Republic of Iraq
Ministry of Industry and Minerals

Preparatory Survey on New Fertilizer Plant and Intermodal Transportation Terminal Project

(PPP Project in Khor Al Zubair, Republic of Iraq)

Final Report

March 2013

Japan International Cooperation Agency

UNICO International Corporation
Mitsui & Co., Ltd.
Toyo Engineering Corporation

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Abbreviation

Abbreviation	Full Name
AACEI	The Association for the Advancement of Cost Engineering, International
AC	Area Distribution Center
ACES21	Advanced process for Cost and Energy Saving 21
BPIE	Board of Protection & Improvement of Environment
B/S	Balance Sheet
BWRO	Brackish Water Reverse Osmosis
CBI	Central Bank of Iraq
CIRR	Commercial Interest Reference Rate
CO_2	Carbon Dioxide
CoM	Council of Ministers
C/P	Counterpart
CPA	The Coalition Provisional Authority
CPI	Corrugated Plate Interceptor
dB	decibel
DC	Distribution Center
DCF	Discount Cash Flow
DCS	Distributed Control System
DER	Debt Equity Ratio
DSCR	Debt Service Coverage Ratio
D/F	Draft Final report
DWT	Dead weight tonnage
ECA	Export Credit Agency
EDC	Effective date of contract
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPC	Engineering, Procurement and Construction
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FEED	Front End Engineering Design
Fertecon	Fertecon Limited, UK
FIRR	Financial Internal Rate of Return
FOB	Free on Board
FS	Feasibility Study
GCPI	General Company for Port of Iraq
GDP	Gross Domestic Product
GHG	Green House Gas

Abbreviation	Full Name
GIIP	Good international industry practice
ha	hector
HAVAC	Heating, ventilating, and air-conditioning
ID	Iraq Dinar
IDC	Interest during construction
IEA	International Energy Agency
IFC	International Finance Corporation
IFC EHS	IFC Environmental, Health and Safety Guidelines
IGG	Inert Gas Generator
IMF	International Monetary Found
IOC	International Oil Companies
IRR	Iraq Republic Railways
ITT	Intermodal Transportation Terminal
JICA	Japan International Cooperation Agency
KAZ	Khor Al Zubair
KZP	Khor Al Zubair Port
LLCR	Loan Life Coverage Ratio
LLI	Long Lead Items
LP/HP	Law Pressure/ High Pressure
mmbpd	Million barrel per day
MIM	Ministry of Industry and Minerals
mmscf/d	Million Standard Cubic Feet per Day
mmbtu	Million British Thermal Unit
MOA	Ministry of Agriculture
MOEN	Ministry of Environment
MOM	Minutes of Meeting
MOO	Ministry of Oil
MOT	Ministry of Transportation
MOTr	Ministry of Trading
m/s	Meter per second
MTPD	Metric ton per day
MT/Y	Metric ton per year
NDP	National Development Plan
NEPA	National Environmental Policy Act
NEXI	Nippon Export and Investment Insurance
NG	Natural Gas
NH3	Ammonia

Abbreviation	Full Name
NIC	National Investment Commission
NPV	Net Present Value
NRDM by N.R.I.A	New Railways Designing Manual N.R.I.A (New Railways Implementation Authority)
ODA	Official Development Assistance
O&M	Operation and Maintenance
OVHD	Overhead costs
PF	Project Finance
PFC	Petrochemical Fertilizer Committee
P & ID	Piping & Instrument design
P/L	Profit and Loss
PMC	Project management Consultant
PO	Purchase order
PPP	Public Private Partnership
RO	Reverse Osmosis
ROD	Records of Discussion
SA	Survey Achievements
SCAS	State Company for Agricultural Supply
SCF	State Company of Fertilizer-South Region
SGC	South Gas Company
SOC	South Oil Company
SPC	Special Purpose Company
SWRO	Sea Water Reverse Osmosis
TC	Transfer Center
TEU	Twenty Foot Equivalent Unit
TOR	Terms Of Reference
TPA	Ton per annum
UAN/NPK	urea and ammonium nitrate/ NPK fertilizer
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UQP	Um Qasr Port
WWF	World Wide Fund for Nature

Chapter 1. Preface

1.1 Survey Background

On May 7, 2012, Japan International Cooperation Agency (hereinafter referred as " JICA") signed the implementation contract for "Preparatory Survey on Fertilizer Project and Logistics Terminal Project (as PPP Infrastructure Project)" with the survey consortium, which consists UNICO International Corporation, Mitsui & Co., Ltd., and Toyo Engineering Corporation (hereinafter referred as the "Survey team"). The projects is expected to be established in Khor Al Zubair a (hereinafter referred as "KAZ") area in the Republic of Iraq (hereinafter referred as "Iraq"), where potential Japanese investor is considering for its investment in the fertilizer project.

The fertilizer project is planned to be a core facilities for the development of the agricultural sector in Iraq.by the construction of fertilizer production facilities in KAZ plant " in the cooperation with the Iraqi Ministry of Industry and Minerals (hereinafter referred as "MIM").

The logistics terminal project is expected to increase efficiency in storage, handling and transportation of the containers and general cargos to be landed at KAZ port and the industrial products to be produced in the KAZ area, including the fertilizers. The project is assumed to be constructed with the concept of the Intermodal Transportation Terminal (herein after referred as "ITT").

The surveys relating to the logistics terminal project was carried out with the consideration on the potentiality of the Japanese ODA Loan by JICA.

1.2 Purpose of Survey

1.2.1 Project (PPP PROJECT)

The project targeted by this survey is the development project to construct and operate the large-scale fertilizer production facility to comply with the increasing fertilizer demand in Iraq with the combination to establish the ITT project to deliver the cargos and products nationwide from KAZ (hereinafter collectively referred as "PPP PROJECT").

Since the agricultural infrastructure in Iraq, including the fertilizer production facilities and transportation facilities needs to be improved, the development project with the above two components can be recognized as an important project for the Iraqi National development.

(1) Fertilizer Project

■ Project Capacity

Ammonia plant: 2,700 tons per day / (MT/D)

Urea plant: 3,000 tons per day / (MT/D)

From the view point of the competitiveness and the project profitability in fertilizer business, it is desirable to build the larger size of the plant. The appropriate capacity of the plant shall be determined by the following factors;

① The size of the plant commercially proven in the world.
② The size of the commercially accessible market (domestic and international)
③ Feedstock (natural gas) availability

The survey team agreed on the above plant capacity with MIM. Details are described in Chapter 3.

■ Feedstock Supply

The feedstock, natural gas, shall be supplied by the Iraqi Ministry of Oil (MOO)

In this survey, a stable supply of natural gas required for the plant was confirmed by MIM and MOO.

■ Application Technology

Modern process technology with the environmentally-friendly and efficient production cost shall be applied for the project.

Details are described Chapter 3 and catalogs are attached as appendixes.

■ Marketing

Products from the project shall be supplied to the domestic and international markets in ammonia and urea.

The ammonia shall be exported to the neighboring markets such as India and Japan.

The urea shall supplied to the domestic markets and international market depending on demand and supply situations of the Iraqi domestic market.

(2) ITT project

■ Project Capacity

ITT Project is the combined logistics terminal of railway and track with the annual handling/transportation capacity of more than 2,000,000 tons.

ITT project is linked to the country's transport network associated with the Iraqi Ministry of Transportation (MOT), IRR and GCPI. The expected railway transportation volume is 2,000,000 tons per annum.

■ **Railway Vehicles**

The project includes the provisions of railway vehicles such as diesel locomotives and wagons required for the operation of ITT Project.

The cost for the rehabilitation and/or newly laying of the railway track from the ITT terminal to the integration point to the existing railway system is included in the scope of the ITT Project.

Details are described in Chapter 4.

(3) Project Schedule

The following is the expected project schedule.

1) Preparatory Survey for the PPP PROJECT 2012-2013

2) Fertilizer Project

- Preparation of the plant site Late 2013
- Start of the plant construction Early 2014
- The completion of the Plant 2017
- The start of the commercial operation 2018

MIM has a strong desire to complete the construction of the plant until the end of 2017 and to start commercial operation from the beginning of 2018. The survey team estimates through the survey that it would take 4 year (48 month) for the plant construction in Iraq from the effective date of EPC contract (Engineering, Procurement and Construction Contract) to the plant completion

3) ITT Project

- **The feasibility study for the Japanese ODA Loan for the project 2013-2014**
  The feasibility study shall be subject to the acceptance by the Japanese Government /JICA based on the request of the Iraqi Government.
- The appraisal of the Japanese ODA loan 2014-2015
- Nomination of the project management consultant 2014-2015
- Tendering of the contractor(s) for the project and/or of the supplier(s) of the equipment/materials. 2015-2016
- The completion of the project 2018-2019
- The start of the commercial operation 2018-2019
  The implementation schedule of ITT project is basically to comply with the implementation schedule of the fertilizer project.

Since the financing for ITT Project is expected from Japanese ODA loan, it is assumed that it would take 1-2 years for the agreement in the both Japanese and Iraqi Governments. The study team understands that the completion of ITT Project could comply with the schedule of the Fertilizer Project and the schedule of the rehabilitation project of KAZ port, which is

currently under planning, since the completion of the ITT Project could be achieved within 3 years after the start of the engineering and procurement works.

It might require the several steps before the start of the construction due to the finance arrangement of the ODA loan.

1.2.2 Survey Objectives

The PPP PROJECT, consisting of the Fertilizer Project and ITT Project, is expected to contribute to the socio-economic development of Iraq.

The main objective of this survey is to evaluate the feasibility of the proposed PPP PROJECT and to verify the suitability of the PPP PROJECT to the socio-economic needs in Iraq.

(1) Survey Area

Since the PPP Project is expected to be carried out in KAZ area of Basra province in Iraq, the southern region of Iraq, it was necessary to collect information and data for both the entire Iraq and the southern region of Iraq. The site survey and the discussion with the Iraqi counterparts and other stakeholders in Iraq were conducted in Iraq (Baghdad and Basra) and Jordan (Amman).

(2) Scope of Survey Work

The survey was carried out based on the scope of the work in the Preparatory Survey as specified in the implementation contract for "Preparatory Survey on Fertilizer Project and Logistics Terminal Project (as PPP Infrastructure Project)" signed on May 7, 2012.

The survey was conducted based on the following point of view.

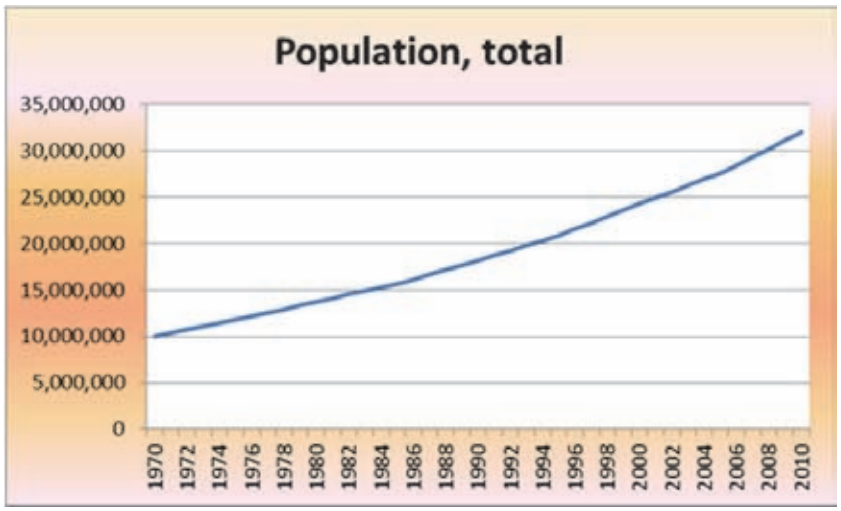
- Economic viability of the projects
- Contribution to the socio-economic development of Iraq
- Justification of PPP Structure for the project
- Japanese ODA projects
- International cooperation
- Consideration on the environmental and social impacts

Chapter 2. Background of the Project

2.1 Situation in Iraq

2.1.1 Macroeconomic Indicators of Iraqi Economy

Social and economic reconstruction of Iraq has been steadily, as shown in Figure 2-1, the population of Iraq is increasing continuously.



(Source: UNICO with data of World Databank[1], 2012.9 access)

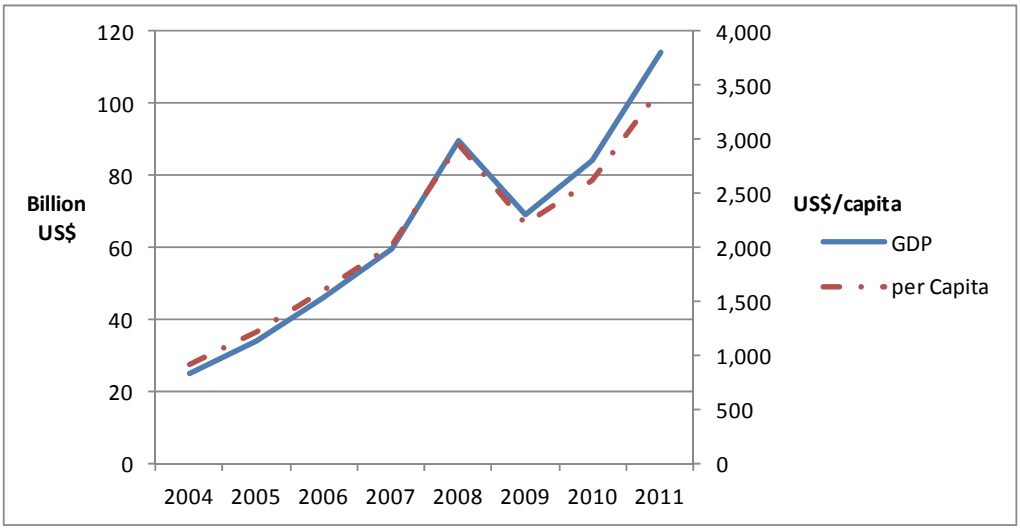
Figure 2-1: Changes in the population of Iraq（1970-2010）

In Iraq, wide range of economic improvement, healthy long-term finance, and improvement for sustainable standard of living, are geared by major policy reforms by the government. Large parts of Iraq's economy are dependent on the oil sector, which accounts for over 90% of foreign exchange earnings and government revenue. Oil exports have come back to the level prior to 2003, and the government revenue has been recovered under support by the world good crude oil price since mid-2009. The government of Iraq is building systems for development to implement economic policies.

IMF "World Economic Outlook" issued in October 2012 projects annual real GDP growth at 10.2% and 14.7% for 2012 and 2013 respectively.

Remarkable growth of gross domestic product (GDP) and GDP per capita are recorded as shown in Figure 2-2. Nominal GDP of Iraq in 2004 being 24.9 billion US Dollars in 2003 increased to 114.2 billion US Dollars and GDP per capita (nominal) 3,478 US Dollars

[1] http://databank.worldbank.org/ddp/home.do



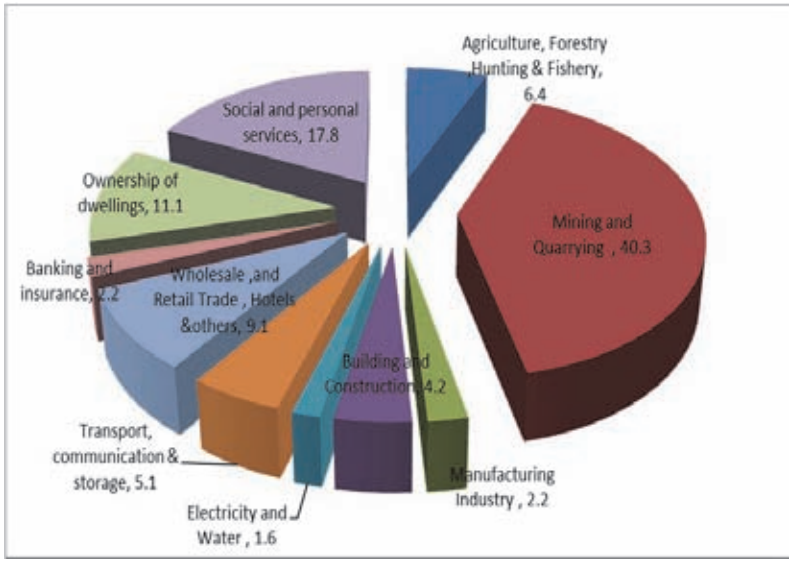
(Source: IMF)

Figure 2-2: GDP and GDP per Capita in USD (nominal) 2004-2011

2.1.2 Current Structure of Iraqi Economy

Figure 2-3 shows the breakdown of GDP by economic activities in Iraq from January 2011 to March 2011. This figure shows the following points.

- Portion of oil production (the ratio of the largest mining and quarrying 40.3%) is large.
- Proportion of manufacturing is small (only 2.2%).



