934,139	20,002,657,675	20,002,657,675	14,560,814,049	14,560,814,049	5,569,323,396
		5% Social Service Reserve	2,613,770,460	2,222,517,519	2,222,517,519	1,617,868,227	1,617,868,227	618,813,710
		7% Research And Development Reserve	3,659,278,644	3,111,524,527	3,111,524,527	2,265,015,518	2,265,015,518	866,339,195
		33% Employees Share	19,804,805,906	15,689,258,272	15,689,258,272	10,043,984,406	10,043,984,406	3,663,527,398
		Remaining To General Reserve	2,673,620,049	3,424,392,395	3,424,392,395	3,869,682,355	3,869,682,355	1,658,270,514
		Distributable Profit 30% From Activity Cost	52,275,409,197	44,450,350,388	44,450,350,388	32,357,364,555	32,357,364,555	12,376,274,213

Source: Prepared by JICA Study Team based on GCPI Financial Statements

Table 3.5-8 Balance Sheet of GCPI

Ministry of Transportation
General Company For Ports In Iraq
Balance Sheet

Index No.	Accounting Manual No.	Account Name	Financial Statements in 2012		Financial Statements in 2011		Financial Statements in 2010	
			2012 Dinar	2011 Dinar	2011 Dinar	2010 Dinar	2010 Dinar	2009 Dinar
	1	**Assets**						
		Fixed Assets						
1	11	Fixed Assets (Book Value)	51,330,561,810	48,116,078,427	48,116,078,427	43,585,519,422	43,585,519,422	46,586,456,761
2	12	Project Under Construction	32,227,258,204	3,555,928,075	3,555,928,075	3,549,320,689	112,770,963,811	695,920,179
3	15	Long-Term Investment	14,000,000	14,000,000	14,000,000	14,000,000	14,000,000	14,000,000
			83,571,820,014	51,686,006,502	51,686,006,502	47,148,840,111	156,370,483,233	47,296,376,940
		Current Assets						
4	13	Inventory (AT Cost)	11,859,619,806	17,881,502,643	17,881,502,643	18,138,892,408	18,138,892,408	18,037,447,269
4	138	Letters Of Credit For Purchasing Materials	12,060,110	12,060,110	12,060,110	12,060,110	12,060,110	12,060,110
4	1421	Short- Term Loans	9,515,758,630	2,072,658,830	2,072,658,830	0		
5	16	Debtors	133,863,860,818	105,652,014,680	106,508,486,282	107,862,482,614	107,862,482,614	102,677,401,998
6	18	Cash	176,342,433,451	117,791,134,157	117,791,134,157	69,260,833,158	69,260,833,158	32,942,228,521
			331,593,732,815	243,409,370,420	244,265,842,022	195,274,268,290	195,274,268,290	153,669,137,898
		Total Assets	415,165,552,829	295,095,376,922	295,951,848,524	242,423,108,401	351,644,751,523	200,965,514,838
	2	**Liabilities**						
		Long - Term Liabilities						
	211	Paid- In Capital (Nominal Capital)	603,000,000	603,000,000	603,000,000	603,000,000	603,000,000	603,000,000
7	22	Reserves	90,720,970,473	68,112,479,665	74,806,469,973	47,771,399,602	52,149,589,200	44,391,748,895
			91,323,970,473	68,715,479,665	75,409,469,973	48,374,399,602		
	225	Accumulated Deficit: Balance At 31/12					(4,378,189,598)	(15,163,977,783)
		Current Liabilities						
8	26	Creditors	323,841,582,356	226,379,897,257	220,542,378,551	194,048,708,799	303,270,351,921	171,134,743,726
		Total Liabilities and Shareholders' Equity	415,165,552,829	295,095,376,922	295,951,848,524	242,423,108,401	351,644,751,523	200,965,514,838
		Investment Budget Accounts	797,290,806,143	183,269,508,630	219,185,696,631	170,638,166,201	170,638,166,201	148,105,788,244

Source: Prepared by JICA Study Team based on GCPI Financial Statements

Table 3.5-9 Statement of Cash Flow

Ministry of Transportation
General Company For Ports In Iraq
Statement Of Cash Flow For The Fiscal Year Ended Dec. 31, 2010

Index No.	Accounting Manual No.	Details	Sub- Total 2010	Grand Total 2010
		Cash Flow From Operations		
		Cash Received From:		
	41- 44	Revenue OF Current Activity	186,104,335,364	
	48	Manufacturing Revenues exept Acc No. 482	275,306,014	
	49	Other Revenues Exept Acc No. 493	1,002,615,282	
1	26	Creditors Revenues Account Exept Acc No. 265 And Operation Surplus	3,305,421,859	
2	22	Increase (Decrease) In Reserves	(68,534,001)	
				190,619,144,518
		Deduct Cash Payment:		
	31-35	Uses	136,217,735,013	
	38	Manufacturing Expenses	316,362,000	
	39	Other Expenses	2,220,343,639	
3	13	Increase In Inventory	101,445,139	
4	16	Debtors Of Current Activity Except Acc No. 165	5,562,326,322	
				144,418,212,113
		Cash Flow From Extaordinary Item :		
		Cash Received From:		
5	165	Debtors Of Non- Current Activity	377,245,706	
6	265	Creditors Of Non- Current Activity	8,124,957	
				385,370,663
		Cash Flow From Investing Activity		
		Cash Paid To :		
		Purchase Of Fixed Assets	(2,409,917,725)	
7		Projects Under Construction	(2,853,400,810)	
				(5,263,318,535)
		Cash Flow From Financing Activity		
		Cash Paid To:		
		Contribution In Financing Units	300,000,000	
		Dividends	5,004,380,197	
				(5,304,380,197)
		Net Cash Flow From Three Activities		**36,018,604,336**
		Cash Balance Jan. 1,2010 (At The Beginning Of Period)		**32,942,228,521**
		Cash Balance Dec. 31,2010 (At End Of Period)		**69,260,833,158**

Source: Prepared by JICA Study Team based on GCPI Financial Statements

3.6 Port Policy, Laws and Regulations of Iraq

3.6.1 Port Policy of Iraq

Most recent policy for port development and management is mentioned in National Development Plan (NDP) 2013-2017, issued by Ministry of Planning in January 2013. Summary of the policy is understood as follows:

(1) Status quo of Iraq ports and necessary improvements

- Basrah Province is the only province that faces the sea and has international ports for import and export. Presently four ports in Basrah have a total of 46 berths and estimated capacity of the four ports is 16,650,000 tons. As the total cargo throughput of the four ports has already reached 14,810,000 tons in 2012, it is an urgent task to expand the capacity of ports.
- Operation profit of GCPI is reported to be 69 billion dinar in 2011, which may be too small in terms of total income of GCPI, so it is necessary to improve profit margin of GCPI operations[1].

[1] While NDP refers to improve profit margin, which is 30% in 2011, 40% in 2012, it is at a satisfactory level in comparison with other ports. However, expense for wages and salaries, which is 44% of the revenue in 2012, seems to be very high level and to be reduced.

- GCPI has a staff of about 10,000 people, however one third of staff is considered to be redundant.
- Iraqi ports are under severe competition with neighboring ports[2]. It is important to improve port facilities, cargo handling productivity and capacity, so that Iraqi ports can attract ships to call. Port sales and incentives to shipping companies shall be taken into consideration.
- Depth of approach channels is limited from 7.5 m to 12 m and the maximum size of a calling vessel is very much limited.
- Port management system in Iraq is far behind in modern information technology. It is urgent to modernize port operations and computerize port documentation.
- Many wrecks still remain in navigation channel and are a big nuisance to ships' smooth entry and departure.
- Problems of Iraqi ports are insufficient navigation aids, lack of modern cranes and cargo handling equipment, old fashioned port facilities and deterioration.
- Less port investment by the government (Port investment of US$ 460 million is planned during a period from 2007 to 2011, however only 40% is disbursed).
- Private sectors are reluctant to invest in Iraqi ports.
- Educational level of port staff is insufficient, well qualified or trained personnel are very limited, and there are not enough engineers with technical skills. There are a lot of redundant personnel, and consequently port performance of cargo handling remains at a low level.

(2) Potential of Iraqi Ports

- National Development Plan 2013-2017 estimates that cargo throughput of Iraqi ports will increase from 15 million tons in 2012 to 53 million tons in 2018.
- In order to enable land bridge transportation between the Mediterranean Sea and the Arabian Gulf, Al Faw Grand Port is planned to accommodate 12,000 GRT vessels. Rail connection between the two ports is also indispensable for successful land bridge connection.
- While Iraqi ports are presently feeder ports, it is expected that some services are extended to Iraqi ports via a hub port in the Arabian Gulf. It will make shipping services to Iraq more competitive and efficient.

(3) Port and Channel Development Plan

- Total capacity of Iraqi ports is estimated at about 16.65 million tons with a total of 46 berths in four ports, i.e. 22 berths in Umm Qasr Port, 12 berths in Khor Al Zubayr Port, 3 berths in Abu Flus Port, 9 berths in Al Maqil Port. It is planned to develop an additional 19 berths in UQP, 13 berths in KZP, null in Abu Flus Port, and 5 berths in Al Maqil Port by the year 2017. Total capacity of cargo throughput will be increased to 29 million tons with a total of 83 berths.
- To deepen approach channels, maintain the design depth of channels, install navigation aids and vessel traffic control system.
- To facilitate removal of wrecks, removal target is 3 wrecks each from 2013-2015, 4 wrecks each from 2016-2017.

[2] Land transportation routes from Jordan, Syria and Turkey are temporary closed, but have a potential to be competitors after ceasefire in the region.

- To procure dredgers, tug boats, signal ships, mooring boats, passenger boats, and other work vessels.
- To introduce electronic documentation and port management system.
- To provide marine services for oil platform, Liquefied Petroleum Gas (LPG) terminal in Khor Al Zubayr.
- To modernize and install enough cargo handling equipment.
- To develop Al Faw Grand Port, NDP set a target for development of 10-11 container berths, 6-7 general cargo berths, and cargo handling of 10 million tons in 2018. Final target of the development is 22 container berths, 22 general cargo berths and cargo handling of 40 million tons in 2038.
- To encourage private participation in the development of Al Faw Grand Port, Umm Qasr Port, and Khor Al Zubayr Port, by means of Build Operate Transfer (BOT), operation concession, or other forms of private investment. Development target of UQP is 13 multi-purpose terminals with a capacity of 3.75 million tons and 4 container terminals with a capacity of 2 million TEUs. Target of KZP is 13 multi-purpose terminals with a capacity of 4.25 million tons. It is planned to use the Al-Muamer Terminal at Al Faw with a capacity of 100,000 tons, to develop Al Maqil Port and Abu Flus Port with participation of private sectors.
- To improve the training program of GCPI training center and enhance skills and knowledge of port employees.
- To reduce port tariff in order to make Iraqi ports more competitive.

3.6.2 Laws and Regulations on Iraqi Ports

Iraqi ports are developed, managed and operated by GCPI under Law of Ports and Harbors (No.21, 1995). Law of Ports and Harbors is a basic law consisting of 12 articles promulgated in 1995, and specific provisions are stipulated in Regulations of Ports and Harbors announced by Director General of GCPI. GCPI manages and operates five ports in accordance with these regulations.

Regulations on Ports and Harbors consist of 358 articles, which are mainly concerned with ship entry and departure, navigation of ships, vessel traffic, safety of ships, pilotage, signals, accidents, salvage, search and rescue, cargo handling, dangerous cargoes, and other matters related to port operations.

There is no provision related to the development of port, management and maintenance of port facilities, private participation in port activities and port development, concession of port development and operation, and other matters related to port administration. It is therefore necessary to revise/establish laws and regulations on such activities.

Table 3.6-1 Contents of Law of Ports and Harbors

Law of Ports and Harbors		
Article	1	Definitions/Terminology
	2	Application of the law (Civil ports and harbors)
	3	Land and water boundaries of every port and harbor (Decision by the Minister)
	4	Roles and responsibilities of the Company
	5	Director General of the Company
	6	Port Manager
	7	Relation to the Law of Transport, No.80, 1983
	8	Fine on violators
	9	Wages, revenues and charges of the Company

10 Power to issue regulations for implementing the law (by the Minister)
11 Statement of Al-Basrah Port, 1919, void
12 Effective date: 180 days after official announcement

Law of Ports and Harbors (No.21, 1995)
Signed on 6 November 1995 as Law No.21

Table 3.6-2 Regulations on Ports and Harbors

Chapter 1		Maritime Terminology
Section	1	Definitions
Chapter 2		Procedures of Arrival and Departure
Section	1	Pre arrival procedures
	2	Arrival procedures
	3	Clearance
	4	Departure procedures
	5	Communications
Chapter 3		Vessel Traffic Control
Section	1	Vessels with defects in machinery, equipment or construction (structure)
	2	Closure of the maritime channel
	3	The draft (Maximum limit of the draft of ships)
	4	Ships constrained by their draft
	5	Speed limits
	6	Widthwise and lengthwise inclination of ships
	7	Individuals at the control room of ship
Chapter 4		Ship/vessel movement inside the channel
Section	1	Ships/vessels on a one-way channel
	2	Zones where towing or tugging is prohibited
	3	Pull-in power and gravity to ships
	4	Ships with constraints
	5	Ships without constraints
	6	Crossing paths of two vessels
	7	Giving way to other vessels
	8	Crossing paths (Priority of ships navigating in channel)
	9	Berthing and mooring
Chapter 5		Pilotage
Section	1	Compulsory pilotage
	2	Liability of harbor pilot and docking pilot
	3	Information required by the docking pilot
	4	Docking pilot remains on board
	5	Docking pilot ladder
	6	Docking pilot mechanical crane
	7	Duty of agent toward the docking pilot
	8	License and certificate of docking pilot
Chapter 6		Safety at the Ports and Harbors
Section	1	Duties and responsibilities of the ship master while ship is moored at harbor
	2	Safety measures inside the harbor
	3	Vessel crew
	4	Departure preparations and ground work
	5	Towing and tugging
	6	Duties and responsibilities of liquid gas carrier
Chapter 7		Accidents
Section	1	Collision
	2	Grounded Ships
	3	Fire and precautions against fire
	4	Disease and epidemics
Chapter 8		Signals
Section	1	The flag of Iraq
	2	Signal for requesting a health clearance
	3	Signal for requesting a docking pilot
	4	Light and sign at the port
	5	Slow speed
	6	Liquid gas carriers
	7	Distress signals
	8	Maritime Buoys

Chapter 9	Maritime environment and pollution control
Chapter 10	Vessel inspection
Section 1	Inspection of ships
2	Ship registration certificate
Chapter 11	Rescue, salvage, and wreck removal
Section 1	Vessels at risk
2	Maritime salvage
3	Sunken ships or half-sunken ships
4	Searching for Flotsam
5	Reward
Chapter 12	Requirements and conditions for practicing a maritime profession or at the ports
Part II	Loading and unloading
Chapter 1	Allowing vessels and ships to dock at wharves
Chapter 2	Ships or vessels docked at the wharf
Chapter 3	Cargo handling and warehousing
Chapter 4	Loading and unloading explosives and hazardous substances
Chapter 5	Warehousing cargo and transit zone
Part III	
Chapter 1	Penalties
Chapter 2	General and final provision

Source: Regulations of Ports and Harbors, GCPI, 1998

3.6.3 International Maritime Conventions ratified by Iraq

Important maritime conventions related to port management and operations are the International Convention for the Safety of Life at Sea (SOLAS, 1974) and The International Ship and Port Facility Security (ISPS) Code under SOLAS Convention. Other important conventions are the Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972, International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997(MARPOL), and Convention on Facilitation of International Maritime Traffic (FAL), 1965, and others related to Hazardous and Noxious Substances.

Not so many conventions adopted by International Maritime Organization (IMO) are ratified by Iraq. Last ratification by Iraq was on International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978. Together with economic recovery, it is recommended to ratify COLREG and MARPOL conventions in terms of safe, secure and environmentally sound port operations. List of maritime conventions and status of Iraq is summarized in Table 3.6-3.

Table 3.6-3 Maritime Conventions and Status of Iraq

Conventions	Status	Full Name
SOLAS Convention 74	x	International Convention for the Safety of Life at Sea (SOLAS), 1974
SOLAS Protocol 78	-	
SOLAS Protocol 88	-	
LOAD LINES Convention 66	-	International Convention on Load Lines (LL), 1966
LOAD LINES Protocol 88	-	
TONNAGE Convention 69	x	International Convention on Tonnage Measurement of Ships (TONNAGE), 1969
COLREG Convention 72	-	Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972
CSC Convention 72	-	International Convention for Safe Containers (CSC), 1972
CSC amendments 93	-	

SFV Protocol 93	-	The Torremolinos International Convention for the Safety of Fishing Vessels (SFV), 1977
STCW Convention 78	x	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) , 1978
STCW-F Convention 95	-	International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995
SAR Convention 79	-	International Convention on Maritime Search and Rescue (SAR), 1979
STP Agreement 71	-	Special Passenger Trade Ships Agreement, 1971
STP Protocol 73	-	
IMSO Convention 76	x	Convention on the International Maritime Satellite Organization (IMSO C), 1976
IMSO amendments 2006	-	
IMSO amendments 2008	-	
INMARSAT OA 76	x	Operating Agreement on the International Maritime Satellite Organization,1976
INMARSAT amendments 94	-	
INMARSAT amendments 98	-	
FACILITATION Convention 65	x	Convention on Facilitation of International Maritime Traffic (FAL), 1965
MARPOL 73/78 (Annex I/II)	-	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997(MARPOL)
MARPOL 73/78 (Annex III)	-	
MARPOL 73/78 (Annex IV)	-	
MARPOL 73/78 (Annex V)	-	
MARPOL Protocol 97 (Annex VI)	-	
London Convention 72	-	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LC), 1972
London Convention Protocol 96	-	
INTERVENTION Convention 69	-	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (INTERVENTION), 1969
INTERVENTION Protocol 73	-	
CLC Convention 69	-	International Convention on Civil Liability for Oil Pollution Damage (CLC), 1969
CLC Protocol 76	-	
CLC Protocol 92	-	
FUND Convention 71	-	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971
FUND Protocol 76	-	
FUND Protocol 92	-	
FUND Protocol 2003	-	
NUCLEAR Convention 71	-	Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material (NUCLEAR), 1971
PAL Convention 74	-	Athens Convention relating to the Carriage of Passengers and their Luggage by Sea (PAL), 1974
PAL Protocol 76	-	
PAL Protocol 90	-	
PAL Protocol 02	-	
LLMC Convention 76	-	Convention on Limitation of Liability for Maritime Claims (LLMC), 1976
LLMC Protocol 96	-	
SUA Convention 88	-	Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA), 1988
SUA Protocol 88	-	
SUA Convention 2005	-	Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA), 1988
SUA Protocol 2005	-	
SALVAGE Convention 89	-	International Convention on Salvage (SALVAGE), 1989

OPRC Convention 90	-	International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990
HNS Convention 96	-	International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS)
HNS Protocol 2010	-	
OPRC/HNS 2000	-	Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol)
BUNKERS CONVENTION 01	-	International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
ANTI FOULING 01	-	International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001
BALLASTWATER 2004	-	International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004
NAIROBI WRC 2007	-	Nairobi International Convention on the Removal of Wrecks, 2007
HONG KONG CONVENTION	-	The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009

(x: ratified by Iraq)
Source: IMO Database Site

3.7 Conditions of Port and Harbor Operation

3.7.1 Umm Qasr Port South

Umm Qasr Port South is composed of 11 berths with No.1 through No. 9 berths facing the Umm Qasr Channel and the rest facing the Umm Qasr-Trench in greater UQP. Iraqi Navy occupies No.1 berth, and a generator-ship is alongside No.9 berth on a permanent basis for providing electricity to the area near the port. Other berths in the port are under commercial usage at present as described below.

(1) No.2 and No.3 Berths (Berth length: 250 meters each)

These berths are managed and operated by GCPI handling food products such as sugar, grain, food-oils and so on. There is a grain evacuator on the berths; however, there is no silo near the berths.

*GCPI has an idea to modify these berths, including the area behind the berths, to container terminals (CT) in the near future; however, it is not going to be mentioned about the plan and or its possibilities in this Study Report.

(2) No.4 Berth (Berth length: 250 meters)

The berth including a container yard of 70,000 m2 behind the berth is managed and operated by GCPI and CMA-CGM, a French shipping company, as a dedicated CT of CMA-CGM. GCPI provides the berth and CY; the actual operation of the CT is done by CMA-CGM alone. The JO contract of GCPI with CMA-CGM expired at the end of 2013. Accordingly, GCPI needs to make a new contract with a terminal operating company (TOC). This will be done by an open bidding system soon. (GCPI is now in the process of doing this.)

CMA-CGM allocates a ship between Khor Fakkan port in UAE and UQP South on a weekly basis, handling around 1,000 boxes per call at present (as of September 2013). TEU/box ratio at the port is about 1.55; thus, CMA-CGM can be said to be handling around 80,600 TEU per annum at the CT. (1,000 boxes x 52 weeks x1.55 = 80,600)

(3) No.5 Berth (Berth length: 250 meters)

The berth including a container yard of 100,000 m2 behind the berth, and is managed and operated by a JO company between GCPI and Gazal, a TOC serving three (3) shipping lines as Yangming, Simathec and Evergreen. GCPI provides the berth, including two (2) units of quay-side gantry cranes (QGC) on the berth, and CY; though, the actual operation at CT is done by Gazal alone. The JO contract with Gazal expired at the end of 2013 as is the same as Berth No.4. Accordingly, GCPI needs to make a new contract with a TOC. (GCPI is currently in the process of doing this.)

Gazal handles 2.23 ships a week (Evergreen's ship calls the berth for discharging a part of the containers, and moves to ICT, No.11a-b berth; for handling the rest of the containers which is calculated as 0.23 ship calls per week), while average handling volume is around 860 boxes per call at present. Accordingly, Gazal can be said to be handling around 154,600 TEU per year at the CT as the TEU/box ratio at the port is about 1.55 (860 boxes x 2.23 x 52 weeks x 1.55 = 154,575).

(4) No.6 and No.7 Berths (Berth length: 250 meters each)

These berths are managed and operated by GCPI, the same as berth No.2 and No.3, handling general cargoes (GC), such as cement, pipes, machineries, and so on.

* The space behind No.6 berth, however, is operated by a JO company between GCPI and Sabaa as a storage yard for storing various cargoes handled at the port independently without activities related to the berth.

(5) No.8 Berth (Berth length: 250 meters)

The berth including CY of 75,000 m2 behind the berth, which is divided into 3 areas in total, is jointly managed and operated by GCPI and Gulftainer, a TOC serving for Mediterranean Shipping Company (MSC) at the CT. GCPI offers the berth and CY though the actual operation at the CT is performed by Gulftainer. The JO contract with Gulftainer will expire at the end of year 2015.

Gulftainer handles one (1) ship a week, and its handling volume is around 1,000 boxes per call at present. Accordingly, Gulftainer can be said to be handling around 80,600 TEU per annum at the CT as the TEU/box ratio at the port is about 1.55. (1,000 boxes x 52 weeks x 1.55 = 80,600)

(6) No.10 Berth (Dolphin-Pier Structure: Pier length: 385meters)

This berth, actually a Dolphin Pier, including some silos behind the berth, is operated by the Ministry of Trade (MOT) in Iraq, handling grains, mainly wheat at present.

(7) No.11 Berth (Berth length: 190 meters)

This berth is a dedicated terminal for handling sugar, operated by the Ministry of Industry (MOI).

3.7.2 Umm Qasr Port North

(1) No.11-a, and No.11-b Berths (Berth length: 375 meters in total)

The berths, including a CY of 250,000 m2 (including an area of 100,000 m2 which will be developed soon) behind the berths, is jointly managed and operated by GCPI and Gulftainer, the same as No.8 berth/CT in UQP North, serving for four (4) shipping lines as UASC, Maersk, APL and Evergreen at present. GCPI provides the berth and CYs although the actual operation at the CT is done by Gulftainer. GCPI made a contract with Gulftainer in August 2012 which allows Gulftainer to use the terminal for 10 years until July 2022, with an option for 10 more years.

Gulftainer handles 3.77 ships a week (count Evergreen's ship as 0.77 calls per week, due to double calling at No.5 berth), and its average handling volume is around 800 boxes per ship call

at present. Accordingly, Gulftainer can be said to be handling around 243,100 TEU per year at the CT as the TEU/box ratio at the port is about 1.55. (800 boxes x 3.77 ships x 52 weeks x 1.55 = 243,090)

(2) No.12, 13 and 16~19 Berths (Berth length: 200 meters each)

These six (6) berths are managed and operated by GCPI through 14 local stevedoring companies under GCPI, handling imported GC cargoes such as sugar, wheat, rice, pipes and so on as the main GC berths of the Port. Ship operations of the major cargoes, such as sugar, wheat and rice, at the berths are done by "direct discharging" system, i.e. cargoes are unloaded from ships to trucks dispatched by consignees directly using ship-gears or un-loaders; hence, the berths are basically congested due to the large number of trucks. Although, these cargoes should be better to be stored once into sheds behind the berths before delivering to consignees.

(3) No. 14 and 15 Berths (Berth length: 200 meters each)

These berths are jointly operated and managed by GCPI and Aloreen. Operational methods at the berths are the same as other GC berths in UQP North, i.e. direct discharging system for the major cargoes, while the rest of cargoes are handled by in-direct system.

Besides the GC operation at berth No. 14 and 15, Aloreen is constructing a container yard (CY) of 40 ha behind the berths 12, 13, 14, and 15 outside the fence of the UQP North and the road leading to UQP South. Another CY of 5.5 ha is also being constructed by Aloreen beside of Gulftainer's Umm Qasr Logistics Center, in the North West of UQP North, outside the fence of the North Port.

Part of the contract between GCPI and Aloreen is to remove the existing Jetty No.22 and construct three (3) berths in the Northern part of River No. 1 (UQ Trench; Starting from Berth No. 21). Two of them are for handling container and or GC cargoes with 200 meter-long berths each, and the third one is for Ro-Ro ships with a 150 meters berth.

(4) No.20 Berth (Berth length: 200m, No. 21 is used for Ro-Ro ships)

The berth, including a CY of 116,000 m2 behind the berths, are managed and operated by GCPI itself. However, due to the many rail-tracks in the CY, the Max storage capacity is only 4,500 TEU per time with stacked containers 3 high, which is too small to handle containers even at present. Beside of the above mentioned CY, GCPI has an Off-dock CY, named Anham, which has a maximum capacity of around 3,500 TEU per time by stacking containers 2 high over an area of 90,000 m^2.

Anham CY is not paved yet. According by the capacity is much less than that of an ordinary paved CY.

(5) No.22, 23 and 24 Berths

These berths are going to be rehabilitated by Aloreen to three (3) berths. Two of them will be modified for handling GC cargoes with a 200 meter-long berth each, and the third one is for Ro-Ro ships with a 150 meter-long berth.

3.7.3 Khor Al Zubayr Port

Khor Al Zubayr Port (KZP) is the second largest port in Iraq, located about 20 km north of UQP. There are 13 berths and piers in the port; however, only nine (9) of them are commercially used at present, i.e., No.2 through No.4 and No.5 through No.10 berths.

Table 3.7-1 Berth Details of Umm Qasr Port

UQP	Berth No.	Operator	Berth length (m)	Equipment		Current Commodities handled	Contract	Performance	GCPI Future Plan
				on Rail	Movable				
South	1	Navy	260	-	-	-	-	-	-
	2	GCPI	250	3 QC	7 unlorder(Sugar) 2 unloader (Cement)	Sugar, Grain, Edible oil, Food stuff	-	-	Container
	3		250						
	4	CMA-CGM	250	-	-	Container	GCPI JO till Dec. 2013	88,000 TEU/yr	
	5	Cazal	250	2 QGC	-	Container	GCPI JO till Dec. 2013	57,000 TEU/yr	
	6	GCPI	250	-	1 Unloader (Cement)	Cement, Pipe, Machine, GC	-	-	
	7		250						
	8	Gulftainer	250	-	2 Mobile Crane	Container	GCPI JO till Dec. 2013		
	9	GCPI	170	-	-	Power plant barge	-	-	-
	10	MOTr	285	2 Unloaders and Belt conveyer to Silo		Wheat	-	2.7 Mil.ton/yr	-
	11	MOI	190	-	-	Sugar	-	-	-
	11-a/b ICT	Gulftainer	375	2 QGC	-	Container	From Oct. 2013, 5+5 years	353,000 TEU/yr	Container
North	12	GCPI	200	2 QC	-	Wheat, Rice, Cement, Sugar Pipe, other GC	-	-	Back yard be converted to CY of 40 ha by Aloreen Co.
	13		200	1 QC	-		-	-	
	14	GCPI	200	5 QC	-		Yard is operated by Aloreen	-	
	15		200	1 QC	-				
	16	GCPI	200	5 QC	1 Mobile Crane		-	-	-
	17		200	4 QC			-	-	-
	18		200	12 QC			-	-	-
	19		200	5 QC	-		-	-	-
	20	ICTSI/ GCPI	350	2 QGC	1 Mobile Crane	Container	From 2014	-	-
	21								
	22	Aloreen/ GCPI	150			Ro/Ro, Car, GC, Container	From Oct. 2013, 5+5 years	-	-
	23		200						
	24		200						

Source: Prepared by JICA Study Team Based on GCPI Interview

(1) No.2 through No.4 Berths (Berth length: 540 meters in total)

These three (3) berths are managed and operated by GCPI through local stevedoring companies under KZP-GCPI, handling cement mainly. Ship operations (basically discharging only) at the berths are done by "direct discharging" system, the same as at UQP.

GCPI, however, made a contract with Martrade Logistic (Mar-Log) giving them a right of prior-use of the berths and a storage yard behind the berths in April of 2013 due to expansion of their business at the port. Mar-Log plans to install a heavy mobile crane (MC) on the berths for handling containers, contained parts and furnishings of Oil-Rigs, and pipes. However, the cement handling operation at the berths should not be affected for a while because total berth length is 540 meters.

Mar-Log will start using the berths for 8 years after rehabilitation works of the berths are completed (estimated to take 4 years). Hence, most probably, Mar-Log has a right to use the berths until the end of March 2025.

(2) No.5 through No.6 Berths (Berth length: 740 meters in total)

These berths were built for exporting bulk fertilizers but this function was shut down a long time ago. At present, a series of belt conveyers remain on the berths. Accordingly, GCPI uses the berths for Dhow ships mainly, handling sugar, beans, GCs and dates (for export), because it is impossible to use heavy MCs at the berths. GCPI also utilizes the berths for tanker ships for importing and or exporting oil products by portable pumps.

(3) No.7 Berth (Berth length: 250 meters)

GCPI has allowed Mar-Log to use No.7 berth and a storage space (50,000 m2) behind it by a concession contract since early 2012 while No.8 remains as a common berth for handling GCs. Mar-Log handles pipes, modules and furnishings related to Oil-Rigs at No.7 berth; utilization rates of the berth reached 50% by the middle of 2013. Hence, as stated already, Mar-Log made a contract with GCPI to use berth No. 2 through No.4 preferentially as it prepares to expand its business in the near future.

(4) No. 8, No. 9 and No. 10 Berths (Berth length: 800 meters in total)

No. 8 berth is a GC berth with two (2) warehouses behind the berth. No. 10 and 11 berths were built for importing iron ore; however, operations stopped a long time ago. Therefore, there are two (2) units of QGC and belt-conveyers for handling the ore. Ministry of Oil (MOO) operates and manages the berths for importing oil products at present, such as gasoil, benzene, kerosene and so on which are sent to Sheva by pipe lines and stored in the tanks there.

Ministry of Industry (MOI), primary owner of the berths, plans to re-use the berths for importing iron ore and or exporting iron products soon after negotiating with a Turkish investor.

GCPI/MOO will develop three (3) berths for handling oil products between UQP and KZP to compensate for No. 9 and No. 10 Berths.

A new electrical iron mill is also planning to be built near the existing one by a JV between Iraq and foreign investors.

(5) No. 12 Berth

No. 12 berth will soon handle oil products after it is repaired as a joint operation facility between GCPI and private investors in Iraq.

Table 3.7-2 Berth Details of Khor Al Zubayr Port

Berth No.	Operator	Berth length (m)	Equipment		Current Commodities handled	Contract	GCPI Future Plan
			on Rail	Movable			
1	GCPI	-	-	-	-	-	-
2	Mar-Log	540	-	-	Cement	Prioroty usage is given to Mar-Log under a contract	Mar-Log plans to handle containers
3			8 QC	-			
4							
	No berth	-	-	-	Mooring Working vessels, FC	-	-
5	GCPI	740	Loader (Fertilizer) Belt conveyer		-	-	-
6	GCPI						
7	Mar-Log	250	-	-	-	-	-
8	MOO	800	8 QC	-	Oil Products	-	Exchange with Berths No.2-4
9							
10			Loader (Iron powder) Belt conveyer				
11	NAVY	90	-	-	Power Plant Ship	-	-
12	Mar-Log	To be developed		-	-	-	-

Source: Prepared by JICA Study Team Based on GCPI Interview

3.7.4 Al Maqil Port

Al Maqil Port was the first international port in Iraq built in 1919, located 135 km above the river-mouth of Shatt Al Arab River. The port has 15 berths in total on the right bank of the river with narrow aprons; thus, it is difficult to handle cargoes effectively. However, the area behind berths No. 13 and 14 is around 200 m wide which is more than sufficient to handle containers. In fact, GCPI in Al Maqil Port made a 10 year contract with NAWAH, a TOC in USA, to use berth No.14 with the space behind for storing containers. NAWAH started their operation at the port after construction of the CY. NAWAH plans to extend their facilities to berth No.13 as well as No.12 in the future as their business expands.

However, Al Maqil Port has an indisputable Achilles heels at present. First, there are very shallow places in the river mouth of Shatt Al Arab River which extend for a few miles with the shallowest place being minus 2 meters. Therefore, only lighter ships with 5 meters draft as maximum in high-tide periods can maneuver to the port. Second, there are two (2) small bridges just six and half (6.5) km downstream of the port which prevent ships from entering the port smoothly; the bridges are opened for the ships for only a few hours on Sundays, Wednesdays and Fridays from 01:00.

- GCPI in Al-Maqil Port plans to utilize facilities in the port in the future as;

  - GC berths: No.2, No. 6~9 and No. 12 berths (total 6 berths)
  - Container berths: No.10~11, No.13~15 berths (total 5 berths)
  - As ship yards: No.3~5 berths (total 3 berths)

  * GCPI does not use No.1 berth at present, nor does it plan to in future.
- Iraq Government has no plan to dredge the river mouth at present due to residual unexploded bombs and sea-mines from the Iraq-Iran War.

Table 3.7-3 Berth Details of Al Maqil Port

Berth No.	Operator	Berth Length (m)	Equipment		Current Commodities	Contract	GCPI Future Usage Plan
			on Rail	Moveable			
		510		not in use (Sunken Vessel)			
1	GCPI	350	11 QC	1 MC	GC		
2					GC		
3		460	no wharves (revetment only)				
4							
5							
6		610	19 QC		GC		
7					GC		
8					GC		
9					Moored Training Ship		
10		550			GC		
11					GC		
12					GC		Container Berth
13	NAWAH	350			Container	10 years from Dec. 2012	Future plan for No. 13 berth
14							
15	GCPI	180			not in use		

Source: Prepared by JICA Study Team Based on GCPI Interview

3.7.5 Abu Flus Port

Abu Flus Port is located about 110 km upstream from the river mouth of Shatt Al Arab River (or around 25 km downstream of Al Maqil Port), on the right-side bank of the river. The port has three (3) 175 meter long berths with 18 meter wide aprons constructed by iron structured plates. The plates are not strong enough to tolerate heavy container handling equipment (CHE).

Accordingly, stevedore labors of the port use two (2) units of lighter MC together as a pair when discharging and or loading a container for spreading the weight of the MC and the container at berth No. 3.

As a result, together with the damage inflicted by the US Army during the Iraqi War, almost all of the plates on the berth are seriously damaged at present. Accordingly, GCPI in Abu-Flus Port is going to replace the plates with precast concrete plates within 18 months from now on (Oct. 2013); however, the strength of the apron will still not be sufficient to support heavy CHE.

No.1 and No.2 berths of the port are used for handling GC and cement cargoes by direct discharging system: the cargoes are discharged from ships-sides on to trucks prepared by consignees the same as other ports in Iraq. The apron of the berths is made of iron structured plates also; however, they are all in good condition having been recently renewed.

Table 3.7-4 Berth Details of Abu Flus Port

Berth No.	Operator	Berth length (m)	Equipment		Current Commodities	GCPI Future Usage plan
			on Rail	Movable		
1	GCPI	170	2 QC		General Cargo	
2		170	3 QC		General Cargo	
3		170			Container	

Source: Prepared by JICA Study Team Based on GCPI Interview

3.8 Efficiency of Terminal Operations at Iraqi Ports

Commodities and calling ships have distinguishing features at UQP, KZP, Al Maqil Port, and Abu Flus Port. The cargo volumes by commodity handled, and number of ships that brought respective commodities to the respective ports in 2012 are reviewed hereunder.

3.8.1 Container Terminal Operations

(1) UQP South Port

1) No. 4 Berth: Joint Operation between GCPI and CMA-CGM (Berth length: 250 meters)

As described already, CMA-CGM handles around 80,600 TEU of containers per annum at the berth. CMA-CGM has neither QGC nor MC on the berth; hence they use ships cranes (SC) for the stevedoring operations. The ship calling at CT at present has 3 units of SC; thus, CMA-CGM can handle satisfactory numbers of containers per unit time.

CMA-CGM operates 24 hours a day with 3 shift system (08:00~16:00, 16:00~24:00 and 00:00~08:00, having a one (1) hour meal breaks in each shift) and 365 days a year. However, they handle only one ship per week; thus, they work only around 1.5 days per week in reality. On the other hand, they operate CY-Gate for only 7.5 hours a day, from 08:30~16:00 on a 365 days a year basis.

They have seven (7) units of Reach Stackers (RS) for handling laden containers, two (2) units of Empty Handlers, two (2) units of Fork Lifts and seven (7) units of Tractor/Chassis. They also have a computerized TOS made by CMA-CGM for operating and managing their entire CT activities.

Ships operational productivity of CMA-CGM CT is 14 lifts/SC/hour in net, including opening and or closing ships hatch-covers, according to CMA-CGM; thus, it can be said that CMA-CGM' stevedoring operation is very productive for SC operations. However, actual productivity is around 11 lifts/SC/hours on average throughout the entire operation as the smaller ships calling the CT at present (CMA-CGM Impala; LOA 184.7m, DWT 22,900 tons) do not allow containers to be spread evenly for three (3) cranes throughout the hatches.

- Crane productivity and berth productivity of a CT is different, especially for smaller ships.

- Terminal operators care more about crane productivity; however, shipping lines care about berth productivity more, because stevedoring hours (for deciding ships sailing time) depended on the berth productivity.
- Container handling volumes per crane vary by ship's size. In the case of a medium sized ship as CMA-CGM's, its largest crane handles 100, then the next one handles 80~90, and the smallest one around 60~70 in ratio, due to a limitation of the hatch numbers and or its capacities.
- Accordingly, 11.0 lifts/SC/hours on average throughout the entire operation should be used for calculating ships sailing time, instead of 14.0, in general.

ISSUES:

a) Lower Container Handling Volume due to Low Berth Utilization Rate

The problem of CMA-CGM's CT at Berth No.4 is that the berth is used exclusively by CMA-CGM but only one ship per week calls; hence, the berth utilization rate becomes very low. In fact, their berth utilization rate at present is only 25.8%. (See Table 3.8-1)

(1,000 boxes/((24-3 hours)x0.8 work-efficiency factor x 11.0 lifts/SC/hour x3 SC))/7 days = 0.258

Assuming that a Net berth utilization rate of 55 % is the maximum for liner container ships, CMA-CGM's berth utilization rate is only 46.9% at present. If CMA-CGM handles their ships up to maximum (55% of Net berth utilization rate) by their present working conditions, they can handle 172,000 TEU per year at least. (See Table 3.8-1)

Moreover, if a new TOC (terminal operating company) uses two (2) units of MC for the stevedoring operation at No.4 CT with a 17 lifts/MC/hour of productivity (this is the standard productivity at the port at present); he can handle 177,200 TEU per annum. (See Table 3.8-1)

Accordingly, there is 96,600 TEU per annum of margin at No.4 CT comparing with the current handling volume of 80,600. Hence, GCPI has to carefully examine a new prospective TOC to determine whether he can generate a sufficient volume of containers to the CT or not. If GCPI makes the contract with CMA-CGM again (or any other shipping line), GCPI has to make sure that ships other than CMA-CGM's will call in order to use the CT to full capacity.

b) CY Space Shortage due to Lengthy Dwelling time of Import Laden Containers at the CY

One of the serious problems of CTs in Iraqi ports is that the dwelling-time of import laden containers is more than 20 days on average. There are various reasons for the long dwelling time but the Iraqi Customs clearance system and the tardiness of receiving containers related to Iraqi Government are most responsible. As a result, every TOC in UQP is forced to prepare extra CY spaces inside and or outside of the port to keep storing these long dwelling containers in the CYs which is a big burden for the TOCs.

- Share of the containers related to Iraqi Government at UQP is around 20%~30% at present
- Dwelling time for Governmental containers are 7~60 days; while 10~30 days for commercial ones.
- Contents of Governmental containers are various grains, sugar, various equipment/goods related to oil/oil-rig, some electric goods and so on.

In the case of CMA-CGM at No.4 CT, they can stack 5,000 TEU of containers at a time as Dead Max CY Capacity in their CY of 70,000 m2 by stacking containers in 3 high. Thus, the workable Max Capacity of the CY becomes 3,750 TEU/time (75% of DM Capacity), and then sustainable Max CY Capacity becomes 2,885 TEU/time (1/1.3 of Workable Capacity).

- Dead Max CY Capacity: Max stacking capacity but no room left for additional containers.
- Workable Max CY Capacity: 25% of Dead Max Capacity is withheld as CY free room allowance to keep CY operations running smoothly on a daily basis.

- Sustainable Max CY Capacity: Workable Max Capacity is divided by 1.3 as CY free-room allowance to keep CY operations running smoothly on a weekly basis.
  (1.3 is the standard CY peak factor number for usual CTs but Iraq's should be higher since fewer ships call per week. It can be calculated by "Peak-day volume/average volume in a week")

Based on this sustainable Max CY capacity number (2,885 TEU/time), capacity of CMA-CGM's CY becomes only around 70,200 TEU/year, assuming 15 days as the average container (import as well as export) dwelling time at the CY. Accordingly, CMA-CGM can be said to be facing a shortage of CY space even at present because they are forecast to handle 80,600TEU of containers in 2013. (2,885 x 365 / 15 = 70,192)

- Possible solution would be for CMA-CGM to partially stack containers 4-high at their CY and then asking shipping line (CMA-CGM) to haul export containers (almost all are empty ones) into the CY a few days prior to the ship's arrival. In this way, the average CY dwelling time could be reduced to around 15 days.
- CMA-CGM will start operation of an inland container depot (ICD) by the end of 2013. Located 40 km north of Baghdad, the ICD will have a dedicated rail terminal within its area of 20 ha.

For handling 177,200 TEU of containers per year, the possible max berth capacity of the CT, CMA-CGM has to secure 106,800 m^2 of extra CY space near the port (or outside of the port) when the average CY dwelling time of containers is 15 days, or 47,800 m^2 of extra CY space when the dwelling time is 10 days. However, this problem is manageable if CMA-CGM utilizes the ICD. (See Table 3.8-1 and Table 3.8-2)

c) Terminal Operation System by Reach Stackers (including Empty Handlers)

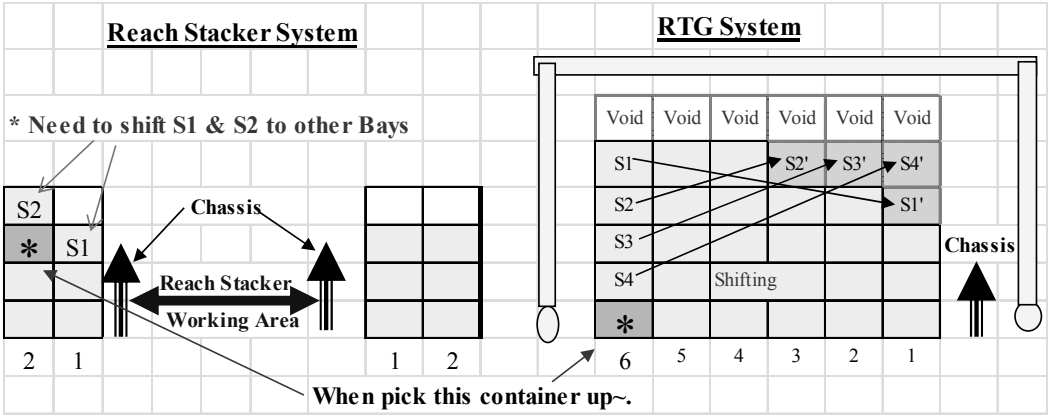
Another serious problem of Iraqi CTs is that the main CHE used at the CYs is RS including empty handlers. When delivering import laden containers to consignees at such CYs, RS drivers are forced to shift (move) other nearby containers to other CY bays. These shifting works of RSs at the CYs are not only slowing down the operation, but are also very dangerous because RS has to move round the passages (trucks wait here making queues) in between the pile of containers holding with containers to be shifted.

- This is one of the main reasons why the stevedoring productivity at Iraqi CTs is very low.

When trying to minimize the yard shifting at a CY under RS system, such TOC needs to stack containers at his CY by one (1) row with 3 high at the most; however, it requires a huge CY space for the TOC. Accordingly, many TOCs in the world changed their CY operating system from RS (including Straddle Carrier systems) to Rubber Tired Gantry Crane (RTG) in these decades because RTG system has many advantages compared with other systems.

- RTG can hold more containers per unit area than any other CHE, enabling them to be stacked in 6 rows with 4~5 tiers per CY-bay by a standard RTG; though it is expensive more than other type of CHEs.
- RTG can receive and or deliver containers without shifting them to other CY-bays as shown in Figure 3.8.1-1; in addition, address control/management of the stored containers in the CY is easier with less maintenance and repair (M&R) costs compared with other CHE.

GCPI, hence, shall make efforts to alter the current contract periods with operators from 5 years to 15~20 years at least in the future, and encourage them to introduce the RTG system for not only optimal utilization of the CY spaces, but also for achieving higher operational efficiency, productivity and safety.



Source: JICA Study Team

Figure 3.8-1: Actual Shifting at RS/RTG Yards within a CY-Bay

2) No.5 Berth: Joint Operation between GCPI and Gazal (Berth length: 250 meters)

Gazal handles three (3) ships (one ship out of the three calls the berth only for discharging a part of the containers which is equivalent to 0.23 calls per week) a week and its average handling volume is about 860 boxes of containers per call. Thus, their handling volume becomes around 154,600 TEU of containers per annum at the CT. Gazal uses two (2) units of QGC (one unit of QGC was out of service as of early in Jan. 2014) for their ships stevedoring operation; however, they use MC/SC as well when the QGC are down; thus the ship calling the berth/CT has SCs.

Gazal operates 16 hours a day with a 2 shift system (08:00~16:00 and 20:00~04:00, having a one (1) hour meal breaks in each shift) 345 days a year. They have six (6) units of RSs for operating both ship and CY-Gate operations. Their stevedoring operational productivities are 25 lifts per hour by a QGC, 17 lifts per hour by a MC and or 11 lifts per hour by a SC.

ISSUES:

a) Lower Container Handling Volume due to Low Berth Utilization Rate

Gazal handles 2.23 ships a week and its handling volume becomes around 154,575 TEU of containers per annum. Hence, the berth utilization rate of 58.2% is the highest in the Port as shown in Table 3.8-1.

((860 boxes x 2.23)/((16-2 hours)x0.8 work-efficiency factor x average (25 lifts /QGC /hour x 1 & 17 lifts/MC/hour)))/7 days = 0.582

Assuming that a berth utilization rate of 55 % is the maximum for liner container ships; Gazal's berth utilization rate becomes 105.9%, exceeding its capacity.

- This high ratio, however, is actually an advantage of Gazal due to its shorter working hours compared to others.

On the other hand, if a new TOC uses two (2) units of QGC with the working condition of CMA-CGM's (24 hours a day with a 3 shift system (08:00~16:00, 16:00~24:00 and 00:00~08:00, having a one (1) hour meal-breaks in each shift), 365 days a year), he can handle 311,303 TEU per annum.

Accordingly, there is 64,400 TEU of margin per annum at No.5 CT compared with the current handling volume. Hence, GCPI has to carefully examine when contracting with a new TOC for the CT whether he can call in enough volume of containers to the CT or not. Otherwise, GCPI will ruin the QGCs and 100,000 m2 of wide CY space of the CT by the unsatisfactory level of utilization rate.

b) CY Space Shortage due to Lengthy Dwelling time of Import Laden Containers at the CY

At No.5 CT, Gazal can stack 6,600 TEU of containers per time as Dead Max CY Capacity in their CY of 100,000 m2 by stacking containers 3 high overall. Thus, the workable Max Capacity

of the CY becomes 4,950 TEU/time (75% of DM Capacity), and then sustainable Max CY Capacity becomes 3,808 TEU/time (1/1.3 of Workable Capacity).

Based on this sustainable Max capacity number (3,808 TEU/time), annual capacity of Gazal's CY becomes around 92,700 TEU, assuming 15 days as the average CY dwelling time of containers. Hence, Gazal can be said to be facing a serious CY space shortage problem at the moment. (3,808 x 365 / 15 =92,654)

On the other hand, for handling 219,000 TEU of containers per year, the possible max berth capacity of the CT, Gazal has to secure 136,000 m2 of extra CY space near the port (or outside of the port) when the average CY dwelling time is 15 days or 57,500 m2 of extra space when the dwelling time is reduced to 10 days. (See Table 3.8-1 and Table 3.8-2)

c) Terminal Operation System by Reach Stackers (including Empty Handlers)

The operation system of No.5 Berth/CT is the same as RS system as CMA-CGM's at No.4 CT; thus issues at No. 5 CT are the same as the CMA-CGM's. (See the comments in the above section.)

3) No.8 Berth: Joint Operation between GCPI and Gulftainer (Berth length: 276 meters)

Gulftainer handles an MSC's ship at the berth/CT on a weekly basis with two (2) units of MC, and its handling volume is about 1,000 container boxes per call. Thus, their handling volume becomes around 80,600 TEU of containers per annum.

Gulftainer operates 24 hours a day with a 2 shift system (08:00~20:00 and 20:00~08:00, having a one (1) hour meal-break in each shift), 363 days a year. They use RSs for both ship and CY-Gate operations, just the same as other operators in UQP, and their stevedoring operation productivity is 17 lifts per hour by an MC.

ISSUES:

a) Low Containers Handling Volume due to Low Berth Utilization Rate

The problem of Gulftainer's CT at Berth No.8 is the same as at No.4 berth: berth utilization rate is very low because they handle only one ship per week. In fact, their berth utilization rate at present is only 23.9%.

(1,000 boxes/((24-2 hours) x 0.8 work-efficiency factor x 17 lifts/MC/hour x2 MC))/7 days = 0.239

Assuming that a berth utilization rate of 55 % is the maximum for liner container ships Gulftainer's berth utilization rate is only 43.4% at present. Accordingly, if they handle ships up to the maximum by their present working conditions, they can handle 185,700 TEU per year at least as shown in Table 3.8-1. This means that there is a margin of 105,100 TEU/year in No.8 CT, compared with the current volume. However, Gulftainer operates No.11-a/11-b berths as well at the same port (though they belong to UQP North), which is very close to No.8 berth; thus, they can probably utilize the No.8 berth/CT flexibly together with the other berths for filling its capacity up to the maximum in the near future.

b) CY Space Shortage due to Lengthy Dwelling-time of Import Laden Containers at the CY

At No.8 CT, Gulftainer can stack 4,500 TEU of containers per time as Dead Max CY Capacity at their 75,000 m2 CY, which is divided in three (3) places, by stacking containers 3 high overall. Thus, the workable Max Capacity of the CY becomes 3,375 TEU/time (75% of DM Capacity), and then sustainable Max CY Capacity becomes 2,596 TEU/time (1/1.3 of Workable Capacity).

Based on this sustainable Max capacity number, annual capacity of Gulftainer's CY becomes around 63,200 TEU, assuming 15 days as the average dwelling time of containers at the CY. Accordingly, Gulftainer can be said to be facing a certain CY space shortage problem at the moment. (2,596 x 365 / 15 = 63,173)

On the other hand, for handling 185,700 TEU of containers per year, the possible max berth capacity of the CT, Gulftainer has to secure 145,500 m2 of extra CY space near the port (or outside of the port) when the containers average CY dwelling time is 15 days, and then 72,000 m2 of extra space when the dwelling time is reduced to 10 days. (See Table 3.8-1)

c) Terminal Operation System by Reach Stackers (including Empty Handlers)

The operation system of No.8 Berth/CT is the same as RS system as CMA-CGM's at No.4 CT; thus, issues at No. 8 CT are the same as the CMA-CGM's. (See the comments related to No.8 CT.)

(2) UQP North Port

1) No.11-a / 11b Berths (ICT): Joint Operation between GCPI and Gulftainer (375 meters)

Gulftainer, a TOC based in Khor Fakkan port in UAE, handles 3.77 ships per week of UASC, Maersk, APL and Evergreen, each on a weekly basis. The ships commenced to call the CT one by one since 2012, and the latest one started to call at the CT in August 2013. Evergreen's ship call at No. 5 Berth also on the same voyage for discharging a part of the containers: thus ship calls at ICT are counted as 0.77.

Gulftainer has two (2) units of QGC on the berths for handling about 800 boxes of containers per ship call on average. However, due to the rapid increase in the container handling volume, Gulftainer installed two (2) units of MC in October 2013. Accordingly, they are capable of handling 243,100 TEU of containers or more per annual at the CT. (800 x 3.77 x 1.55 x 52 = 243,090)

- The berths have only 375 meters in total; thus it is long enough for a vessel calling the port at present, but too short for two (2) ships when larger sized ships call the berths at the same time in future. Hence, the number of berths is considered to be 1.5 for the Study.

Gulftainer operates 24 hours a day with 2 shift system (08:00~20:00 and 20:00~08:00, having a one (1) hour meal-break in each shift), 363 days a year. They use RSs for both ship and CY-Gate operations, just the same as other operators in UQP, and their stevedoring operational productivity is 20 lifts per hour by a QGC which is very low considering their capabilities and experience.

ISSUES:

a) Container Handling Volume at the Terminal

Gulftainer handles around 243,100 TEU of containers per annum at the CT at present which means their berth utilization rate is 42.9% (assuming number of berths is 1.5). Assuming that a berth utilization rate of 55 % is the maximum for liner container ships, No.11a-b berth utilization rate is 78.1%. Accordingly, its maximum capacity becomes 311,300 TEU per year as shown in Table 3.8-2. This means that there is a margin of 68,200 TEU/year in their CY, compared with the current volume.

b) CY Space Shortage due to Lengthy Dwelling time of Import Laden Containers at the CY

In the case of Gulftainer at No.11-a/11b CT, they can stack 16,600 TEU of containers per time as Dead Max CY Capacity at their 250,000 m2 of CY (including 100,000 m2 of reserved space) by stacking containers 3 high overall. Thus, the workable Max Capacity of the CY becomes 12,450 TEU/time (75% of DM Capacity), and then sustainable Max CY Capacity becomes 9,577 TEU/time (1/1.3 of Workable Capacity).

Based on the sustainable Max capacity number (9,577 TEU/time), annual CY capacity of Gulftainer terminal becomes around 233,000 TEU, assuming 15 days as the average dwelling time of containers at the CT. Hence it can be said that Gulftainer is already facing a shortage of CY space at present. (9,577 x 365 / 15 = 233.040)

- Possible solution would be to stack containers in their CY 4-high partially, and then ask shipping lines to haul export containers (almost all are empty ones) into the CY a few days

prior to the ship's arrival. Accordingly, their containers' average CY dwell-time could be reduced to around 12~13 days.

- In fact, APL, one of their customer shipping lines, has an ICD. in UQP area for storing their empty containers, so other shipping lines could do the same.

On the other hand, for handling 311,300 TEU of containers per year, the possible max berth capacity of the CT, Gulftainer has to secure 84,000 m^2 of extra CY space near the port (or outside of the port) when the containers average CY dwelling time is 15 days although the current CY space should be enough when the average dwelling time is reduced to10 days. (See Table 3.8-1 and Table 3.8-2)

- Gulftainer has already secured a storage space, called "Logistic Center", in the port, and plans to use an area of 10 ha for storing their overflowing containers. Hence, they could handle the maximum number of containers at No.8 as well as No.11-a/11-b berths.
- However, Gulftainer plans to transport (shift) the containers from No.11-a/11-b CT to the logistic center passing through either aprons of Berth No.12~21 or passages in between warehouses in behind the berths. Accordingly, operations of GC-ships and warehouses at berth No.12 through 18 and or CT operation at berth No.19-21 will be seriously affected.

c) Terminal Operation System by Reach Stackers (including Empty Handlers)

The operation system of No.11-a/11-b Berths/CT is the same as RS system as CMA-CGM's at No.4 CT; thus the issues at the CT are the same as the CMA-CGM's.

Gulftainer chose to employ Reach Stackers as main CHE at the CT, instead of RTGs, even though the RS system has many disadvantages as described already. Gulftainer should have chosen an RTG system because they made a 20 year-long contract with GCPI for the CT which is sufficient time for recovering their investments and considering their capability and experience in operating an RTG system. Hence, most probably Gulftainer should transfer their operations from the CTs in UQP to CTs in Al Faw Grand Port in the future due to its various advantages as described in later sections.

2) No. 20 Berth: Own Operation by GCPI, or Operation by ICTSI

GCPI installed two (2) units of QGC on berth No. 20, and then one (1) unit of MC on berth No.19 (although it is a GC berth) and 21 each. GCPI handled only one (1) ship per week, and its handling volume is about 1,000 boxes per ship call on average. Accordingly, the capacity was only 80,600 TEU per annum at the CT. (1,000 x 1.55 x 52 = 80,600)

GCPI operates 18 hours a day with a 2 shift system (08:00~19:00 and 21:00-04:00, having a one (1) hour's meal-break in day-shift only), 350 days a year. GCPI uses RSs for both ship and CY-Gate operations, just the same as other operators in UQP, and their stevedoring productivity is 16 lifts per hour by a QGC and or 10 lifts per hour by a MC which is very low compared with other operators in the port.

- GCPI plans to modify the CT operating system from RS to RTG. As railway tracks remain in the CY behind the berths, they shall be removed to build a full scale container yard. Without removing rail tracks, operations of CY cannot be effective as expected.

ISSUES:

a) Lower Container Handling Volume due to Low Berth Utilization Rate

The problem at GCPI's CT at Berth No.20 is the same as No.4, No.5 and or No.8 berths: only one ship per week is handled even though GCPI has two (2) berths; hence, the berth utilization rate becomes very low. In fact, their berth utilization rate at present is only 20.2%.

(1,000 boxes/((18-1 hours) x 0.8 w.e. factor x 16 lifts/QGC/hour x2 QGC))/7 days/2 berths = 0.202

Accordingly, assuming that a berth utilization rate of 55 % is the maximum for liner container ships, GCPI's No. 20~21 berth utilization rate is only 36.7% at present. If GCPI handles

ships up to its maximum by the present working conditions, GCPI can handle 240,000 TEU per year at least. (see Table 3.8-1)

Moreover, if GCPI utilizes their two (2) berths fully, using two (2) units of QGC and MC each, up to the berth capacity for 24 hours a day with 3 shifts as it is at present for 363 days as Gulftainer does with their productivities, 20 lifts/QGC/hour and 17 lifts/MC/hour, GCPI can handle 423,000 TEU of containers per annum. (See Table 3.8-1)

Accordingly, there is a 335,000 TEU per annum of large margin at GCPI's CT compared with the current volume. However, as stated already, the operation and management of the CT will be difficult due to various problems. Therefore, GCPI should rent out the terminal to a competent private TOC. Otherwise, GCPI will waste the berths, QGCs and MCs there by the unsatisfactory level of utilization.

b) CY Space Shortage due to Lengthy Dwelling time of Import Laden Containers at the CY

GCPI has CY space of about 116,000 m2 behind the berth No.20-21; however, due to the rail-trucks in the CY, its Dead Max CY capacity is only 4,500 TEU/time when containers are stored 3 high. Thus, the workable Max Capacity of the CY becomes 3,375 TEU/time (75% of DM Capacity), and then sustainable Max CY Capacity is only 2,596 TEU/time (1/1.3 of Workable Capacity).

Based on this sustainable Max CY capacity number (2,596 TEU/time), annual capacity of GCPI's CY becomes around 63,000 TEU, assuming 15 days as the average dwelling time of containers at the CY. Accordingly, GCPI is facing a serious shortage of CY space at present. (2,596 x 365 / 15 = 63,173)

- Beside of the On-dock CY mentioned in above, GCPI operates an Off-dock CY (Anham CY; with a 90,000 m2 of space); which has XXX TEU/time of the capacity by stacking containers 2 high all-over.