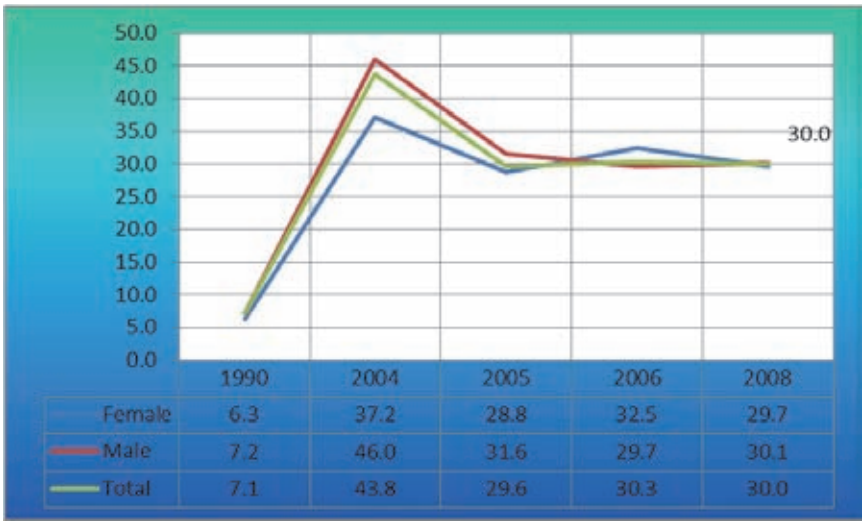
(Source: COSIT, 2011[2], Iraq PPP Survey Team)

Figure 2-3: Proportion of GDP by Economic Activities of First Quarter of 2011(%)

[2] Central Organization of Statistics & Information Technology(COSIT), 2011, Annual Abstract of Statistics 2010-11 http://cosit.gov.iq/english/annual_abstract_of_statistics2010-2011.php (last acess May 23 2012)

In Iraq, the share of the manufacturing industry in GDP is very low 2.2%. Manufacturing development may be a key for further development of the nation. For future sustainable development and increasing employment, supports to manufacturing sectors are important.

As shown in Figure 2-4, the unemployment rate in Iraq has remained high at about 30% in 2008. This is one of the most important issues to be solved for Iraqi society and economy as well.



(Source: COSIT, 2011, Iraq PPP Survey Team)

Figure 2-4: Unemployment rate by gender of Iraq (1990-2008 years)

2.1.3 National Investment Plan in the National development Plan for2010-2014

In 2010, the Iraqi government announced the National Development Plan 2012-2014 years (hereinafter referred to as "NDP 2010-2014"). The NDP 2010-2014 has explicitly stated that as a national goal, put a high priority, especially in the following two points.

- The diversification of the economy, to create jobs on a large scale.
- Improve productivity in the industrial sector, to strengthen the international competitiveness.

Targets of NDP 2010-2014:

1. Achieve 9.38% annual GDP growth rate
2. Create 3 million - 4.5 million new jobs
3. Promote diversification of the economy- manufacturing industry, agriculture, industry, and tourism in particular.
4. Increase role of private sector in the field of domestic and international transportation, retail, communications, ports/airport management, education, health, and housing.
5. Enhance productivity and competitiveness -oil, gas, petrochemical, fertilizer, cement, pharmaceutical industry, dates/fruit processing, , livestock industry and tourism
6. Poverty reduction, rural development, improvement of education and health services, specially.
7. Implement of development across each Provinces
8. Establish of sustainable development in a balanced economic, social and environmental.
9. Strength the role of local government and establish of complementarity

National investment plan in the 2010-2014 NDP

Investment plan in amount equivalent to 1,860 billion US Dollar was established by the government in the NDP 2010-2014. Breakdown of U.S.$1,860 billion is investment $100 billion from the government budget, and private investment has been planned at U.S.$86 billion.

2.2 Investments in Iraq

2.2.1 Status of Foreign Investments in Iraq

National investment plan expects the private investment during the five-year period 2010-2014 to be U.S.$86 billion. Private investments are important in the industrial sector and infrastructure sector for development in particular.

2.2.2 Investment in Iraq

The government is intending to rebuild the economy and attract foreign investment in Iraq, and the laws and regulations were legislated. Iraq has established a system of open trade and investment to focus on strengthening the private sector. Business environment in Iraq is gradually improved by laws that came into effect after 2003; legal system to attract the foreign investment such as the same treatment as domestic investors to foreign investors has been improved. The following is the name of the laws and regulations.

- Trade Liberalization Policy Law No. 54 of 2004
- The Central Bank Law No. 56 of 2004
- Law No. 64 of 2004, Amending Company Law No. 21 of 1997
- Interim Law on Securities Market No. 74 of 2004

- Law No. 80 of 2004, Amending Trademarks and Descriptions Law no. 21 of 1957
- Patent, Industrial Design, Undisclosed Information, Integrated Circuits And Plant Variety Law No. 81 of 2004
- The Banking Law No. 94 of 2004
- Insurance Regulatory Law No. 10 of 2005
- Investment Law No. 13 of 2006(revised in 2010)
- Kurdistan Region Investment Law No. 4 of 2006
- Private Investment In Crude Oil Refining Law No. 64 of 2007
- Iraqi Environmental Protection and Implement Law No.27 of 2009

The Investment Law No 13 of years 2006 (revised 2010), defines an important frameworks on investment in Iraq.

2.2.3 Situation of the southern region of Iraq

(1) Social situation in the region Basra

Located at the southern end of Iraq, which is equivalent to 19,070 km2, accounting for 4% of the country Iraq, Basra province has a population of 1.91 million people which is equivalent to 6% of the total resident. Thus, the population density in Basra is equal to or greater than about 1.5 times the average of the entire Iraq. The city of Basra, located along the canal shuttle Arab capital is at a distance of 545km from Baghdad and 55km from the Persian Gulf. As shown in Figure 2-5, Basra province is composed of seven districts.

(Source: International Information Analysis Unit)

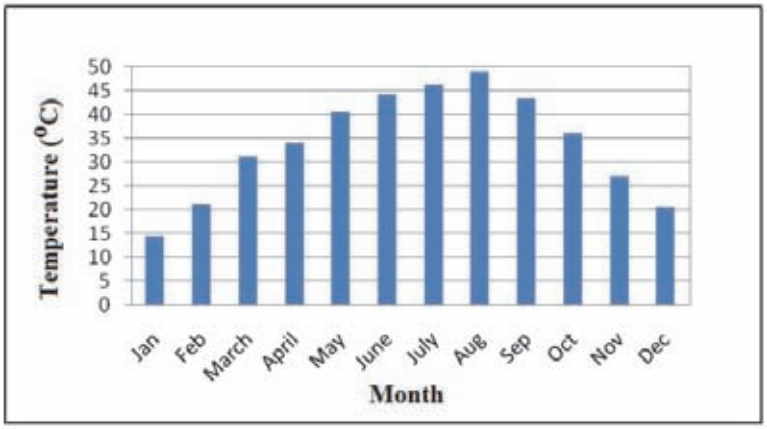
Figure 2-5: Districts in Basra province

(2) Weather condition

During construction and operation of the fertilizer plant, natural conditions such as climate and environment in the land for the plant will become an important issue.

■ Temperature

Climate in Basra province, there can sometimes be less than 5 degrees in the winter; the average monthly temperature never goes below 10 degrees. Sometimes the cold weather comes in the middle of winter from December to February, basically the warm winter in Basra, the highest temperature sometimes reaches 22 degrees. In the summer, outdoors will be high temperatures and dry. While the average daily temperature in July and August, the hottest season, reach 50 degrees, the temperature of the night drops to around 35 degrees. Figure 2-11 shows an average monthly temperature of the city of in Basra in 2009 by Climate Committee in Iraq (in Basra station) published. For high temperatures in summer, it is necessary to sufficiently consider the set of design and operating conditions for fertilizer plant.

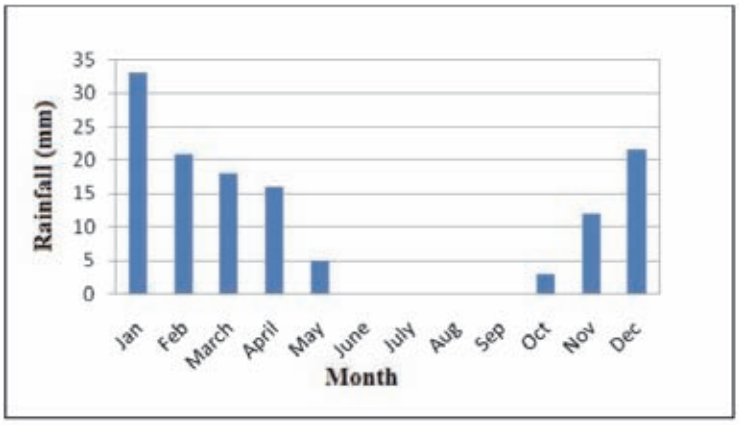


(Source: Iraqi Climate Committee)

Figure 2-6: Monthly average temperature in Basra (2009)

■ Amount of precipitation:

In the dry season from June to September, rain start from October, in the Basra province, and stop by the end of May. As seen from monthly average amount of precipitation in Basra in 2009 shown in Figure 2-12, each seasonal amount of precipitation is less than 125mm.



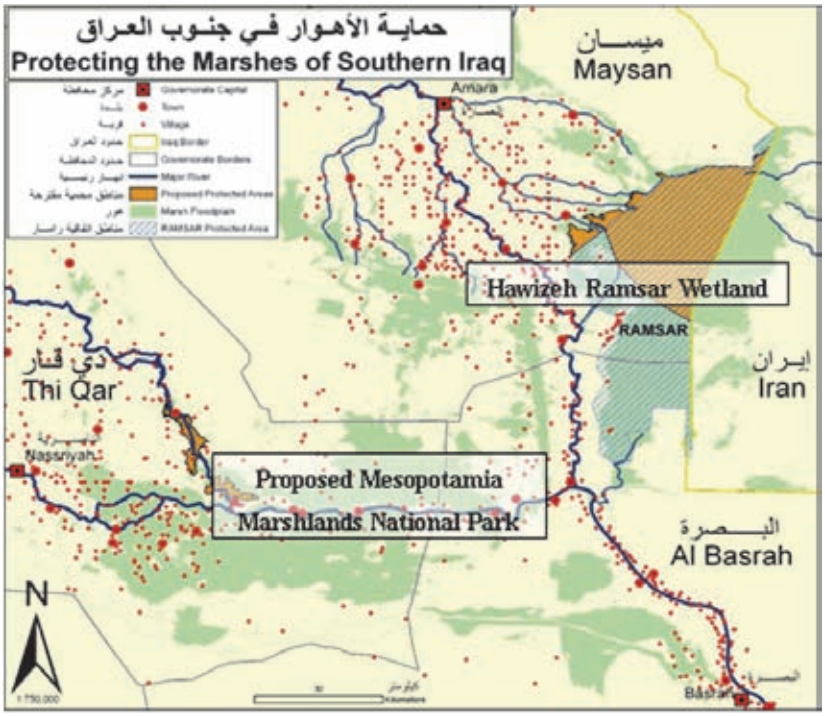
(Source: Iraqi Climate Committee)

Figure 2-7：Monthly amount of precipitation in Basra province (2009)

(3) Environmental condition

To summarize the meteorological feature in Iraq, the dusty hot summer without rain. Little precipitation and relatively warm winter. Weather conditions do not differ much with other Middle Eastern countries. However, the difference with other countries in the Middle East, in Iraq had been that the abundant water resources in the mountains from the position Turkey, Syria, Iran.

The most valuable term on natural environment of the country conditions in Iraq was that there was wetlands inside and outside of the country. Area of wetlands, including the border between Iraq and Iran, which was around 20,000 square kilometers in the 1970s, but it was decreased to 5-7% when the old regime collapsed in 2003. The three main wetlands; (1)Al hammer wetlands located on the south bank of the Euphrates river, (2) Central wetlands located on the west bank of the Tigris River and on the north bank of the Euphrates river, and (3) Al Hawizeh wetlands located on the east bank of the Tigris river (Ramsar Convention registration) See Figure 2-8. So far, for the protected area management activities are not carried out in the area KAZ.



(Source: University of Victoria Library)

Figure 2-8: Natural protected areas in southern Iraq

2.3 Situation in the agricultural sector and the infrastructure sector in Iraq

2.3.1 Agricultural sector in Iraq

According to the NDP, the total arable land in the country of Iraq, including irrigated farmland,and dry land is 418.0 million ha. The total area of land that can be irrigated is 9.3 million ha. In order to irrigate all this land, reasonable arrangements for the use of river water among the countries sharing the river including the Iraq (Iraq, Iran, Turkey, Syria and Jordan) is required.

The current total irrigated area is 5.4 million ha, corresponding to 58% of the land that can be irrigated. This is a low percentage, as FAO estimates the percentage planted irrigated land in the Middle East and North Africa at an average of 62 percent. A large part of the land is in poor condition because of salinity and the fact that it is filled with ground water, especially in the central and southern areas because of bad operational works, poor maintenance, and lack of integrated water logging.

In Iraq, to reduce food imports for food security, at the same time, from the fact that the improvement of productivity, especially to contribute in terms of job creation, the development of the agricultural sector is important. For development of the agricultural sector as a goal, an annual growth rate of 7.0% is targeted to be achieved by the year 2014 (NDP).

2.3.2 Transportation sector and infrastructure in Iraq

Restoration and maintenance of infrastructure is essential in order to achieve early and effective reconstruction and development of society and economy of Iraq. However, they are still limited. NDR 2007-2010 pointed out that reconstruction and development in transportation and communication services, postal services and international service network are far behind from expected.

Furthermore, in the NDP 2010-2014, the needs for improvement of the transportation sector of Iraq by achieving the following issues are emphasized.

1) Increase the efficiency and capacity of the current network traffic
2) Integrate different transportation system
3) Improve its efficiency in the field of management and operations, not only the facilities and institutions, efficiency and performance of public enterprises in the transportation sector
4) Develop and promote freight transport by rail, and protect the road network from damage
5) Reduce accidents of traffic network
6) Provide shortcut rote to reduce the travel time from the center of the town
7) Contribute to strengthening the economic independence in Iraq.
8) Reduce transportation costs
9) Strengthen its position as a commercial point of transportation and transit geographical strategic points of Iraq
10) Increase the contribution of the transport sector to GDP
11) Strengthen the role of the private sector at the variety of transportation activities, in particular in the portion of the implementation of operation and service delivery

In order to address the need for transportation expansion of Iraq, Iraq MOT is committed not only to realize the new development but also to achieve the early restoration of the transport system. In the second site survey, survey team saw a large number of construction and renovation projects in Basra province.

(Source: Survey Team in October 2012)

■ Railroad

Reform of the railway sector in Iraq currently is under active movement. In both passenger and cargo, rail transport is a very important sector of the national transport sector. Compared to other means of transport, especially for freight, rail transport provides long-distance transport with the relatively low cost. Iraq was a pioneer using the train for transport. However, because of the long-term war and sanctions for decades, current activities of railway transportation in Iraq are smaller than in the past (Table 2-1). The current amount of cargo transportation is less than 10% in the 1980s.

Table 2-1: Transportation by railway system in Iraq (1979-2008)

Year	Length of railroad lines (km)	Number of passengers (1,000 passengers)	Transported cargo (1,000 Tons)	Income (1,000 Dinars)	
				Passengers	Cargo
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
2006	2,272	4	165	15	1,049
2008	2,295	107	257	-	-

(Source: NDP 2010-2014)

Further information on the status and plans of restoration and development of railway in Iraq, is described in Chapter 4 of this report.

■ Ports

Currently, Iraq MOT has been carrying out several port rehabilitation projects in the southern region, including KAP.

Currently, MOT is in the process of implementing the new Faw port construction projects. The project includes five miles of rubble-mound breakwater, pier and two temporary floating docks of 260 feet. New port is expected to become one of the largest ports in Iraq and to alleviate the congestion of UQP, in the Persian Gulf area. Rail project to the new Faw port from Zuberuis is being planned.

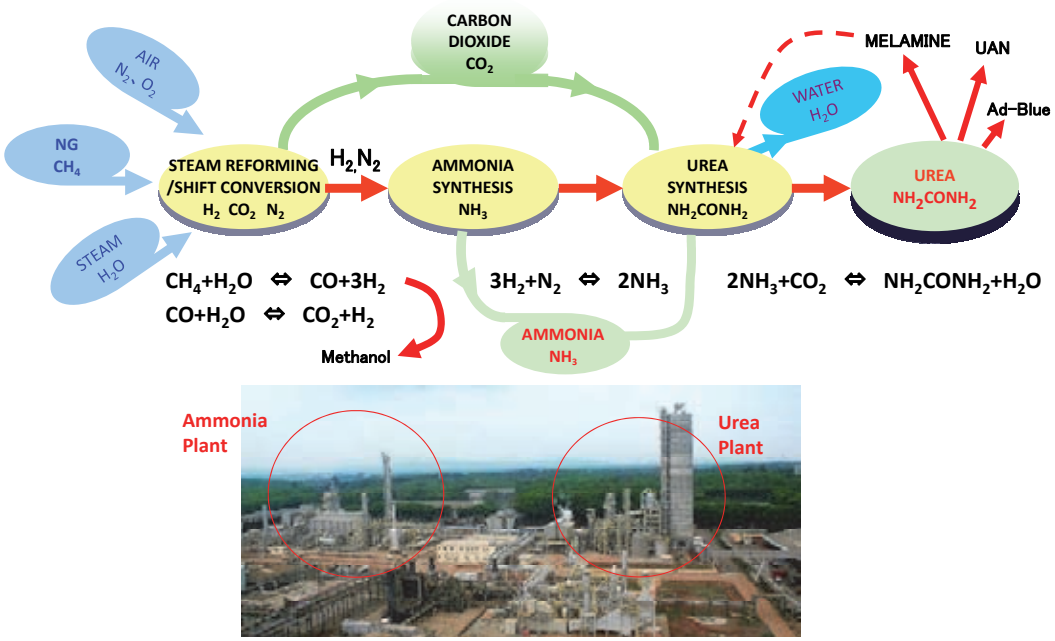
Chapter 3. Fertilizer Plant

■ Fertilizer

Fertilizer is classified as organic fertilizer and inorganic (chemical) fertilizer. The start of the modern science of plant nutrition material can be backed to the middle of 19th century. Chemical synthetic fertilizer has supported growth of population with nitrogen (N), phosphorus (P), potassium (K) and others in addition to naturally available organic fertilizer. Fertilizer consumption increased with establishment of commercial industrialized fertilizer production. Increased production of chemical fertilizer absorbed a limitation of agricultural production to some extents for increasing population. Fertilizer is important for agriculture that is the base of nutrition for people, and is necessary for all industries, which are supported by people. Production increase of chemical fertilizer is one of the most important targets for future development of Iraq.