On the other hand, for handling 423,000 TEU of containers per year, the possible max berth capacity of the CT, GCPI has to secure 385,000 m2 of extra CY space near the port (or outside of the port) when the containers average CY dwelling time is 15 days, or 234,000 m2 of extra space if the dwelling time could be reduced to 10 days. (See Table 3.8-1)

- Due to the small CY capacity relative to its large berth, 63,000 TEU vs. 423, 000 TEU, berth No.20~21 CT has many difficulties even for a competent TOC.
- The TOC has to move all the import containers from On-dock CY to Off-dock CY within a few days after being discharged from ships, then deliver them at Off-dock CY to consignees.
- Export containers (empties in general) also have to be received at On-dock CY a few days prior to the ships' arrival to reduce its dwelling time at the CY, required for relevant shipping lines.

c) Terminal Operation System by Reach Stackers (including Empty Handlers)

The operation system of No.20~21 Berths/CT is the same as RS system as CMA-CGM's at No.4 CT; therefore issues at the CT are the same as the CMA-CGM's.

Table 3.8-1 Capacity of UQP by Present Conditions

1. Berth Capacity **By Present Conditions**

Berth Capacity	UQP: Container Terminals					
	No. 4	No. 5	No. 8	ICT(11a-b)	No. 20	Total/Ave.
Operator: at Present	**CMA-CGM**	**Gazal**	**Gulftainer**	**Gulftainer**	**GCPI**	**-**
1) Berth Length (m)	250	250	276	375	200	1,351
2) Quay-side Crane; Type and Numbers						
- Type	Ship-Cranes	GC&MC	MC	GC &MC	GC	-
- Unit No.	3	1&1	2	2&2	2	13
3) Ship Call No/week	1	2.23	1	3.77	1	9
		*Evergreen's ship calls both No.5 and No.11a&b Terminals				
4) Handling Volume at Present (As of Jan. 2014)						
- Boxes/call	1,000	860	1,000	800	1,000	4,660
- TEU/call (1.55 as TEU/Box)	1,550	1,333	1,550	1,240	1,550	7,223
- TEU/year	**80,600**	**154,575**	**80,600**	**243,090**	**80,600**	**639,464**
5) Productivity (Lifts/Crane/hour)						
- Gantry Crane (GC)	-	25.0	-	20.0	16.0	20.3
- Mobile Crane (MC)	-	17.0	17.0	17.0	-	17.0
- Ship Gear (SG)	11.0	-	-	-	-	11.0
6) Effective Stevedoring Hours per Day: 80% of Net Working hours as Effective						
	16.8	11.2	17.6	17.6	13.6	15.4
7) Required Working Days per Week						
	1.80	4.08	1.67	4.51	2.30	2.87
8) Berth Occupancy Rates at Present (As 1.5 Berths for No.11a & b)						
	25.8%	58.2%	23.9%	42.9%	32.8%	36.7%
9) Berth Utilization Rates at Present: 55% as the Maximum Rate						
	46.9%	105.9%	43.4%	78.1%	59.7%	66.8%
10) Possible Maximum Handling Volume per Year by Present Operational Conditions						
	172,036	**154,575**	**185,690**	**311,303**	**135,047**	**958,650**
11) Possible Additional Handling Volume per Year						
	91,436	0	105,090	68,213	54,447	319,186

2. CY Capacity

CY Capacity	UQP: Container Terminals					
	No. 4	No. 5	No. 8	No. 11 a&b	No. 20	Total/Ave.
Equipment using at CY	**R.Stackers**	**R.Stackers**	**R.Stackers**	**R.Stackers**	**R.Stackers**	**-**
1) CY Space (m2)	70,000	100,000	75,000	250,000	116,000	611,000
2) CY Capacity-1: TEU/time					*67,500*	
- Dead Max at 3-high	5,000	6,600	4,500	16,600	4,500	37,200
- Workable Max (75% of-)	3,750	4,950	3,375	12,450	3,375	27,900
- Sustainable Max (PF:1.3)	2,885	3,808	2,596	9,577	2,596	21,462
3) CY Capacity-2: TEU/year, when average CY Dwell-days are;						
- 7 days	150,412	198,544	135,371	499,368	135,371	1,119,066
- 10 days	**105,288**	**138,981**	**94,760**	**349,558**	**94,760**	**783,346**
- 15 days	**70,192**	**92,654**	**63,173**	**233,038**	**63,173**	**522,231**
- 20 days	52,644	69,490	47,380	174,779	47,380	391,673

3. Requiring Extra CY Space for Handling Containers Equalizing with the Berth Capacity

Req. Extra CY Space for Equalizing with B. Capa.	UQP: Container Terminals					
	No. 4	No. 5	No. 8	No. 11 a&b	No. 20	Total/Ave.
1) When Average CY Dwell-day of the Containers is 10 Days						
- Shortage TEU/year	66,747	15,594	90,930	0	40,287	213,558
- Required CY Space (m2)	**44,376**	**11,220**	**71,969**	**0**	**28,698**	**156,263**
2) When Average CY Dwell-day of the Containers is 15 Days						
- Shortage TEU/year	101,844	61,921	122,516	78,265	71,874	436,419
- Required CY Space (m2)	**101,565**	**66,830**	**145,453**	**83,961**	**76,797**	**474,606**

*Numbers in columns colored in Yellow should be amended once obtained the exact data.

Source: Prepared by JICA Study Team based on information from GCPI and private operators

Table 3.8-2 Capacity of UQP by Possible Best Operational Conditions

1. Berth Capacity **Future Possibility by Best Practice**

Berth Capacity	UQP: Container Terminals					
	No. 4	No. 5	No. 8	ICT(11a-b)	No. 19-20	Total/Ave.
Operator: at Present	**CMA-CGM**	**Gazal**	**Gulftainer**	**Gulftainer**	**GCPI**	**-**
1) Berth Length (m)	250	250	276	375	400	1,551
2) Quay-side Crane; Type and Numbers						
- Type	MC	GC&MC	MC	GC &MC	GC &MC	-
- Unit No.	2	1&1	2	2&2	2&2	13
3) Ship Call No/week	1	2.23	1	3.77	1	9
		*Evergreen's ship calls both No.5 and No.11a&b Terminals				
4) Handling Volume at Present (As of Jan. 2014)						
- Boxes/call	1,000	860	1,000	800	1,000	4,660
- TEU/call (1.55 as TEU/Box)	1,550	1,333	1,550	1,240	1,550	7,223
- TEU/year	**80,600**	**154,575**	**80,600**	**243,090**	**80,600**	**639,464**
5) Productivities by Best Practice (Lifts/Crane/hour)						
- Gantry Crane (GC)	-	25.0	-	20.0	20.0	21.7
- Mobile Crane (MC)	17.0	17.0	17.0	17.0	17.0	17.0
- Ship Gear (SG)	-	-	-	-	-	-
6) Effective Stevedoring Hours per Day: 80% of Net Working hours as Effective						
	16.8	16.8	17.6	17.6	16.8	17.1
7) Required Working Days per Week (Use 2 Cranes/ship/time as Max)						
	1.75	2.72	1.67	4.51	1.61	2.45
8) Berth Occupancy Rates at Present (As 1.5 Berths for No.11a & b, and 2 berths for No.19-20)						
	25.0%	38.8%	23.9%	42.9%	11.5%	28.4%
9) Berth Utilization Rates at Present: 55% as the Maximum Rate						
	45.5%	70.6%	43.4%	78.1%	20.9%	51.7%
10) Possible Maximum Handling Volume per Year by Best Operational Conditions						
	177,249	**218,955**	**185,690**	**311,303**	**385,777**	**1,278,974**
11) Possible Additional Handling Volume per Year						
	96,649	64,380	105,090	68,213	305,177	639,509

2. CY Capacity

CY Capacity	UQP: Container Terminals					
	No. 4	No. 5	No. 8	No. 11 a&b	No. 19-20	Total/Ave.
Equipment using at CY	**R.Stackers**	**R.Stackers**	**R.Stackers**	**R.Stackers**	**RTG**	**-**
1) CY Space (m2)	70,000	100,000	75,000	250,000	116,000	611,000
2) CY Capacity-1: TEU/time					*67,500*	
- Dead Max at 3-high	5,000	6,600	4,500	16,600	4,500	37,200
- Workable Max (75% of-)	3,750	4,950	3,375	12,450	3,375	27,900
- Sustainable Max (PF:1.3)	2,885	3,808	2,596	9,577	2,596	21,462
3) CY Capacity-2: TEU/year, when average CY Dwell-days are;						
- 7 days	150,412	198,544	135,371	499,368	135,371	1,119,066
- 10 days	**105,288**	**138,981**	**94,760**	**349,558**	**94,760**	**783,346**
- 15 days	**70,192**	**92,654**	**63,173**	**233,038**	**63,173**	**522,231**
- 20 days	52,644	69,490	47,380	174,779	47,380	391,673

3. Requiring Extra CY Space for Handling Containers Equalizing with the Berth Capacity

Req. Extra CY Space for Equalizing with B. Capa.	UQP: Container Terminals					
	No. 4	No. 5	No. 8	No. 11 a&b	No. 20	Total/Ave.
1) When Average CY Dwell-day of the Containers is 10 Days						
- Shortage TEU/year	71,961	79,974	90,930	0	291,018	533,882
- Required CY Space (m2)	**47,842**	**57,543**	**71,969**	**0**	**207,300**	**384,655**
2) When Average CY Dwell-day of the Containers is 15 Days						
- Shortage TEU/year	107,057	126,301	122,516	78,265	322,604	756,743
- Required CY Space (m2)	**106,763**	**136,315**	**145,453**	**83,961**	**344,701**	**817,193**

*Numbers in columns colored in Yellow should be amended once obtained the exact data.
Source: Prepared by JICA Study Team based on information from GCPI and private operators

(3) Khor Al Zubayr Port

KPZ is the only port that handles liquid bulk. Though the port handles several kinds of commodities, the sizes of the calling ships are smaller than those of UQP, because the waterways leading to KZP from UQP have not yet been fully restored or upgraded.

The one of characteristic features of KZP is that the port handles steel, pipe, iron powder and electric equipment, which are related to the specific importers among local industries. In addition, the port is called by many small ships such as Dhow ships and barges. Dates, which is the largest export dry goods of Iraq, are shipped on these small ships.

The port has no specific terminal exclusively used for containers and no liner service is calling on the port. Containers are brought to the port on the deck of cargo ships.

(4) Al Maqil Port

Container operation at Al Maqil Port will commence soon by NAWAH, an American TOC, at Berth No.14 (operations will be extended to Berth No. 13 and 12 in the future). At present, therefore, the operations system is unclear but as stated previously Al MaqilPport has some serious weak points for liner container ships to call the port on a regular basis.

Firstly, there are very shallow areas at the river mouth of Shatt Al Arab River that extend for a few miles with the shallowest place being minus 2 meters. Therefore, only lighter ships with 5 meters draft as maximum in high-tide periods can maneuver to the port. Second, there are two (2) small bridges just six and half (6.5) km downstream of the port which prevent ships from entering the port smoothly; the bridges are opened for the ships for only a few hours on Sundays, Wednesdays and Fridays from 01:00.

Accordingly, it can be said that there is a very slim chance for certain sized container ships to call the port on a regular basis, although smaller feeder container ships between hub ports in UAE and or Al Faw Grand Port, which will be developed by Iraqi MOT/GCPI in the near future, will call the port.

(5) Abu Flus Port

As stated already, container operation at the port is done by using two (2) units of lighter MC together as a pair when discharging and or loading a container at berth No. 3. because the apron, made by iron structured plates, is not strong enough for supporting heavy equipment such as RSs. The plates, by now already seriously damaged, will be replaced by concrete ones within 18 months; however the concrete ones will also not be strong enough for the use of RSs.

Furthermore, container operation at Abu Flus Port is done by “direct discharging (and loading) methods”, the same as GC handling operations at all the ports in Iraq, i.e., discharging containers directly from the ships-side on to chassis prepared by consignees. Thus, some dozens of trailer-chassis are gathered inside the port area before starting the discharging works to avoid incurring idling times by trailers during the operations.

In the case of Abu Flus Port, the current operation system is best because GCPI will not be able to use any heavy CHE at the apron in the future also. Abu Flus GCPI needs effective coordination with consignees and truckers to ensure that trailer-chassis are prepared in a timely manner based on the discharging and or loading sequence plans.

3.8.2 General Cargo Terminal Operations

(1) UQP

1) Commodities handled

The cargo volumes with breakdown by commodity and the number of calling ships which brought respective commodities to UQP (including both the South and North Harbors) are

summarized in Table 3.8-3. The total cargo volume was 9.3 million tons, while the total number of calling ships was 922 including 89 ships that did not carry cargoes.

It is observed in the Table that the volume of containers was the largest, wheat was the second, rice was the third (the volume of these three commodities were larger than a million tons), sugar was the fourth, general cargo was fifth, pipe and steel sections was the sixth (the volume of these three commodities were larger than a half million tons). The port also handled cement and cars. The volumes of container cargo and food dry bulk were much larger those handled at the other three ports. It should also be noted that these dry bulk cargoes were brought by larger ships having DWT of 20,000 to 50,000 tons. Thus, UQP is playing a role to handle containers and food dry bulk cargoes. The port is the only port that has RoRo ramp and import vehicles.

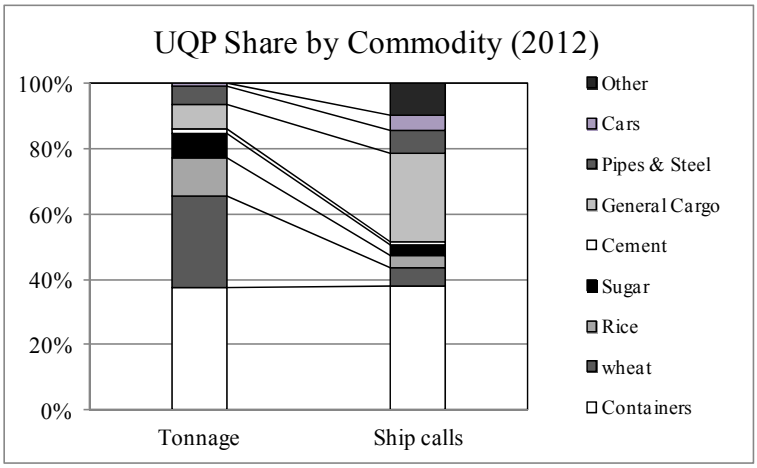
While Cement, general cargo and pipe/steel sections are also handled at KZP, the volume of general cargoes and pipes/steel sections are much smaller than UQP. Though the volume handled was much smaller than KZP, large ships having DWT of 20,000 or larger were employed for the import of cement at UQP.

Table 3.8-3 Average ship size by commodity at UQP in 2012 (unit: ton)

Commodity	Containers	wheat	Rice	Sugar	Cement	General Cargo	Pipes/Steel Sections	Cars
Total tonnage	3,475,367	2,637,732	1,092,684	714,794	129,008	681,959	514,862	88,784
Ship calls	350	52	33	32	6	252	63	45
ton/ship	9,930	50,726	33,112	22,337	21,501	2,706	8,172	1,973

Source: GCPI UQP monthly cargo volume and ship call statistics 2012, edited by Study Team

Figure 3.8-2 shows the share among the volumes of and number of ships employed for the import of respective commodities. It is observed that, at UQP, both the share of volume of container cargo and the number of calls of container ships encompasses 40%. The sum of the container volumes, wheat, rice and sugar amounts to 80 % of the total cargo volume at UQP, while the number of ships employed for the import of these four commodities account for only 50%. This delineates the characteristics of UQP that plays such a role to receive large ships that bring in large volumes.



Source: GCPI UQP monthly cargo volume and ship call statistics 2012, edited by Study Team

Figure 3.8-2 Share of volumes and ships employed for respective commodities

2) Operational scheme (Only Terminals under GCPI's Control)

GC handling operations at both UQP South and North are done by "in-direct discharging (and or loading) system"; i.e. cargoes are stored in sheds before being delivered to consignees (or loading onto ships). However, major cargoes such as sugar, wheat and rice are handled by "direct discharging" system, i.e. cargoes are discharged at ship side by ships cranes/un-loaders directly on to trucks prepared by consignees.

It seems very convenient and economical for GCPI as few laborers are required, nor are warehouses or CHE such as fork lifts or trucks required. However, this system has various problems from the standpoint of operational efficiency and or berth utilization. Firstly, shipping lines have to prepare all the necessary trucks on a daily basis through consignees based on the operation schedules; thus, the berth aprons are generally congested by trucks.

Secondly, operation becomes very slow because not many laborers can work on the truck due to the limited space; sometimes only the driver of the truck is working. Accordingly, the berths and aprons are congested by ships and trucks as both are forced to stay there for prolonged times.

- It is difficult for more than three (3) persons to work together on a truck at the same time due to the narrow space.

The current GC handling practices of UQP, direct discharging (and or loading) system can be continued until a shortage of GC berths arises. However, eventually GCPI will have to adopt more "Orthodox ways" for utilizing the assets (berths and warehouses) more by reducing its ship and cargo handling time.

Orthodox Practices (System or Ways):

a) GC ships operations are done by professional workers (longshoremen), assigning 1~2 ship-crane drivers, 4~6 labors in hatch and 3~5 labors/drivers on the apron with CHE (fork lift and trucks in cases) per crane (gang).
b) GC cargoes, such as sugar bags, are piled flatly on pallets, placed on net-slings, then discharged onto the aprons by ship-cranes for storage in assigned warehouses nearby using forklifts (and trucks in cases).
c) Consignees come to the warehouse where their cargoes are stored for picking the cargoes up once the cargoes clear Customs.
d) Delivery of the cargoes is done through other doors of the warehouses than the apron's so as not to interfere with the unloading work at the aprons.

Advantage of Orthodox Practices:

a) Cargo handling efficiency can be more than doubled by lowering the berth utilization rates or by increasing the berthing windows for handling more GC ships.
b) Safety at the aprons can be increased tremendously by eliminating approaches of external trucks to the berth aprons for receiving cargoes.
c) Consignees come to a warehouse for picking their cargoes up, but the warehouse operator can deliver cargoes at other doors than the apron-side so as not to affect operations.
d) Berth No.12 through No.18 in North UQP are ideal for practicing this orthodox operation as there are two (2) warehouses behind the berths.
e) GCPI, hence, has to decide the working system particularly who will operate and manage the warehouses by what methods and so on to keep operations running smoothly.

*However, in the case of cement cargo, GCPI may continue the current practice of direct discharging at isolated berths to prevent cement dust from contaminating clean cargoes.
*. In that case, GCPI shall to ask the relevant shipping lines/consignees to hire two (2) laborers at a ship's hatch and on a truck and rotate them hourly with fresh labors to maintain operational efficiency.

(2) KZP

1) KZP Oil Rig Related Cargoes' Handling Operations

Martrade-Logistics (Mar-Log) handles Oil-Rig related cargoes, including modules and pipes at No.8 berth of the port using special slings. Utilization rate of the berth is reaching 50% already as of the middle of 2013 according to Mar-Log; thus, GCPI and Mar-Log have agreed to use No.2 through No.4 berths on a preferential basis for preparing business expansion of the company.

According to Mar-Log, handling of Oil-Rig related cargoes will increase in future; hence, they will utilize No.8 berth fully (60% of net usage or more) by early 2014, and then commence operations at No.2~4 berths in early 2014. Initially, 200 meters out of the total berth length of 540 m should be sufficient. Considering Mar-Log's professional experience and capability, utilization plan of GCPI for these berths should be reasonable.

2) Commodities handled

The grand total of the cargo volume handled at KPZ in 2012 was 4.3 million tons, while the total number of calling ships was 531. The volumes and ship calls of respective commodities at KZP in 2012 are shown in Table 3.8-4.

The volume of liquid bulk is the largest, Cement was the second and pipes were the third: 3.1 million, 0.73 and 0.22 million tons. The volumes of other commodities such as general cargo, electric equipment, iron powder were in the range from 10,000 to 50,000 tons. The port also imported a relatively small volume of containers and steel. Since there is no container liner service at KZP, the containers were brought by general or bulk cargo ships rather than full container ships.

Dates are exported at KZP by either cargo ships or small ships, which are called "Dhow ship" that bring other import commodities. Incidentally, Dhow ships are employed for the import of sugar and beans.

At present, the water depth of the Khwar Az Zubayr Channel, which is the waterway between UQP and KZP, restricts the passage of large ships. Thus, the sizes of ships calling on KZP are relatively smaller than those calling on UQP. The dredging of the Khwar Al Zubayr Channel is planned in Phase II of the Iraq Port sector Rehabilitation Project. When the project is completed and the depth of the channel is ensured, it is foreseen that cement and pipes, which are the major commodity of KZP, will be imported by large size ships as at UQP.

Table 3.8-4 Cargo volumes per ship at KZP by commodity (unit: ton)

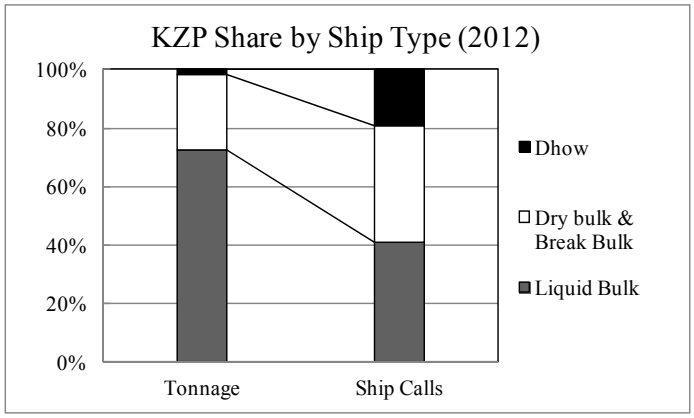
Commodity	Liquid Bulk	Cement	Cargo	Steel	Pipes	Suger
Tonnage	3,097,344	731,793	47,100	1,001	218,266	21,376
Ship Calls	218	96	53	1	29	9
Average ton/ship	14,208	7,623	889	1,001	7,526	2,375

Commodity	Iron Powder	Electric Equipment	Dates	Containers	Dhow Ship
Tonnage	10,832	31,140	19,537	8,154	77,093
Ship Calls	6	8	1	9	101
Average ton/ship	1,805	3,893	19,537	906	763

Source: GCPI KZP cargo and ship call statistics 2012, edited by JICA Study Team

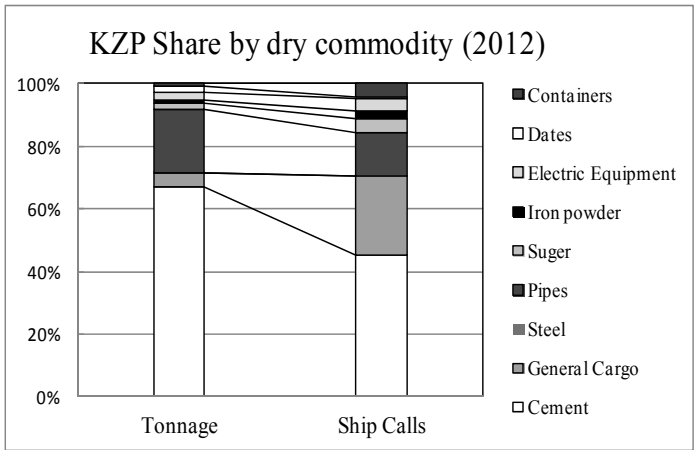
Table 3.8-4 shows the share among the volumes of and number of ships employed for the import of respective commodities. The volume of liquid bulk encompasses 70% of the total cargo volume at KZP in 2012. Tankers have a 40% share of the total number of calling ships of KZP. About thirty percent (30%) of the total cargo volume is Dry bulk and general cargoes, while ships employed for the import of these cargoes amount to 40 %. Though dhow ships have a 20% share in the total ship calls, they carried only a few percent of total cargo volume.

The cargo volumes, excluding those carried by tankers or dhow ships, and the ship calls by commodity are shown in Figure 3.8-4. It is observed in the Figure that cement has a 70% share in the cargo volume and only 45% in ship calls. The share of the sum of the volumes of cement, general cargoes and pipes amount to a 90 % share.



Source: KZP cargo and ship monthly statistics 2012, edited by Study Team

Figure 3.8-3 Share by ship types



Source: KZP cargo and ship monthly statistics 2012, edited by Study Team

Figure 3.8-4 share by commodity

3) Operational scheme (Only Terminals under GCPI's Control)

GC handling operations at berth No.2~4 and No.5~6 in the Port are done by "direct discharging system"; just the same as UQP, i.e. discharging cargoes at ships-sides by ship cranes directly on to trucks prepared by consignees. Hence, the actions GCPI has to take when KZP-GCPI faces a shortage of berths are the same as addressed in the section on UQP.

However, there is no warehouse behind No.2~4 berths at KZP; thus, KZP-GCPI has to ask Mar-Log to move their operation from No.8 berth to No.2~4 berths. Hence, KZP-GCPI can use No.7 and No.8 berths for GC ships as dedicated GC terminals as these berths have two (2) warehouses behind the berths.

* Water depth in front of No.2~4 berths will become minus 12 meters once JICA Phase-II project is completed.

(3) Al Maqil Port

1) Commodities handled

Al Maqil Port handles Cement and general cargos only (see Table 3.8-5 and Figure 3.8-5). In 2012, the port handled a total of 877, 000 tons of cargoes (730,000 tons of cement and 150,000 tons of general cargo) and was called on by 743 ships. Due to the water depth of the Shatt al Arab Channel, which is the waterway leading to Al Maqil Port and Abu Flus Port, only small ships are calling on the port. A container terminal was newly opened at Berths No. 13 and 14 of the port and

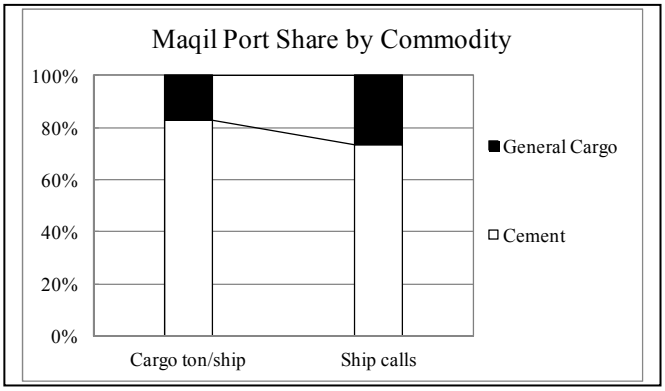
started operation in 2013. It is expected that the port will play another function as the container port nearest to the local markets.

Table 3.8-5 Cargo and ship calls at Al Maqil Port (2012)

	Cement	General Cargo
Tonnage	726,468	150,395
Ship Calls	545	198
Ton/ per hip	1,333	760

Source: GCPI, Maqil Port cargo and ship call monthly statistics 2012, edited by Study Team

As observed in Table 3.8-5, the volume of cement per ship is almost double of that of general cargo. Therefore, while the volume of cement encompassed 80 % of the total cargo volumes of the port, the number of ships that brought cement to the port was less than 80%. Cement was first handled at the port in 2010 and has been the principal commodity since then.



Source: GCPI, Maqil Port cargo and ship call monthly statistics 2012statistics, edited by Study Team

Figure 3.8-5 Volumes and ship calls by commodity at Al Maqil Port (2012)

2) Operational scheme

General cargo handling operations at berths No.6~11 in the Port are done by "direct discharging system"; just the same as UQP or KZP, i.e. discharging cargoes at ships-sides by ship cranes directly on to trucks prepared by consignees. Hence, the actions GCPI has to take when Al Maqil-GCPI faces a shortage of berths are the same as addressed already in the section on UQP.

(4) Abu Flus

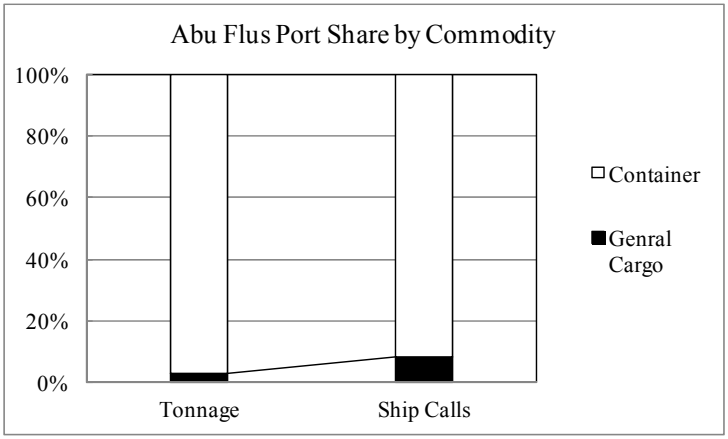
1) Commodities handled

Commodities handled at Abu Flus Port in 2012 were general cargo and containers only (see Table 3.8-6 and Figure 3.8-6). Container was the principal commodity at Abu Flus Port. Since 2007, when Abu Flus port first handled only a few containers, the volume of container cargoes has been increasing , while other commodities have kept reducing. In 2012, the port practically handled containers only.

Table 3.8-6 Commodities and ship calls at Abu Flus Port (2012)

	General Cargo	Container
Tonnage	16,093	508,961
Ship Calls	13	147
Ton/ per hip	1,238	3,462

Source: GCPI Abu Flus Port cargo and ship call Statistics 2012, edited by Study Team



Source: GCPI Abu Flus Port cargo and ship call Statistics 2012, edited by JICA Study Team

Figure 3.8-6 Share of volumes and ship calls by commodity

2) Operational scheme

GC handling operations at berth No.1 and 2 in the Port are done by "direct discharging (and or loading) system"; just the same as UQP or other ports in Iraq, i.e. discharging cargoes at ships-sides by ship cranes directly on to trucks prepared by consignees. Hence, the actions GCPI has to take when Abu Flus-GCPI faces a shortage of berths are the same as addressed already in the column of UQP.

3.9 Legal Framework on Environmental and Social Considerations

3.9.1 Laws and Regulations related to Environment

(1) General

Laws and regulations relating to the environmental and social considerations in Iraq are summarized in Table 3.9-1.

Environmental Impact Assessment (EIA) is stipulated in Protection and Improvement of the Environment (Law No.27, 2009). This law requires development projects to submit EIA report to obtain a permission from MOE.

Table 3.9-1 Laws and Regulations Related to Environment

Classification	Law and Regulation	Outline
General	Protection and Improvement of the Environment (Law No.27,2009)	This law aims to protect and improve the environment and natural resources, preserve public health, biodiversity and cultural and natural heritage, to ensure sustainable development. This law stipulates submission of Environmental Impact Assessment Report for the project which has negative impact on the environment.