■ Urea, Ammonia and Nitrogen

Nitrogen fertilizers include urea ($CO(NH_2)_2$), ammonium sulfate ($(NH_4)_2SO_4$), anhydrous ammonium nitrate (NH_4NO_3). Main feedstock is ammonia. Ammonia is a compound of nitrogen and hydrogen with the formula NH_3, which is gas under atmospheric pressure and temperature. 80% of commercially produced ammonia is used as feedstock of fertilizer. Ammonia transportation requiring high pressure pipeline and vessel or under liquefied conditions, involves higher cost than that for fertilizer. Figure 3-1 is an image of fertilizer (ammonia and urea) plant process



(Source: the Study Team)

Figure 3-1: Image of Ammonia and Urea Complex

3.1 Market Analysis

This paragraph 3.1 describes market analysis under information available from;

- On international market：International Fertilizer Association (IFA)
- On Iraqi domestic market : MIM and FAO including its statistics information FAOSTAT

3.1.1 Ammonia International Market

(1) Demand and Supply

The world ammonia demand is estimated to exceed 150 million ton in 2010. Demand for fertilizer continues to increase under growing population in the world. Annual ammonia demand for 20 years from 2000 to 2020, in which average demand increase was around 2.5% per year and may reach 200 million in 2020.

(2) Market Price

Natural gas being feedstock of and being large cost share excluding plant depreciation cost in production of ammonia, price of natural gas provides a large influence to ammonia price. Market price index often used is such price as that at Yuzhn, near Odessa, Ukraine, Caribbean price like Trinidad and Tobago, and Middle East price.

Sharpe price hike and down in 2008 was caused by crude oil, natural gas and energy price in market. Prices from 2010 to 2012 is rather stable at in the range between US$350 and 500/ton.

Ammonia price for 10 years from 2011 to 2020 would be US$400-600/ton.

3.1.2 International Market of Urea

(1) Demand and Supply

Urea being 90% of chemical fertilizer, its demand is very wide that relates to the world population, food demand, agricultural policy of countries in the world. Recently, demand in China, India and African countries continues to increase. The supply is influenced by ammonia price being closely linked with energy and natural gas price. Under high natural gas situation, many high cost urea production plant decrease or cease production, as revenue does not cover cost. Old inefficient high production plants would be retired more than in past. Production capacity and demand forecast toward 2020.

Transportation of Urea being easier than that of ammonia, trading volume in the world more than 20% of its production is larger than ammonia. The trade destination and origin being almost same as in ammonia, are to China and India from middle east.

(2) Urea Market Price

Major portion of urea Production cost (Cash Cost) excluding depreciation and interest is purchasing price of natural gas, which is also source of energy. Transportation cost of urea can be sometimes lower than a half of ammonia, which requires high pressure or low temperature for transportation and storage. Typical market price at Yuzhn, near Odessa, Ukraine, at New Orleans, and at Middle East is .

Sharpe price hike and down are found in 2008 and 2009, caused by crude oil, natural gas and energy price in market. Prices from 2010 to 2012 is rather stable at in the range between US$250 and 500/ton.

Price forecast for ten years from 2011, telling urea price being US$350-500/ton.

3.1.3 Urea Iraqi Domestic Market

Supply to domestic market from this project is urea, as all of ammonia produced from this project will be exported.

(1) Demand

Ministry of Agriculture (MOA) made the request in 2010 to MIM on supply of urea as described in Table 3-1.

Table 3-1: Iraqi Domestic Urea Requirement for 2007-2025

(ton)

Priod	Urea Requirement
2007-2011	1,530,000
2012-2016	1,925,000
2017-2021	2,145,000
2022-2025	2,310,000

(Source: MIM based on the information from MOA, Iraq)

(2) Supply

Supply source of fertilizer from domestic production is limited, as Table 3-2 showing production plants in Iraq.

Table 3-2: Fertilizer Plants in Iraq

(Unit: ton/year)

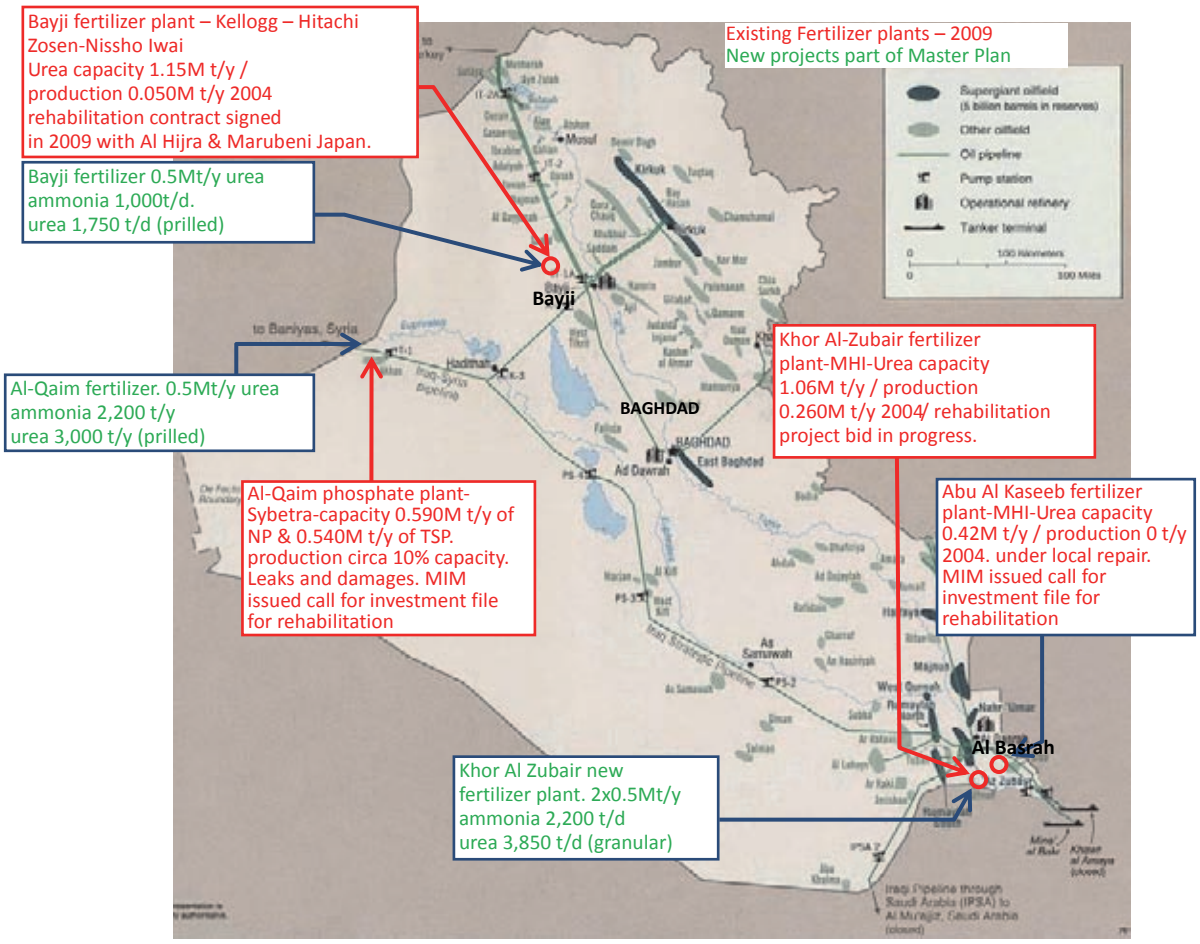
Fertilizer Plant	Capacity	Production in 2010 (ton)
Abu Al Kaseeb (1st plant)	50,000	Decommissioned
Abu Al Kaseeb (2nd plant)	420,000	Decommissioned
Khor Al Zubair	1,000,000	250,000 (Partial operation)
Bayji	500,000	120,000 (Partial operation)
Total	1,970,000	370,000

(Source; MIM)

According to State Company of Fertilizer (SCF), current operation and production in Iraq are as follows;

- Production by SCF in 2011 was 250,000 ton – 300,000 ton at South Region Plant and 120,000 ton at Beyji Plant due to limited supply of natural gas.
- In normal operation, SCF operates one of two production lines (keeping one production line as stand-by), and changes the mode at 4 months interval to reverse stand-by to operation and operation to stand-by. Normal production is about 65-75% of the plant capacity.
- Current gas supply to SCF is such quantity as necessary for operation of one production line.

Fertilizer plants in Iraq are shown in Figure 3-2, including refurbishment and new construction projects .



(Source: JICA, 2012, Study on the Activation of Iraq Private Sector)

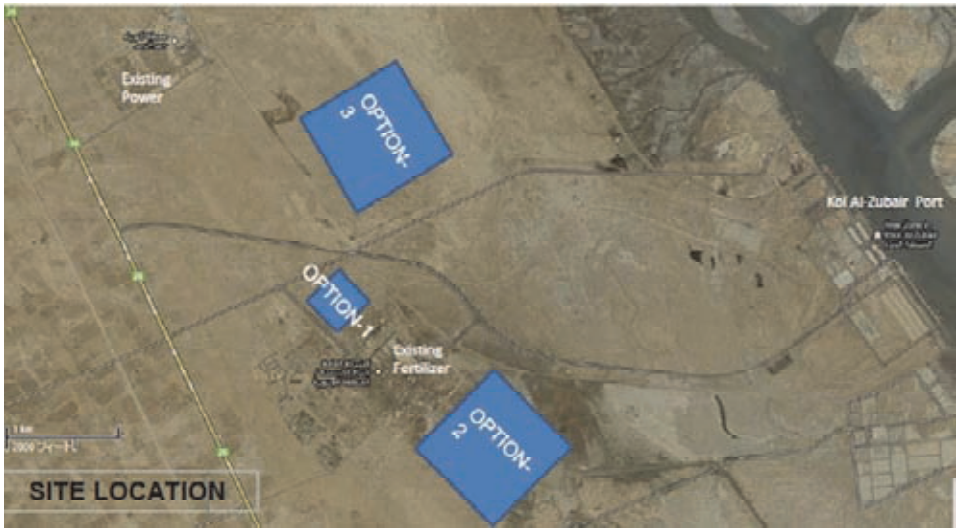
Figure 3-2: Existing and New Fertilizer Plants in Iraq

3.2 Fertilizer Plant (Project Specifications)

The Survey Team defined the following project specifications for the Fertilizer Project through the Survey Work in Japan and the Local Survey in Jordan and Iraq.

3.2.1 Project Location

Based on the discussions with Iraqi Counterpart and the studies for Fertilizer Project by the second meeting in October 2012, the Survey Team nominated the three locations for the Project surrounding the existing fertilizer plant (SCF) in KAZ as shown in the following figure and photos.



(Source: the Survey Team)

Figure 3-3: Nominated Project Locations

(Photos taken by the Survey Team in October 2012)

The Survey Team made a visiting investigation on the nominated locations in KAZ. Table 3-6 shows the summary of the evaluation on selection of the plant site.

Table 3-3: Summary of the Evaluation of the Plant Site

Site	Option 1	Option 2	Option 3
Location	Northwest of the Existing Plant	Southeast of the Existing Plant	Between Power Plant and the Existing Plant
Distance from water intake location, Khor Al Zubair (Canal)	4 – 5 km	4 – 5 km	2 – 3 km
Land Owner	State Company of Fertilizer (SCF)	Ministry of Finance（MOF）	Ministry of Industry and Mine(MIM)
Land Acquisition	Owner is SCF. No private owned land is involved.	Coordination with MOF and other ministries is necessary. No private owned land is involved.	Easier as the owner is MIM. No private owned land is involved.
Area	Limited (400m x 400m – 500m) by existing rail road.	Wide area is possible, if approved by MOF and other ministries.	Wide area is possible.
Addition area	May be obtained in SCF existing plant under coordination and cooperation.	unnecessary	unnecessary
Obstruction	Railways and low voltage power line	Swampy area (partial)	Existing pipeline for crude oil import (can be removed as not used)
Social and Environmental	No significant environmental risks and impact is predicted in the area, which is in the industrial zone. Details are provided in Chapter 78.		
Feed Stock Receipt & Products Supply	Need further studies on cooperation with the existing SCF. May increase efficiency or raise confilicts.	There may be conflicts with KAZ port expansion in future.	Flexibility is high.
Construction Cost	Common facility arrangement may decrease cost, or the limited space availability, may increase cost. Need further studies.	Construction at swampy land may involve cost increase, including soil improvement.	
Social and Environmental	No significant environmental risks and impact is predicted in the area, which is in the industrial zone. Details are provided in Chapter 7.		
Remarks	The area (400m x 400m-500m) is smaller than plant area (550m x 850m) of the reference general plot plan shown on DWG No. OOT4311-010. However, some facilities like utility plants can be located in the existing SCF area as common facilities.	The area is sufficient for new facilities and also for future expansion. However, there is certain swampy area in which soil improvement may be required. For development of the site, coordination with MOF and other ministries is necessary.	The area is sufficient for new facilities and also for future expansion For land clearance, no obstacle exists except crude oil import pipeline.
Evaluation	Recommend further studies.	Not recommended at this stage.	Recommended, if superior than option 1 in future studies.

(Source: the Survey Team)

The area of the Option 2 site is large and sufficient for new facilities and also for future expansion. However, a development plan for the Option 2 site has not yet been decided. Chemical complex may be developed, and Khor Al Zubair port development may require some back yards including roads and facilities in a part of the Option 2 site. There is some swampy area in which soil improvement may be required. The Option 2 site is not considered as better than the Option 1 and than Option 3.

The Option 3 site is large and sufficient for new facilities and also for future expansion. The option 1 site is easy to get supports from and cooperation with SCF, the Plant of which being

next to it. The issue that area of the Option 1 site is not large may be solved by arranging some facilities like utilities in SCF plant outside of the new plant. Cooperation between the new plant and SCF plant may produce a cost reduction in capital expenditure and operation expenses as well as efficiency increase. Further studies are recommended on the Option 1 site, including plant layout and operation cooperation with SCF plant. Then, final conclusion shall be obtained by comparison between Option 1 and Option 3 sites.

■ Survey for Existing Plant

The Survey Team made the Survey for the existing SCF Plant in October 2012.

- Plant Outline:

Existing SCF plant initially constructed by MSEC in 1971 using Topsoe's ammonia technology and Snam's urea technology, followed by the expansion in 1976 and production started with 1,000 mt/d ammonia and 1,600 mt/d urea production x 2 trains in 1979. A common water treatment facility was furnished for the 2 trains.

While the production was started in 1979, the operation was stopped in 1988. SCF has certain maintenance agreement with MHI. The main compressor is Dressor and the main steam turbine vendor is MHI. Currently, SCF suffered from the shortage of feed natural gas (1,000 mmscfd shortage), subsequently SCF forced to operate only 50% operation (one train only). The shortage of the feed natural gas would be eased in 2017. However, existing plant facilities are not in operation due to rehabilitation work during the survey.

A rehabilitation work is in progress using yen credit from JICA.

Ammonia Plant

Ammonia Plant Structure

Reformer

Reformer (Exhaust Dust)

Urea Plant

Urea Plant Structure

Granulator

Cooling Tower

(Photos taken by the Survey Team in October 2012)

The following is the remarks through the Survey for the existing plant.

- The existing fertilizer plant is not in operation and under rehabilitation.
- The plant facilities and each component are severely deteriorated by ages and sword since year 1971.
- NH_3 converter is vertical type vessel.
- There is one compressor house accommodating five compressors.
- Prilling tower is made by concrete with 40m height.
- Conveyor type is mechanical.

- Off-site & Utility Facilities

<Urea Exporting Facility>

The urea exporting facility has both bulk and bagged export function for both truck and rail wagon. Truck loading spots for bulk are furnished with 4 rows x 2 units. Truck loading spots for bag are furnished with 2 rows x 7 units. Bagging facilities consists of 14 rows with 50 kg/bag. Bulk storage area for one train can hold 90,000 ton of urea product.