	Environmental Criteria for Industrial, Agricultural, and Public Service Projects (1990) Environmental Determinants for the Establishment of Projects and Monitor the Implementation of Safety (Instruction No.3, 2011)	Tease instructions list a wide range of potentially polluting industries and activities into three categories (A, B and C) and sets out how far certain industrial activities in each class can be located from municipal and urban areas.
Port	Law Concerning Ports (Law No. 27, 1995).	This law regulates navigation and port safety, the prevention of water pollution, the operation of importation and exportation agents, and the registration of ships.
Water Quality	Preservation of Rivers and Public Water from Contamination (Regulation No.25 , 1967)	This regulation relates to the protection of rivers and public water bodies from contamination. The concentration standard for the discharge of wastewater into public water bodies is also regulated.
	Wastewater Discharge Quality Requirements (Instruction No.1)	This instruction provides discharge concentration limits for a number of substances contained in wastewater, in accordance with the provisions of Article (16) of Regulation 25.
	The New Determinants for the Prevention of Pollution of Rivers (No. 25, 1967)	This instruction provides physical, chemical, and biological guidelines for water quality and wastewater discharges.
Air Quality and Noise	National Clean Air Act (1979)	Local air quality standards are defined by this Act. This Act establishes long term, medium and short term ambient quality standards across a range of pollutant parameter.
	Determinants of national and private emission activities (Instruction No.3 2012)	This law aims to control emissions to the air from a variety of sources (including industrial (factories, power stations, incinerators, oil installations, etc.), non‐industrial, and vehicles). It establishes emissions limits for the discharge of certain pollutants to the air.
	Noise Prevention Law (No. 21, 1966)	This regulation aims to prevent excessive noise in public places.
	Instructions No. 2 (1993)	This instruction details the conditions for determining the levels of noise emitted from sound equipment in tourist facilities.
Wildlife and Habitats	Protection of Wild Animals and Birds (Law No.17, 2010)	This law aims at protecting the wildlife as a national wealth, defining hunting areas, controlling licensing regulations of hunting and specifying species of which hunting is allowed or banned and hunting seasons.

	Regulating the Exploitation and Protection of Aquatic Life (Law No.48, 1976)	This law regulates fishing and aquaculture including general rules of fishing activities, fishing gear, marketing and industrialization of aquatic products, fee and licenses.
Waste	Public Health Act (Law No. 89, 1981)	Chapter V of Public Health Act sets specifications for healthy burial of wastes. This chapter indicates five fundamentals concerning determination of site selection, methods of burial, machinery required, staff involved and other requirements.
Chemical materials	Safe Storage and Handling of Chemicals, (Instructions No. 4,1989)	This instruction details the requirements for the safe storage and handling of chemicals, being issued in accordance to the provisions of the sixth and seventh paragraph of Article (3) and Article (105) of the Public Health Law No. 89, 1989.
Land Acquisition	Acquisition Law No. 12 (1981)	This law stipulates procedure, rules and compensation etc. of land acquisition related to project execution.

Source: JICA Study Team

(2) EIA Legislation

With respect to EIA, Protection and Improvement of the Environment (Law No.27,2009) stipulates as Table 3.9-2. Article 10 stipulates the requirements of EIA report. EIA procedure shall be required to the current facilities or their expansions or renewals accordance with Article 12. The Law doesn't mention a public participation or publication of an EIA report.

Table 3.9-2 Protection and Improgement of the Environment (Law No.27, 2009)

Article 8

The planning authorities in the State shall undertake to include the considerations of environmental protection, pollution fighting, optimal utilization of the natural resources and sustainable development in the development projects plans.

Article 9

The entities whose activities produce environmental pollution should carry out the following:

(1) Provide means and systems of pollution treatment by utilizing and operating the cleanest environmental techniques, check their adequacy, and rectify any defect immediately and notify the Ministry about it.
(2) Provide measurement devices, observe the pollutants according to their nature and record the results of the measurements in records for this purpose to enable the Minister to acquire them. In case that these devices are not available, the Ministry should carry out the measurements by its devices in the authorized office, consultative authorities and laboratories and it will be subject to the monitoring and auditing of the Ministry.
(3) Establish a database about environmental protection and sustainability, including the concentrations and levels of the pollutants produced from the source and according to their nature.
(4) Using the renewable energy mechanism to reduce pollution.

Article 10

(1) The owner of any project should submit a report that estimates the environmental impact before building the project, it shall include the following:-
 a) Estimation of the positive and negative impacts of the project on the environment and the impact of the surrounded environment on it.

b) The proposed means to avoid and treat the causes of the pollution to comply with regulations and instructions of the environment.
c) Incidental and probable cases of pollution and the precautions which should be taken to avoid them.
d) The possible alternatives to use a less harmful technology to the environment and to reduce the utilization of resources.
e) Reduce and recycle wastes or re-use them whenever its possible.
f) Estimate the environmental feasibility study of the project and estimating the cost of the pollution to the production.

(2) The technical and economic feasibility study of any project shall contain the report stipulated in Item (1) of this Article.

Article 11
The entities whose activities affect the environment adversely shall be prohibited from practicing these activities unless getting an approval from the Ministry.

Article 12
The provisions stipulated in Articles 9, 10 and 11 of this Law shall be applied to the current facilities or their expansions or renewals.

Source: Protection and Improvement of the Environment (Law No.27, 2009), Ministry of Oil Website

(3) Project Category

With respect to the categories for environmental impacts of the projects, Environmental Criteria for Industrial, Agricultural, and Public Service Projects (1990) and Environmental Determinants for the Establishment of Projects and Monitor the Implementation of Safety (Instruction No.3, 2011) list a wide range of potentially polluting industries and activities into three category (A, B and C) and sets out how far certain industrial activities in each class can be located from municipal and urban areas. These projects include such as food, chemical, petrochemical and oil industries. Any port facilities are not included in these projects

Environment Polluting Activities Category (A) – This category is for intensive environmentally polluting activities, including major agricultural or industrial projects that could result in significant impacts on environment quality over large areas. Such activities should be located away from villages, towns, cities, etc., including areas of cities, districts, sub-districts and villages, etc. nominated for development under a rural settlement plan. Suitable pollution controls/ abatement equipment should be provided to protect the environment.

Environment Polluting Activities Category (B) – This category relates to those activities which have less potential to result in pollution than those in Category (A). Such activities include industrial, agricultural, or other activities which can result in site contamination which can be controlled. Such activities can therefore be established within city boundaries and within the development plots allocated for them, provided that pollution control equipment/treatment units are installed in accordance with relevant national regulations and instructions.

Environment Polluting Activities Category (C) – This category relates to activities which cause minor levels of pollution that can be treated i.e. industrial factories that do not result in significant contamination, and small-scale agriculture and residential complexes, hotels, and hospitals, which generate pollution with mainly organic content that can be treated easily using pollution control equipment/treatment units. Such activities can thus be established within and outside of city borders, without any limitation, in accordance with these instructions. This also allows farm owners to set up environmentally non-polluting industries within their farms.

(4) Consultation with Environmental Authority

According to consultations with MOEn (the Environment in the Southern Region) by JICA Study Team, there are no laws or regulations which stipulate EIA at the planning stage in Iraq, therefore the Strategic Environmental Impact Assessment (SEA) report to be prepared in this project is not required to be submitted to MOEn. It was also confirmed that there are no laws or regulations related to dredging and dumping activities, however, consultation with MOEn is requested before commencement of dredged soil dumping.

3.9.2 Organization of Environmental Authority

MOEn is relatively new organization established in 2003 and is composed of the following configurations according to Order No. 896 on 24-11-2011 issued by MOEn.

Ministry Center

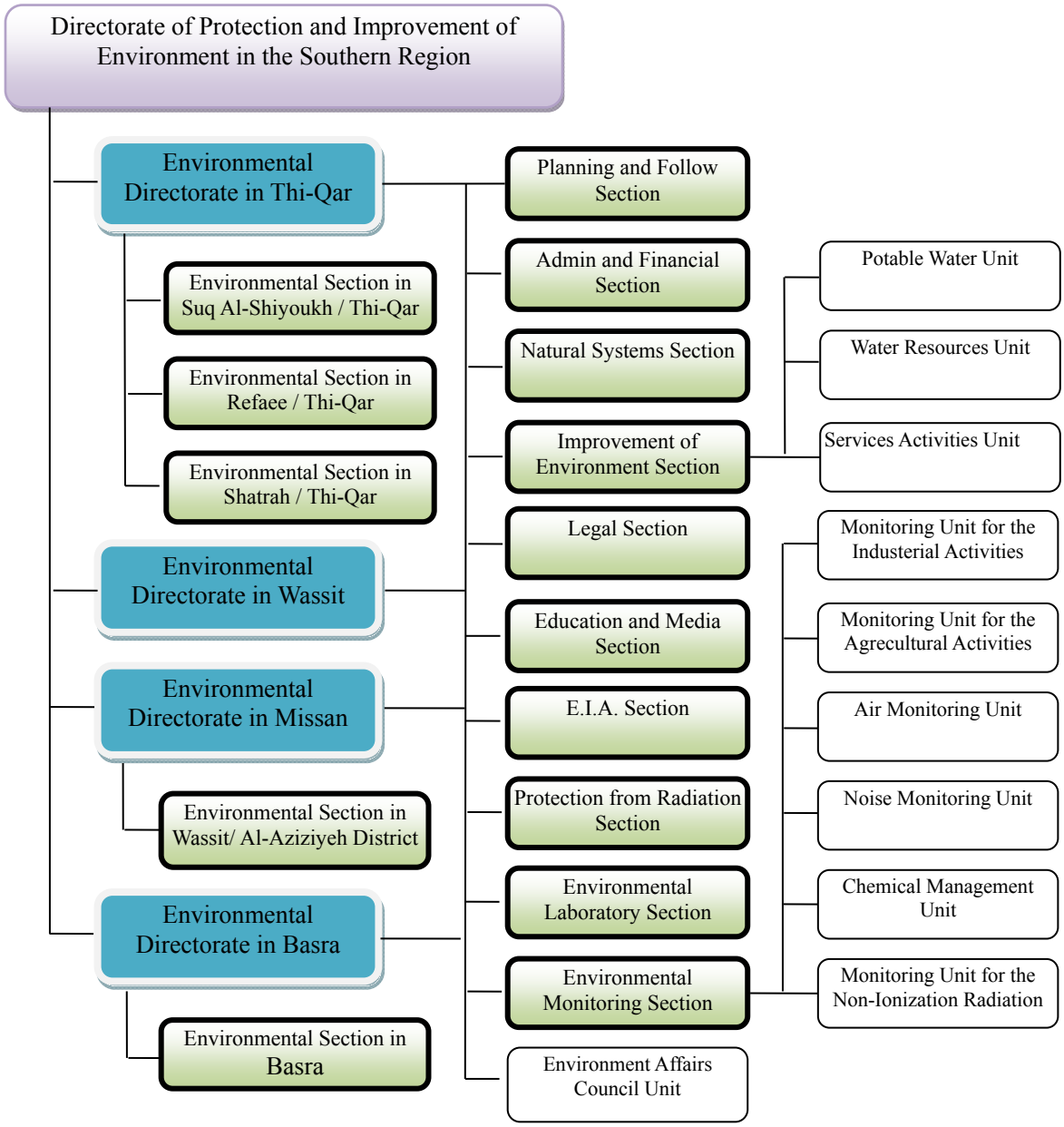
- Minister's Office
- Office of the Inspector General
- Technical Department
- Legal Department
- Department of Planning and Follow-up
- Department of Administrative Service and Finance
- Department of Environmental Awareness and Media
- Department of Internal Audit and Control
- Department of Public Relations
- Section of Relations and International Environment
- Board of Protection and Improvement of Environment
- Contracts Section

Related organization

- Radiation Protection Center
- General Directorate of Protection and Improvement of the Environment in the Southern Region
- General Directorate of Protection and Improvement of the Environment in the Northern Region
- General Directorate of Protection and Improvement of the Environment in the Central Region
- General Directorate of Protection and Improvement of the Environment in Middle Euphrates Region.
- Central Environmental Laboratory

The organization structure of the environment in the southern region who is in charge of Basrah Governorate is shown in Figure 3.9-1.

Board of Protection and Improvement of Environment is established pursuant to the Low No. 27 of 2009. The Board is headed by the Minister of Environment and consists of relevant ministries including MOT and MOO. The Board is held at least once in two months to make advices on the environmental issues or to give opinion on the environmental matters of plans and projects. In each governorate, Board of Protection and Improvement of Environment in the Governorate is established. Chairman of the Board is the governor, and activities and operations are determined by the head of the Board.



Source : Modified by JICA Study Team based on the document of Environment in the Southern Region

Figure 3.9-1 Organization structure of Directorates of Environment in the Southern Region

CHAPTER 4

Chapter 4. Long-term Strategy for Port Development and Administration

4.1 Future Socioeconomic Framework

4.1.1 Population

According to "World Population Prospects, The 2012 Revisions by United Nations", the total population in 2012 in Iraq is expected to be 32.88 million and the growth rate was 2.68 % for the last decade.

In the demand forecast, the future population growth rates were estimated using reference "World Population Prospects, The 2012 Revisions by United Nations". The average annual growth rates towards the respective target years are as follows (see Table 4.1-1):

- Average annual growth rate of 2.60 % in the period of 2012-2025
- Average annual growth rate of 2.03 % in the period of 2025-2035

Table 4.1-1 Population Forecast up to 2035

Year	2002	2012	2015	2020	2025	2030	2035
Population (x 1,000)	25,231	32,884	35,767	40,699	45,892	50,967	56,105
Annual Growth Rate	2.68%		2.60%			2.03%	

Source: World Population Prospects; the 2012 Revision by United Nations

4.1.2 Gross Domestic Product (GDP)

Table 4.1-2 shows the past GDP by World Bank and Forecast of the GDP Growth Rate by IMF. The GDP of Iraq in the year 2012 was estimated to be US$ 53.089 billion. The average annual growth rate was 2.12 % and 7.05 % for the period of 2002-2012 and 2007-2012, respectively. The future annual growth rate of GDP in 2012-2018 is estimated to be 7.23 % using the IMF Data & Statistics as shown in Table 4.1-2.

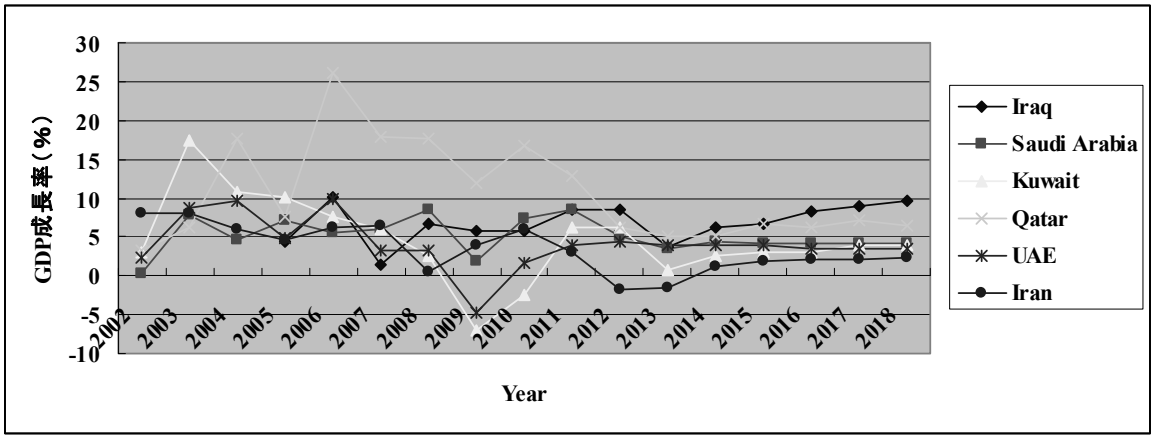
- Average annual growth rate of 2.12 % in the period of 2002-2012 (record for the last decade)
- Average annual growth rate of 7.05 % in the period of 2007-2012 (record for the last five years)
- Average annual growth rate of 7.23 % in the period of 2012-2018 (forecast)

Table 4.1-2 Past GDP and Forecast of GDP Growth Rate

Year	*GDP, Constant Price/Base Year 2005 (million US$)	**GDP Growth Rate (annual %)	***GDP per Capita (current US$)
2000	49,967	-4.30	-
2001	46,669	-6.60	-
2002	43,029	-7.80	-
2003	25,258	-41.30	-
2004	37,003	46.50	1,352
2005	36,744	-0.70	1,794
2006	37,250	1.38	2,266
2007	37,763	1.38	3,003
2008	40,259	6.61	4,328
2009	42,597	5.81	3,575
2010	45,092	5.86	4,278
2011	48,962	8.58	5,529
2012	53,089	8.43	6,305
2013		3.66	6,377
2014		6.34	6,656
2015		6.64	6,869
2016		8.26	7,287
2017		8.95	7,812
2018		9.64	8,468

Source: *World Bank,
**World Bank (2000~2012) and IMF Data & Statistics (2013~2018),
***IMF Data & Statistics

The trend of the GDP growth rate in the Gulf countries belonging to Organization of the Petroleum Exporting Countries (OPEC) is shown in Figure 4.1-1. According to the figure, the growth rate of all the countries was fluctuating before 2012. For example, growth in Qatar and Saudi Arabia had continued with a high percentage but the growth rate dropped in 2009 and 2010 including UAE, most probably due to global recession. According to the "World Economic Outlook-Transitions and Tensions Oct. 2013" by IMF, growth in the oil exporters decelerated substantially in the first half of 2013, driven by falling oil production. Growth will likely increase to 4 percent in 2014 with a recovery in global demand and higher oil production in Saudi Arabia, Iraq and Libya. Sustainable and equitable growth over the medium term depends on an improved sociopolitical environment and macroeconomic stability, increased economic diversification, and accelerated job creation. As a result, it is expected that the GDP growth rate after 2014 for the above countries except Iraq would be about 5 %.



Source: Prepared by Study Team based on IMF Data & Statistics

Figure 4.1-1 Change and Forecast of GDP Growth Rate for Gulf Countries in OPEC

Table 4.1-3 shows forecast of the GDP growth rate in the Non-OECD countries, based on the "OECD Economic Policy Papers No.03, Looking to 2060: Long-term global growth prospects, Nov. 2012" by OECD. According to the above forecast, the growth rate for countries except China, India and Russia is stable or increases a little before 2030 and it will be half of the previous figure after 2030 for almost all of the countries. Further the growth rate of Saudi Arabia, which is like Iraq in terms of population and the industrial frame, will change between 4.2~4.4 %/year and 2.4 %/year before 2030 and after 2030, respectively.

Table 4.1-3 Forecast of GDP Growth Rate by OECD

	Average growth in GDP 1995-2011	Average growth in GDP 2011-2030	Average growth in GDP 2030-2060
Argentina	3.6	3.6	2.2
Brazil	3.3	4.1	2.0
China	10.0	6.6	2.3
Indonesia	4.4	5.3	3.4
India	7.5	6.7	4.0
Russia	5.1	3.0	1.3
Saudi Arabia	4.4	4.2	2.4
South Africa	3.4	3.9	2.5

Source: OECD Economic Policy Papers No.03, Looking to 2060: Long-term global growth prospects, Nov. 2012, OECD

According to the "National Development Plan 2013-2017" by Ministry of Planning in Iraq, the GDP growth rate will be an annual average of 13.31 % at fixed 2012 prices over the duration of the plan. Further the plan aims that non-oil economic activities (commodities + distribution + services) and crude oil activity would have an annual growth rate of 7.5 %/year and 18.7 %/year, respectively.

4.2 Future Scenario of Shipping Network serving Iraq and the Gulf

Three (3) Scenarios can be proposed for the possible Future Shipping Network in the Gulf including Iraq. (Bulkers and tankers business is excluded from the study as it is not suitable for the wording of network)

Scenario 1

"Feeder method will be prevailing in the future in the same manner as before. Containers will be on-carried to the destination by feeder boats from the hub at the mouth of the Gulf"

Irrelevant to the capacity of ports, it is most probable that the feeder system is prevailing in the Gulf from the viewpoint of carriers' economy even in 2035 and thereafter. It is 500 nautical miles deviation from UAE ports to Iraqi ports. That means 3 days deviation at minimum: 2 days of steaming and 1 day port stay. Carriers are using large vessels of 9500TEU type on average for their Europe-Asia services. In order to deviate to Iraq, one more vessel is needed to maintain the loop.

For example, the typical ships' turnaround of voyage (loop) is 70 days. If a loop is extended by 3 days, the turnaround will be 77 days to maintain weekly services. Naturally, 11 (eleven) vessels is needed (77 days÷7days). The annual additional cost will be, 1 (one) additional ship's cost, 7 day x 10 ships' cost and fuel cost of 11 x 2 days. Besides, the carrier must bear the risk of delayed transit time for the important destinations in the competitive business environment.

The feeder cost is far less than the direct call, even if a carrier should charter a Panamax containership as was explained before in 3.3.3. Trial calculation was based on 4,000 TEUs transportation demand to Iraq via Dubai. However, 4,000 TEUs loading or discharge at one port is very extraordinary. Only Shanghai, Hong Kong or Singapore may fulfill this standard. In 2012, 1,750 TEUs were discharged primarily to Dubai on average. Therefore, feeder method is one of most efficient ways of transportation by gathering small quantity of cargo from various vessels for on-carriage. This lowers the price of imports and reduces the public burden. The hub and feeder concept is the fundamental concept of any means of transportation.

Bandar Abbas has a possibility to become a hub as it situates at the mouth of the Gulf and is expected to have a large amount of primary cargo to Iran. Services from Indian Ocean may increase. Middle size containerships up to Panamax will be sufficient to carry the expected demand. For such sized containerships, it is sometimes economical to pay direct call to other Gulf ports when the quantity reaches economical breakeven for the carriers.

Scenario-2

"As the economy of the Indian Ocean Rim develops, intra-regional service route may increase in accordance with the regional trade growth. Africa, Indian subcontinent including the rim of the Andaman Sea and the Bay of Bengal, and Middle East will have tighter economic relationships. As the regional trade develops, the liner services might swell up to 150 loops. Gulf ports may become busy by accepting those vessels"

It is promising that the economy of Iran and Iraq will develop. As the industrial goods export increases in the future, the purchasing power grows and there will be more imports to both countries. When the carriers find it profitable, they will start or reinforce the Indian Ocean route. For example, the route may be to start from the hub in Malaysia or Sri Lanka, call West Coast of India, Pakistan and the Gulf ports. Some may start from East Africa or Turkey to India via the Gulf. The ship size can become as large as Panamax size.

However, the ship size for such short sea services is not likely to exceed Panamax size by 2035. The characteristics of inter-regional liner services are to deploy small vessels among small number of ports of short distance. In the case of East Asia regional trade, 800 ships for 450 loops having the average capacity is 1,400 TEUs as of June, 2013. Europe/North America Liner Services, one of three major routes, have 34 loops using 4600TEU ships on average. It is easy to assume the future size of vessels needed.

Scenario 3

"The cost structure may change. The transshipment cost of the hub port goes up to the level where the economy of the carriers cannot maintain transshipment by paying twice cargo work expenses in the hub port. And eventually, it becomes common to call the destination ports, especially at Iranian and Iraqi ports"

It is more practical that mother ships call at Iraqi ports if the cargo volume reaches 4,000 TEUs per call. The reason why the transshipment cost at UAE is small is because the government aimed its ports to function as hub ports. It will be the key for the UAE ports to maintain their low cost.

The steaming to the mouth of the Gulf is some 1,600 nautical miles deviation when compared with the direct steaming from the Suez to Colombo, Sri Lanka. It is imperative for the carriers to make profit without adopting feeder method. This requires the carriers to call the Gulf ports as the final destination. And, this will happen when the charter rate of feeder vessels recovered the normal rate and the purchasing power of Iran/Iraq area considerably increased.

4.3 Prospects of Cargo Traffic Demand

4.3.1 General

Future cargo volumes are forecast by commodity for imported and exported cargoes (Micro Analysis). These forecasted volumes are grouped by imported and exported cargoes and summed up as the total imported cargo, the exported cargo and the grand total cargo. Further macro analysis is conducted in consideration of a correlation with the indicator in the hinterland. As a result, it is confirmed that there is no significant error in comparison between the results of macro analysis and micro analysis.

4.3.2 Demand Forecast by Macro Analysis

Real Gross Domestic Product is the main economic indicator common to all countries in the world and there is a strong correlation between real GDP and cargo volumes handled at the international ports. It is considered as a confirmed fact all over industry in the country that a production rate on each industry will change if real GDP changes because real GDP accounts for price changes that may occur due to inflation. Based on the above, it is judged to be adequate that real GDP is used as a socioeconomic indicator for the forecast of cargo volumes handled at ports in Iraq, and macro analysis will be conducted to obtain the future cargo volumes.

The average annual growth rate in Iraq was 2.12 % and 7.05 % for the last decade and the last five years, respectively. According to IMF Data and Statistics, the average annual growth rate is forecast to be 7.23 % from 2012 to 2018. It is expected that the GDP growth rate for the Gulf countries except Iraq will be about 5 %. Further the GDP growth rate will be an annual average of 13.31 % at fixed 2012 prices over the duration of the plan, according to the "National Development Plan 2013-2017" by Ministry of Planning in Iraq.

Based on the above information, the following GDP growth rate for Iraq in the future is assumed:

- The average annual middle growth rate will be 7.5% from 2012 to 2018, based on IMF Data and Statistics and the average annual high growth rate will be 9.5%, reflecting the active target by "National Development Plan 2013-2017", and referring to 9.64%/year in 2018 forecasted by the IMF Data & Statistics shown in Table 4.1-2. The average annual low growth rate will change like the rate in the other Gulf countries.
- The average growth rate from 2012 to 2025 will be the same as the rate from 2012 to 2018.
- The average annual middle growth rate from 2012 to 2035 will be 6.0 %, referring the future growth rate of the Non-OECD countries, based on the OECD Economic Policy Papers No.03, Looking to 2060: Long-term global growth prospects, Nov. 2012". Further it is assumed that the growth rate in Iraq will be restored to the state which the other Gulf countries retraced, considering that the growth rate in Iraq is higher compared to their rate in the same period. The high and low growth rates are assumed to be 7.5 % and 4.4 % respectively.

The future GDP growth rates in Iraq by the growth scenario are shown in Table 4.3-1.

Table 4.3-1 Future GDP Growth Rate in Iraq

Scenario/Year	2012～2018	2012～2025	2012～2035
Low Growth	5.5 %	5.5 %	4.4 %
Middle Growth	7.5 %	7.5 %	6.0 %
High Growth	9.5 %	9.5 %	7.5 %

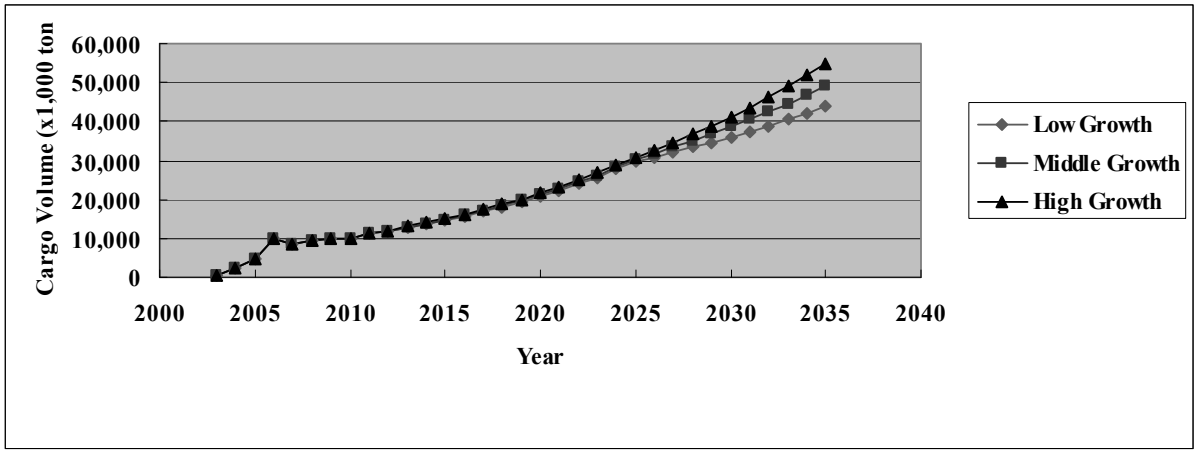
Source: Prepared by JICA Study Team based on view of forecasts of IMF, OECD and Iraq NDP (2013-2017)

4.3.3 Result of Macro Analysis

Future cargo demand is closely related to the socioeconomic activities in the port hinterland. The cargo volume by macro analysis is estimated based on the correlation between GDP in Iraq and cargo volumes in ports of Iraq. The projected cargo volume except liquid bulk is calculated using the following regression formula. Results are shown in Figure 4.3-1.

$Y = 0.2202 X + 314.51$ $(R^2 = 0.9579)$

Where, X: GDP in Iraq (million US$)
Y: Future Cargo Volume (thousand MT)



Source: JICA Study Team

Figure 4.3-1 Demand Forecast by Macro Analysis

4.3.4 Result of Micro Analysis

Besides the abovementioned Macro Analysis, future demand for import and export of typical commodities is estimated by commodity-wise analysis. Estimated volume of import and export is summarized as shown in Table 4.3-2.