<Raw Water Receiving & CW system>

Raw water for the existing SCF plant is taken at Abu Al Khasib, which is 45 km far from the site, and is sent via the pipeline to the site. The raw water is fresh water because the river is not connected to the sea. The location of water intake point and SCF is shown in the following map.

The required raw water make up is 3,000 m^3/hr for the two (2) trains of the plant. The raw water supply pipe diameter is 36 inches at BL connected to the clarifier. RO system (500 m^3/hr) is provided for further water treatment. Nine (9) CW cells are furnished for one (1) train plant. Two (2) 72 inches Return pipes are connected to the cooling tower for one (1) train. CW circulation rate is 34,000 m^3/hr. Ten (10) CW supply pumps with 5,000 m^3/hr are provided.

- Review Note of Soil Survey Report

A review has been conducted by the Survey Team on the following report:

«Soil Investigation Report for Specified Locations Inside State Company of Fertilizers Basra, IRAQ, October 2009 made by University of Basra College of Engineering, Engineering Consulting Bureau»

1) Although some of factual data are missing from the report, the report is clear enough for preliminary study purposes.
2) As the sub-surface is composed of fill and medium to dense sand, it may be said that higher bearing capacity within permissible settlement can be expected for shallow foundations depending on the size and depth of foundations.
3) In the FEED and/or EPC stage of the Project, a detailed geotechnical investigation should be carried out in the proposed site, and a foundation design basis should be established.

3.2.2 Specifications of Fertilizer Plant

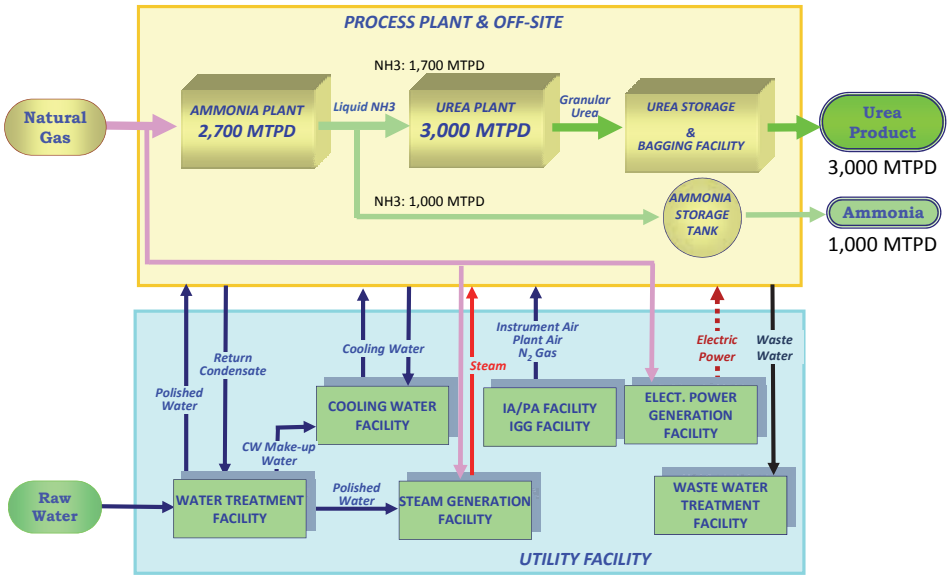
(1) Configuration of Ammonia Plant and Urea Plant

The specifications of the plant are prepared based on the following capacity and applicable technologies.

No.	Service	Capacity	Remarks
1	Ammonia Plant	2,700 MTPD	KBR Purifier Process 1,700 MTPD for Urea Production 1,000 MTPD for Export
2	Urea Plant	3,000 MTPD	Toyo ACES21 Process, Granulation

(Source: the Survey Team)

The configuration of the Fertilizer Plant is shown in the following figure.



(Source: the Survey Team)

Figure 3-4: Fertilizer Plant Configuration

(2) Utility and Off-site Facilities

■ Utility and Off-site Facilities Configuration

The utility and off-site facilities consist of the following units and systems:

(a) Raw Water Intake

(b) Desalination

(c) Polisher

(d) Sweet cooling water

(e) Potable water

(f) Fire fighting

(g) Nitrogen

(h) Instrument and plant air

(i) Power generation

(j) Emergency power

(k) Package Boiler

(l) Feed gas metering

(m) Waste water treatment

(n) Refrigerated ammonia storage

(o) Liquid loading facility

(p) Urea bulk storage

(q) bagging facility

(r) Flare system

(s) Electrical system

(t) Instrumentation and process control system

(u) Buildings

■ Description of Utility Facilities

Principle function and configuration of the utility facilities are described hereunder.

<Raw Water Intake >

Raw water is pumped from the water intake consisting of stop logs, bar screens, travelling screens, pumps and a basin. The raw water system is designed considering its specification as brackish water.

<Desalination unit>

Majority of the raw water pumped from the basin is used for the raw water cooling system. Turbine surface condensers are directly cooled by the raw water. Also raw water is used to exchange heat with sweet cooling water in the plate type heat exchangers. Warm raw water return is sent to the cooling tower and reused for heat exchange with sweet cooling water. The blow down from the cooling tower is sent back to the river after appropriate treatment.

<Desalination>

The desalination unit[3] consists of Seawater Reverse Osmosis (SWRO), Brackish Water Reverse Osmosis (BWRO) and associated filers, pumps, analyzers and buffer tanks. Before treating in the BWRO, a part of stream is branched to potable water unit, service water system and fire fighting water system. Desalinated water from the BWRO is then sent to the Polishers for further treatment.

Note 3: Water from Khor Al Zubair River will be utilized. But, the salinity is high because the intake point is near the Umm Qasar Port. Therefore, Desalination system is required.

<Polishers>

Mixed Bed Polishers are installed to treat desalinated water together with process and turbine condensate returned from the ammonia plant, urea plant and utility facilities. Polished water is sent to the deaerators in the ammonia plant and the Power and Steam

Generation Facility for producing steam.

<Sweet Cooling Water>
The Sweet Cooling Water system is a closed circuit system consisting of cooling water pumps, plate type heat exchangers, filters, chemical dosing units and pipe works. The sweet cooling water is used to cool fluids in the ammonia/urea plant, utility and Power and Steam Generation Facilities except for turbine surface condensers. The main supply and return headers to the ammonia/urea plant will be buried underground.

<Nitrogen Generation>
Nitrogen is generated by IGG (Inert Gas Generator) to supply gaseous nitrogen to the ammonia/urea plant and utility facilities. The Unit consists of IGG, liquid nitrogen tank(s) and nitrogen vaporizer.

<Instrument and Plant Air>
The plant air is supplied from Process Air Compressor in the ammonia plant to Plant Air Reservoir after regulated by a pressure control valve in the normal operation. This plant air is supplied to Instrument Air Dyer to remove moisture and reserved in Instrument Air Reservoir for further distribution.
Separate from the above Process Air Compressor, an air compressor is provided for supplying Plant Air for general use. On the other hand, a Diesel Engine Driven Plant Air Compressor is provided as a back-up source in emergency cases such as power failure and steam failure.

<Description of Power and Steam Generation Facility>
Liquid fuel is utilized for the steam generation and steam turbine generator (STG) is considered for power generation. Also an emergency diesel engine generator set is installed for the black start purpose and safe shutdown in case of emergency conditions.
The Power generation system is designed considering self-sustained for electric power of the complex and the national network is considered as back-up source. For normal operation, the electric power supply from the SCF and the national network is not considered.

<Description of Other Facilities>
Description of the waste water treatment, the refrigerated ammonia storage, the urea bulk storage, bagging system and the liquid loading facility is provided hereafter.

<Waste Water Treatment>
A final catch basin is installed to monitor and control quality of waste water before discharging to the battery limit. All kinds of waste water from the complex including

polisher regeneration water after neutralization, oily water after treated by a CPI separator, boiler blow down, RO waste water, off spec. process condensate and sanitary waste water are collected in the final catch basin, while cooling raw water blow down and non-contaminated storm sewer will directly flow into the outfall and Khor Al Zubair River. Caustic and acid dosing systems are equipped for the final catch basin for adjusting the quality of the waste water.
The waste water discharged from the outfall shall meet the quality requirements of the World Bank guidelines and/or Local regulations for the industrial waste.

The requirement of the World Bank guideline is shown in the following figure. The process condensate water from the Ammonia and Urea plant in normal operation are not discharged to outside, but re-utilized as boiler water.

Service	World Bank Guideline	
Ammonia Plant	NH_3	5 mg/l
	T-N	15 mg/l
	TSS	30 mg/l
Urea Plant	Urea	1 mg/l
	NH_3	5 mg/l

According to the Iraq regulation, the amount of Ammonia discharged from Ammonia and Urea plant shall be controlled. The amount of Ammonia included in the actual waste water is normally under 5 ppm. The value meets the requirement of Iraq regulation (10ppm).

<Refrigerated Ammonia Storage>
The ammonia storage tank, which is single containment types surrounding by a bund wall, is designed to contain 20,000 metric tons of refrigerated ammonia, i.e. corresponding to 20days of liquid ammonia production (1,000 mt/d). The capacity of ammonia storage tank is sufficient in consideration of production buffer and shut-down period of Urea plant. The boil off gas is normally liquefied by the refrigeration compressor in the ammonia plant, but a stand-by compressor for the boil off gas will be installed to liquefy the boil off gas from the tanks. The product ammonia transfer pumps and dedicated flare stack will be installed nearby the tanks.
<Urea Bulk Storage>
The urea bulk storage is designed with a capacity of 90,000 metric tons of urea product, i.e. corresponding to 30days of urea production (3,000 mt/d). It depends on the method of shipment, but the capacity of urea bulk storage is sufficient in general. The urea bulk storage system consists of conveyor transfer system from the urea plant, a travelling tripper and a portal scraper. The urea product is transferred to the bagging system after the storage.

<Bagging System>

Bagging System located beside the urea bulk storage consists of conveyor system, bagging hoppers, bagging machines, bagging conveyors, bag transfer conveyors, dust removal system and truck loaders. Eight lines of bagging machine, which have a capacity of 50kg-bag x 1,000bags/h for each, will be equipped considering 8hours operation for 3,000metric tons per day production. Bagged urea is finally shipped from the complex by trucks.

Only a conveyor connection is considered for future plan of bulk loading system, such as train loading. The detail of the bulk loading system shall be planned by others. The existing bulk loading system (It is not used for urea storage, but warehouse for KZP cargo at present.), including bag storage, in KAZ will be utilized for loading to ships.

<Liquid Loading Facility>

Beside the liquid loading jetty, there will be three (3) identical ammonia storage tanks which will be able to contain 20,000 metric tons of refrigerated ammonia respectively. The idea of the location for storage tanks is shown in the following map. Liquid Ammonia shall be delivered to Loading Facility at KZP by pipelines. After confirmation of availability for the area, the location of tanks shall be decided. The storage tanks are single containment types surrounding by a bund wall. The boil off gas compressor will be installed to liquefy the boil off gas from the tanks and vapour return from the loading jetty. The product ammonia transfer pumps and dedicated flare stack will be installed nearby the tanks.

At the liquid loading jetty, there will be two (2) loading arms for refrigerated ammonia are considered including one stand-by having 2,500m^3/h capacity for each.

Power supply for facilities of liquid loading jetty shall be done by National Network or existing power supply system in the jetty. In the next stage, availability of the existing electrical facilities in KZP shall be studied in detail. If power supply from those existing sources is not assured, power supply from power generation facility in the new Fertilizer Plant should be studied.

■ Major Equipment/Units and Buildings in Utility and Offsite

a) Utility Facility

No.	Service	Capacity	Remarks
1	Raw Water Intake Facility	2,400 m^3/h	Raw Water Treatment, Raw Water Pumps
2	Cooling Water Facility	40,000 t/h	Cooling Tower, Plate Heat Exchanger, Raw Water Circulation Pumps, Sweet Cooling Water Pumps
3	Desalination Unit	180 m^3/h	Desalination Unit (SWRO/BWRO), Desalinated Water Tank, Desalinated Water Pumps
4	Potable Water System	30 m^3/h	Potable Water Unit, Potable Water Tank, Potable Water Pumps
5	Polisher Unit	690 ton/h	Polisher, Polished Water Tank, Polished Water Pumps
6	Fire Fighting Facility	1,000 m^3/h	Fire Water Pumps
7	Boiler Unit	170 ton/h	Deaerator, BFW Pumps, Package Boiler, Flash Drum, Turbine Condenser, Condensate Pumps, Chemical Injection System
8	Power Generation	25 MW	Steam Turbine Generator
9	Emergency Generator	5 MW	Engine Generator
10	Back-up Air System	1,800 Nm^3/h	Air Compressor System
11	IA/PA System	2,800 Nm^3/h	Plant Air Receiver, IA Dryer, IA Receiver
12	Nitrogen System	250 Nm^3/h	IGG, Liquid Nitrogen Tank, N2 Vaporizer
13	Flare Stack	---	Front-end, Ammonia
14	NG Receiving Station	---	NG pre-treatment, NG metering station
15	Waste Water Treatment	140 m^3/h	CPI Separator, Oily Water Pit, Neutralization Pit, Final Check Basin

No.	Service	Capacity	Remarks
16	Urea Storage Facility	90,000 ton	Urea Bulk Storage House, Conveyor, Portal Scraper
17	Bagging Facility	400 ton/h	50kg-bag, bagging facility, truck loaders
18	Ammonia Storage Facility	20,000 ton	Dome Roof Cold Ammonia Tank, Package Refrigerator, Ammonia Flare Stack, Ammonia Transfer Pump, Ammonia Heater

b) Jetty Area

No.	Service	Capacity	Remarks
1	Ammonia Storage Facility	60,000 ton	Dome Roof Cold Ammonia Tanks, Package Refrigerator, Ammonia Flare Stack, Ammonia Transfer Pumps
2	Ammonia Loading Facility	2,500 m^3/h	Loading Arms

c) Buildings

No.	Service	Remarks
1	Control Building	Including laboratory
2	Substation	
3	Warehouse	
4	Maintenance Work Shop	
5	Chemical Storage House	
6	Administration Building	Including office rooms
7	Truck Loading Area	For Bagged urea product
8	Fire Station	Fire Fighting equipment storage, Fire engine stand-by area
9	Entrance Gate Houses	

(4) Plot Plan for Fertilizer Project

The Survey Team prepared the preliminary plot plan for Fertilizer Project as shown in the following pages. It was a typical plot plan for ammonia-urea plant with the considerations on the site conditions and the requests by MIM in the meetings.

3.2.3 Construction Plan

Please refer to attachment A.

3.2.4 Capital Cost of Fertilizer Plant

(1) Plant Cost

The cost of Fertilizer Plant (EPC Cost) is estimated as followings.

Table 3-4: Fertilizer Plant Cost

(Unit: Million USD)

Ammonia Plant	630
Urea Plant	270
Utility Facility	175
Off-Site Facilities	519
EPC Cost Total	1,594

(Source: Estimated by the Survey Team)

The above cost is estimated by the internal data of the engineering company in the Survey Team. In accordance with the Association for the Advancement of Cost Engineering, International (AACEI) RP 18R-97 "Cost Estimate Classification System", the estimation class 4 used for feasibility study is applied.

The expected capital cost of the Fertilizer Plant will be discussed and finalized in the third meeting with MIM in December 2012.

3.2.5 Feedstock and Utility Supply for Fertilizer Project

The required feedstock and utility for the plant are stipulated as follows. The Survey Team confirmed that the feed stock specified in the following table could be supplied for the project.

No.	Service	Capacity	Remarks
1	Natural Gas	83,000 Nm^3/h	10,000 LHV $Kcal/Nm^3$ base
2	Fuel Oil	11,000 kg/h	10,000 LHV kcal/kg base
3	Raw Water	2,400 m^3/h	

The Survey Team received the data and information on the natural gas and water which are used for the existing plant (SCF) from MIM/SCF and utilized the data for reference.