Table 4.3-2 Forecast Cargo Volumes for Ports in Iraq

Cargo/Year	Unit	2012	2015			2025			2035		
			Low	Middle	High	Low	Middle	High	Low	Middle	High
(Import Cargo)											
1. Container Cargo	**TEU**	**294,649**	**433,000**	**483,000**	**535,000**	**1,045,000**	**1,454,000**	**1,964,000**	**1,553,000**	**2,359,000**	**3,471,000**
2. Conventional Cargo											
(1) Grain (wheat)	ton	2,644,783	1,372,000	2,244,000	2,520,000	1,152,000	1,152,000	2,149,000	1,707,000	1,707,000	2,703,000
(2) Rice	ton	1,092,684	1,211,000	1,211,000	1,211,000	1,416,000	1,416,000	1,416,000	1,531,000	1,531,000	1,531,000
(3) Sugar	ton	742,239	773,000	773,000	773,000	1,129,000	1,129,000	1,129,000	1,549,000	1,549,000	1,549,000
(4) Cement	ton	1,587,269	0	1,100,000	3,000,000	0	1,800,000	5,400,000	0	2,600,000	6,600,000
(5) Steel & Pipes	ton	734,129	330,000	550,000	770,000	290,000	840,000	950,000	320,000	1,080,000	1,140,000
(6) Vehicle	no.	69,694	93,000	93,000	93,000	570,000	570,000	570,000	686,000	686,000	686,000
(7) Others	ton	922,477	551,000	878,000	1,236,000	596,000	947,000	1,650,000	763,000	1,265,000	2,021,000
Sub-total (except Vehicle)	**ton**	**7,723,581**	**4,237,000**	**6,756,000**	**9,510,000**	**4,583,000**	**7,284,000**	**12,694,000**	**5,870,000**	**9,732,000**	**15,544,000**
3. Liquid Bulk (Oil Product)	ton	2,731,572	0	4,510,000	4,750,000	0	0	480,000	0	0	4,520,000
Import Total	ton	**10,455,153**	**4,237,000**	**11,266,000**	**14,260,000**	**4,583,000**	**7,284,000**	**13,174,000**	**5,870,000**	**9,732,000**	**20,064,000**
(Export Cargo)											
1. Container Cargo (Empty)	**TEU**	**294,644**	**433,000**	**483,000**	**535,000**	**1,045,000**	**1,454,000**	**1,964,000**	**1,553,000**	**2,359,000**	**3,471,000**
2. Conventional Cargo											
(1) Dates	ton	82,510	106,000	106,000	106,000	0	0	0	0	0	0
(2) Others	ton	0	0	0	0	0	0	0	0	0	0
Sub-total	**ton**	**82,510**	**106,000**	**106,000**	**106,000**	**0**	**0**	**0**	**0**	**0**	**0**
3. Liquid Bulk											
(1) Oil Product (Heavy fuel oil)	ton	365,772	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
(2) Oil Product (Gasoline, Gasoil	ton	0	0	0	710,000	3,480,000	5,220,000	9,320,000	2,390,000	2,450,000	6,610,000
(3) LNG/LPG	ton	0	0	0	0	2,000,000	2,000,000	2,000,000	4,000,000	4,000,000	4,000,000
Sub-total	**ton**	**365,772**	**600,000**	**600,000**	**1,310,000**	**6,080,000**	**7,820,000**	**11,920,000**	**6,990,000**	**7,050,000**	**11,210,000**
Export Total	**ton**	**448,282**	**706,000**	**706,000**	**1,416,000**	**6,080,000**	**7,820,000**	**11,920,000**	**6,990,000**	**7,050,000**	**11,210,000**
Grand Total											
Container Cargo	**TEU**	**589,293**	**866,000**	**966,000**	**1,070,000**	**2,090,000**	**2,908,000**	**3,928,000**	**3,106,000**	**4,718,000**	**6,942,000**
Conventional Cargo	**ton**	**7,806,091**	**4,343,000**	**6,862,000**	**9,616,000**	**4,583,000**	**7,284,000**	**12,694,000**	**5,870,000**	**9,732,000**	**15,544,000**
Liquid Bulk Cargo	**ton**	**3,097,344**	**600,000**	**5,110,000**	**6,060,000**	**6,080,000**	**7,820,000**	**12,400,000**	**6,990,000**	**7,050,000**	**15,730,000**

Source: Prepraed by JICA Study Team

(1) Container Cargoes

1) TEU/BOX Ratio

The TEU/BOX ratio in each terminal has been reported by GCPI as shown in Table 4.3-3. The table shows an average TEU/BOX ratio to be about 1.6. In addition the average TEU/BOX ratio is about 1.5 according to the recent world trend in "Container Census 2013", while the ratio in developing countries is bigger than 1.5 because 20' containers tend to increase.

Table 4.3-3 TEU/BOX Ratio at the Terminal in UQP

	Berth 20 (UQP-N)			ICT (UQP-N)			UQP-S			Average
	20' (%)	40' (%)	TEU/BOX Ratio	20' (%)	40' (%)	TEU/BOX Ratio	20' (%)	40' (%)	TEU/BOX Ratio	TEU/BOX Ratio
2012	50	50	1.50	47	53	1.53				
2013	44	56	1.56	32	68	1.68	40	60	1.60	
TEU/BOX Ratio			1.53			1.61			1.60	1.6
Share (%)			12.5			50.0			37.5	

Source: Prepared by JICA Study Team based on the GCPI's information

As a result, it is assumed that the TEU/BOX ratio from 2006 to 2009 and from 2010 to 2012 is 1.7 and 1.6 in ports of Iraq respectively.

2) Number of Containers Handled at Ports

It has been reported that GCPI's data on the container cargo volume shows only imported containers. In consideration of the above TEU/BOX ratio, the number of containers and the total weight of the container volume from 2006 to 2012 in ports of Iraq are shown in Table 4.3-4 to Table 4.3-7.

The number and the total weight of containers handled at KZP are shown in Table 4.3-5. An average weight of containers (=12.4 ton/TEU) handled at UQP is used to calculate the weight of containers in KZP.

Table 4.3-4 Number and Total Weight of Containers Handled at UQP

(Unit: MT)

Year		Number of Containers		Total Weight (MT)	Weight/TEU (MT/TEU)
		Box	TEU		
2006	Laden	39,463	67,087	819,573	12.2
	Empty	39,463	67,087		
	Subtotal	78,926	134,174		
2007	Laden	40,778	69,323	823,475	11.9
	Empty	40,778	69,323		
	Subtotal	81,556	138,645		
2008	Laden	75,372	128,132	1,562,767	11.0
	Empty	75,372	128,132		
	Subtotal	150,744	264,236		
2009	Laden	86,009	146,215	1,817,238	12.2
	Empty	86,009	146,215		
	Subtotal	172,018	292,431		
2010	Laden	132,008	211,213	2,776,358	13.1
	Empty	132,008	211,213		
	Subtotal	264,016	422,426		
2011	Laden	123,927	198,283	2,662,142	13.4
	Empty	123,927	198,283		
	Subtotal	247,854	396,566		
2012	Laden	166,021	265,634	3,475,367	13.1
	Empty	166,021	265,634		
	Subtotal	332,042	531,267		

Source: Prepared by JICA Study Team based on GCPI's data

Table 4.3-5 Number and Total Weight of Containers Handled at KZP

(Unit: MT)

Year		Number of Containers		Total Weight (MT)	Weight/TEU (MT/TEU)
		Box	TEU		
2006	Laden	855	1,454	18,023	12.4
	Empty	855	1,454		
	Subtotal	1,710	2,907		
2007	Laden	2,339	3,976	49,306	12.4
	Empty	2,072	3,522		
	Subtotal	4,411	7,499		
2008	Laden	2,473	4,204	52,131	12.4
	Empty	3,191	5,425		
	Subtotal	5,664	9,629		
2009	Laden	1,047	1,780	22,071	12.4
	Empty	1,518	2,581		
	Subtotal	2,565	4,361		
2010	Laden	1,535	2,456	30,454	12.4
	Empty	1,425	2,280		
	Subtotal	2,940	4,736		
2011	Laden	1,007	1,611	19,979	12.4
	Empty	1,012	1,619		
	Subtotal	2,019	3,230		
2012	Laden	453	725	8,988	12.4
	Empty	450	720		
	Subtotal	903	1,445		

Source: Prepared by JICA Study Team based on GCPI's data

The number of containers and the total weight of the container volume handled at the Abu Flus port are shown in Table 4.3-6.

Table 4.3-6 Number and Total Weight of Containers Handled at Abu Flus

(Unit: MT)

Year		Number of Containers		Total Weight (MT)	Weight/TEU (MT/TEU)
		Box	TEU		
2006	Laden	0	0	0	-
	Empty	0	0		
	Subtotal	0	0		
2007	Laden	23	39	650	16.5
	Empty	23	39		
	Subtotal	46	79		
2008	Laden	8,006	13,610	224,572	16.5
	Empty	8,006	13,610		
	Subtotal	16,012	27,220		
2009	Laden	9,527	16,196	267,240	16.5
	Empty	9,527	16,196		
	Subtotal	19,045	32,392		
2010	Laden	12,119	19,391	319,961	16.5

	Empty	12,119	19,391		
	Subtotal	24,239	38,782		
2011	Laden	17,326	27,722	461,007	16.6
	Empty	17,326	27,722		
	Subtotal	34,652	55,443		
2012	Laden	17,682	28,291	466,809	16.5
	Empty	17,682	28,291		
	Subtotal	35,364	56,582		

Source: Prepared by JICA Study Team based on GCPI's data

3) Forecast of Container Cargoes

The volume of imported container cargoes has been increasing along with GDP growth in the same period as shown in Table 4.3-7.

The projected volume of imported container cargoes is estimated by adopting the linear regression analysis by correlating with GDP in Iraq.

$$Y = 27.745\ X - 863{,}792\ (R^2 = 0.928)$$

Where, X: GDP in Iraq (x 1,000 US$)
Y: Imported Container Volume (TEU)

Accordingly, the projected volume (middle growth) of container cargoes handled at ports is as follows.

Table 4.3-7 Forecast of Container Cargoes

Year	2006	2007	2008	2009	2010	2011	2012	2025	2035
GDP (Million US$)	37,250	37,763	40,259	42,597	45,092	48,962	53,089	135,930	201,209
Container Volume Import (TEU)	68,541	73,338	145,947	164,191	233,060	227,616	294,649	1,454,000	2,359,000
Container Volume Export (TEU)	68,541	72,924	147,167	164,992	232,884	227,624	294,644	1,454,000	2,359,000
Container Volume Total (TEU)	137,081	146,262	293,114	329,183	465,944	455,240	589,293	2,908,000	4,718,000

Source: Prepared by JICA Study Team based on GCPI's data

(2) Conventional Cargoes

1) Wheat

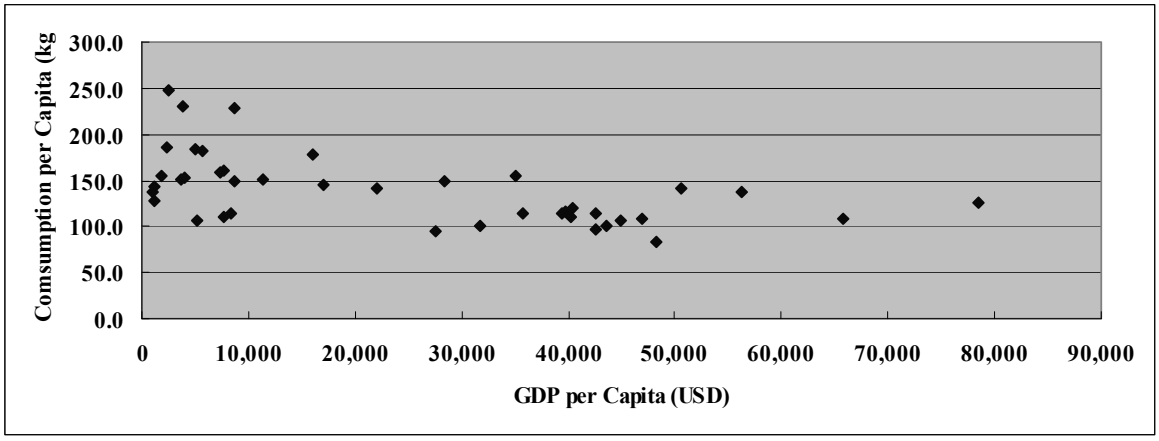
Table 4.3-8 shows past trend of wheat consumption, production and import in Iraq. According to the table, an average consumption rate per capita and an average share of wheat import in ports to the total import volume (wheat and flour) from 2006 to 2011 are 195 kg/year and 72 % respectively.

Table 4.3-8 Trend of Wheat Consumption, Production and Import in Iraq

Year	2006	2007	2008	2009	2010	2011	2012
Population (x1,000)	28,094	28,811	29,528	30,245	30,962	31,923	32,884
Consumption per capita (kg)	221	186	165	194	188	214	-
Domestic Consumption (x1,000ton)	6,220	5,349	4,879	5,859	5,812	6,847	-
Domestic Production (x1,000ton)	2,086	2,203	1,255	1,700	2,749	2,809	-
Import Volume (x1,000ton)	4,134	3,147	3,624	4,159	3,063	4,038	-
Wheat (bulk)	2,839	2,424	2,963	3,050	1,855	2,889	-
*Flour (container)	1,295	723	661	1,108	1,209	1,149	-
Import from Ports as bulk cargo (x1,000ton)	2,861	2,331	3,293	2,913	1,811	2,762	2,645
Share of Bulk Import (%)	69	74	91	70	59	68	-

Note: *Flour converted into wheat (conversion factor=0.74)
Source: Prepared by JICA Study Team based on the data of FAO and World Bank

Figure 4.3-2 shows relationship between the consumption rate per capita of cereals and GDP per capita in the selected countries. According to the figure, the consumption rate per capita of cereals is trending smaller as GDP per capita is larger. For example, the consumption rate ranges from 100 kg to 250 kg in case of GDP per capita less than 10,000 USD and its rate ranges from 100 kg to 200 kg in case of GDP per capita between 10,000 USD and 30,000 USD.



Source: Prepared by JICA Study Team based on the data of FAO and World Bank, 2009

Figure 4.3-2 Consumption Rate of Cereals and GDP per Capita in Selected Countries

Based on the above trend, the future consumption rate per capita of cereals in Iraq is assumed as shown in .

Table 4.3-9 Future Consumption Rate per Capita of Cereals in Iraq

	2006~2011	2013	2015	2025	2035
GDP per capita (USD)		6,377	6,869	14,509	19,331
Total Consumption Rate (kg)	240(average)	240	233	200	180
Wheat (kg)	195	195	189	160	145
Rice (kg)	45	45	44	40	35

Source: Prepared by JICA Study Team based on the data of FAO and World Bank

The consumed volume of wheat in the future is estimated by multiplying estimated population and consumption rate per capita in the future. The future production volume of wheat in Iraq is calculated based on following scenarios:

- High growth case: Future wheat production is based on the wheat production plan of National Development Plan (NDP) 2013-2017 by Ministry of Planning, Republic of Iraq and remains at the target volume after year 2017.

- Middle growth case: Future wheat production is based on the growth rate for the past 6 years (from 2006 to 2011) with an upper limit of the target volume in NDP 2013-2017.
- Low growth case: It is assumed that 75 % of the target rate described in NDP 2013-2017 will be achieved at year 2025 and remains after that.

In consideration of the above scenarios, the future import volume of wheat is estimated as shown in Table 4.3-8. A consumption rate per capita and a share of wheat import from ports to the total import volume (wheat and flour) are assumed to be 195 kg in 2013 and 70 % respectively.

Table 4.3-10 Future Import Volume of Wheat

	2011	2013	2015	2025	2035
Population (x1,000)	31,923	33,845	35,767	45,892	56,105
Consumption per capita (kg)	214	195	189	160	145
Domestic Consumption (x1,000ton)	6,847	6,600	6,766	7,343	8,135
Domestic Production (x1,000ton)	2,808				
High growth		3,784	4,806	5,697	5,697
Middle growth		3,162	3,560	5,697	5,697
Low growth		2,982	3,166	4,273	4,273
Import Volume (x1,000ton)	4,038				
High growth		2,816	1,960	1,646	2,438
Middle growth		3,438	3,206	1,646	2,438
Low growth		3,618	3,600	3,070	3,862
Import from Port as bulk cargo (x1,000ton)	2,762				
High growth		1,971	1,372	1,152	1,707
Middle growth		2,407	2,244	1,152	1,707
Low growth		2,533	2,520	2,149	2,703

Source: Prepared by JICA Study Team based on the data of FAO and World Bank

2) Rice

Table 4.3-11 shows past trend of rice consumption, production and import in Iraq. According to the table, an average consumption rate per capita and an average share of rice import from ports to the total import volume are 44 kg/year and 88 % from 2006 to 2011 respectively.

Table 4.3-11 Past Trend of Rice Consumption, Production and Import in Iraq

Year	2006	2007	2008	2009	2010	2011	2012
Population (x1,000)	28,094	28,811	29,528	30,245	30,962	31,923	32,884
Consumption per capita (kg)	60	39	44	42	41	34	-
Domestic Consumption (x1,000ton)	1,692	1,129	1,300	1,273	1,279	1,078	-
Domestic Production (x1,000ton)	363	393	248	173	156	235	-
Import Volume (x1,000ton)	1,329	736	1,052	1,100	1,123	843	-
Import from Ports (x1,000ton)	957	688	969	955	947	1,049	1,093
Share of Import from Ports(%)	72	94	92	87	84	100	-

Source: Prepared by JICA Study Team based on the data of FAO and World Bank

The consumed volume of rice in the future is estimated by multiplying estimated population and consumption rate per capita in the future. The future production volume of rice in Iraq is calculated based on the rice production plan of National Development Plan (NDP) 2013-2017 by Ministry of Planning, Republic of Iraq and remains at the target volume after year 2017.

The future import volume of rice is estimated as shown in Table 4.3-10, based on the consumption rate per capita of cereals in the future in Table 6.1.8. A consumption rate per capita and a share of rice import from ports to the total import volume are assumed to be 45 kg/year in 2013 and 90 % respectively.

Table 4.3-12 Future Import Volume of Rice

	2011	2013	2015	2025	2035
Population (x1,000)	31,923	33,845	35,767	45,892	56,105
Consumption per capita (kg)	33.8	45.0	44.2	40.0	35.0
Domestic Consumption (x1,000ton)	1,078	1,523	1,580	1,836	1,964
Domestic Production (x1,000ton)	235	176	234	263	263
Import Volume (x1,000ton)	843	1,347	1,346	1,573	1,701
Import from Ports (x1,000ton)	1,049	1,212	1,211	1,416	1,531

Source: Prepared by JICA Study Team based on the data of FAO and World Bank

3) Sugar

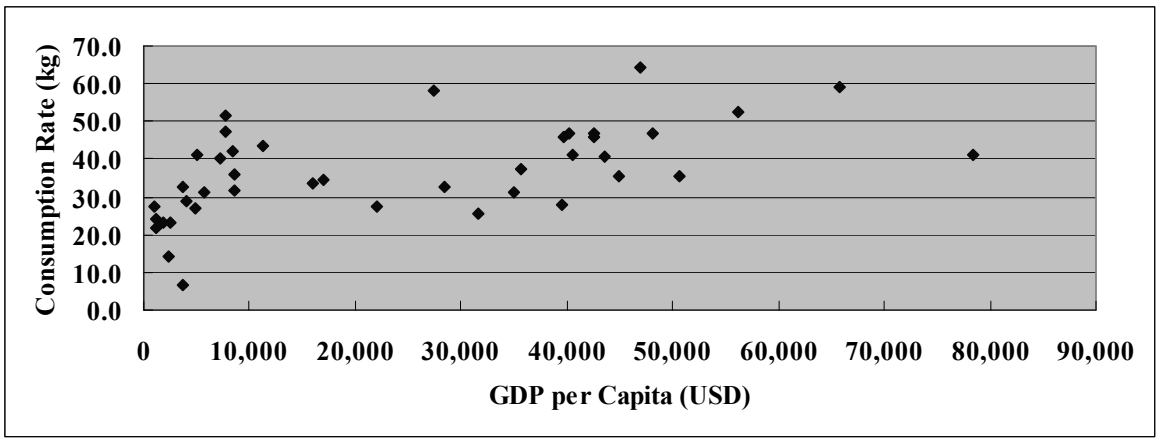
Table 4.3-13 shows past trend of sugar consumption and import in Iraq. Sugar has not been produced in Iraq. According to the table, an average consumption rate per capita and an average share of sugar import to the total import volume are 35 kg/year and 63 % from 2006 to 2011 respectively.

Table 4.3-13 Past Trend of Sugar Consumption and Import in Iraq

Year	2006	2007	2008	2009	2010	2011	2012
Population (x1,000)	28,094	28,811	29,528	30,245	30,962	31,923	32,884
Consumption per capita (kg)	47	26	36	36	36	26	-
Domestic Consumption (x1,000ton)	1,329	736	1,052	1,100	1,123	843	-
Import Volume (x1,000ton)	1,329	736	1,052	1,100	1.123	843	-
Import from Ports (x1,000ton)	419	844	702	347	547	826	742
Share of Import from Ports(%)	32	100	67	32	49	98	-

Source: Prepared by JICA Study Team based on the data of FAO and World Bank

Figure 4.3-3 shows relationship between the consumption rate per capita of sugar and GDP per capita in selected countries. According to the figure, the consumption rate per capita of sugar is fluctuating having no connection with GDP per capita. Over sixty kilograms per year (60 kg/year) of the consumption rate seems to be upper limit.



Source: Prepared by JICA Study Team based on the data of FAO and World Bank, 2009

Figure 4.3-3 Consumption Rate of Sugar and GDP per Capita in Selected Countries

Referring to the above trend, the consumption rate per capita of sugar in the future is calculated as shown in Table 4.3-14. The consumed volume of sugar in the future has been estimated by multiplying estimated population and consumption per capita in the future. In this demand forecast, taking account of the recent consumption, the future consumption of sugar in Iraq is calculated on the assumption that per capita consumption in Iraq will increase by 0.5 kg/year up to 60 kg/year and remain at 60 kg/year after that.

A consumption rate per capita and a share of sugar import from ports to the total import volume are assumed to be 35 kg/year in 2013 and 60 % respectively.

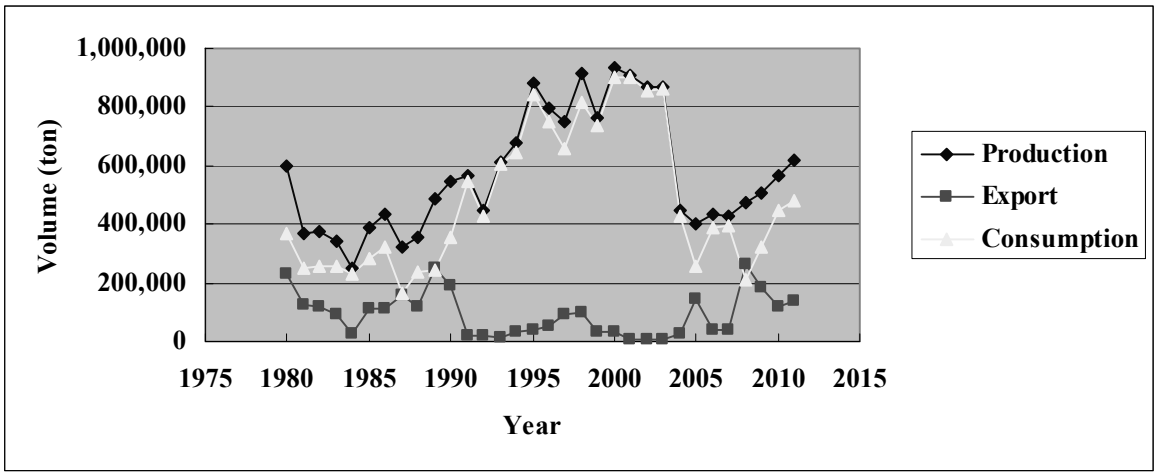
Table 4.3-14 Future Import Volume of Sugar

	2011	2013	2015	2025	2035
Population (x1,000)	31,923	33,845	35,767	45,892	56,105
Consumption per capita (kg)	26.4	35.0	36.0	41.0	46.0
Domestic Consumption (x1,000ton)	843	1,185	1,288	1,882	2,581
Import Volume (x1,000ton)	843	1,185	1,288	1,882	2,581
Import from Ports (x1,000ton)	826	711	773	1,129	1,549

Source: Prepared by JICA Study Team based on the data of FAO and World Bank

4) Dates

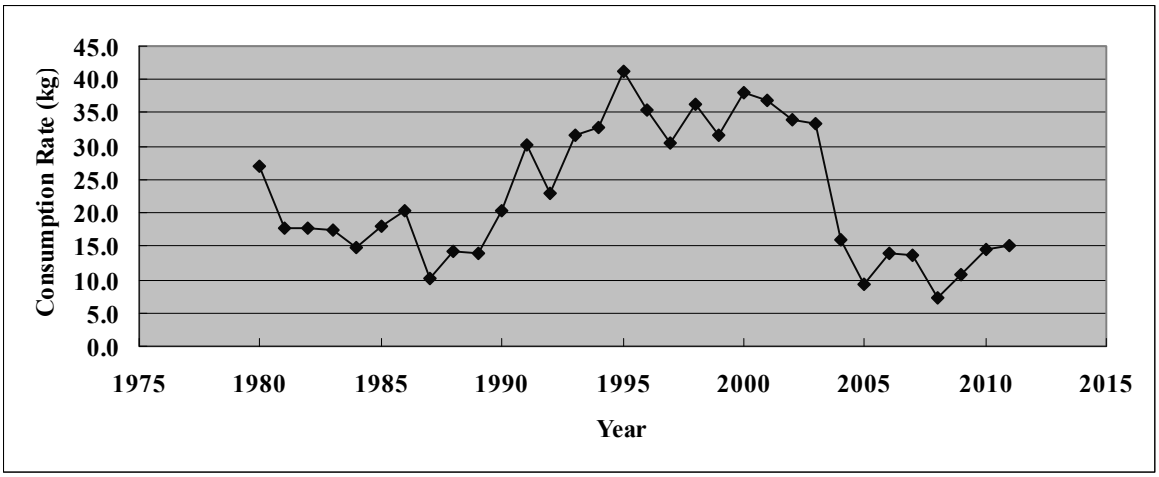
Figure 4.3-4shows changes of the production, export and consumption volume of dates in Iraq. The production volume increased since 1984 and suddenly dropped in 2003 due to the Iraq War. In addition its volume has increased again after the war. The consumption volume is also trending as well. The export volume is fluctuating without any trend. It is estimated that surplus products are exported after required products are consumed in the domestic market.



Source: Prepared by JICA Study Team based on Data of FAOSTAT

Figure 4.3-4 Production, Export and Consumption Volume of Dates in Iraq

The consumption rate per capita of dates in Iraq is shown in Figure 4.3-5. Its rate has changed as well as the production volume with time lag of few years. This means that the consumption rate per capita was bigger as the production rate was increasing and the reverse has also occurred. For example the consumption rate per capita had increased with a rate of over 3 kg/year from 1987 to 1995.



Source: Prepared by JICA Study Team based on Data of FAOSTAT

Figure 4.3-5 Annual per Capita Consumption of Dates in Iraq

The consumed volume of dates in the future has been estimated by multiplying estimated population and consumption per capita in the future. The future production volume of dates in Iraq is calculated based on the dates' production plan of National Development Plan (NDP) 2013-2017 by Ministry of Planning, Republic of Iraq and remains at the target volume after year 2017. Based on the trend in Figure 4.3-4 and Figure 4.3-5, it is assumed that the consumption rate per capita will be bigger with a rate of 3 kg/year as the production volume will increase with its upper limit (= 1,050,000 tons).

Table 4.3-15 shows future export volumes of dates in Iraq. A consumption rate per capita and a share of dates export from ports to the total export volume are assumed to be 15 kg/year in 2013 and 100 % respectively.

Table 4.3-15 Future Export Volume of Dates

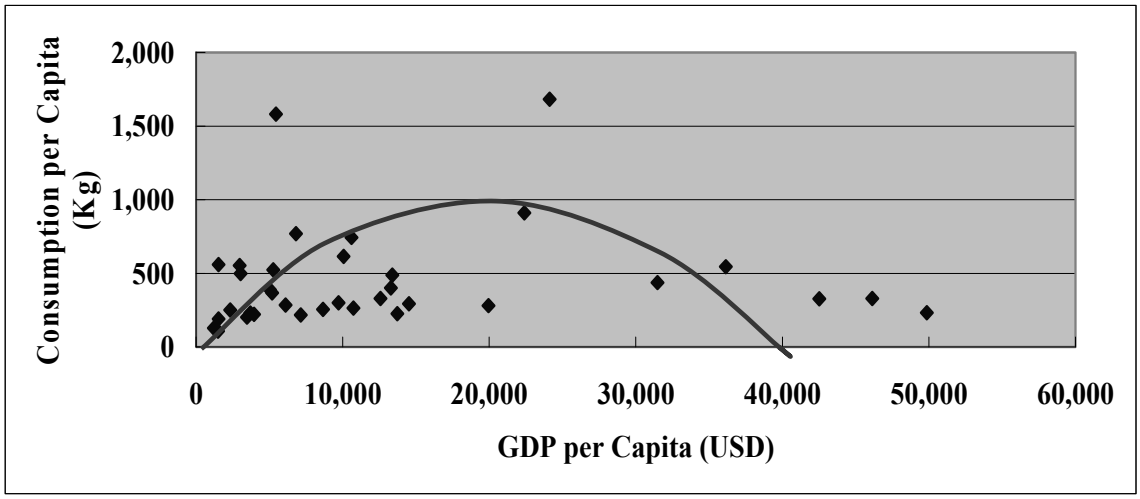
	2011	2013	2015	2025	2035
Population (x1,000)	31,923	33,845	35,767	45,892	56,105
Consumption per capita (kg)	15.1	15	21	23	19
Domestic Consumption (x1,000ton)	481	508	751	1,050	1,050
Domestic Production (x1,000ton)	619	679	857	1,050	1,050
Export Volume (x1,000ton)	138	171	106	0	0
Export from Ports (x1,000ton)	113	171	106	0	0

Source: Prepared by JICA Study Team based on the data of FAO and World Bank

5) Cement

Source: Prepared by JICA Study Team based on the data of International Cement Review and World Bank, 2011

Figure 4.3-6 shows relationship between consumption rate per capita of cement and GDP per capita in 2011 in the selected countries. Consumption per capita rates still remain low in most countries. It is found that most undeveloped countries are on the rising part of the cement consumption on bell-curve, which suggests that consumption per capita tends to rise in an early stage of economic development before GDP per capita reaches advanced levels and will be more moderate at a low level as GDP per capita will grow.



Source: Prepared by JICA Study Team based on the data of International Cement Review and World Bank, 2011

Figure 4.3-6 Relationship between Consumption Rate of Cement and GDP per Capita in the Selected Countries

Past trend of cement consumption, production and import volumes in Iraq is shown in Table 4.3-16. Statistical data from "International Cement Review" and "International Trade Centre" are referred to for figures of domestic production rates and import volumes respectively. Consumption of cement in Iraq has been increasing in recent years and the volume of Iraqi cement imports also increasing steadily for the past 5 years owing to massive construction activity in the country's commercial, industrial and residential sectors. Recently about 60~70% of local consumption of cement has been imported, mainly from Iran and Turkey.

Table 4.3-16 Past Trend of Cement Consumption, Production and Import in Iraq

Year	2006	2007	2008	2009	2010	2011	2012
Population (x1,000)	28,094	28,811	29,528	30,245	30,962	31,923	32,884
Consumption per capita (kg)	260	171	213	268	417	480	547
Domestic Consumption Rate (x1,000ton)	7,291	4,941	6,286	8,096	12,910	15,323	18,000
Domestic Production Rate (x1,000ton)	2,800	800	2,900	2,400	3,500	6,200	7,500
Import Volume (x1,000ton)	4,491	4,141	3,386	5,696	9,410	9,123	10,500
Import from Ports (x1,000ton)	2,872	1,495	1,033	1,893	1,849	2,033	1,587

Source: Prepared by JICA Study Team based on data from "International Cement Review" and "International Trade Centre"

Table 4.3-17 shows future import volumes of cement. Following assumptions are used to estimate the future import volumes in Iraq.

- Domestic demand mentioned in "Final Report of Iraqi Integrated National Energy Strategy (INES)" is adopted for the consumption rate of cement in Iraq. Based on the above consumption rate, the consumption rates per capita in 2025 and 2035 are 1,090 kg and 1,052 kg respectively, which seem to be on bell-curve in Figure 6.1.5. Per capita consumption of 1,090 kg is higher than the world average of 550 kg, and that of neighbouring Iran (770 kg), but still modest compared to other Middle East economies, including Saudi Arabia (1,683 kg).
- According to INES, INES plans to bring total cement capacity to 65 MPTA (million tones per annum) by 2030. Based on this plan, it is assumed that the above capacity will be achieved in 2030 for the high growth case, 75 % of the capacity for the middle growth case and 50 % of the capacity for the low growth case.
- The average share of the import volume from ports to the total import volume is nearly 25% for the last 5 years. It is assumed that this share will remain.

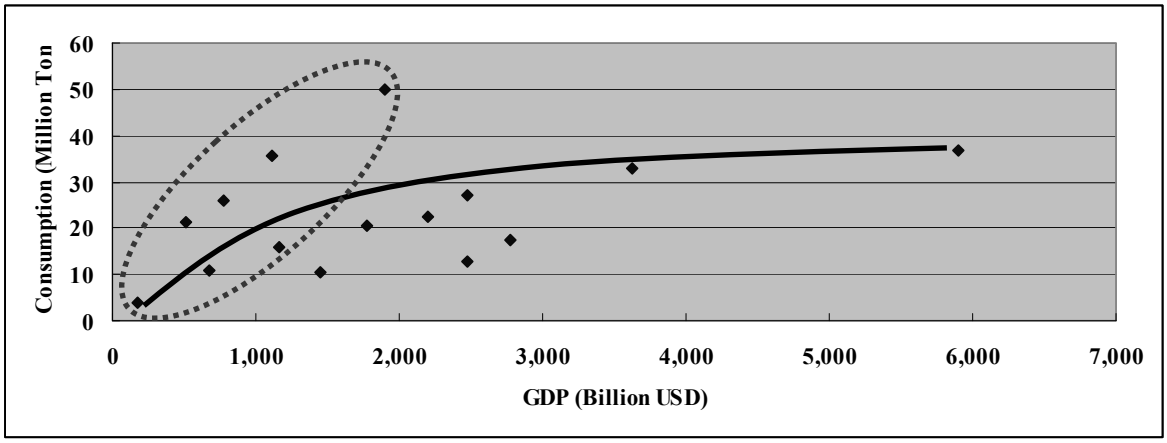
Table 4.3-17 Future Import Volume of Cement

	2012	2015	2025	2035
Population (x1,000)	32,884	35,767	45,892	56,105
Consumption per capita (kg)	547	755	1,090	1,052
Domestic Consumption Rate (x1,000ton)	18,000	27,000	50,000	59,000
Domestic Production Rate (x1,000ton)	7,500			
High growth		30,000	57,000	65,000
Middle growth		22,500	42,750	48,750
Low growth		15,000	28,500	32,500
Import Volume (x1,000ton)	10,500			
High growth		(3,000)	(7,000)	(6,000)
Middle growth		4,500	7,250	10,250
Low growth		12,000	21,500	26,500
Import from Ports (x1,000ton)	1,587			
High growth		0	0	0
Middle growth		1,100	1,800	2,600
Low growth		3,000	5,400	6,600

Source: Prepared by JICA Study Team based on Data from INES by Iraq Prime Minister Advisory Commission

6) Steel and Pipes

Figure 4.3-7 shows relationship between the consumption rate of steel and GDP (current prices) in selected countries in 2011. It is found that most undeveloped countries are on the rising part of the steel consumption on the curved line, which suggests that the consumption rate tends to rise in an early stage of economic development before GDP reaches advanced levels and will be more moderate at a certain level as GDP will grow. Undeveloped countries on the rising part, which include Turkey, Saudi Arabia, Iran, Iraq, South Korea, Mexico and Russia, are enclosed with an ellipse drawn by a red dotted line.



Source: Prepared by JICA Study Team based on Data from "World Steel in Figures 2013" by World Steel Association (Year 2011)

Figure 4.3-7 Relationship between Consumption Rate and GDP in the Selected Countries (Year 2011)

Past trend of steel consumption and import volumes in Iraq is shown in Table 4.3-18. Statistical data from "International Trade Centre" are referred to for figures of import volumes. Consumption volumes of steel in Iraq are almost equal to import volumes because of no record for domestic production at present. Consumption of steel in Iraq has been increasing remarkably in recent years owing to massive construction activity in the country. Steel materials have been imported mainly from Turkey and Ukraine.

Table 4.3-18 Past Trend of Steel Consumption, Production and Import in Iraq

Year	2006	2007	2008	2009	2010	2011	2012
Population (x1,000)	28,094	28,811	29,528	30,245	30,962	31,923	32,884
Consumption Rate (ton)	570,268	546,692	864,905	1,576,442	1,678,361	2,261,415	2,916,942
Consumption per capita (kg)	20	19	29	52	54	71	89
Import Volume (ton)	570,268	546,692	864,905	1,576,442	1,678,361	2,261,415	2,916,942
Import from Ports (ton)	67,875	210,117	362,637	450,914	493,712	327,351	734,129

Source: Prepared by JICA Study Team based on data from "International Trade Centre"

Table 4.3-19 shows future import volumes of steel. Following assumptions are used to estimate the future import volumes in Iraq.

- Domestic demand mentioned in INES is adopted for the consumption rate of the middle growth case in 2025 and 2035 in Iraq and the average consumption rate per capita in the Middle East countries (=250 kg) is used for the high growth case in Iraq.
- According to INES, INES plans to bring total steel production capacity to 10.2 million tonnes per annum (MPTA) by 2030. Based on this plan, it is assumed that the above capacity will be achieved in 2030 for the high growth case, 75 % of the capacity for the middle growth case and 50 % of the capacity for the low growth case.
- The average share of the import volume from ports to the total import volume is about 30 % for the last 7 years. It is assumed that this share will remain.

Table 4.3-19 Future Import Volume of Steel

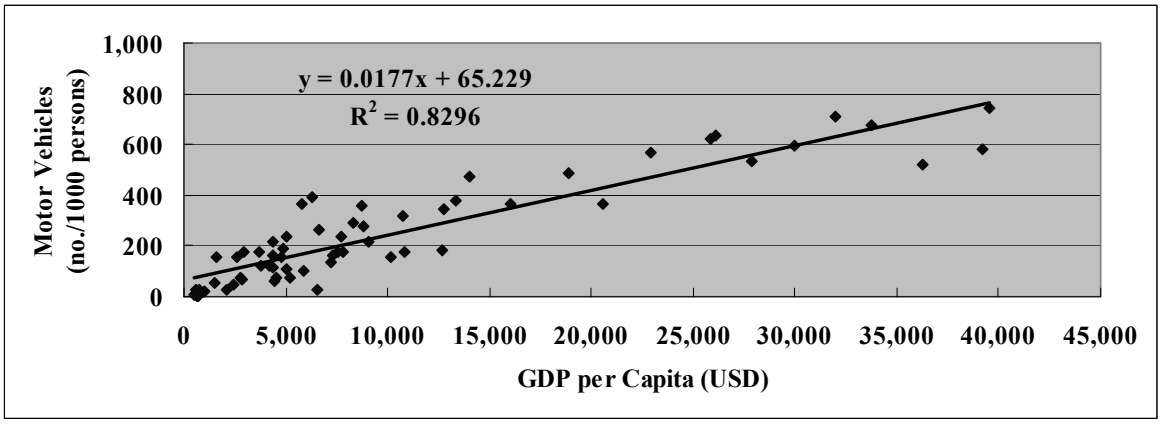
	2012	2015	2025	2035
Population (x1,000)	32,884	35,767	45,892	56,105
Consumption per capita (kg)	89			
High growth		112	250	250
Middle growth		112	163	155
Domestic Consumption Rate (x1,000ton)	2,917			
High growth		4,000	11,500	14,000
Middle growth		4,000	7,500	8,700
Low growth		4,000	7,500	8,700
Domestic Production Rate (x1,000ton)	0			
High growth		2,900	8,700	10,200
Middle growth		2,175	6,525	7,650
Low growth		1,450	4,350	5,100
Import Volume (x1,000ton)	2,917			
High growth		1,100	2,800	3,800
Middle growth		1,825	975	1,050
Low growth		2,550	3,150	3,600
Import from Ports (x1,000ton)	734			
High growth		330	840	1,140
Middle growth		550	290	320
Low growth		770	950	1,080

Source: Prepared by JICA Study Team based on Data from INES by Iraq Prime Minister Advisory Commission

The consumption rates for the high growth case in 2025 and 2035 seem to be on the curved line in Figure 6.1.6.

7) Vehicles

The relationship between the number of vehicles holding per 1,000 persons and GDP per capita of 2010 in the selected countries is shown in Figure 4.3-8.



Source: Prepared by JICA Study Team based on Data from World Bank, 2011

Figure 4.3-8 Number of Vehicles Holding and GDP per Capita in the World

The number of vehicles holding has been increasing along with GDP per capita growth in the same period as shown in Figure 4.3-8. The projected volume of vehicle holding per 1,000 persons is estimated by adopting the linear regression analysis by correlating with GDP per capita in Iraq.

$$Y = 0.0177X + 65.229 \ (R^2 = 0.8296)$$

Where, X: GDP per capita in Iraq (USD)
Y: Vehicle holding per 1,000 persons (unit)

Table 4.3-20 shows past trend of vehicle import in Iraq. Based on the cargo data at UQP, 1.61 tonnes /unit is used for an average weight of a vehicle. Iraq has a population of over 30 million and vehicles per capita is estimated at around 11 percent in 2011, lower than neighboring countries Iran and Turkey which have 15 percent penetration. Owing to the recent economic growth, the number of vehicles in Iraq has been increasing remarkably in recent years. Major export countries to Iraq are Korea, China and Japan.

Table 4.3-20 Past Trend of Vehicle Import in Iraq

Year	2006	2007	2008	2009	2010	2011	2012
Population (x1,000)	28,094	28,811	29,528	30,245	30,962	31,923	32,884
GDP per capita (USD)	2,266	3,003	4,328	3,575	4,278	5,529	6,305
Number of Vehicle (x1,000unit)		1,125	1,160	1,291	1,385	3,501	
Vehicle Holding per 1000p (unit)		39.1	39.3	42.7	44.7	109.7	
Import Vehicle (ton)	133,283	126,652	105,744	287,170	269,636	299,627	
(Number)	82,784	78,666	65,680	178,366	167,476	186,104	
Import from Ports (ton)	41,486	3,417	44,326	94,636	100,136	58,376	88,784
(Number)	25,768	2,122	27,532	53,178	62,196	36,258	69,694

Source: Prepared by JICA Study Team based on data from "International Trade Centre" and "Statistics of Private Sector Motorcars registered at General Directorate of Traffic until 31/12/2011 by Central Statistical Organization, Ministry of Planning in Iraq"

Table 4.3-21 shows future import volumes of vehicles. Following assumptions are used to estimate the future import volumes in Iraq.

- The projected volume of vehicle holding per 1,000 persons in 2025 and 2035 is estimated at 322 units and 407 units respectively, based on the correlation between the number of vehicles holding and GDP per capita.
- It is assumed that an average share of the import volume from ports to the total import volume is 30 % in 2015 which is nearly an average share for the last 6 years at ports, 50 %

in 2025 and 70 % in 2035, based on the share of imported vehicles from Asia to the total imported vehicles in Iraq (refer to Table 4.3-21).

Table 4.3-21 Share of Imported Vehicles from Asia to Total Imported Vehicles in Iraq

(Unit: million US$)

Year	2006	2007	2008	2009	2010	2011	2012	2013
Total	975	1,043	1,900	2,036	2,556	2,529	3,192	3,044
Korea	54	88	198	317	786	820	971	984
China	96	89	125	215	307	379	788	473
Japan	49	41	119	111	124	115	117	409
Thailand	4	19	69	54	135	91	193	251
Indonesia	0	0	2	0	0	0	0	6
Asia total	203	236	513	698	1,352	1,406	2,069	2,123
(Share %)	20.9	22.7	27.0	34.3	52.9	55.6	64.8	69.8

Source: Prepared by JICA Study Team based on data from "International Trade Centre"

Finally the future import volume of Vehicles is shown in Table 4.3-22.

Table 4.3-22 Future Import Volume of Vehicles

Year	2012	2014	2015	2024	2025	2034	2035
Population (x1,000)	32,884	34,806	35,767	44,853	45,892	55,077	56,105
GDP per capita (USD)	6,305	6,656	6,869	13,495	14,509	18,754	19,331
Number of Vehicle (unit)		6,370	6,680	13,640	14,780	21,880	22,860
Vehicle Holding per 1000p (unit)		183	187	304	322	397	407
Import Vehicle (unit)			310,000		1,140,000		980,000
Import from Ports (unit)	69,694		93,000		570,000		686,000

Source: Prepared by JICA Study Team

8) Other Conventional Cargoes

The imported volume of other conventional cargoes has been fluctuating and in a trend of decrease for the last seven years as shown in Table 4.3-23. However the proportion of the other conventional cargo volumes to the total dry cargo volumes is stable in the range of 11% to 15% with an average rate of 13% from 2008 to 2012. Therefore, it is assumed that the above proportion will remain at an average rate (=13%) for the future volume of the other conventional cargoes.

Accordingly, the future imported volume of other conventional cargoes is calculated at 878,000 tons, 947,000 tons and 1,265,000 tons in the middle case of 2015, 2025 and 2035, respectively.

Table 4.3-23 Forecast of Other Conventional Cargoes

Year	2006	2007	2008	2009	2010	2011	2012	2015	2025	2035
GDP (M USD)	37,250	37,763	40,259	42,597	45,092	48,962	53,089	69,952	135,930	201,209
Other Cargo (x1,000 MT)	1,756	1,692	1,015	1,157	1,005	898	922	878	947	1,265

Source: Prepared by JICA Study Team

(3) Liquid Bulk

"Integrated National Energy Strategy (INES)" by Iraq Prime Minister Advisory Commission and "Iraq Energy Outlook 2012 (World Outlook Special Report)" by International Energy Agency (IEA) are referred to.

1) Crude Oil in Iraq

Contracts on crude oil already in place with international companies imply an extraordinary increase in oil production capacity, to a level almost five times higher than today's 3 million barrels per day (mb/d), over the current decade. Reaching output in excess of 9 mb/d by 2020 would equal the highest sustained growth in the history of the global oil industry and IEA

anticipates movement towards possible trajectories for oil output lower than that implied by current contracts.

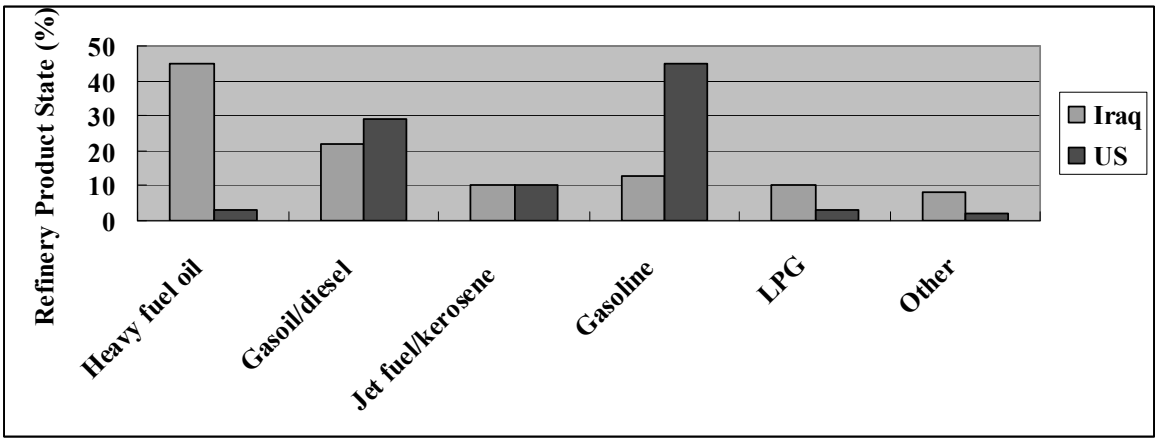
In the central scenario by IEA, Iraq's oil production will be more than doubles to 6.1 mb/d by 2020 and reaches 8.3 mb/d in 2035. The largest increase in production comes from the concentration of super-giant fields in the south around Basrah. A resolution of differences over governance of the hydrocarbon sector would open up the possibility for substantial growth also from the north of Iraq, where contracts awarded by the Kurdistan Regional Government, though contested by the federal authorities, have made this one of the most actively explored hydrocarbon regions in the world. In a high case, in which a more favorable view on the prospects is taken for energy sector development, Iraq's oil production rises rapidly to surpass 9 mb/d by 2020 and increase further to a level around one-quarter higher than the central scenario (10.4 mb/d) in 2035. In a delayed case, in which investment in Iraq's energy sector rises only slowly from the levels seen in 2011. For the projection period as a whole, investment is around 60 % of the level in the central scenario (3.7 mb/d in 2020 and 5 mb/d in 2035), acting as a significant constraint on the pace at which the sector develops.

Achieving the required level of oil production and export will require rapid coordinated progress all along the energy supply chain. Adequate rigs will need to be available at the right time. Early investment in a challenging project to bring up to 8 mb/d of water inland from Gulf to Iraq's southern field will be essential to support oil production and to reduce potential stress on scarce freshwater resources. Sufficient oil storage and transportation capacity will be needed to accommodate the expansion in output and diminish the risk of over-reliance on the southern sea-borne route. The infrastructure and investment requirements in the high case, which anticipates oil production of 9.2 mb/d already in 2020, are even more demanding.

2) Oil Products in Iraq

Oil supply to domestic refineries of around 670 kb/d in June 2012 was slightly higher than the 630 kb/d average delivered in 2011. The current nameplate capacity of Iraq's refineries stands at around 960 kb/d, but it is estimated that only about 770 kb/d of this capacity is operational, which the country's three largest refineries at Baiji, Doura and Basrah accounting for around 70 % of the total. These are supplemented by a large number of small topping plants, but these are unable to produce high-quality petroleum products.

The range of oil products produced by Iraq's refineries falls well short of its domestic needs and of the possibilities afforded by modern and more complex refineries. Around 45 % of the products coming out of Iraqi refineries are heavy fuel oil, with gasoline accounting for less than 15 % of the total. This product mix means that Iraq has to import around 8.5 million liters per day of gasoline and 2.6 million liters per day of diesel to meet demand. It also has a large surplus of heavy fuel oil for which it has no domestic use or export possibilities. In 2011, Iraq blended an average of 150 kb/d of heavy fuel oil (about half of the total heavy fuel oil) into the exported stream of crude oil, lowering its quality and price. It is expected that with product yields similar to those of an average refinery in the United States shown in Figure 4.3-9, Iraq could have avoided the shortfall of gasoline and diesel and eliminated its surplus of heavy fuel oil.



Source: Prepared by JICA Study Team based on Data from "Iraq Energy Outlook 2012"

Figure 4.3-9 Average Refinery Product State in Iraq Compared to United States, 2011

A part of Iraq's new oil infrastructure is required to cater for the anticipated rise in domestic demand, with the largest share going to the rehabilitation of Iraq's refining sector. Thus far the government's attempts to attract large-scale private investment have not been successful: Iraq's three main refineries in Doura near Baghdad, Basrah and Baiji remain in urgent need of upgrading. The main addition in recent years has been the 40 kb/d refinery in Erbil which is now being expanded to 100 kb/d, but the bulk of investment made has been in even smaller-capacity topping plants, which can be built quickly but have not made a dent into Iraq's deficit of some key oil products, particularly gasoline, at a time when domestic demand is growing rapidly.

According to "Integrated National Energy Strategy (INES)" by Iraq Prime Minister Advisory Commission, the Ministry of Oil (MOO)'s existing plan to upgrade and expand Iraq's refinery system in the short- to medium-term will significantly improve Iraq's refinery capabilities.

- 840 kbpd of new refinery capacity is planned through the addition of 5 refineries, to be constructed at Karbala (140 kbpd in 2016), Amara (150 kbpd in 2017), Kirkuk (150 kbpd in 2018), Nasiriya (300 kbpd in 2019), and Qayyarah (100 kbpd in 2019).
- Existing refineries are to be upgraded-the Daura refinery from 120 to 140 kbpd in 2013, the Basrah refinery from 165 to 210 kbpd in 2013, and topping units at Haditha and Kask.
- 210 kbpd of inefficient topping capacity will be phased out in 2017-18, including units in samawa, Najaf, Diwania, Nasiriya, Amara, Sainia, Haditha, Kask, and kirkuk.

Table 4.3-24 MOO Refinery Expansion Plan

Refinery	Refinery Capacity (kb/d)			
	Year 2012	Year 2015	Year 2025	Year 2030
Existing	736	736	545	545
Additional	-	94	905	905
Total	736	830	1,450	1,450

Source: Prepared by JICA Study Team based on Data from INES by Iraq Prime Minister Advisory Commission

According to the MOO refinery plan, fuel oil will continue to be in surplus, gasoline will be in surplus after 2018, and gasoil will be in deficit after 2024 (Since the MOO plan does not extend beyond 2020, this gasoil deficit can be corrected through introduction of additional capacity, but that will be likely create a further oversupply of fuel oil and gasoline).

3) Natural Gas (LPG and LNG) in Iraq

Iraq's gas production is dominated by associated gas and historically much of this gas was flared. Iraq began to invest in large-scale gas processing facilities only in the 1980s and maintenance and expansion of these facilities has not kept pace with the volumes produced. In June 2012, nearly 2 bcm of gas were produced, with around 55 % coming from southern oilfields.

However, it is estimated that due to the lack of gas processing capacity, more than half of the gas produced was flared. This monthly estimate is consistent with the estimate for 2011, where total production was around 20 bcm, of which around 12 bcm was flared. Putting gas gathering and processing facilities in place, developing the gas transmission network and bringing online new gas-fired power plants are therefore urgent priorities for the authorities.

Iraq's declared aim for the gas sector is to utilize a valuable domestic resource in support of its economic development, with the power sector a strong priority for gas use, followed by domestic industry. Iraq also aims to become an exporter of natural gas. In the IEA projections, Iraq's marketed gas production is expected to increase significantly over the projection period, from less than 10 bcm in 2010 to almost 90 bcm by 2035 in the central scenario, and close to 115 bcm in the high case. These projections depend on Iraq putting in place the gas infrastructure to capture and process the rising volumes of associated gas, mainly from the southern oil fields, and successfully developing non-associated gas fields.

Table 4.3-25 shows forecast of Iraq gas production by region in the central scenario and the high case.

Table 4.3-25 Iraq Gas Production Forecast by Region

（Central Scenario） (Unit: bcm)

Central Scenario	2010	2015	2020	2025	2030	2035
South	3	7	29	40	43	47
Centre			0.5	0.5	1	1
West			0.3	2	6	9
North	4	7	12	30	32	31
Total	7	13	41	73	82	89
Of which associated	5	10	32	42	46	51

(High Case) (Unit: bcm)

High Case	2010	2015	2020	2025	2030	2035
South	3	10	45	53	55	58
Centre			0.5	1	4	6
West			0.3	4	7	10
North	4	9	17	35	39	40
Total	7	18	63	92	105	114
Of which associated	5	13	49	55	59	62

Source: Prepared by JICA Study Team based on Data from "Iraq Energy Outlook 2012"

Investment in Iraq in new or rehabilitated gas processing facilities has not kept pace with increases in oil output and, as of 2012, the country has the capacity to process around 8 bcm of gas per year. There is only a very limited national distribution network. The above projections need, over the projection period, for processing capacity to increase by more than ten times in the central scenario, and by more than thirteen times in the high scenario. They also require the timely development of a transport network to the power plants and industrial facilities that will account for the bulk of Iraq's domestic consumption. Iraq's non-associated gas production rises from a very low base to almost 40 bcm in the central scenario and to more than 50 bcm in the high case in 2035. The bulk of this output comes from the north of the country, primarily from the KRG area: by 2035, total gas production from fields awarded by the KRG reaches 20 bcm in the central scenario and 29 bcm in the high case, the overwhelming majority of which is non-associated gas.

Iraq's projected production in 2035 consists of roughly equal shares of associated and non-associated gas. Gas provides an important substitute for oil use in the domestic market, freeing up the more valuable and more easily exported commodity. In the projections, the associated gas that will be produced along with rising oil production will not be sufficient in itself to allow for gas export. In the central scenario, cumulative production of associated gas is enough to cover only around 70 % of anticipated demand within Iraq over the period to 2035. The development of Iraq's non-associated gas resources will therefore be the key to determining the prospects for, and extent of potential gas export.

Table 4.3-26 shows gas export forecast in Iraq. In the central scenario, rising gas production is accompanied by increasing use of gas in power generation until the latter part of this decade, with a surplus in the national balance available for export from 2020. Gas export is stable around 10-15 bcm during the 2020s, before rising again after 2030 to reach 17 bcm by the end of the projection period.

Table 4.3-26 Gas Export Forecast

(Unit: bcm)

Year	2020-2030	2030-2035
Central Scenario	2~10/15	15~17
Year	2019-2025	2025-2035
High Case	8~25	25~37
Delayed Case	0	0~7

Source: Prepared by JICA Study Team based on Data from "Iraq Energy Outlook 2012"

If and when Iraq does start to export its gas, it will have a wide range of available markets, with many of its neighbours dependent on imports of gas to meet their domestic needs. Four of Iraq's neighbours are currently reliant upon imports (Turkey, Jordan, Kuwait and Syria) and Saudi Arabia also faces a looming deficit of gas. In the central scenario, Turkey and other European markets are expected to require substantial additional volumes of imported gas. To the south, LNG export would provide Iraq with an entry to the fast-growing markets in the Asia-Pacific region.

In the high case, the volume of gas available for export is pushed as the increase in production (both from associated and non-associated gas) is larger than the projected increase in domestic demand. Gas export also starts slightly earlier than in the central scenario, in 2019, and reaches 25 bcm by the mid-2020s and 37 bcm by the end of the projection period. By contrast, in the delayed case, associated gas is held back by lower oil production, while opportunities in non-associated gas are deemed unattractive or too risky because of prolonged uncertainty over the conditions for investment and export. In this case, production is initially able to keep pace with (lower) domestic gas demand, but a surplus emerges only after the mid-2020s, with projected exports reaching 7 bcm by 2035.

4) Energy Demand in Iraq

Iraq's total primary energy demand moves into a new and prolonged phase of strong growth in the central scenario, increasing by nearly 6 % per year to reach 160 million tonnes of oil equivalent (Mtoe) in 2035- more than four times higher than in 2010. Energy demand in the current decade along grows by more than two and a half times, reflecting rapid growth of the economy, fuelled by the proceeds of swift growth in hydrocarbon supply and a growing population.

In the high scenario, faster oil production growth pushes economic growth higher and energy demand more than trebles over the current decade, reaching 187 Mtoe by 2035 – 17 % higher than in the central scenario. Additional oil and gas export revenues stimulate higher government spending, and public and private consumption, resulting in the greater energy consumption. By contrast, in the delayed case, the flatter oil production growth profile results in slower economic growth and energy demand and Iraq's fuel mix also changes more gradually, as new power generation and gas processing facilities are built more slowly.

Table 4.3-27 Iraq Primary Energy Demand by Fuel and Scenario

(Unit: Mtoe**)

		Central Scenario			High Case	Delayed Case
Year	2010	2020	2035	2010-35*	2035	2035
Oil	32	75	92	4%	114	69
Gas	6	37	66	10%	71	39
Others	0.4	0.7	1.6	n.a.	1.4	1.6
Total	38	113	160	6%	187	110

*Compound average annual growth rate.

**Tonnes of oil equivalent

Source: Prepared by JICA Study Team based on Data from "Iraq Energy Outlook 2012"

Table 4.3-27 shows Iraq primary energy demand by fuel and scenario. In the central scenario, fossil fuels still account for 99 % of Iraq's energy mix in 2035 (58 % oil and 41 % natural gas), compared to 95 % in the rest of the Middle East and 75 % globally. This means that fossil fuels continue overwhelmingly to dominate Iraq's energy economy between now and 2035. In the central scenario, oil demand in Iraq is more than doubles in the next ten years, to around 1.7 million barrels per day (mb/d) by 2020, and goes on to exceed 2 mb/d in 2035. In the period to 2020, demand growth is driven by transport and the power sector. Oil demand growth moderates to just over 1 % per year after 2020, reflecting contrasting trends: a large and rapid decline in oil consumption in power generation (as natural gas availability increases), offset by a less rapid, but still significant, increase in consumption in end-use sectors, particularly transport. In the high case, oil demand reaches 2 mb/d in 2020 and 2.5 mb/d in 2035, while it reaches only 1.6 mb/d in 2035 in the delayed case but retains a larger share of Iraq's overall energy mix.

In all scenarios, natural gas becomes a major pillar of the domestic energy economy. In the central scenario, gas demand increases by around 10 % per year on average, reaching 39 billion cubic meters (bcm) in 2020 and 72 bcm in 2035. Natural gas accounts for around half of all energy demand growth in Iraq over the outlook period.

5) Import/Export of Oil Products

a) Import of Oil Products

Based on the forecast of the energy demand and the production plan of oil products in Iraq, future import volumes of oil products are forecasted as shown in Table 4.3-28.