- Climatic Conditions
- Actual analysis of Natural Gas in Summer & Winter For Khor al Zubair plant
- Specification of branch water analysis (Shatt-Al-Arab)
- Sea Water specification in Um-Qasir
- Analysis Results of Waste Water

Chapter 4. Intermodal Transportation Terminal (ITT) Project

4.1 Concept of Intermodal Transportation Terminal (ITT)

4.1.1 Background of Project

Linguistic definition of Intermodal Transportation Terminal (ITT) Project has been spread not only in Japan but internationally for over 30 years as efficient transportation mode to handle big cargo volume with cost effective mode. In addition transportation mode has been shifted to sea and railway transportation to reduce the emission of CO_2, SOX, NOX, PM and etc. from the aspect of environmental and social considerations. These trends accelerated the needs to prepare the logistic system not only domestically but also to cover multi-national logistic system. This, in other words, International Consistent Logistic triggered the preparation of modern logistic system and caused to establish and develop detailed network service to deliver the products to final destination, which can mainly be classified as the followings;

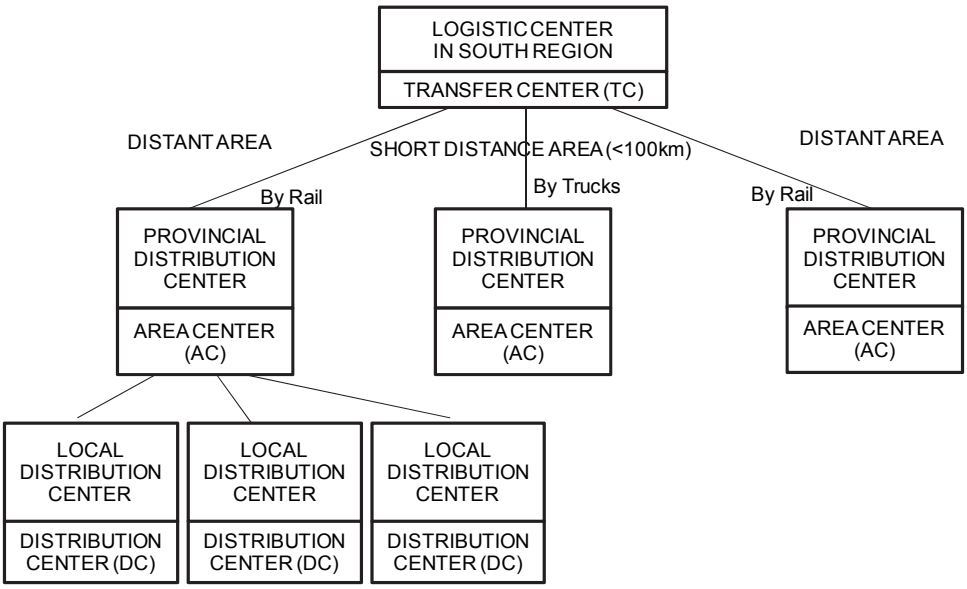
Technical Advancement of Port Logistic Facility and its Operation System Preparation

Intensive Logistic Facilities and its Multi-Function Modality

In Iraq several policies have been adopted to revive political and economical stability initiated by the USA after 2003. Establishment of Logistic System in the south region of Iraq where the only sea access can be maintained will contribute to the economical development taking geographic and geopolitical advantages of Iraq into account. Preparation of logistic infrastructure will lead to the improvement of investment environment together with investment to the manufacturing industry by the Japanese private sectors. Real target of the ITT project is the establishment of function of logistic center in a broad sense adding the function of logistic of production to general cargo logistic system. Preparation of similar terminals in the major cities will be proposed as the connecting points of logistic network in Iraq in the future. This project will be evaluated as a triggered project to establish the logistic system in Iraq shown in Figure 4-1.

The Basra ITT can be defined as Transfer Center (TC) functionally in the Figure 4-1. Fertilizer, foods, basic materials and etc. will be transported from the TC to Area Center (AC) or large transit centers situated in major cities and then transferred to the each Distribution Center (DC) located in several districts to cover local residential areas. Each area center could satisfy the requirements of the needs for temporary storage, sorting functions and processing function. It is envisaged that a containerized cargo will surely be increasing as the distinguished increase of population and of variety of import cargos reflecting to the improvement of daily life in the future. The large scale manufacturing projects including the petrochemical complex as a core of production industry will increase in near future and several rehabilitation projects of existing manufacturing facilities such as steel, cement and glass industries will have been in progressing

in parallel in the south region. Then the needs for manufacturing logistic system will be increased dramatically. It is the important thought background behind ITT project to fulfill the necessary conditions of meeting with the requirements expected in 2025 as the proceeding action in line with the above forecasted scenario and on putting the improvement of economic environment into insight.



(Source: the Survey Team)

Figure 4-1: Concept of Logistic Center in South Region (1)

4.1.2 Consistency with the National Development Plan (2010-2014) in Iraq

The NDP 2010-2014 describes following three (3) sectors are important sectors in the development of national economy., i.e.,

Energy Sector

Agriculture Sector

Tourist Sector

In regards to the energy sector, many international tenders have been already executed and then the development projects of oil and gas and the modernization projects in refinery section are in progress including Japanese government and private companies participation in the downstream parts.

As for the Agriculture Sector it is one of issues to increase domestic supply under such situation that a 65% of the necessary foods are imported still depending on the “Oil and Foods“ Program. The rehabilitation of the existing fertilizer plant constructed in the year of 1970s by Japanese company is being implemented as one of countermeasures to improve the

current situations to secure the required amount of fertilizer.

Rural development is also one of the important issues set out in the NDP 2010-2014. Many products including necessary daily-life related ones has to delivered to rural areas. The concept of Logistic Center with ITT function in southern region as shown in the Figure 4-1 is the concept to satisfy the needs and requirements. It is expected that the ITT project will be the starting point to satisfy the necessity for the achievement of the future target.

In establishment of foundation for the successful shift to the market economy, it is considered to be important to collaborate in the manner of good partnership among public, private companies and citizens. In corresponding to such thought it is planned to realize the objectives that the construction project of a Large Fertilizer Plant as a Japanese private investment and Intermodal Transportation Terminal for the distribution of products in the domestic market as public sector investment which will be expected to be materialized under JICA ODA loan. The ITT facilities are planned to transport the urea products from the existing fertilizer plant under the rehabilitation and from the new large Fertilizer Plant to all over Iraq, the southern region, the region of municipal area, central western region, south eastern and northern regions from Baghdad. The ITT facilities will play one of important roles of logistics of the imported cargos from the ports in the southern area of the Iraq.

4.1.3 PROJECT Philosophy

Based on the background of the Project mentioned above, the concept of ITT project is generated as follows;

- The “ITT Project” is planned to establish highly efficient and cost competitive Logistic System in Basra Region in Iraq where remarkable increase of cargo volume will be expected in the future.
- The “ITT” plan is deeply considered to reconstruct the logistics terminal facilities with the most advanced operation and maintenance system in the south region, Iraq in order to enable a smooth and efficient handling and transportation of dramatically increasing cargo volume as the country economic restoration is advanced.

While in line with the above considerations for the “Logistic Center in Kohr Al Zubair (KAZ)” has been studied to transport urea fertilizer produced in the new “Fertilizer project” and in the existing SCF south region plant under rehabilitated, two essential factors were also studied such as

(a) Vitalization of Oil and Gas production industry and the related industry

(b) Revitalization and early improvement of Agricultural industry as the industry in Iraq being one of the important industries as an economic infrastructure for the country economy

While the policy for the above item (a) has been intensively built up as the most important emergency economic measures, a various measures for agricultural industry restoration (item b) have also been seriously taken. It is generally called in the agricultural sector that there are three (3) important key countermeasures in improving agricultural activities, such as

(1) Mechanized farming : Improvement of productivity and production volume
(2) Introduction of new seeds : Rearing of seeding
(3) Application of fertilizers : Increase of production volume based on the yield upgrading

Further to the above countermeasures, the optimum utilization of fertilizers is also essential for rapid improvement of production yield of agricultural products.

Accordingly the “Fertilizer project” absolutely needs the logistic system for the fulfillment of the above expectation.

For the realization of this concept, new fertilizer production facility and its distribution system “ITT” are strongly desired to be constructed under the PPP scheme.

In particular “ITT” must be an infrastructure for mass handling and mass transportation of fertilizers and other industrial products, including container cargos in future, focusing the year of 2025 ~ 2035.

At present the marine cargos are mostly bulk cargos, such as cement, sugar, wheat, steel material and others, however as the time passes a more commodities and consumers goods related to daily life could be increased. Then the “Logistic Center” should be quite functional for smooth and proper handling and distribution of fertilizers, other industrial products ,and imported products and goods.

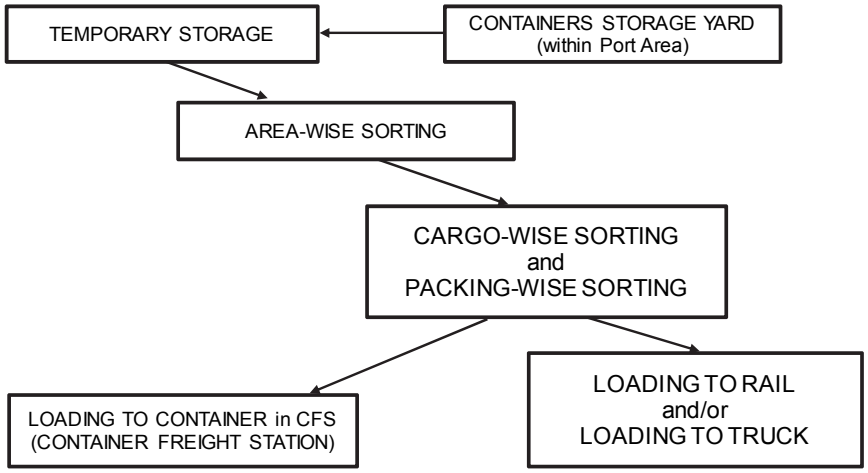
The following network of logistic system for industrial products and commodities might be a final goal to establish KAZ Logistic Center including ITT facilities.

In the above figure, TC means ITT as a logistic center in South Region in Iraq and ITT will be connected to AC in each Governorate by rail for long distance and by truck within 300 km zone.

AC will be a core facility for logistic services in each Governorate and will be connected to DCs located in each district inside Governorate.

Accordingly TC will be constructed adjacent to main railway stations in major cities to form a really efficient domestic network. However KAZ ITT must be a comprehensive multimodal shift logistic center to cover the three different transportation modes.

The function required for the ITT Logistic Center in KAZ port area shall be as follows:

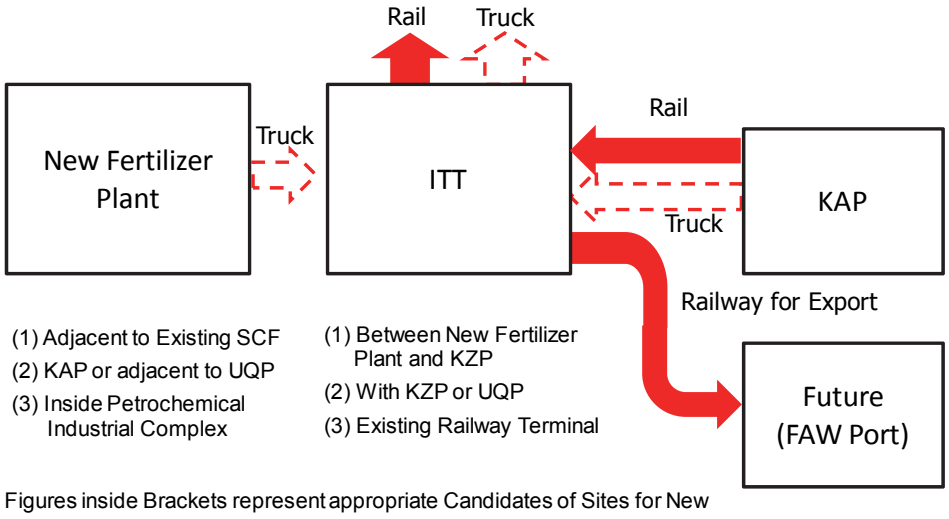


(Source:the Survey Team)

Figure 4-2: Concept of Logistic Center in South Region (2)

In line with the requirement for its functions, the **"terminal site"** location has been also surveyed based on our analysis of the existing facilities and current operation in railway systems and port areas.

The block flow shown below represents an example:



(Source:the Survey Team)

Figure 4-3: Concept of ITT Project in South Region

The items of (1)-(3) shown in the figure 4-3 above represent appropriate candidate sites for Fertilizer Plant and ITT

Through the several meetings, a site for the ITT facilities is selected in the open land adjacent to KZP as the final location of ITT facilities at this study stage in the consideration of effective

utilization to the maximum extent of the existing rail siding and urea warehousing with conveyor system plus bagging plant to be rehabilitated at the project execution stage. (SCF will carry out the plant audit in KZP soon.)

4.1.4 Challenges in Iraq Transportation Sector

The transport sector is one of the important sectors in industries; the importance of this sector is evidenced as every citizen needs to move and communicate in order to accomplish his everyday tasks and other activities.

The transport sector activities consist of roads and bridges, passenger and cargo transports, railway transport, ports, shipping and civil aviation. According to Iraq National Development Plan for the year 2010 – 2014 (NDP) visions will be achieved through the following major points;

1. Increasing the efficiency of the existing transportation network and its capacity
2. Integrating transport network systems among each other
3. Increasing and improvement of the efficiency and performance of the transport sector institutions, facilities and its companies
4. Increasing rail transportation and decreasing damage of road
5. Reducing accidents on the transport network
6. Reducing time for transportation between major cities
7. Contributing to strengthening the economic independence of Iraq
8. Reducing transportation cost
9. Strengthening Iraq's geographical location in the international transport and transit trade
10. Increasing the sector's contribution to GDP
11. Increasing the role of private sector for various transportation business, particularly for operation and delivery services

4.1.5 Current Status of Transportation in Iraq and South Region

Iraq owned a large fleet of cargo transportation by trucks under the Ministry of Trade. The large fleet was severely damaged by several destructive incidents in the past and does not satisfy the current needs for cargo transportation. As the result of wrong management of transport sector together with excess employment of staffs as compared with the required number of staffs to suit the demand. 4,670 staffs are still working in the public land transportation company, which aggravate the management of the company. Government of Iraq plans to privatize the company including management by public and private partnership. Understanding the issues mentioned above current status of land transportation was described as follows;

The following (Figure 4-4) is the Existing Major Route Map of Roads and Railways in Iraq.

Figure 4-5 shows the major road network in south region of Iraq.

(Source: Ministry of Transport, Iraq)

Figure 4-4: Existing Major Route Map of Roads and Railways in Iraq

(1) Road Transport

A six-lane international expressway was developed in 1987 to link the Arabian Gulf States with the Mediterranean Sea. The road would stretch from the Jordanian border through Al Rutbah to Tulayah near An Najaf, then to Ash Shaykh and Ash Shuyukh in the south of Iraq, and finally to Safwan at the Kuwaiti border. According to Iraq national Plan for the years 2010 – 2014 The total length of highways (outside the municipal boundaries and Municipality of Baghdad) is about 48,941 Km, as follows;

Highways = 1,084 Km

Arterial Roads = 11,254 Km
Rural Roads = 10,357 Km
Boarder Roads = 11,000 Km
Secondary Roads = 15,246 Km

As for the bridges, there are 1,260 concrete and steel bridge, and 52 floating bridges scattered throughout the country, however this network did not cover the needs of the country, especially rural roads. According to international standards, each 100 inhabitants/Km^2 of population density required 1 Km/Km^2 of roads, and road density in Iraq is around 0.19 Km/Km^2, and what is required is for this ratio to reach 0.75 Km/Km^2, which means that the road network should be increased up to 240,000 Km and if unpopulated desert area is excluded, the need for new roads is up to 20,000 Km.

Before 2003, Iraq's highway network was considered to be in a fairy good condition in terms of efficiency and capacity, but due to what it has suffered during the war in 2003 and its aftermath, this network suffered significant deterioration and most of its paths was destroyed and damaged as a result of military operations and acts of sabotage and lack and security and periodic maintenance. On the other hand, the increase in the number of vehicles that entered the country after 2003 has largely increased. Furthermore the increase in fuel and asphalt prices after 2003 led to increasing the cost of execution and maintenance of road projects and road projects have not been implemented as the result.

According to Iraq Master Plan produced in 2005 main road network of about 12,000 km extension and a total extension of about 41,000 km have been identified during the preliminary assessment (Phase 1 - Data Collection). The result of the same analysis on the whole reference network shows as about 56% of total network is in fair maintenance conditions, about 31% in bad conditions, 7% in very bad conditions and only 6% is in good conditions. Road projects are classified into ten as the Macro Project 1 to 10. The total cost for implementing the macro-project is US$ 990,000,000, considering both design procedure (US$ 90,000,000) and works (US$ 900,000,000).

(2) Railway Transport

In many cases, rail transport is more efficient than trucking when covering distances longer than 300 km. Iraq possesses an extensive railway network. During its years under sanctions, half the goods imported to Umm Qassr Port (UQP) were carried to inland destinations via railway network. The existing railway network which has been included in the transport multimodal network is constituted by the five main lines.

They are all standard gauge with single track. There is only one section with double track, which is located on the Baghdad – Husaibah line, from Sheik Dari station to Rutba Road station (length 104 km). The total length of the existing railway network is 1901 Km and there are

108 stations. In addition to the main lines there are several branch lines serving industrial and military sites. The main branch lines have a length of about 400 Km, but there are at least 150 Km of minor branch lines most of them not active.

The functions are panned to be improved as the following manners:

a) Phase 1 in the short term:

- All stations with dispatch manager (yard master) and single track line. Interlocking devices will be designed to foresee the future control by a CTC (SCC for big network).
- The Telecommunications system is realized and in all stations and singular points are available telephone/data services (offices, waiting rooms, point, and so on.).
- The Baghdad Loop Line not yet implemented.

b) Phase 2 in the medium term

The following shall be implemented:

- Baghdad Western Loop Line with ACEI equipments controlled by SCC and double track line (option to leave stations of Western Loop Line without dispatch manager on site using remote control);
- SCC system in the Central Control Point of Baghdad;
- Peripheral sites, remote controlled by SCC, only for Western Loop Line;
- Audio and visual people information system is realized.

c) Phase 3 in the long term

This Phase includes basically the following:

- Doubling of all main track lines and implementation of the new lines to Mosul via Kirkuk and to Basra via Kut.
- Completion of the Loop Line of Baghdad.
- Modification of SCC in Baghdad for introducing peripheral sites of main track lines and peripheral sites of the Loop.
- Option to use remote control from SCC in Baghdad for all main track lines and Loop Line.

IRR has 6 regional operation units in Iraq and the expected project area is belonged to the Basra Railway Region.

■ **Progress of Railway Rehabilitation**

The rehabilitation of railway in Iraq has been on going, including Basra Railway Region. However, the current transportation capacity is very limited. The current operation of the

Basra Railway Region is also very limited as follows;

- One passenger train (Basra-Baghdad) per day
- Transportation of oil products from MOO refinery (limited volume)
- Transportation of import materials for the rehabilitation of railways from the Umm Qasr Port (limited volume)
- No transportation of the import cargo from Umm Qasr Port and Khol Al Zubair Port

The rehabilitation and the construction of double truck in the Basra Railway Region have proceeding as shown in the following photos taken by Iraq PPP Survey Team in October 2012.

(Taken by the Survey Team in October 2012)

The existing railway facilities in Khor Al Zubair area have not been operated for long time and the considerable rehabilitation works would be necessary for the re-utilization of the railway facilities. Followings are the photographs taken by the survey team to prove the necessity of rehabilitation.

(Photos taken by the Survey Team in October 2012)

(3) Current Situation of Ports in South Region

■ **Umm Qasr Port (UQP)**

UQP is the biggest Iraqi foreign trade cargo port in Iraq and the only port facing the Arab Bay of the Arabian Gulf. UQP is the most multifunctional primary port and water depth is deep enough to enable large cargo ships to navigate in Iraq. The port is located close to the border of Kuwait near the entrance of the Arabian Gulf on the west bank of the Khor Al Zubayr River, approximately 90 km upstream from the northwest edge of the Arabian Gulf. The port is located at a distance of about 70 km from the southern entrance in the city of Basra. The UQP was constructed in 1965. Since the completion of the urgent dredging project by UNDP in 2003, 50,000 DWT size vessels have been able to enter UQP during high-tide levels and the function of the port was recovered to a limited extent. However, the required water depth was not achieved for the entire area of the channel and port basin, and consequently, the utilization of cargo handling operations was only 50% of the port sector's former capability. Siltation in the 50 nautical mile approach channelwas a problem even though UNDP and Japan assisted in dredging and wreckage removal in 2009-2012. The Port of Dubai has also helped to reestablish procedures for passenger and cargo transport.

The following is the aerial view and the layout of UQP. Following photographs show the overall aerial view of UQP.

(Source: GCPI)

Canal dredged artificially and port along the river situated south from north port are the north and south port, respectively as shown in the left hand side photograph.

21 berths are existed in UQP (North and south port).

■ **Khor Al-Zubail Port (KZP)**

The KZP is located 60 km from the center of Basra City, 105 km from the northern end of the Arabian Gulf, and about 20 Km from UQP and constructed from 1975 to 1980. KAZ was operated as a free trade zone and industrial port supporting industrial developments in Basra and its vicinity. Soon after the end of the war in 2003, the general cargo berths were operated by Maersk Sealand Line for two years. Management of port operations was handed over to

General Company for Port of Iraq (GCPI) on March 3, 2005. In 2010 a joint operating contract for berth no. 8 was made with the German company, Marlog (MARTRADE Group).

◆ Berth Information

KZP was designed to handle general cargo and bulk cargoes such as wheat, fertilizer, phosphate and petrochemicals imports/exports, as well as sponge iron and iron ore imports. The bulk handling facilities include conveyors and ship loaders for fertilizer exports and ship unloaders for iron ore imports. The iron ore handling facilities comprise open stockyards located within the port complex, equipped with belt conveyors, stackers, and bucket wheel stackers/reclaimers. The designed water depth at the berth front is -12 m. According to the latest available bathymetric survey conducted in 2005, water depth varies from 8.2 m to 8.5 m. And no such survey has been conducted since then. Current water depth is between 6 m and 8 m due to the lack of dredging operation for maintenance. Berth Nos. 2 and 3 had not been used till recently due to the existence of shipwrecks along the berths. Figure 4-7 is the layout of KZP.

(Source: GCPI)

Figure 4-5: Jetty at KZP

General Cargo Berth No. 1 is being used as temporarily anchoring for empty cargo ships and temporary placing for sunken ships after lifting. Berth No. 1 will be tendered for concession soon and 5 companies including BP have been invited. Berth Nos. 2 & 3 has no records of being used by GCPI for cargo handling from 2006 to 2011. After removing the wreckages in front of these berths, cargo ships carrying general cargo such as cement, have been using these berths. Berth Nos. 6 and 7 have been used for Fertilizer and Phosphate.

These berths were planned to be used for exporting fertilizer products by MTI, however at presently Berth No. 6 is used for unloading general cargo mainly from India. Cargo ships carrying general cargo such as bagged sugar, rice, cement, and soya beans also use these berths. Berth No. 8 was used for Petrochemicals. Concession contract was made with Marlog (MARTRADE Group) German Company in 2010. Berth No. 9 was used for Petrochemicals. Presently tankers use this berth for importing petrochemical products and exporting fuel oil.

Berth No. 10 was used for Sponge Iron Import This berth was planned to be used for importing sponge iron. Presently tankers use this berth for importing petrochemical products and exporting fuel oil under MOO's management. Berth No. 11 was used for Raw Iron Imports. This berth was planned to be used for importing iron ore. Presently tankers use this berth for importing petrochemical products under MOO's management Berths No's 9 to 11 are under control of MOO at present. Berth No. 12 was used for General Cargo. A 125 MW capacity Turkish power barge is berthed here under GCPI management

◆ Berth Structure

The berth structure was constructed as a detached type on the typical type of river port. The berth and land is connected with access bridges.

◆ Port Operation Concession

Operation of No. 1 Berth will be tendered for concession. Five (5) companies including BP were invited. A joint operating contract for KZP's berth No. 8 had been made with the German company Marlog (MARTRADE Group) in August 2010. The contract stipulates that Marlog (MARTRADE Group) will administrate and operate berth No. 8. According to the terms of the contract, Marlog (MARTRADE Group) should prioritize to moor the arriving ships at this wharf at its own accountability and to minimize such ships from waiting. The contract also stipulates that Marlog should supply the wharf with the required equipment and machinery. According to a Japanese company, Marlog are also interested in a joint-operation contract as long as the surrounding activities coincide with their company's activities.

◆ Cargo Handling Equipment

The efficiency of port operations and services is required to improve at least up to an internationally recognized minimum level, in order to cope with the increasing traffic of ships and cargo volume. Under the present situation of damaged cargo handling equipment, damaged berthing facilities, insufficient communication equipment, and insufficient and damaged water supply facilities, and electric power supply substations, the port seems to have difficulty in providing effective services and efficient operations. The port management office of KZP is also short of working vessels like dredgers, tug boats, pilot boats, and

suitable cargo handling equipment for bulk cargo and containers. The port management office cannot provide efficient service to port users. (according to the hearings from GCPI).

◆ Present Situation of Access Channel

The channel between UQP and KZP was developed by dredging to a depth of -12 m. Maintenance dredging has not been carried out for the last ten years, except for partial maintenance dredging which was carried out in this channel by GCPI using own their dredgers from 1998 to 2002. According to the latest survey conducted in 2006 by the Japan External Trade Organization (JETRO), the channel between UQP and KZP, the upstream of the channel has shallow depths from around -8.2 to -8.5 m, and a ship size of 20,000 DWT can be navigated up to KZP. The port basin of KZP is as shallow at around -8.2 m. The following is the photographs of the KZP taken by the Iraq PPP Survey Team in October 2012 to demonstrate to visualize the above statement.

(Photos taken by the Survey Team in October 2012)

The back side of berths shows the large warehouses used for storage of fertilizer which are not used at present. These warehouses will be part of study if these can be used as a part of ITT facilities. Left 2 photographs below shows the warehouses for general cargo. Office of forwarder and their vehicles can be identified in the right side of the above. These photographs were taken by the survey team.

4.1.6 Demand Analysis

(1) Analysis Approach

The demand for the ITT Project shall be estimated based on;

1) The volume of the containers and cargos to be handled at KZP and,

2) The volume of fertilizer and other industrial materials to be produced in the KAZ area.

The demand shall be analyzed for the railway transportation based on the distance from KAZ to the cargo destinations.

(2) Volume of Containers/Cargos at KZP

The assumption on the volume of containers/cargos at KZP was made based on the available information/reports and hearings from the MIM, IRR and GCPI. Completion and commercial operation commencement of ITT are assumed to be on the end of 2018and from early 2019, respectively. The Survey Team forecasted the cargo volumes at KZP in 2025 as shown in the following table 4-1. Explanation of Table 4-1 is as follows;

- Import cargo of item 3 of liquid bulk is excluded from ITT project.
  Therefore relevant cargo to ITT project is item 2 of general cargo and its total is 626, 4000 tons.
- Export cargo to be handled at ITT project is item 2 of general cargo and its total is 175,000 tons. Containers in export cargo is empty, which is the same used for the import container.

Table 4-1: Cargo Volume Forecast at KZP in 2025

Import or Export	Item of Cargo / Year	Unit	2025
Import	1. Container Cargo	TEU	34,000
	2. General Cargo		
	(1) Crain (Wheat)	tons	22,000
	(2) Rice	tons	0
	(3) Sugar	tons	121,000
	(4) Dates	tons	0
	(5) Cement	tons	2,824,000
	(6) Steel & Pipes	tons	2,430,000
	(7) Vehicles	unit	0
	(8) Others	tons	867,000
	3. Liquid buil (Petrochemical products)	tons	1,686,000
	Total Import Cargo excluding Container Cargo & Vehicles	**tons**	**6,264,000**
Export	1. Container Cargo (Empty)	TEU	34,000
	2. General Cargo		
	(4) Dates	tons	110,000
	(8) Others	tons	65,000
	3. Liquid Bulk (Fuel Oil)	tons	2,253,000
	Total Export Cargo excluding Container Cargo & Liquid Buil	**tons**	**175,000**
	Total Export Container Cargo (Empty)	**TEU**	**34,000**

(Source: Produced by Survey team based on the data obtained from MOT/GCPI)

(3) The volume of Fertilizer and Industrial Materials

The volume of urea production in KAZ is expected at 1,500,000 – 1,800,000 Ton /Y in 2018 (Urea production from the New Fertilizer plant and from the existing SCF Plant after rehabilitation were forecasted to be 810,000 – 860,000 tons and 760,000 – 960,000 tons in 2018, respectively). The most of the products shall be sold and distributed in Iraq in 2020. In the other hand MIM has a plan to increase the production capacities of fertilizer (urea/ UAN/NPK) by the fertilizer plants in the west and the central area to comply with fertilizer demand in those area. MIM is considering the switch the major target market for urea to be produced in the south region from the domestic market to the export market after the increase of the production capacities in the west and central region. The Survey Team forecasts the sales of the urea produced in KAZ area as follows.

Table 4-2: Forecasts Urea Sales from South Region

(Tons/year)

	2018-2020	2021-2024	2025
Domestic Sales	1,500,000	1,2000,000	1,200,000
Export	0	250,000	800,000
Total	1,500,000	1,500,000	2,000,000

(Source: Iraq PPP Survey Team)

* Conservative figure of 1,500,000 tons is applied for the study among the figures ranging from 1,500,000 to 1,800,000 tons considering realistic operational conditions.
* Urea for export assumed to be zero and all urea produced is consumed within Iraq before 2021.
* After 2021 in which production will exceed demand, approximately 20% of production volume is assumed to be exported as an excess of domestic demands in Iraq.
* In 2025 other new fertilizer plant in the southern region will start operation and further increase of urea for export will be necessary.

MIM has also a plan to rehabilitate the steel mill and petrochemical plants as well as to set a new petrochemical complex in Basra /KAZ area. Although at this moment the capacities and schedules of those projects are not clear, it can be assumed that the production volume of the industrial materials at 2,000,000 Ton/year could be achieved by 2025 and about 29% of production volume will be distributed for long distance area suitable for transportation by rail.

(4) Distribution Analysis of population for forecast of transportation demand and Distance from KAZ area.

Transportation demand by railway for northern area was assumed to be in proportion to the population.

The following table shows the regional population in Iraq.

Table 4-3: Regional Population in Iraq

Place	Number of Housing Units	Number of Households	Population	
			2009	2011
Ninevah	423,885	425,861	3,106,948	3,270,422
Kirkuk	221,171	234,697	1,325,853	1,395,614
Diala	214,024	202,171	1,371,035	1,443,173
Al-Anbar	198,096	178,283	1,483,359	1,561,407
Baghdad	1,064,175	1,037,189	6,702,538	7,055,196
Babylon	252,025	245,682	1,729,666	1,820,673
Kerbera	157,990	149,408	1,013,254	1,066,567
Wasit	157,905	152,777	1,150,079	1,210,591
Salah Al-Deen	204,309	180,542	1,337,786	1,408,174
Al-Najaf	183,549	177,132	1,221,228	1,285,484
Al-Qadisiya	146,733	140,848	1,077,614	1,134,313
Al-Muthanna	86,038	84,603	683,126	719,069
Thi Qar	220,910	214,554	1,744,398	1,836,181
Maysan	125,808	122,847	922,890	971,448
Basrah	327,185	338,232	2,405,434	2,531,997
Total	**3,983,803**	**3,884,826**	**27,275,208**	**28,710,309**

(Source: Developed by the Survey Team according to census results in Iraq)

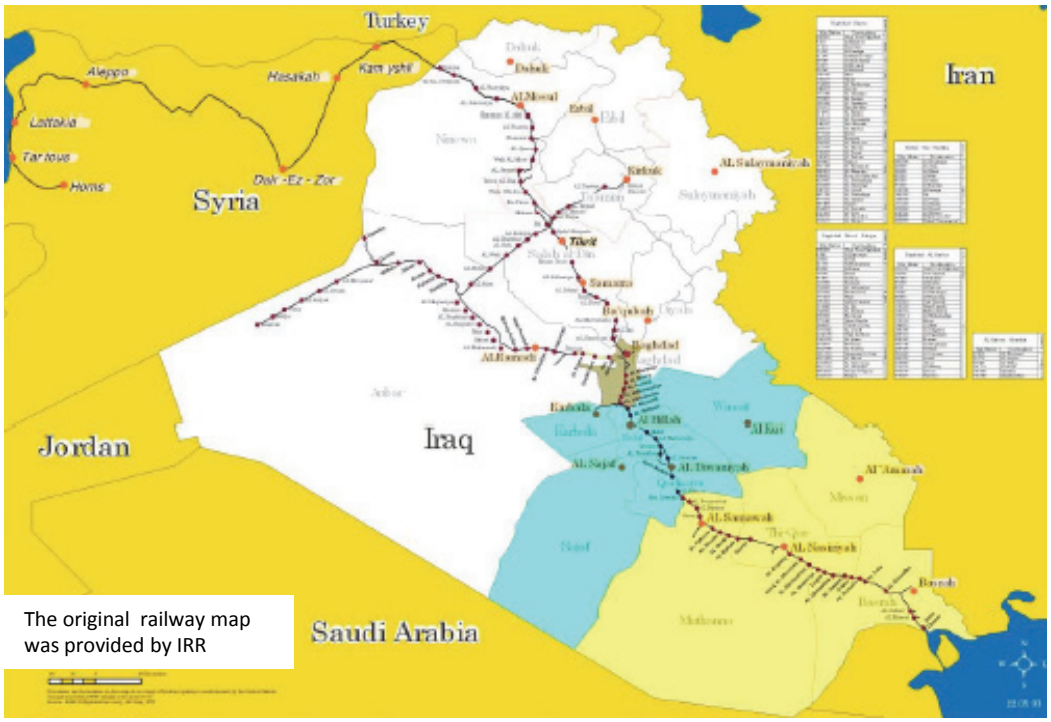
Table 4-4: Distance from Baghdad & from Basra South from Bagdad

Place	Along Railway Line	from Baghdad (Km)	from Basra (Km)
Baghdad	Baghdad	0	550
Babylon	Al-Hilla	110	440
Kerbala	Al-Hilla	110	440
Wassit	Al-Hilla	110	440
Najaf	Diwaniyah	210	340
Qadissiya	Diwaniyah	215	335
Muthana	Samawah	380	170
Thi Qar	Al Nasiriyah	380	170
Missan	Al Nasiriyah	380	170
Basra	Basra	550	0

(Source: Developed by the Survey Team based on the information provided by IRR)

Considering the geographical location on KAZ area, the destination of the containers/cargos is assumed to be limited within Baghdad and its southern area. The transportation by Truck is assumed to be suitable for the transportation to the destinations within 300km from Basra from the economical view point. The following table shows the distance from Basra to each province (region).

The Survey Team identified the applicable destinations for railway transportation from KAZ as the area marked blue in the following figure (Figure 4-8).



(Source: Developed by the Survey Team)

Figure 4-6: Cargo Distribution from KAZ by Truck and Rail

(5) Estimation of Demand for Railway Transportation from KAZ in 2025

Based on the above studies for demand forecast (the volume of containers/cargos at KZP, the volume of fertilizer and industrial materials in KAZ area and the regional transportation demand and distance from KAZ), the Survey Team made the following demand forecast for railway transportation from KAZ in 2025.