Table 4.3-28 Import of Oil Products

(MOO Plan)

Oil Products	2012	2015	2025	2035
1. Gasoline				
Supply (kbpd)	95	115	365	365
Demand (kbpd)	145	175	245	310
Import (ton)	2,180,000	2,610,000	(5,220,000)	(2,390,000)
2. Gasoil				
Supply (kbpd)	125	135	285	285
Demand (kbpd)	140	180	295	380
Import (ton)	710,000	2,140,000	480,000	4,520,000
3. Total				
Import (ton)	2,890,000	4,750,000	480,000	4,520,000
Export (ton)			(5,220,000)	(2,390,000)

(Option 1)

Oil Products	2012	2015	2025	2035
1. Gasoline				
Supply (kbpd)	95	115	410	410
Demand (kbpd)	145	175	245	310
Import (ton)	2,180,000	2,610,000	(7,180,000)	(4,350,000)
2. Gasoil				
Supply (kbpd)	125	140	340	340
Demand (kbpd)	140	180	295	380
Import (ton)	710,000	1,900,000	(2,140,000)	1,900,000
3. Total				
Import (ton)	2,890,000	4,510,000	0	0
Export (ton)			(9,320,000)	(2,450,000)

(Option 2)

Oil Products	2012	2015	2025	2035
1. Gasoline				
Supply (kbpd)	95	175	325	440
Demand (kbpd)	145	175	245	310

Import (ton)	2,180,000	0	(3,480,000)	(5,660,000)
2. Gasoil				
Supply (kbpd)	125	195	295	400
Demand (kbpd)	140	180	295	380
Import (ton)	710,000	(710,000)	0	(950,000)
3. Total				
Import (ton)	2,890,000		480,000	4,520,000
Export (ton)		(710,000)	(3,480,000)	(6,610,000)

Source: Prepared by JICA Study Team based on Data from INES by Iraq Prime Minister Advisory Commission

In the above tables, option 1 is a modified MOO refinery plan. Under this option, the Amara refinery is expanded to 300 kbpd by 2021 and is configured to process South Heavy crude and to provide deeper conversion. The Nasiriya refinery also is configured to process South Heavy crude from nearby field and to provide deeper conversion. It is built in two phases of 150 kbpd each, coming on line in 2019 and 2024. Capacity at the Qayyarah refinery is increased in line with Najma & Qayyarah North Heavy production, reaching 70, 140, and 210 kbpd by 2015, 2017 and 2019 respectively, and providing an option for integrated base-oil production and lubricant blending plants.

Option 2 is a clean-slate refinery plan. Under this plan, which attempts to optimize future refinery development without constraints imposed by existing plans, a complex refinery is built in Missan in two to three phases, reaching 450 kbpd total capacity and capable of processing South Heavy crude. The Qayyarah refinery plan is the same as in option 1. In the long term a new 300 kbpd export-oriented refinery is built in Basrah, configured to process South Heavy crude and to provide deep conversion.

b) Export of Heavy Fuel Oil

Table 4.3-29 shows a development plan of oil products based on "National Development Plan (NDP) 2013-2017".

Table 4.3-29 Development Plan of Oil Products

(Unit: x1,000 ton/year)

	2012	2013	2014	2015	2016	2017
Refined Oil	27,200	36,200	37,600	37,600	37,600	43,000
Liquid Gas	321	445	584	584	767	949
Gasoline	3,900	5,200	5,400	5,400	7,800	9,900
Kerosene	3,400	4,500	4,600	4,600	5,500	5,600
Gas Oil	6,200	7,400	7,700	7,700	9,300	9,600
Black Oil (Heavy Fuel)	13,300	17,700	18,400	18,400	19,700	13,100

Source: Prepared by JICA Study Team based on Data from "NDP 2013-2017"

According to the above table, there is a large surplus of heavy fuel oil which has no domestic use or export possibilities. In 2011, Iraq blended an average of 150 kb/d (about 8 million tones per year which is equal to nearly half of the total heavy fuel oil produced) of heavy fuel oil into the exported stream of crude oil, lowing its quality and price.

Based on the above, it is assumed that the bulk of the heavy fuel oil is blended into the exported stream of crude oil except domestic use and a small amount (= 600,000 tonnes which is an average volume loaded at KZP for the last five years) is exported as fuel oil for vessels at KZP. It is expected in the near future that the modernization and expansion of Iraq's refinery capacity will bring a significant improvement in the product state, increasing the share of gasoline produced relative to heavy fuel oil and finally eliminate its surplus of heavy fuel oil.

6) Export of LNG/LPG Gas

Potential gas export markets and route are shown in Table 4.3-30.

Table 4.3-30 Potential Gas Export Markets

Potential Market	Route	Expected Q'ty (bcm/yr)
Present Importer (Turkey, Jordan, Kuwait and Syria)	Pipeline on Land	
Saudi Arabia	Pipeline on Land	
European Market	Pipeline on Land	15~30
Asia-Pacific Region	Tanker from Iraqi Ports	5.5 or more

Source: Prepared by JICA Study Team based on Data from "Iraq Energy Outlook 2012"

Turkey and other European markets are expected to require substantial additional volumes of imported gas. The likelihood of new gas transportation capacity across Turkey to accommodate export volumes from Azerbaijan offers an opportunity for tie-ins from northern Iraq, and possible extension of these pipeline routes into southeast Europe provide an opening for Iraq to become a supplier to European gas markets, which are projected to require almost 200 bcm in additional gas imports as demand rises and indigenous production falls.

To the south, LNG export would provide Iraq with an entry to the fast-growing markets in the Asia-Pacific region. However, the higher supplied cost is that of LNG to Asia-Pacific markets, primary because of the large investment required in liquefaction capacity; this option does, though, offer flexibility in terms of destination and access to the higher prices assumed to be available in Asia-Pacific markets, compared with Europe. As a part of the investment plan for the Basrah Gas Company, Shell and Mitsubishi have proposed a southern export facility, with a capacity of 4 million tonnes of LNG per year (around 5.5 bcm per year). Such a gas export project would require a large up-front investment in liquefaction and export facilities.

Based on the above, it is assumed that maximum 4 million tonnes of LNG per year will be exported to Asia-Pacific markets by 2035, probably for Japan, after 2025 on condition that rising gas production in Iraq is accompanied by increased use of gas in power generation until latter part of this decade, with a surplus in the national balance available for export.

4.4 Issues on Port Development, Management and Operations

Ports of Iraq are important national assets for promoting international trade through smooth import and export by accommodating ocean going vessels and realizing competitive maritime transport. However, shipping companies, shippers and consignees indicate difficulties in using Iraqi ports, which are poor port service, low port productivity, high cost, shallow channel, long cargo dwelling in port, ship waiting for tide, and many other problems. Iraqi ports are still on the way to restoration after a long war and face the following problems in port development, management and operations.

4.4.1 Issues on Port Infrastructure

Total cargo throughput of Iraqi ports reached 14.9 million tons in 2012, in which container cargo would account for half of the total in tons, i.e. 589,000 TEUs in number of boxes. Accounting for GDP growth of Iraq, cargo throughput will make a rapid growth for the next 10-20 years. Consequently Iraqi ports will face a shortage of port facilities and queues of waiting ships in the near future. It is therefore urgently required to take following measures.

- To supply enough cargo handling facilities for coping with demand for import and export of general, bulk, liquid cargoes, and laden and empty containers.
- To avoid ship waiting in anchorage, which may be caused by a shortage of port capacity.
- To restore old and damaged port facilities
- To develop modern well equipped container terminals and bulk terminals, reform old-fashioned terminals to modern terminals, and remove unnecessary old cranes and warehouses.

- To improve approach channels, Abdullah Channel and Umm Qasr Channel, which are now available for ships up to 50,000 DWT subject to a limit of draft, tide, and traffic direction.
- To negotiate navigation rules in the area adjacent to Mubarak Port, rules on bathymetric surveys and maintenance dredging with the authority of Kuwait.
- To dredge the Khor Al Zubayr Channel urgently,
- To remove wrecks in Shatt al Arab River and dredge channels for ship navigation, whose shallowest point has now only a depth of 2 meters under low water datum and 5 meters under the high tide water level. It is imperative to negotiate with Iran on dredging in the Shatt al Arab River.
- To make a practical plan to develop and open Al Faw Grand Port, which needs a large amount of initial investment, development of access road and railways, and approach channel. Milestones of the development shall be clarified to investors for their long-term investment in port infrastructures.
- To encourage private sectors to invest in port development and operations, while private sectors are reluctant to long-term investment.
- To develop dry ports near Bagdad and other large cities as a center for distribution and collection of maritime cargoes.
- To formulate and disseminate a port development plan of each port, schedule of construction and inauguration, and to give incentives to private investors for port development and operation. In particular, a Roadmap to develop and open Al Faw Grand Port shall be practical to avoid duplication of investment in Umm Qasr Port (UQP) and Al Faw Grand Port.
- To revise Law of Ports and Harbors in order to clarify roles and functions of the government in port development, management and operations, to stipulate powers and responsibilities of port authority and port management body, and to establish provisions on rights and responsibility of private port investors and operators.

4.4.2 Issues on Port Management and Operations

All ports of Iraq are administered and managed by GCPI, and some terminals are operated by private companies under lease agreement with GCPI. Iraqi ports are therefore categorized as "Service Port" where the port authority manages a port, regulates activities in a port, provides all kinds of port services including pilotage, cargo handling and storage.

"Service Port" is usually a state owned port and their employees are public service employees, who have less motivation to provide good services and have an attitude of giving permission to use the port rather than an attitude of promoting the use of their port. In order to improve cargo handling productivity and quality of port services, it is imperative to change the ports of Iraq from "Service Port" to "Landlord Port". The "Landlord" manages a port and regulates port activities but does not render cargo handling services but commissions private companies to provide such port services. Separation of regulators and operators is necessary for the change from a Service Port to a Landlord Port.

(1) Improvement of productivity and efficiency of container terminals

- Low berth occupancy ratio (Container berths are not used as designed, number of calling vessels remain at low levels),
- Shortage of container yard due to long dwelling time of imported containers,
- Lack of RTG and shortage of container yard (Reach stacker operated yard needs wider area than RTG operated one. Private operators are reluctant to introduce RTGs.),

- Long waiting queue of trucks for entering port, loading cargo, and clearing the departure gate. (Trucks cause chaos in port.)
- Lack of electronic data processing for port operations.

(2) Issues on oil terminals and liquid cargo handling

- Lack of capacity for the export of oil products and import of oil related materials is anticipated in Khor Al Zubayr Port (KZP).
- Increase of tanker calls are expected at the oil tanker jetty located on Khor Al Zubayr Channel between Umm Qasr Port (UQP) and KZP, and tankers pay special attention to their safe navigation, mooring and cargo handling as dangerous cargo carriers.

(3) Issues on productivity of general cargo terminal

- Low productivity of break bulk cargo operations, i.e. discharging of sugar, wheat, rice and the like, is brought about by direct loading on trucks on a wharf. (Break bulk cargo shall be stored in a shed and delivered to trucks later.)
- Lack of bulk loading and unloading facilities (Cement/Grain Silo, Pneumatic unloader, Belt conveyor, and other bulk cargo handling facilities)

(4) Issues on competitive port operations

- Port fees and charges for general services are considerably high in port fee and charges.Charges for entry include tug boat service, pilotage, berthing and unberthing and does not consistant with the quantity of services provided. Total cost for ship entry and cargo handling is at a high level.
- Tariff of GCPI is applied to a terminal operated by private company. Private operators cannot offer lower charges or volume discount to a specific user. Profit share scheme between GCPI and private company gives less incentive to private investment.
- Dwelling time of cargo is longer than free of charge period in many cases due to slow procedures related to cargo delivery.
- Lengthy procedures of customs documentation, inspection, and clearance. Electronic customs clearance system has not been introduced.
- Necessary days for transportation from UQP to Bagdad after cargo arrival at the port is much longer than that from Aqaba Port to Bagdad.
- Competition between private terminals is not brought in due to pricing policy of GCPI.

(5) Issues on Port Management Body

- Stevedoring services provided by GCPI and private operators are not competitive due to the fact that the same tariff is applied to services. Advantages of private operations are not well realized.
- Ports of Iraq are categorized as “Service Port” and GCPI controls everything related to port management and operations. It is indispensable that GCPI becomes a regulatory body and does not provide stevedoring services, so that Iraqi ports will become “Landlord Port”. (Revision of Law of Ports and Harbors will be necessary for the sake of this transformation)
- Capital raising for new channel dredging, maintenance dredging, construction of breakwaters, land reclamation and development of other port facilities.
- Granting long-term concessions on port development and operations, and incentives for private investors.

- Strengthening earning capacity by reducing redundant employees, encouraging transfer of port workers to private operators, and promoting capacity development of port employees by job training and re-education.

(6) Private Port Facilities outside the GCPI Ports

- Many private jetties and mooring facilities are located in the Shatt al Arab River, however, those facilities are not administered by GCPI in terms of ship safety, environmental pollution, rational use of public water areas, nor seaborne cargo statistics.
- Oil terminal located between UQP and KZP may be owned by a private company or public oil agency. Port facilities of such terminal shall be supervised by GCPI from the viewpoint of ship safety, water pollution, dangerous goods handling and proper ship management.

4.5 Basic Concepts for Port Development

4.5.1 Assessment of Ports' Internal and External Environment

External environment of Iraqi ports is not foreseen clearly because it is deeply concerned with changes of the political situation in the Middle East. The following situations can be assumed but the opposite situations can also take place in the same manner.

(1) External Environment

- Conflict in the Middle East will continue for more than a decade(s).
- Land transportation through Syria will not be resumed for the time being.
- Iraq and Iran will agree to operate maintenance dredging in the Shatt al Arab.
- Land transportation through Turkey may be interrupted by the conflict.
- Land transportation through Jordan may be interrupted by the conflict.
- Land transportation through Kuwait may be interrupted by the conflict.
- Iraq and Kuwait will agree to transport cargoes through the border and Mubarak Port will be used for the import of Iraqi cargoes.
- Kuwait may require Iraq to change the route of Abdullah Channel near the Mubarak Port to develop the port.
- Suez Canal may be closed due to trouble in the Middle East and Iraqi dry channel may be used for transportation between Europe and Asia.
- Political situation of Iraq will become stable and foreign investment can be resumed without obstacles.

(2) Internal Environment

- Iraqi risks are removed and foreign direct investment in ports will increase considerably.
- Economic development of Iraq is accelerated and cargo throughput will rapidly increase.
- Direct services to Asian ports will be opened owing to increase of trade volume.
- Agricultural production in Iraq will recover and agro products will be exported to neighboring countries.
- Damaged fertilizer factory will resume operation and new fertilizer factory will be established, and products of fertilizer or ammonia will be exported from Iraq.
- Oil refinery and/or steel industry will be located in the coastal area.
- GCPI may be privatized and become a joint stock company.

- Iraq dinar exchange rate will fall and port fees and charges will be lowered in US dollar basis.
- Productivity of cargo handling will increase due to special efforts of GCPI.
- Customs and GCPI will collaborate on the installation of electronic data interchange system, and port clearance procedures will be simplified and shortened.

Internal and external environments of Iraqi ports are summarized as shown in Table 4.5-1. External environment is not so stable and will change easily following international/regional political situations. It is assumed in the Table that the economic situation and international transport situation will be improved in the near future. Land transportation through Syria will be resumed but its timing is not foreseen. Agreement between Iraq and Iran on the maintenance of Shatt al Arab channel may be made in the future but its timing is not foreseen either.

Assumptions on internal and external environments shall be reviewed and revised in an appropriate manner, so that the roadmap for port development can be modified to meet the demand for cargo throughput.

Table 4.5-1 Internal and External Environments

Internal Environment			External Environment		
Finance	1	GCPI is a state owned company under Ministry of Transport and Ministry of Finance.	Economy	1	Political situation of Iraq becomes stable, public order is well maintained, and foreign investment increases.
	2	Large investment is necessary for port development, facility restoration, channel dredging, and equipment		2	High economic growth is expected over a long period of time.
	3	Income of GCPI was USD 270 million in 2012, Gross margin USD 120 million and its ratio is considerably high.		3	Industries locate in the coastal area.
	4	Personnel expenses account for 80% of the cost.		4	Agricultural production is recovered and agro products are exported.
	5	Major part of GCPI's profit is sent to the Ministry of Finance, and MOF allocates budget for investment.			
Customers	6	UQP and KZP are only two ports which can accommodate ocean going container ships and bulk carriers.	Transport	5	Land transportation through Syria is resumed due to the end of civil war.
	7	Al Faw Grand Port will open in the future.		6	Container feeder vessels become larger in the Gulf services.
	8	Main imports are general goods in containers, sugar, grain, cement and construction materials, and liquid bulk. Exports are limited to petro products.		7	Kuwait's Mubarak Port will open in the near future.
	9	Roads to the hinterland are restored but need further improvement. Railways are not yet restored.		8	Economic sanctions against Iran will be suspended soon and transportation through Iran will be resumed.
	10	Approach channel to UQP is 85 km, tidal restriction and one way traffic caused inconvenience to entering ships.		9	Iran and Iraq will agree to maintain channel in the Shatt al Arab.
Business Process	11	Productivity of container handling is low, cargo dwelling time in yard is longer.	Market	10	Export of agro products will be resumed to neighboring countries.
	12	Import documentation takes long time and procedures.		11	Development of roads and railways will make a good progress.
	13	No incentive for staff to improve port services and performance.		12	Import will increase dramatically due to economic growth.
	14	Port fees and charges are higher and added due to a long unwilling cargo stay in port.		13	Factories will be established in the coastal industrial zones.
Resources	15	Number of employees is about 10,000, which includes many redundant personnel.			
	16	Staff training and education is not enough, and capacity development of employees is imperative.			
	17	GCPI staff members implement dredging work by themselves.			
	18	JV terminals are operated by private company employees.			
	19	Shortage of budget for maintenance of facilities.			

Source: JICA Study Team

4.5.2 Development Concepts and Goals

Roles and goals of GCPI are to develop, maintain, and operate the infrastructure for maritime transport, and to contribute to the economic development of Iraq through ensuring smooth maritime transportation for import and export. For the sake of this purpose, it is imperative to 1) develop international trade ports to satisfy the demand for import and export, and 2) provide competitive and satisfactory customer services. Applying the balanced scorecard method approach to GCPI, visions of four points are summarized as follows.

Finance Perspective:	To make it easy to raise funds for large investment in port/channel development. (Strengthening the financial situation of GCPI by reducing cost and increasing sales)
Customers Perspective:	To reduce user cost at port, increase the quality of port services, and solve the problem of ships waiting for high tide, and one way traffic.
Business Process:	To increase the productivity of cargo handling, minimize dwelling time of cargo and waiting time of trucks.
Learning and Growth Perspective:	To improve business/service capacity of port employees by human resource development. (Promoting: the redeployment of port employees, or transfer to private port operators)

In order to apply SWOT analysis to each vision, Strengths, Weaknesses, Opportunities and Threats are summarized in Table 4.5-2.

Table 4.5-2 SWOT analysis for GCPI

Internal Environment				
	Strengths		Weaknesses	
Finance	1	As a state owned company, GCPI makes an operating profit.	1	GCPI has no incentive to increase gross profit margin.
	2	Large scale investment can be supported by MOF and/or international aid agencies.	2	Projects are not selected by cost-benefit evaluation.
	3	Large profit obtained from operation of oil berths and navigational services	3	Private companies are reluctant to invest in Iraqi ports.
	4	Port dues and general service charges on cargoes are stable income.	4	Eighty percent of expenses of GCPI are wages and pension.
	5	MOF allocates budget for investment.		
Customers	6	No discrimination against users. Two ports can accommodate 50,000 DWT vessels.	5	Port dues and cargo handling/storage charges are considerably high in the region.
	7	Shipping network via Dubai is well established.	6	Productivity of container handling is low, and capacity of break bulk cargo handling is little.
	8	Roads connecting ports to the hinterland are restored and will be developed.	7	No facility to handle sugar, cement and others as bulk cargo.
	9	Distance from Iraqi ports to Bagdad is half than Aqaba Port to Bagdad or Mersin to Bagdad.	8	Long waiting queue of trucks at gates, long dwelling time of cargo, poor service for users.
	10	Iraqi ports have advantage of shorter distance and no border clearance over Kuwait's ports.	9	Water depth of channel and basin is limited. Period of time for port entry and departure is limited.
			10	Difficulty in deploying larger vessels due to a limit of channel depth.
Business Process	11	Restoration of port facilities and channel dredging made progress.	11	Channel dredging and wreck salvage are not enough.
	12	Private operations of some terminals are introduced.	12	Private operators are reluctant to make long-term large investment.
	13	GCPI owns dredgers and maintains navigation channel.	13	Operations of dredgers are not efficient.
	14	GCPI provides seafarer's training and provide pilotage services.	14	Job performance of employees is not satisfactory.
			15	Cost consciousness, competitive sprit for good service, and work discipline are not well developed.
			16	Lengthy procedures for port document-ation.
			17	Customs clearance takes long time.
			18	Ports need a lot of security guards.

Learning and Growth	15	GCPI has experience and expertise for port development, management and operations.	19	GCPI has low incentive to provide good competitive services.
	16	Maritime and port training center is owned by GCPI.	20	Staff training, redeployment of labor, and transfer of redundant employees make slow little progress.
	17	Maritime cargo increase is anticipated in Iraq, and staff can be assigned to growth field.	21	Growth field of port business is commissioned to private sectors and GCPI works only for non-profit business.

External Environment				
	Opportunities		Threats	
Social and Economic Situation.	1	Political situation becomes stable, public order is recovered.	1	Public order in Iraq is deteriorated.
	2	Middle East countries become economic growth center in the future.	2	Conflict in the Middle East is worsened.
	3	Appreciation of oil price continues and national income increases.	3	Income from crude oil export reduces.
	4	Economic development of Iraq will be accelerated.	4	Economic development of Iraq stops.
	5	Risks of investment in Iraq are reduced and foreign port investment increases.	5	Foreign direct investment is suspended.
	6	Iran and Iraq will agree to maintain Shatt al Arab channel.	6	Restoration of diplomatic relations with Iran makes no progress and navigation in the Shatt al Arab is closed.
Transportation	7	Highways in Iraq are developed and well maintained.	7	Land transportation through Syria is resumed and has bigger share than Iraqi port route.
	8	Railways are restored and containers will be transported by rail.	8	Land transportation time and cost of Jordan route and Turkey route are shortened and reduced considerably.
	9	Dry ports are established in Bagdad area and bonded transportation is carried out.	9	Transportation from Mubarak Port in Kuwait is opened and becomes competitive.
	10	Iraqi ports will be used to avert route from conflict areas in the region.	10	Land transportation from Iran becomes possible and replaces part of Iraqi port cargo.
	11	Direct liner services are opened from Iraqi ports to Asia.		

Source: JICA Study Team

Based on the above mentioned analysis, strategic goals of port development are examined and basic concepts for the port development are summarized as the following 7 items.

1) To promote maritime transportation through Iraqi ports.
- To strengthen the competitiveness of transportation through the Iraqi ports route compared with the Aqaba port route and Mersin port route. (Reducing the cost at Iraqi ports, shortening transportation time through the Iraqi ports route, modernizing port facilities, and improving port services)

2) To develop and maintain approach channels that cope with the increasing number and size of calling vessels.
- Khawr Abdullah, Umm Qasr and Khor Al Zubayr channels maintain a depth of 12 meters,

- Aiming at early opening of the port; channel to Al Faw Grand Port be dredged to a depth of 12 m at the initial stage, deepened further at the later stage,
- Shatt-al-Arab Channel maintains the status quo and will be dredged to a depth of 8 meters when Iran and Iraq agrees.

3) To develop port facilities and terminals coping with the increasing cargoes.
- Container cargo is estimated to increase to 3.2 million TEUs (230 - 430 million TEUs) in 2025 and to 5.8 million TEUs (380 - 480 million TEUs) in 2035. UQP is required to develop container facilities to handle up to 250 - 300 million TEUs.
- Al Faw Grand Port is expected to start operations in 2020 - 2025.
- General cargoes are soon containerized or handled in bulk when their volumes increase, therefore, bulk terminals for grain, cement, fertilizer and others are expected.
- Al Maqil Port and Abu Flus Port be restored and serve for Basrah and neighboring provinces.

4) To encourage private participation in port development and operation.
- To grant a concession to capable private companies for the restoration, development and operation of port facilities.
- To encourage private investment; enough period of concession contract, lease contract or other form of contract is ensured to recover their investment. Incentives for their investment are given to overcome risks of investment.

5) To provide user friendly and competitive services.
- To modernize port facilities and equipment, improve productivities of cargo handling, and enhance performance of ports.
- To reduce cargo dwelling time in the port, realize prompt customs clearance, introduce systematic gate and truck operations, and rationalize port procedures.
- To transfer port service works, which can be provided by a private sector, to a private sector and GCPI keeps away from competition with private services.

6) To promote the development of highways, port access roads and railways.
- To develop express highway from UQP to Bagdad, and restore railways from the port to major cities.
- To develop port access road to Al Faw Grand Port.
- To develop dry ports in the suburbs of Bagdad with a bonded area.

7) To establish laws and regulation to ensure proper port development, management and operations.
- To clarify rights, duties and responsibilities of private investors in port development and operations.
- To clarify powers, functions, duties and responsibilities of GCPI.
- To transform Iraqi ports from Service Port to Landlord Port.

These seven strategic goals are derived from SWOT Matrix shown in Table 4.5-3.

Table 4.5-3 SWOT Analysis Matrix

		External Environment	
		Opportunities	Threats
Internal Environment	Strengths	・To promote maritime transportation through Iraqi ports	・To maintain security of Iraqi ports and ensure safety of transportation
		・To develop and maintain approach channels coping with the increasing number and size of calling vessels	・To maintain channels by public work of GCPI
		・To develop port facilities and terminals coping with the increasing cargoes	・To establish laws and regulation to ensure proper port development, management and operation
	Weaknesses	・To encourage private participation in port development and operation	・To promote the development of highways, port access roads and railways
		・To provide user friendly and competitive services	・To reduce cost of Iraqi ports and improve services

Source JICA Study Team

4.6 Strategic Long-term Plan for Port Development and Management

4.6.1 Functional Allotment among Ports

(1) Characteristic features of the four ports observed in the commodities handled

Summing up the observations of the current activities of ports described in Sections 3.7 and 3.8, the characteristic features of the commodities handled in the four ports are summarized as follows:

1) Umm Qasr Port (UQP)

Umm Qasr Port is the largest port in Iraq and handles all kinds of dry cargoes. Currently, the port is the sole port that has deep water berths and is called on by large vessels. The port is, thus, handling wheat and sugar as bulk cargoes that are brought to the port by ships having load capacities of 30,000 to 50,000 DWT.

Having an advantage of the shortest, and fully maintained, access channel from Arabian Gulf to the port, major shipping lines deploy plying their container liner ships to the port, and, therefore, the container cargo volume at the port is much larger than other ports. The container terminals are being developed by the investment of private operators as we'll as GCPI itself, while dry bulk terminals are developed and operated by Ministry of Trade. Inland depots for logistic services are also being developed in the neighborhood of the port area by private operators. Therefore, it is the functions currently performed by the port that should be strengthened further in the future.

2) Khor Al Zubayr Port (KZP)

Khor Al Zubayr Port is the sole port that handles liquid bulk cargoes (oil products). The port also handles several kinds of dry bulk cargoes that are brought by smaller sized ships than those calling on UQP. This is because of the depth restrictions of the access channel, therefore, completion of dredging work is required.

Most of the commodities handled at Khor Al Zubayr Port are import and export products of specific companies such as steel products, pipes, sponge iron, electric equipment, as well as oil products. It is also called by small ships, which are called "Dhow ships", that are loaded at the port with dates, which is currently one of the major export commodities of Iraq.

3) Al Maqil Port

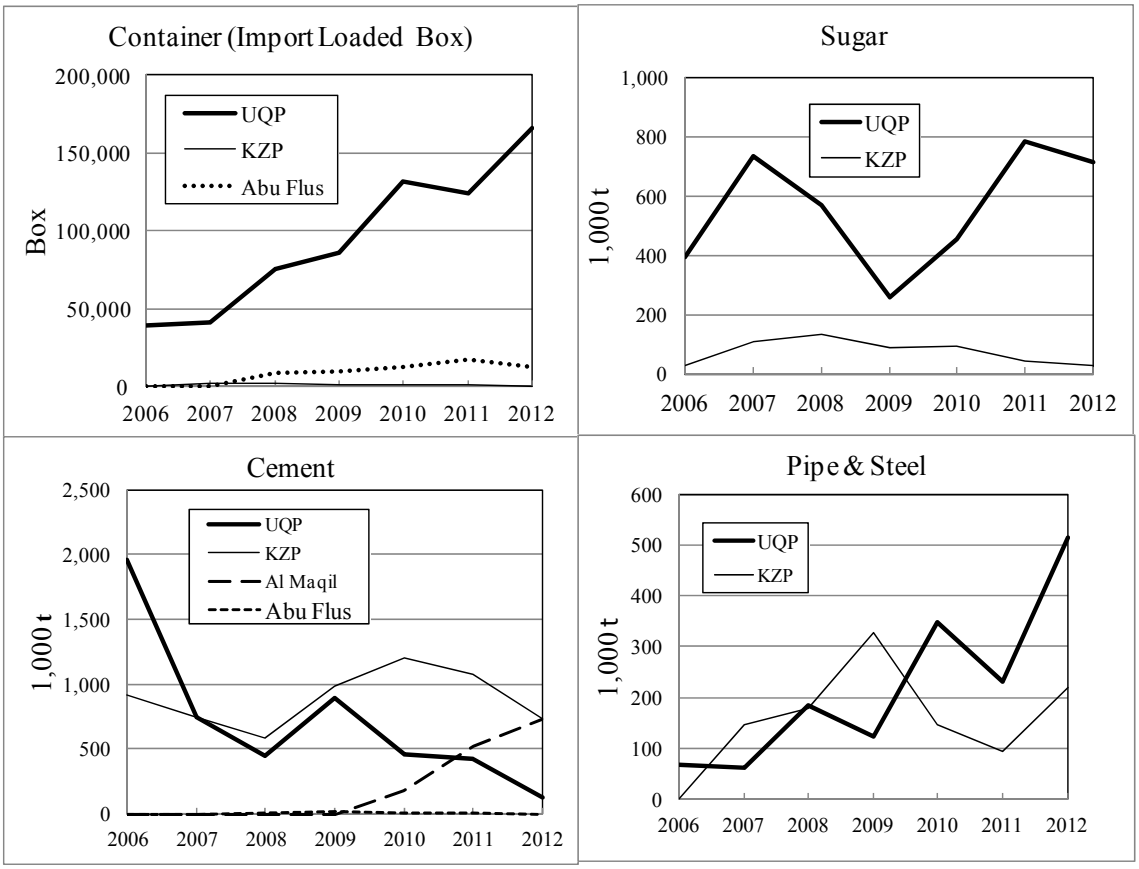
At Al Maqil Port, while the volume of general cargoes has been increasing, the import volume of cement has rapidly increased since 2010. In addition, a container terminal was opened by NAWAH, a private operator, and it is expected that the port will start handling container cargoes soon.