Table 4-5: Forecast of Cargo Volume by Rail from KZP in 2025

	Item		unit	Quantity	Railway Transp[ort (Ton)		Note
from KZP to Baghdad	Import Cargo	1. Container Cargo	TEU	816,000	62%	505,920	
		2. General Cargo					
		(1) Grain (Wheat)	tons	22,000	62%	13,640	
		(2) Rice	tons	0		0	
		(3) Sugar	tons	121,000	62%	75,020	
		(4) Dates	tons	0		0	
		(5) Cement	tons	2,824,000	30%	847,200	*1
		(6) Steel& Pipes	tons	2,430,000	0%	0	
		(7) Vehicle	unit	0		0	
		(8) Others	tons	867,000	0%	0	
		3. Liquid Bulk (Petrochemical products)	tons	1,686,000	0%	0	
		Total Import				**1,441,780**	
	Products	Urea (Domestic Portion of Production im South Region)	tons	1,200,000	50%	600,000	*2
		Product Total				**600,000**	
	Total		tons			**2,041,780**	
from Baghdad to KZP	Export Cargo	1. Container Cargo	TEU	816,000	62%	505,920	
		2. General Cargo					
		(4) Dates	tons	110,000	100%	110,000	
		(8) Others	tons	65,000		0	
		3. Liquid Bulk (Fuel Oil)	tons	2,253,000		0	
		Total Export				**615,920**	
	Products	Others 20% of Total Export	tons			120,000	
		Product Total				**120,000**	
	Overall Total		tons			**735,920**	

(Source: the Survey Team)

*1 Under assumption that most of the imported cement is assumed for consumption in south region, approximately 30% of imported cement is assumed to be transported by rail; since cement factories are located also in north regions, where many limestone mines exist.

*2 Urea domestic supply from KAZ is assumed to be 1,200,000 tons, since rehabilitation of cement factories and construction of new cement factories will be completed in other area like in Baiji. Transportation by railway and truck is assumed to be same percentage of 50:50.

3 62% shown in the Figure 4-5 was assumed by the ratio of population (Population from Baghdad to Al-Qadissiya which is located more than 300km from Basra /Population of south region which is the area from Baghdad to Basra

Total cargo volume to be transported by rail was assumed to be 2 million tons per year (one way).

4.1.7 Design Concept of ITT Projects

Based on the survey as shown in the paragraphs 4.1.1, 4.1.2 and 4.1.3 above the Survey Team considers to develop the ITT Project with the following concept.

(1) ITT concept shall be in conformity with conditions in KAZ area and transportation demand in 2025.

(2) Core facility of ITT shall be suitable for handling and transporting containers and cargos imported and loaded at KZP and fertilizer and other products produced in KAZ area

mainly by railway. Economical point and efficiency of energy consumption of railway transportation is one reason and conformity with the National Strategy on transportation of the Government of Iraq is the another reason.
Ministry of Transport of Iraq is emphasizing historical and geographical advantages of Iraq.

(3) Project boundary of ITT will be within KAZ area (Mureid/Marbel station to KZP)
Location of ITT site will be in the vicinity of KZP and within KAZ area. ITT shall conform to the situation of the industrial development in KZP and KAZ area in the future.

(4) Initial cargo volume to be transported by railway is set to be 2 million tons per year (one way).

(5) ITT project includes the rehabilitation and modernization of railway facilities within the project boundary mentioned at (3) together with the provision of rolling stocks and required relevant equipments and materials.

(6) Unit Load System will be applied for the rationalization of transportation system to this ITT project, which can demonstrate the model for modernization of Iraq and prepare the increase of labor cost happened by the future economical development. Unit Load System will preferably be applied to the relevant area in the vicinity of Baghdad.

4.2 Specification of ITT Facilities

4.2.1 ITT Facilities

Following cargo flow through ITT is assumed in the study

■ Import cargos and containers at KZP

Import containers and cargos unloaded at KZP are transported to domestic markets after customs clearance. The ITT terminal for rail car loading may be located in KZP customs area (Container Terminal). Railway facilities will be prepared at KZP Custom Area. Imported cargos will be loaded to the freight trains using transfer cranes. Imported bulk cargo will be transported directly from KZP by trucks for the area in the vicinity of KZP and for the area more than 300 km from KZP bulk cargo will be transported passing ITT by railway.

Imported raw materials and fuel will be transported by trucks from KZP to process center to be provided in ITT first and processed products will then be distributed with railway container in the future.

■ Fertilizer and other products produced in the KAZ area

Products produced in the KAZ area will be transported by the trucks to the ITT and loaded into railway container cargos there and transported and distributed to the relevant domestic

market. Many 31ft gullwing type container will be used for the efficiency of loading and unloading operations. In future, some products produced in the KAZ area for export will be stored in the ITT.

4.2.2 Assumption for Railway Planning

■ **Planning Philosophy**

A conservative planning philosophy is applied as follows.

(1) Investment

Short implementation schedule.

Social impact, especially right of way, is essential item. So it should be made in use of existing facilities.

(2) Relation with other projects

On this study, it is not depending on IRR future plan and avoiding confliction with other donors' plan, new line, double tracking, and electrification.

■ **Object**

Railway facilities for ITT surrounding KAZ port area, same as surrounding Baghdad suburban area, and Crossing & Passing Stations between two ITTs.

■ **Loading items and volume**

Loading materials and volume should be assumed based on the section 4.1.6 Demand Analysis.

■ **Standard for Specification**

The specifications for railway facilities should be based upon "New Railways Designing Manual N.R.I.A (New Railways Implementation Authority)" provided by IRR.

4.2.3 Plan for operation and railway facility

■ Required transportation volume by rail required transportation volume by rail is 2,000,000 ton/year as one way.

■ Transportation capacity per train

Wagon type is assumed as container wagon, length: 20m, carrying capacity: 40.5 t /wagon, self-weight 19.0t, to correspond to international logistics and to secure the flexibility for variable loading materials.

Two 20 ft. containers, length: 6.058 m, width: 2.438, height: 2.59 m, tare weight: 2

ton/container can be loaded on each container wagon.

Freight train should be organized one locomotive and 20 wagons, carrying capacity: (40.5-2x2) x20=730 ton, length: 20x20+20=Approx.420 m
Traction weight: (19.0+40.5) x20= 1,190t on< 1,200ton

- The number of trains per day and operation plan
  The number of train per year is assumed as follows.
  730 ton/train x 8 service/day one way x365 day/year = 2,131,600 ton/year one way > 2,000,000 ton/year one way. 2,131,600 / 2,000,000 = 106%
  Locomotive capacity is assumed as DF200 / JRF (traction: 1,200 t, Velocity: 110km/ h), hauling capacity and other factor are considered.
  Non-stop service is assumed between Baghdad ITT and KAZ ITT except operation stops at crossing & passing stations.
  Necessary hours between two stations are assumed 12 hours, so schedule speed is assumed 550 km / 12 hours = 45.8 km/ h, same as passenger train, considering improvement of track and rail, double tracking.
  Loading and unloading hours are assumed 6 hours each at ITT in use of effective and high speed container handling system at ITTs.
  One cycle for main line locomotive is assumed 1 day/cycle, and that for wagons is assumed 2 days/cycle. So the minimum number of required main line locomotives is 8x1=8 locomotives, and the minimum of train sets is 8x2=16 train sets.
  The calculation result for cycle time of locomotive and wagons is shown in Table 4-6.

Table 4-6: Cycle Time of Locomotive and Wagons

(hours)

Item	KZA ITT	North	Baghdad ITT		South	KAZ ITT	Total
	Loading	Bound	Unloading	Loading	Bound	Unloading	
Wagons	6	12	6	6	12	6	48
Locomotive		12			12		24

(Source: the Survey Team)

- The number of locomotive and wagon
  Reserve margin is assumed as 20% for delay or scheduled inspection.
  The reason of 20% is shown as below.
  - ◆ Rolling stock inspection is supposed requiring as each 300,000 km cumulative kilo meter.
  - ◆ The inspection period is assumed as 1 month. Table of major maintenance cycles of locomotives and wagons is shown in Table 4-7.

Table 4-7: Major maintenance cycles of locomotives and wagons

Items	Locomotives		Wagons	
	Interval	Period	Interval	Period
General Overhaul	4 years	40 days	5 years	150 days
General Inspection	1 year	17 days	-	-
Periodical Lifting	-	-	20 months except G.O. (2 times/5 years)	10 days
Periodical Inspection	-	-	10 months except P.L. (3 times / 5 years)	4 days
Other Inspections	Small-time on extra inspections			

(Source: the Survey Team)

According to "New Railways Design Manual" followings are found

- 300,000 km/ (550 km x 2) = 272 day
- 30 day / (272+30) = 10% margin for inspection
- Margin for delay 10% + Margin for inspection 10% = 20%

Number of main line locomotives is 8x1.2=10 vehicles, and number of train sets is 16x1.2=20 train sets.

Train set is organized as 20 wagons, without additional coupling (20x20=400 wagons)

The number of shunting locomotives for pushing/ pulling wagons in scheduled inspection at Baghdad area and KAZ area is 2x2=4 locomotives

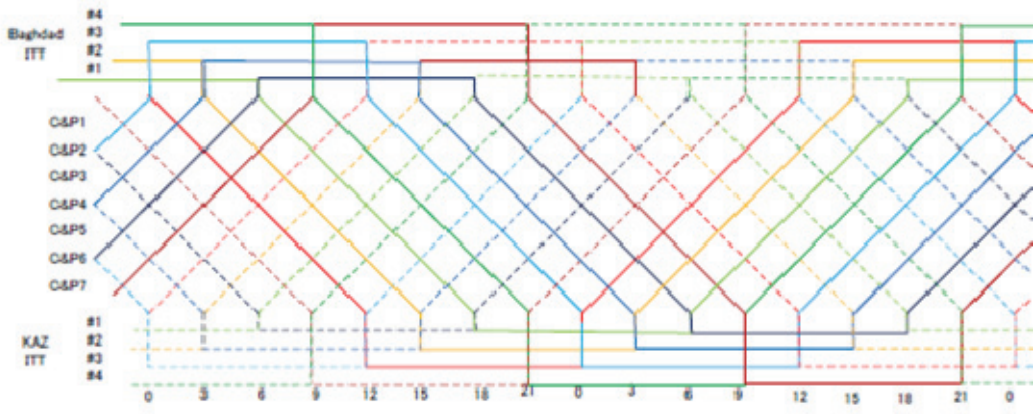
■ Facility plan

Each train sets occupy 12 hours, loading: 6 hours, unloading: 6 hours, at each ITT. Three lines are required at each ITT, in case uniformly headway operation.

Four lines with two platforms and one engine run-round line are assumed for the reason as follows.

- Engine run-round track and lead track are required for locomotive turning direction.
- Long train interval at least one time per day is preferable for main line maintenance. Congested train operation schedule is the factor for increasing required lines at ITTs.

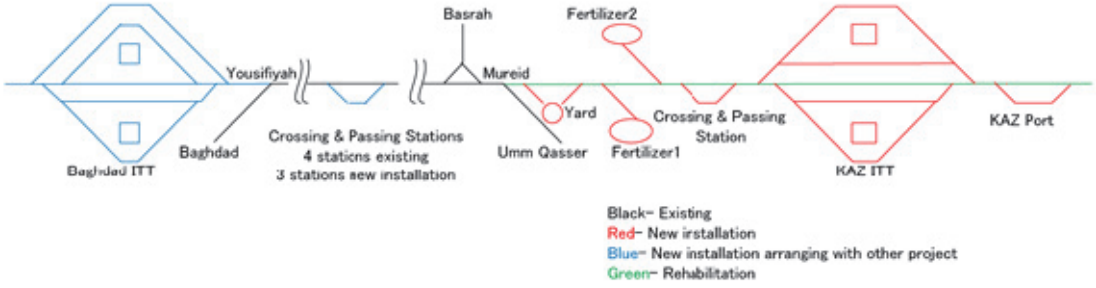
Figure 4-7 shows diagram for estimation of size of facilities.



(Source: the Survey Team)

Figure 4-7: Diagram for Estimation of Size of Facilities

Figure 4-8 shows the Skelton of the planning section. Red part is the object for this project and blue part is the object expected to be constructed by other project.



(Source: the Survey Team)

Figure 4-8: Skelton of the planning section

The candidate location of Baghdad ITT is new railway complex on Baghdad circular line. The area is on the south part of planned circular line around the Baghdad city center, the length of line is expected as 110 km long.

4.2.4 Facility Specifications

■ Preliminary Initial Investment and Operational Cost Estimation

◆ Preliminary Initial Investment

The preliminary initial investment is shown in Table 4-8.

Table 4-8: Preliminary initial investment

(Unit: Million Japanese Yen)

Items				Unit	Rate	Quantity	Amount (million Japanese Yen)	Note
Rolling Stock	Locomotive	Main Line		Nos.	300	10	3,000	Equivalent to Type DF 200
		Shunting		Nos.	200	4	800	
	Wagon	for Container		Nos.	2.5	400	1,000	
	Container	31ft		Nos.	5.0	400	2,000	
Sub-Total 1							**6,800**	
Station	Baghdad ITT, Branch Line			LS	1,000	1	1,000	2 platform, 5 lines, Length:320 m
	KAZ ITT,Yard, Workshop, Branch Line			LS	5,000	1	5,000	
	Crossing & Passing			Locations	200	7	1,400	900 m
Sub-Total 2							**7,400**	
Cargo Handling Facilities *1				station	5,100	1	5,100	KAZ ITT only
Transfer Center Building (Total Floor Area:140x60 3F=25,200 m2)				Lump Sum	14,400	1	14,400	
Power Generation facilities				Lump Sum	600	1	600	
Power Generated Desalination Plant				Lump Sum	600	1	600	
Sub-Total 3							20,700	
Total							**34,900**	

***1 Breakdown of Cargo Handling Facilities per Platform**

Items			Unit	Rate	Quantity	Amount (million Japanese Yen)	
Cargo Handling facilities	Equipment	Gantry Crane	Units	300	5	1,500	
		Forklift	Nos	150	5	750	
		Forklift	Nos	70	5	350	
	Shed	500 m x 70 m	M^2	0.05	50,000	2,500	
Total per Platform						5,100	

*Signaling and telecommunication are not included in the Estimation

(Source: the Survey Team)

31ft Container Gull Wing Type is included in the estimation with the following reasons

- ◆ Two containers of this type are available to carry on 1 wagon.
- ◆ Large aperture is affordable for flexible use, carrying variable items.
- ◆ 400 containers are assumed as exclusive for this freight corridor.
- ◆ Containers are not only on the container wagon, also on track and on land.
- ◆ This type approximately occupies one fourth of all containers.

Regarding the IRR "New Railways Design Manual", the main article for requirement about locomotive and wagon is shown as follows.

- Locomotive for main line
  - ◆ For Freight train speeds of 100km/h for design
  - ◆ Axle load not exceeding 21 tons
  - ◆ Electric transmission
  - ◆ Co-Co type (Co-Co-Co type is recommended by study team)

- Wagon
  - ◆ Maximum speed 100km/h, but the wagon should be able to run empty at 120km/h
  - ◆ Axle load not exceeding 20 ton

■ Preliminary Operational Cost as Reference

Table 4-9 and Table 4-10 show the assumption basis of preliminary operational cost as reference and the preliminarily estimation.

Table 4-9: Assumption Basis of Preliminary Operational Cost

Item		Unit	Value	Remarks
Number of Workers		person	385	operation Km * 70%= 0.7 persons/operation cost= 0.7*550= 385*1
Operation Km		Km	550	
Number of Vehicles	Locomotive	Km/Day	14	Main line 10 Cars
	Wagon	Km/Day	400	Container Wagon
Train Km		Km	8,800	
Vehicle Km	Locomotive	Km/Day/Car	8,800	
	Wagon	Km/Day/Car	176,000	

*1: Refer to Annal Report for Railway issued by Ministry of Land, Infrastructure and Tourism (MLIT) in Japan

(Source: the Survey Team)

Table 4-10: Estimation of Preliminary Operational Cost

(Million JPY)

Item			Japan Fright Railway Company				Planned Line	
			Amount (Thousand Yen)	Unit	Q'ty	Rate (Thousand Yen/Km)	Q7ty	Amount (Thousand Yen)
Operation Cost	Operation Cost	Maintenance of Track and Rail	5,977,321	Operation Distance	8,343	716	10	7,160
		Maintenance of Catenary	2,202,815					
		Maintenance of Rolling Stock	20,358,313	Vehicle (Car)	11,991	1,698	414	702,972
		Operation Cost	29,311,259	Operation Distance (Km)	8,343	3,513	10	35,130
		Transportation Cost	48,523,997	Operation Distance (Km)	8,343	5,816	10	58,160
		General Maintenance Cost	2,199,643	Operation Distance (Km)	8,343	264	10	2,640
		Transportation Administrative Cost	7,915,882	Operation Distance (Km)	8,343	949	10	9,490
		Sub-Total	116,489,230					815,552
	Advertising Cost (1)		162,013					
	Welfare Cost (2)		739,309					
	Administration cost		7,915,882					
	Total (1) + (2) + (3)		8,817,204	Excluded				
Total	Allowance of 7% for Operation							872,641
	Operation cost per 10 km						approximately	900,000

(Source: the Survey Team)

The above figures in Table 4-10 and Table 4-11 are picked up from "Annual report of Railway in Japan, MLIT (Ministry of Land, Infrastructure, Transport and Tourism)" as data of Japan Freight Railway Company.