4) Abu Flus Port

While the volume of general cargoes has decreased since 2007 when the port handled 600,000 tons of general cargoes, and the port no longer handled cement in 2012, the volume of container cargoes that the port started to handle in 2007 has increased to 30,000 TEU. The function of the port has changed over the past five years.

(2) The Transition of the roles and functions of the four ports

Container, sugar, cement, pipe and steel are handled at two or more ports. Figure 4.6-1is drawn to show the comparison of the evolution of the volumes handled at respective ports from 2006 through 2012.



Source: Edited by JICA Study Team based on GCPI Annual Cargo Statistics

Figure 4.6-1 Comparison of volumes by commodity among the ports

1) Container cargoes

In addition to UQP, which is the largest container port and called on by liner container carriers, containers are also handled at KZP and Abu Flus Port, though the volumes are much smaller than UQP. At KZP, containers are brought on the deck of dry bulk ships or general cargo ships rather than liner container carriers. It should be noted that the volumes of container cargoes at Abu Flus Port have been more than 10,000 TEU since 2009 regardless of the damage to the deck of

the quay (Berth No. 3). This is probably because of the proximity of the port to the market in Basrah as well as the discount rate of tariffs applied to Abu Flus and Al Maqil port.

2) Sugar

While sugar is imported at UQP and KZP, it is brought to the former in large ships (more than 20,000 DWT) and in smaller ships (less than 3,000 DWT) to the latter. Though sugar is currently imported in the form of bagged cargo even at UQP, it is foreseen that sugar tends to be brought as dry bulk cargo as the import volume increases and, by installing unloaders and storage facilities, the handling productivity can be highly improved and the capacity of UQP will be expanded.

3) Cement

All the four ports handle cement. Before 2009, it was mainly handled at UQP and KZP. However, it is remarkable that, since 2010, the volume handled at Al Maqil Port has been increasing and that the volume is comparative to that handled at KZP. This is because of the increasing demand at Basrah where restoration work is at full steam by public and private sectors, as well as the proximity of the port to the markets. However, taking into consideration the restrictions by bridges in the access channel to Al Maqil Port, it is difficult for the port to accept more ships or larger ships, other ports will be used as alternative ports for cement import.

4) Pipes and steel

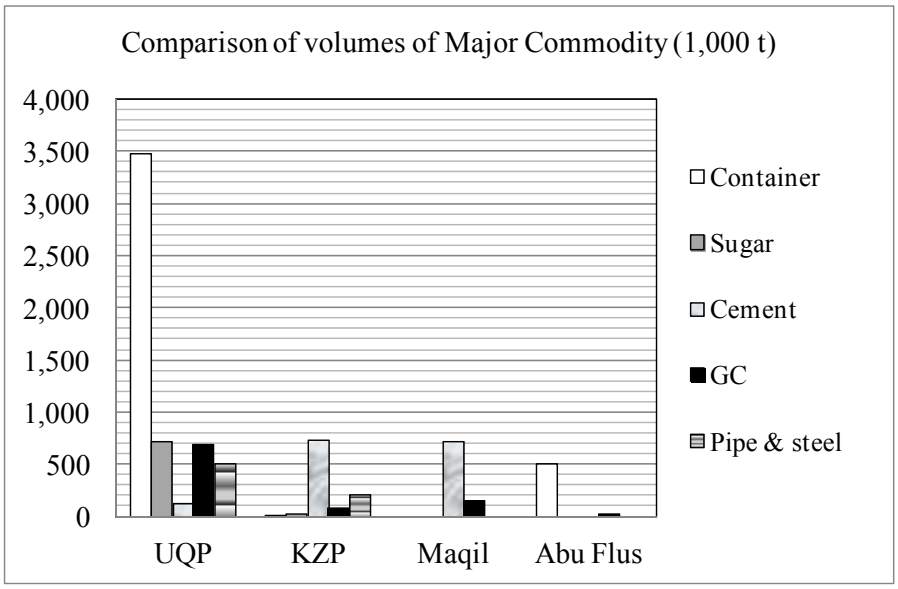
While the volume handled at UQP increased, that at KZP also began to increase in 2012. This is because the oil businesses in the southern regions are expanding and the demand of these materials in the southern regions has been increasing. Thus, KZP exhibits its advantage of proximity to the market. KZP will be playing a more important role in the importation of these materials since a private terminal operator started operation to specifically handle these types of commodities.

Table 4.6-1 shows the commodities handled at the four ports in 2012, while Figure 4.6-2 is drawn to exhibit the comparison of the volumes of major commodities seen at several ports in Table 4.6-1: container, sugar, cement and general cargoes (it should be noted that the ordinate of the graph is logarithmic scale).

Table 4.6-1 Comparison of the commodities handled at the four ports (2012)

Commodity	Unit	UQP	KZP	Al Maqil	Abu Flus
Import Loaded Container	Box	114,896	424	-	12,629
Liquid Bulk	ton	-	3,097,344	-	-
Wheat	ton	2,637,732	-	-	-
Rice	ton	1,092,684	-	-	-
Sugar	ton	714,974	21,376	-	-
Cement	ton	129,008	731,793	726,458	-
General Cargo	ton	681,959	47,100	150,395	16,093
Pipe& steel	ton	514,862	218,266	-	-
Iron Powder	ton	-	10,832	-	-
Steel	ton	-	1,000	-	-
Electriic equipment	ton	-	31,140	-	-
Dates	ton	-	19,537	-	-
Dhaw Ship (Dates)	ton	-	77,093	-	-
Car	Unit	88,784	-	-	-

Source: GCPI Annual Cargo Statistics, edited by Study Team



Source: Edited by JICA Study Team based on GCPI Annual Cargo Statistics

Figure 4.6-2 Comparison of cargo volumes by commodities handled at ports

As observed in Figure 4.6-2, UQP is playing a vital role of container port, it is indispensable to enhance the function of container terminal at the port to cope with the growth of container cargo volumes in the coming years. Located in the vicinity of the regional markets, Abu Flus port is becoming an important container port, until the land transport network is fully improved between UQP and Basrah and its neighborhood. The repair of Berth No.3 of Abu Flus port is vital and the enhancement of container terminal functions of the port is desirable in the short-term plan.

For the import of sugar and cement, it is desirable to enhance the cargo handling system at UQP so that these commodities will be handled more efficiently as dry bulk. With the upgraded unloading system, the transport cost of these commodities will be reduced by attracting larger ships.

General cargoes include their large and heavy cargoes such as plant and machinery. As the largest port of Iraq, UQP has to be ready to receive these special cargoes. In general, it is the tendency of port users that they prefer to unload their cargo at the nearest port to the final destination. Other ports will have the capacity to provide preferred services to local business entities to deliver various types of commodities expeditiously. While large amounts of pipes and steel products are consumed in the inland regions of Iraq, these commodities are also imported by oil industries near KPZ. It is expected for KZP to upgrade their services which are desired by industries in the neighborhood. One possible measure is to promote local industries to develop specialized terminals suitable for their business through the cooperative efforts with GCPI.

(3) Functional allotment among ports

In order to discuss functional allotment among the ports, it is necessary to take into account the various factors such as cargo volumes and commodities that the ports currently handle, the characteristics of environment of each port, availability of spaces for the expansion of port, etc.

Reviewing the major commodities handled at each port, the current characteristic features of its roles and functions are observed. Such features have been formulated over the years under the circumstances of the geographical location, land transportation network, the shipping routes, suitable ship sizes for carrying commodities and etc. It can be said that the current roles and functions observed at the ports are well accepted by the port administration, terminal operators and consignees as the most appropriate system from the standpoint of economy and efficiency under the existing situation. Therefore, in the preparation of future port development, those port facilities

to perform roles and functions that the port should continue in the future must be further upgraded for the economic efficiency and productivity enhancement; while those facilities that are underused and became out of fashion should be renovated for effective use of resources for the demand of new roles and functions. Therefore, it is indispensable to elaborate alternative plans to develop new facilities for the enhancement of the existing facilities in such case that the latter approach is not effective enough to satisfy the port users.

Currently, GCPI is taking steps to enhance its capacity to handle container and general cargoes with investment by private operators through the scheme of concession and joint venture. This is an action in line with the above mentioned port development policy to strengthen the main roles and functions of UQP.

While the kind of major commodities and their volumes handled in the four existing ports are different from each other, the service area of each port is also different. The characteristic features of the roles and functions of the port are summarized as follows:

1) Umm Qasr Port (UQP)

Being the sole port that has the capability of accommodating ships with DWT of 50,000 tons, Umm Qasr Port plays the role of importing sustenance goods for the people such as wheat, rice, sugar, construction materials and other dry commodities. Through the container liner services operated by major world shipping lines, containers are brought to the port from all over the world. The port is, thus, playing a role of the gateway of Iraq where most of the goods to and from all the countries of the world are shipped and unloaded at the port, and the commodities brought to the port are distributed throughout the country.

2) Khor Al Zubayr Port (KZP)

Those commodities handled at KZP are oil products, steel pipes, sponge iron, and electric equipment, which are shipped and imported by specific companies. The port is playing a role as an industrial port, as originally designed, to support industries located in the vicinity of the port and in southern Iraq. GCPI has a plan to dredge and clear sunken ships along the navigation channel between UQP and KZP. When the maintenance of the navigation channel is completed, large ships can call on the port, and the port may complement some functions of UQP such as dry bulk handling. However, it is desirable to avoid handling food stuff such as wheat and sugar at wharves that are handling cement and ore. Thus, it is recommended that KZP should play the roles and functions of an Industrial Port that mainly handles commodities other than food.

3) Al Maqil Port and Abu Flus Port

Al Maqil and Abu Flus Ports are currently called by small ships due to the restriction of water depth of Shatt al Arab River at the mouth facing the Arabian Gulf. Downstream of the river channel is the Iranian border and dredging cannot be done without an agreement between Iraq and Iran. Since there is little prospect of diplomatic talk on this matter, it is unrealistic to prepare development plans with the assumption that the navigation channel will be dredged along the river.

Therefore, the current situation that these two ports allow only small ships to call will continue over the coming years with the roles and functions of two ports which handle goods distributed within Basrah City and its neighborhood.

The advantage of Al Maqil and Abu Flus Ports is proximity to markets in the area in and around Basrah City. Thus the ports should play a role of handling container and general cargoes, including bagged cement and rice, brought from nearby countries that small ships can go back and forth to. Though Abu Flus Port is situated away from Basrah City, it has an operational advantage over Al Maqil Port that ships can call Abu Flus Port any time without being interrupted by the movable bridge located downstream of Al Maqil Port, while those ships calling on the latter port have to schedule their trips in accordance with the bridge opening schedule. Until these movable bridges are reconstructed so as to allow ships to pass through under the bridges, Abu Flus Port

should keep playing the role of an out port of Basrah City that complements the functions of Al Maqil Port.

Apart from the four existing major ports, the construction of Al Faw Grand Port is under way. Originally, the project of the new port aimed at the realization of a land bridge interconnecting the Arabian Gulf and the Mediterranean Sea. However, the new port may also handle containers brought to Iraq as well as transit container cargoes, since the container cargo volume is expected to exceed the container handling capacity of UQP in about 10 years even with the enhancement of operational capacity of the port (see Sections 3.8 and 4.7). Thus, Al Faw Grand Port should be given due consideration as an alternative development plan and the development schedule and investment plans should be carefully examined.

At present, all the container liner service routes originate from hub ports in UAE: either Dubai Port or Khorfakkan Port. The size of ships employed on this route are smaller container ships having a carrying capacity of 3,000 TEU or less, while some of the shipping lines are deploying their large container ships with the capacity of 4,000 to 4,500 TEUs directly to Damman, Saudi Arabia, which is located in the inner area of the Gulf, without transshipment at Dubai Port,.

Therefore, when the ports in Iraq are well developed to accept large ships, it is expected that ocean going container ships call on the ports. If container ships directly call on Iraqi ports, the transportation cost will be reduced because no transshipment cost is required. In order to realize direct ship calls to Iraqi Ports, the container terminals must have a capacity to accommodate large container ships.

Summing up the above discussion, the roles of each port are listed in Table 4.6-2 and Table 4.6-3.

Table 4.6-2 Roles and Functions of Each Port

Port Category	Role	Services and Ships	Present	Future
Principal Port (Gateway Port)	Container Cargo Import and Export	Liner services to Asia and Europe; Calls of mother vessels of these services	None	Al Faw Grand Port (Post Panamax Class Ships) UQP (Panamax Class)
		Feeder services from the Arabian Gulf; Calls of feeder vessels	UQP	Al Faw Grand Port UQP KZP if necessary
	General Cargo Import and Export	Tramper services by large cargo ships	UQP	Al Faw Grand Port UQP KZP
Important Industrial Port	Industrial Cargo, Bulk Cargo Import and Export	Bulk carriers, Tankers of and General cargo ships	KZP	Al Faw Grand Port (Large bulk carriers) KZP (Panamax Class)
Local Port	Trade with Countries in the Arabian Gulf	Liner services by small ships	Abu Flus Port	Abu Flus Port,
		Tramper services by small general cargo ships	Abu Flus Port, Al Maqil Port	Abu Flus Port, Al Maqil Port

Source: JICA Study Team

Table 4.6-3 Possible Categories and Cargoes of Each Port in 2025 and 2035

2025			
Name of Port	**Category**	**Type of cargoes**	**Major Commodities**
Al Faw Grand Port	Supplementary Container Port	Container, Dry Bulk	Container
UQP	National Gateway Port	Container, All kinds of dry cargoes, Vehicle	Container, Wheat, Rice, Sugar, GC, Equipment, Vehicle, Steel products,
KZP	Industrial Port	Liquid bulk, dry bulk and break bulk for factories near the port	Oil products, Cement, Steel Products
Al Maqil	Inner Port of Basrah Province	Break bulk cargoes, Container	Genral Cargoes, Cement
Abu Flus	Out Port of Basrah Province	Container cargoes, Break bulk cargoes	General Cargoes, Container
2035			
Al Faw Grand Port	National Gateway Port	Container, Dry Bulk, Vehicle	Container, Wheat, Vehicle
UQP	National Gateway Port	Dry bulk and break bulk cargoes	Rice, Sugar, GC, Equipment, Steel products, Plant
KZP	Industrial Port	Liquid bulk, dry bulk and break bulk	Oil products, Cement, Steel Products
Al Maqil	Inner Port of Basrah Province	Break bulk cargoes, Container	GC, Cement
Abu Flus	Out Port of Basrah Province	Container cargoes, Break bulk cargoes	GC, Container

Source: JICA Study Team

4.6.2 Investment and Finance

As the investment in port and channel development and its finance shall be examined after the development plan is proposed, this section reviews principles for long-term port investment and its finance.

- Port development under Public Private Partnership (PPP). Public sectors are responsible for the development and maintenance of channels, basins, breakwaters, land reclamation, roads, bridges, and other infrastructures which need a large investment, are not profitable, and are difficultto charge for. Private sectors are expected to develop terminals including pavements, buildings, cargo handling equipment, and storage facilities, and to execute terminal operations, those costs can be recovered by charges on cargo handling and storage.
- Investment of public sectors may be financed by international development funds or foreign ODA agencies, and gradually be shifted to own finance by the government.
- Investment of private sectors can be financed by own funds of investors or official PPP development funds of foreign ODA agencies.
- Collection of port fees and charges shall be based on “Beneficiaries Pay Principle”, and GCPI be operated in a self-supporting manner.
- Development of Al Faw Grand Port needs government support as a national project from the viewpoint of basic economic infrastructure. Super structures of the Port can be developed by private sectors.

4.6.3 Port Management and Operation System Reform

Port authority of Iraq is the General Company for Ports of Iraq (GCPI), a state owned company established under Law No.22 on State Owned Companies in 1997. GCPI is the sole agency for port management and operations, which plays the role of regulator and operator, and the ports are categorized as “Service Ports”.

Service Ports have a monopoly of port operations and therefore have less incentive to cut costs or provide competitive services. Many service ports are transformed to "Tool Ports" where port service companies are allowed to use cargo handling facilities of the port authority and provide services to port users, or to "Landlord Ports" where the port authority owns land premises and/or port facilities but does not provide cargo handling services. Some ports are transformed to fully privatized ports, where the port authority becomes a joint stock company and operates the port. In this case, responsible ministry plays the role of regulator, and the fully privatized port authority operates the port in a monopolistic way.

In order to improve user services of Iraqi ports and make them competitive, Iraqi port system shall be transformed to "Landlord Port" system. Functions of regulator and operator shall be separated and GCPI remains as the regulator. Several operators or stevedores shall be allowed to provide services in port under the supervision of GCPI, but GCPI shall not provide cargo handling services and keep away from competition with private operators. Specific items to be included in the port reform strategy of Iraq are as follows.

- To encourage private participation in port services and competition between private service providers.
- To reduce regulations on port services and port tariff, which shall be deregulated in case that several operators provide services in a port.
- To develop and operate ports by means of PPP.
- To invite shipping lines and international terminal operators to operate their terminals in Iraqi ports.
- To make a master plan for the development, management and maintenance of ports and channels, and disseminate it to port investors.
- To clarify rules and procedures for private sectors to participate in port development and operations, namely those for the approval of their port development plan, construction plan, supervision on terminal operations, responsibilities and rights of operators, and the like.
- To separate regulatory functions and operational functions of the port authority.
- To supervise private terminal operators for the sake of ensuring their safe operations, measures for port and ship security, and actions for environmental protection.
- To define the port management body of private port facilities located outside the ports of GCPI, and clarify the responsible entity for their proper operation and safety measures.
- To prepare contingency plans for coping with accidents in port waters and land premises, and provide necessary machinery and materials.
- To revise port law to realize these items for port reform.

Privatization of a port authority has two types, one is the full privatization of port authority, and the other is the transformation to the landlord type port authority. In the former case, a port authority becomes a commercial joint-stock company and its regulatory power is transferred to a department of the government. A commercial port company usually operates its port under monopolistic competition, it is therefore not expected to provide competitive services with port users.

Experience of port privatization in the UK revealed that cargo handling productivity was not improved by privatization while labor strikes reduced, and a commercial port company is liable to invest its resources in promoting more profitable business than developing port facilities. Recently, the UK government has suspended the policy of compulsory port privatization and is trying to make their ports competitive for the national economy.

In the case of Iraqi ports, it is recommended to reform GCPI as the landlord port authority, and operational functions of GCPI will be commissioned to several private terminal operators.

Efforts shall be made to introduce competitive terminal operations in port rather than monopolistic competition.

4.6.4 Port Sales and Marketing for the Effective Utilization of the Ports

Geographically, Iraq is situated at the northern end of the Gulf. Therefore, Iraqi ports cannot be a gateway for other countries. Inducement of domestic/foreign industries as well as advanced logistics facilities to the hinterland of the port is the royal road to the prosperity. This is fundamental method which all the port authorities of the world are following. World major ports used to nominate local representatives at major trading partner countries to induce liner services or factories to their hinterlands. However, this method is considered to be cost consuming and not effective as before. World major ports are withdrawing from this method.

Sales activities to the container carriers are just time consuming and non-effective. The ships will go to anywhere where profitable cargo is available. The most important thing is the increase of cargo at the hinterland for the port prosperity.

Incentives to induce cargo are considered to be as follows.

- To have vast Free Access Zone behind the port as is done in Jebel Ali. It would be efficient for the exporters to invest in logistics centers for re-export of the cargo.
- To have excellent productivity of the port. It is one of important determinants for the carrier to deploy services. Carriers are always concerned of the port productivity. If the productivity is low, they will not accept voyage charter or raise the charter rate according as the low productivity.
- To provide efficient and economical labor force at hinterlands of the port. It is essential determinant for the investors from abroad to employ more skilled and cheaper labors than their current factory labors.
- To have comprehensive information system for the cargo import/export procedure. The system will definitely enhance the cargo handling production, resulting to more effective custom procedures.
- To have smooth connection to cargo on-carriage. Shippers and Consignees inclusive of cargo forwarders choose the most effective way to receive cargo in their convenient time. If not, they will choose alternative ways, like using other ports and transport routes.
- To have lower rated port tariff to induce shipping lines to call directly for further feeder to neighboring Gulf countries in case of future cost increase at present transshipment ports as Jebel Ali and Khor Fakkan.
- To have better public relations with the World.
- One of most important things for the Port Authorities is to provide necessary information to the users of ports.

4.7 Scenarios of Port Development

4.7.1 Policy Alternatives for Port Development

Container cargo throughput of Iraqi ports is expected to increase considerably in line with the economic recovery and growth of the country. Demand for container cargo handling is estimated as shown in Chapter 4.3 of this report. Present capacity of container handling at Umm Qasr Port (UQP) is assessed as indicated in Chapter 3.8 of this report. In order to meet anticipated demand, the following three alternatives are taken into consideration.

(1) Use of Ports of Neighboring Countries

In case that the capacity of Iraqi ports becomes insufficient to meet the future demand of maritime transportation to Iraq, international ports of neighboring countries, i.e. Mubarak Port and Shuwaikh Port in Kuwait, Aqaba Port in Jordan, Mersin Port in Turkey and some others, can handle import cargoes to Iraq. Investment in UQP can be minimized and the development of Al Faw Grand Port can be delayed behind the present schedule.

(2) Priority Investment in UQP

Priority of port development is given to UQP (South and North), and the development of Al Faw Grand Port will have the second priority. In this case, the public sector needs to invest in the development of infrastructure besides the private investment in terminal facilities. Renewal of the UQP (South) needs to close one or two berths during its rehabilitation. The development of new berths beyond No. 27 in the UQP (North) will face the problem of soft ground at the construction site, which needs big investment and time for soil improvement.

(3) Priority Investment in Al Faw Grand Port

Supposing that container cargo will shift from UQP to Al Faw Grand Port in the near future, investment in the UQP shall be minimized and priority shall be given to Al Faw Grand Port. In case that Al Faw Grand Port cannot open on schedule, it is indispensable to use some ports of neighboring countries as shown in the alternative (1). If such situation takes place, UQP will face heavy ship congestion and high congestion surcharges will be levied, and land transportation costs to Iraq will appreciate considerably. It may be necessary to modify the port development plan of Al Faw Grand Port to develop the first berth in a short period of time.

4.7.2 Scenarios of Container Terminal Development

In order to meet the demand forecasted, it is imperative to improve the performance of cargo handling, capacity of present terminals, and to develop new terminals. UQP is the main container port in Iraq, which handles the majority of container cargo of Iraq. Abu Flus Port is used for importing container cargo but the volume is limited to a small quantity. When Al Faw Grand Port is completed and enters into operation, the new port is expected to handle a considerable amount of container cargo, but its development is behind the schedule. Necessary capacity of UQP depends on the development of AL Faw Grand Port. If port development of the new port is delayed, UQP needs to handle all container cargo to Iraq, but if the new port opens earlier, UQP needs smaller sized development for container handling. Taking these points into consideration, three scenarios are supposed as follows.

(1) Scenario 1 (Redevelopment of UQP South, Development of UQP North with 2 new berths moderate scale container terminal, Development of Al Faw Grand Port)

At Umm Qasr Port, GCPI plans to improve the South Port by leasing the No.2-7 berths to private investors and to make them redevelop the berths and yard behind. Development of UQP (North) No.21-24 berths is planned by Al Oreen Co. as Ro/Ro, general cargo and container berths.

This scenario supposes that South No.4-8 berths will be reformed to container berths with two quay gantry cranes each and a large enough container yard. UQP (North) No.21-24 will be developed by Al Oreen Co., Ltd, and one of which will be a moderate scale container terminal without quay gantry cranes. UQP (North) No.25-27 is supposed to be developed by a private investor as a full scale container terminal with 2 quay gantry cranes at each berth of 200 meters.

Under this assumption, the capacity of Umm Qasr Port is assessed to increase to about 2.5 million TEUs. After that, it is assumed that Al Faw Grand Port will enter into operation at around the year 2025 in case that the demand increased by the middle growth case.

(2) Scenario 2 (Redevelopment of UQP South, Development of UQP North 2 berths with full scale container terminal, Development of Al Faw Grand Port)

This scenario supposes that South No.4-8 berths will be developed as a container terminal with 2 gantry cranes at each berth and enough size of container yard equipped with RTGs. In addition, Al Oreen Co. is supposed to develop UQP North No.21-24, one of which will be a moderate scale container terminal without quay gantry cranes. UQP North No.25-27 is supposed to be developed by a private investor as a full scale container terminal with 3 berths equipped with 6

quay gantry cranes, and a large enough container yard and enough number of RTGs and other cargo handling equipment.

Under this assumption, the capacity of Umm Qasr Port is assessed to increase to about 2.9 million TEUs. After that, it is assumed that Al Faw Grand Port will enter into operation at around the year 2026 in case that the demand increased by the middle growth case. No berth will be necessary at Al Faw Grand Port to meet the demand of 2025 in the middle growth case.

(3) Scenario 3 (Small Scale Improvement of UQP South, No Development of UQP North No.25-27, Early development of Al Faw Grand Port)

This scenario supposes that UQP South No.4-5 will be used at best performance of present facilities, No.6-7 will be developed as a moderate scale container terminal without quay gantry cranes. Al Oreen Co. is supposed to develop UQP North No.21-24, one of which will be a moderate scale container terminal without quay gantry cranes. UQP (North) No.25-27 will be not developed in this scenario. In order to meet urgent demand for container handling, it is supposed that general cargo berths will be used for containerships with gears.

Under this assumption, the total capacity of container handling at Umm Qasr Port is assessed to increase to about 1.6 million TEUs. After that, it is assumed that Al Faw Grand Port will enter into operation at around the year 2019 in case that the demand increased by the middle growth case. Two berths at Al Faw Grand Port will be required to meet the demand of 2025 in the middle growth case.

The container handling capacity of each berth under scenarios No.1-No.3 is summarized in Table 4.7-1.

Table 4.7-1 Cargo Handling Capacity under Three Scenarios

Scenario 1 (Development of South Port, Moderate Development of North Port Berths No.25~27)

Berth	No.4	No.5	No.6	No.7	No.8	ICT	No.20/21	No.22-24	No.25-27	Total
Cranes	G2	G2	G2	G2	G2	G2&M2	G2	M2	G4	Total
TEUs	260,000	260,000	260,000	260,000	260,000	310,000	208,000	177,000	520,000	2,515,000
Increases	166,000		520,000		74,000	0	0	177,000	520,000	1,457,000

Scenario 2 (Development of South Port, Full Scale Development of North Port Berths No.20/21, 25~27)

Berth	No.4	No.5	No.6	No.7	No.8	ICT	No.20/21	No.22-24	No.25-27	Total
Cranes	G2	G2	G2	G2	G2	G2&M2	G2&M2	M2	G6	Total
TEUs	260,000	260,000	260,000	260,000	260,000	310,000	310,000	177,000	780,000	2,877,000
Increases	166,000		520,000		74,000	0	102,000	177,000	780,000	1,819,000

Scenario 3 (Least Improvement of South Port and North Port)

Berth	No.4	No.5	No.6	No.7	No.8	ICT	No.20/21	No.22-24	No.24-25	Total
Cranes	M2	M2	M2	M2	M2	G2&M2	G2	M2	-	Total
TEUs	177,000	177,000	177,000	177,000	186,000	310,000	208,000	177,000	0	1,589,000
Increases	0		354,000		0	0	0	177,000	0	531,000

Note G: Gantry Crane
M: Mobile Crane Number: Number of Unit

Source: JICA Study Team

4.7.3 Development Issues towards Long-term Master Plan

It is imperative to develop UQP, KZP, and Al Faw Grand Port under one of the scenarios No.1-No.3 mentioned in the above section or based on another combination of port facility development components. Necessary components of port facility/channel development are provisionally identified as follows.

(1) Umm Qasr Port

- South Port No.2-7, Development by private operator (Berths No.2-3 for general cargo, Berths No.4-No.7 for container cargo)
- South Port No.8, Redevelopment by Gulftainer Co.
- ICT No.11a & 11b, Improvement by Gulftainer Co.

- North Port No.12-13, Rehabilitation by GCPI
- North Port No.14, Redevelopment by Al Oreen Co.
- North Port No.15-19, Rehabilitation by GCPI
- North Port No.20, Improvement of container handling capacity by GCPI or a private investor
- North Port No.21-24, Development by Al Oreen Co. (Berths for Ro/Ro, General cargo, and Container cargo)
- North Port No.25-27, Full scale development as a container terminal by a private operator
- North Port No. 28 and further berths, Development as private port facilities for private cargo
- Rezoning of port areas for rational location of terminals, gates, parking areas, logistics center, internal roads, railway line and yard, drainage ditches and pipes and other utilities.

(2) Khor Al Zubayr Port

- No. 9 & 10, Berths of the Ministry of Industry to be used for iron industry
- No.11-12, To be developed as general cargo berths
- New 3 berths between UQP and KZP, Development by GCPI for replacement of liquid cargo from No. 9 & No.10
- No.7-8, Possible reform to container berth with enough container yard when UQP reached the full capacity

(3) Al Maqil Port

- Berth No.1, Redevelopment of the waterfront for urban use
- Berth No.2, Operations for general cargo
- Berth No.3-5, Redevelopment of the waterfront for urban use or for shipyard
- Berth No.6-9, Operations for general cargo
- Berth No.10-11, Redevelopment as container berths by a private investor
- Berth No.12, General cargo berth
- Berth No.13, No.14, Redevelopment and operations together with Berth No.14
- Berth No.14, Rehabilitated and operated by NAWAH

(4) Abu Flus Port

- Berth No.1-2, General cargo imported from Iran
- Berth No.3, Redevelopment as a container berth by a private company. (Liner service from Dubai by small container barge with a capacity of 60-100 TEUs

(5) Khawr Abdallah Channel

- The present Abdallah channel is located very close to the Mubarak Port in the section between Mubarak Port and Al Faw Grand Port. It will be necessary to operate the channel jointly between Kuwait and Iraq, or reroute the channel utilizing the approach channel to Al Faw Grand Port.

(6) Shatt al Arab Channel

- Shatt al Arab river is the boundary between Iran and Iraq, therefore dredging of the channel needs agreement between the two countries. Depth of the channel was maintained at -8 meters before the war by frequent dredging work at the river mouth. It is imperative to examine the volume of capital dredging to deepen the navigation channel to the level it was before the war.

(7) Al Faw Grand Port

- Development schedule of Al Faw Grand Port and highway from Al Faw to Umm Qasr has

close connection with the development schedule of UQP and KZP. These development schedules shall be carefully coordinated to avoid duplication of investment, and to supply enough but not excessive capacity to meet the demand.

- Stage plan of the development of Al Faw Grand Port shall be reviewed and re-planned from the viewpoint of early opening with less investment.