4.2.5 Plan for Intermodal Transportation Terminal (ITT)

Table 4-11 shows the forecasted handling volume of container, fertilizer and other industrial products in 2025 at KZP, and estimated volume of cargo transported by truck in 2025.

Table 4-11: Estimated Cargo Volume transported by Truck

	Item		unit	Q'ty	Q'ty (ton)	By Truck		Note
From KAZ to Baghdad	Import	1.Container Cargo	TEU	34,000	816,000	38%	310,080	
		2. General Cargo						
		(1) Grain (Wheat)	tons	22,000	22,000	38%	8,360	
		(2) Rice	tons	0	0		0	
		(3) Suger	tons	121,000	121,000	38%	45,980	
		(4) Dates	tons	0	0		0	
		(5) Cement七	tons	2,824,000	2,824,000	0%	0	
		(6) Steel& Pipes	tons	2,430,000	2,430,000	0%	0	
		(7) Vehicles	unit	0	0		0	
		(8) Others	tons	867,000	867,000	100%	867,000	
		3. Liquid Bulk (Petrochemical Products)	tons	1,686,000	1,686,000	0%	0	
		Total of Export					**1,231,420**	
	Products	Urea	tons	1,000,000	1,000,000	0%	0	New Plant
			tons					
		Total of Product					**0**	
	Total		tons				**1,231,420**	
From Baghdad to KAZ	Export	1. Container cargo	TEU	34,000	816,000	38%	310,080	
		2. General Cargo						
		(4) Dates	tons	110,000	110,000	0%	0	
		(8) Others	tons	65,000	65,000	100%	65,000	
		3. Liquid Bulk (Fuel Oil)	tons	2,253,000	2,253,000		0	
		Total of Export					**375,080**	
	Products	Others	tons	500,000	300,000	62%	186,000	
		Total of Product					**186,000**	
	Total		tons				**561,080**	**▲ 670,340**

(Source : PPP Survey Team)

The 38% in the above figure shows the ratio of the population in the area less than 300 km from Basra and population in southern region (south of Baghdad). Cement, fertilizer, steel products and pipes and liquid bulk are assumed to transport directly and not through ITT. Total quantity of cargo transported by trucks is assumed to be 1,792,500 tons. Figure 4-12 shows number of trucks utilized for the study, assuming that operating days and tonnage per truck are assumed to be 300 days per year and 20 tons per truck respectively.

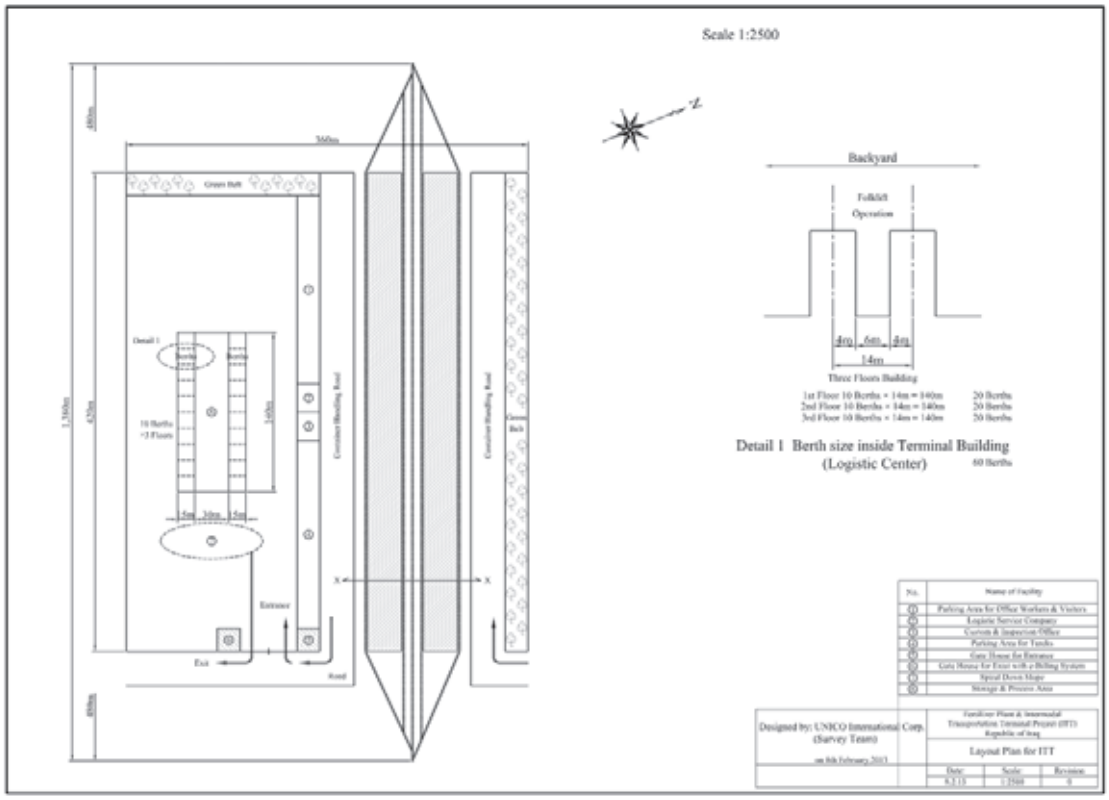
Table 4-12: Estimated Number of Trucks required (2025)

Item	Unit	Estimated Figure
Imported Cargo by Truck (year)	ton/year	1,231,420
Export Cargo by Truck (year)	ton/year	561,080
Total (year)	ton/year	1,792,500
Daily Cargo Volume by Truck assuming 300days working per year	ton/year	5,975
Number of Trucks required assuming 20 tons/truck	Nos	299

(Source: PPP Survey Team)

In result of the estimation, the number of truck using the ITT is to be 300 units. Assuming the waiting time at terminal to be 5 hours, number of berths necessary for transportation terminal was found to be 60 berths.

Layout Plan for ITT is shown in the following Figure 4-9. Figure 4-10, 4-11 and 4-12 show the section of building to cover railway terminal, plan and section of Bulk Loading Facility respectively.



(Source: Produced by Survey Team)

Figure 4- 9: Layout Plan for ITT

The rail lines shall be laid in parallel with the shore line of KZP.

This plot plan has the following features:

* The platform length is 420 m which can accommodate 20 rail wagons
* The numbers of line are 4 lines to be newly constructed plus 1 existing line to be rehabilitated at project execution stage.
* The railway system between Marbel and ITT is expected to be connected with double tracks.
* The site will be enclosed as indicated in plot plan with green belts for protection of sandstorm to be minimized.
* The site also accommodate logistic center facilities with 60 truck berths which consists of three floors building and 10 berths each in both sides of building floor.
* This three – storied building is connected with ground level by ramps on both sides of

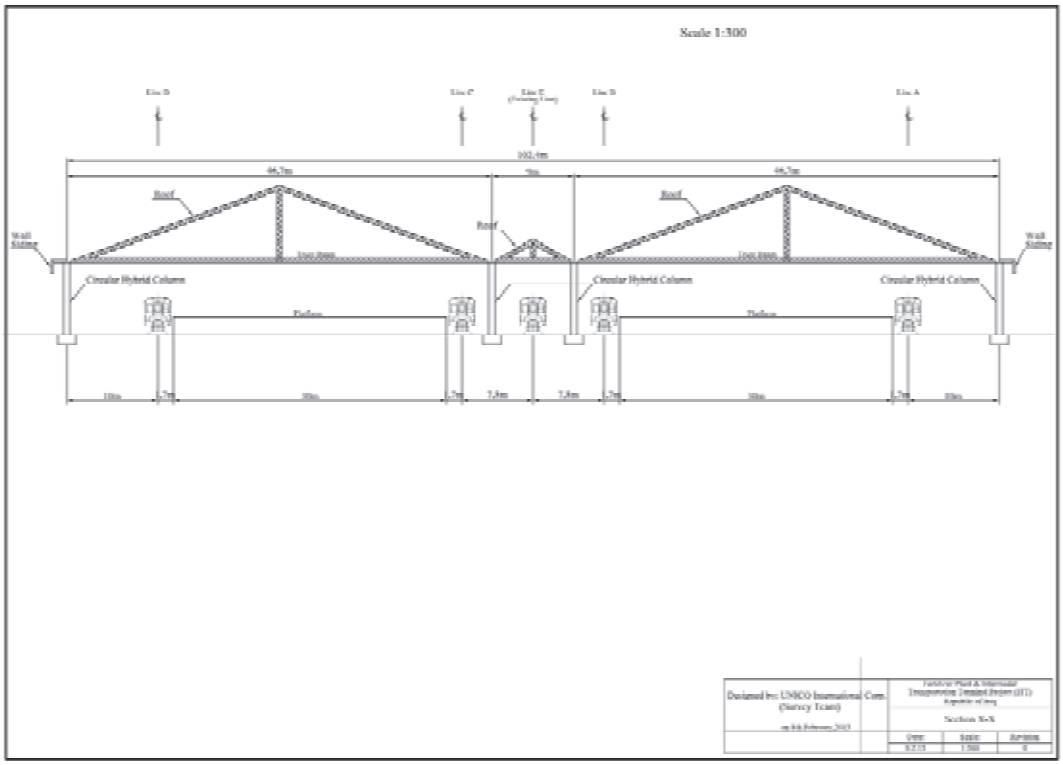
building.

* Inside building there will be equipped with refrigeration warehouses, low temperature warehouses and logistic processing rooms.
* In each floor there will be several logistic services rooms to be operated by private sector's logistic companies in future, who are specialized in logistic services.
* In site there will be invited custom oofice, custom inspection office in independent building and private company's offices in separate building.
* There will be arranged of a parking area for both trucks and commercial cars for office peoples and visitors.

The following drawing shows the section of railway platforms with roof and roof sidings.

The features of this facility are as follows:

* The basic structure is single span structure for each roof with intermediate structural steel columns.
* The space of platforms is of 30 meters wide which enable easy operation of heavy-duty type spreader on platform.

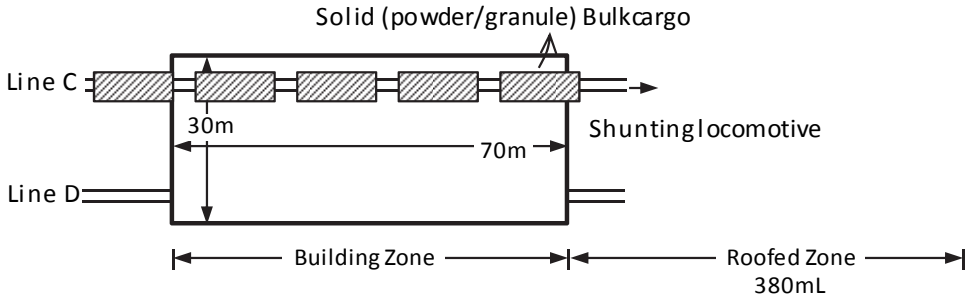


(Prepared by PPP Survey Team)

Figure 4-10: Section for Building to cover Railway Platform

The key technical points are as follows:

1. The numbers of railway lines are new 4 lines for new two platforms and 1 existing line to be rehabilitated
2. Both platforms have the slope to be approachable by vehicle
3. The both platforms enable operation of a heavy-duty type spreader with 40 foot loaded container in its space and load bearing capacity of floor
4. The height of main truss beam from the floor is enough to operate such heavy-duty spreader
5. External sides of both platforms can be approached by a heavy-duty type forklift with loaded container
6. To minimize stormy sands, it provide with the roof siding, not to be impeditive for forklift operation
7. Roof materials shall be selected " anti- corrosion for salty sands"
8. The roof size shall be larger in its length than platform size
9. Alternatively roof could be changed to dome type with transparent membrane which insures a reduction of lighting cost



(Prepared by PPP Survey Team)

Figure 4-11: Plan for Bulk Loading Facility

The preliminary plan of urea bulk loading onto open rail wagons are carried out inside building, which can house three wagons at same time, operated by shunting locomotive.

This building will be constructed adjacent to roof for platforms.

However this facility could be modified in accordance with the final handling system plan.

The following sectional drawing shows bulk cargos loading system which consist of hopper bins for temporary storage with measuring devices and sliding gates for bulk loading.

As in the past experiences by SCF of handling bulk urea it often experienced technical problems of choking due to urea caking phenomena un the Basra weather conditions. A system

in more deeply reconsidered at the execution stage is recommended.

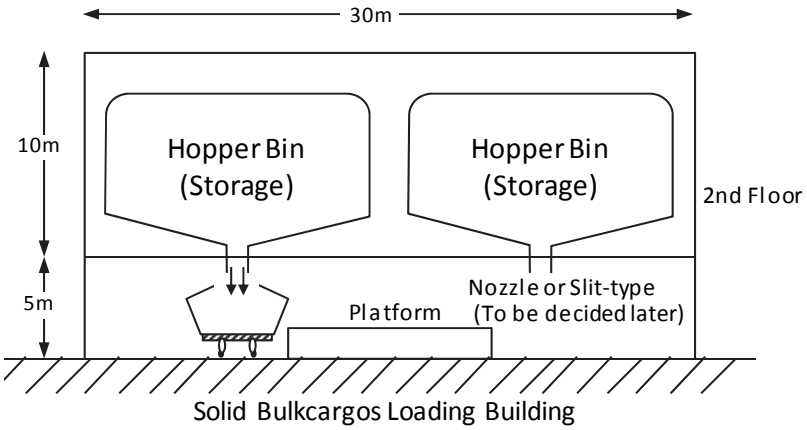


Figure 4-12: Section for Bulk Loading Facility

4.2.6 Schedule of ITT Project

The schedule of ITT Project is assumed as follows.

- The feasibility study for the Japanese ODA loan
  for the project 2013-2014
  The feasibility study shall be subject to the acceptance by the Japanese Government /JICA based on the request of the Iraqi Government.
- The appraisal of the Japanese ODA loan 2014-2015
- Nomination of the project management consultant 2014-2015
- Tendering of the contractor(s) for the project and/or
  of the supplier(s) of the equipment/materials. 2015-2016
- The completion of the project 2018-2019
- The start of the commercial operation 2018-2019
  The implementation schedule of ITT project is basically to comply with the implementation schedule of the fertilizer project, but due to the finance arrangement of the ODA loan, it might require the several steps before the start of the construction.

4.3 Image of Transportation Terminal

The following is an image of the transportation terminal.

Figure 4-13: Image of Transportation Terminal

Chapter 5. Project Structure

5.1 Legal framework for Project Company in Iraq

The legal system in Iraq is basically a mixed legal system of Islamic law and Western-style legal system, as with other Arab countries of the Middle East. The basis of the current legal system in Iraq is the constitution that was approved in Parliament in September 2006. The Iraqi Civil Code established in 1951 (1951 Law No.40) is a customary law that was characterized by the ease of understand, which is similar to the laws of Egypt (French type). The Iraq Commercial Code law (Commercial Code Law No.30) was established in 1984.

Those basic legislation in Iraq can be evaluated as standard for the foreign company to implement projects. However, the detailed clarification shall be required for the foreign investments before implementation of the projects, since there are several issues in the Iraqi legal system, such as the conflict between the central government and local government authority (regional governorates) in oil and natural gas related matters.

5.1.1 Companies Law and State Company Law (including public-private joint-stock company)

In doing business in Iraq, type of the corporate legal entity of the business partner(s) is important . Most of major business partners for the foreign companies are currently the state companies in Iraq under the Iraqi State company Law (Registration Instructions State Companies Law, No., And 22,1997, No.196 of 2004, "Iraqi state company law" collectively). State company is managed by the board. The board members (Director General and the Board of Directors) are appointed by the Minister of the Iraqi Government. In management of the state company, it needs approval from the Minister on making important decision such as borrowing as set out in the article 19 and 18 of the State Company Law "the borrowing must be approved by the all Ministers of CoM (Council of Ministers)".

In accordance with the provisions of Article 15 of the State Company Law, the state companies can carry out joint projects with foreign companies to achieve business objectives having been granted without approval from CoM. Since the past cases for such borrowing in Iraq were very limited, it is considered necessary further confirmation.

“Company Law 21 of 1997 & Registration Instructions, No.196 of 2004 (the "Companies Act" Iraq collectively)” is company except for the state companies.

5.1.2 Iraqi Investment Law (Law No.13, 2006)

Investment Law 13 of 2006 is very important for the foreign firms in doing business in Iraq.

The investment law was established in 2009 and revised in 2009 with the goal to make the same treatment for the foreign investors as domestic investors in order to attract foreign capital. Until then, ownership by foreigner was no allowed under a system that Iraqis can only own land. The revision of the investment law made enable foreigners to own the land when they build houses. By the revision, the foreign companies can use the land for their business in a form of lease, such as up to for 50 years lease term. The Investment law provides the many incentives for investors, such as exemption from customs duty and tax exemption for 10 years, for the import of all capital goods, import tax.

The following is the Iraq Investment Law and the related laws amendment.

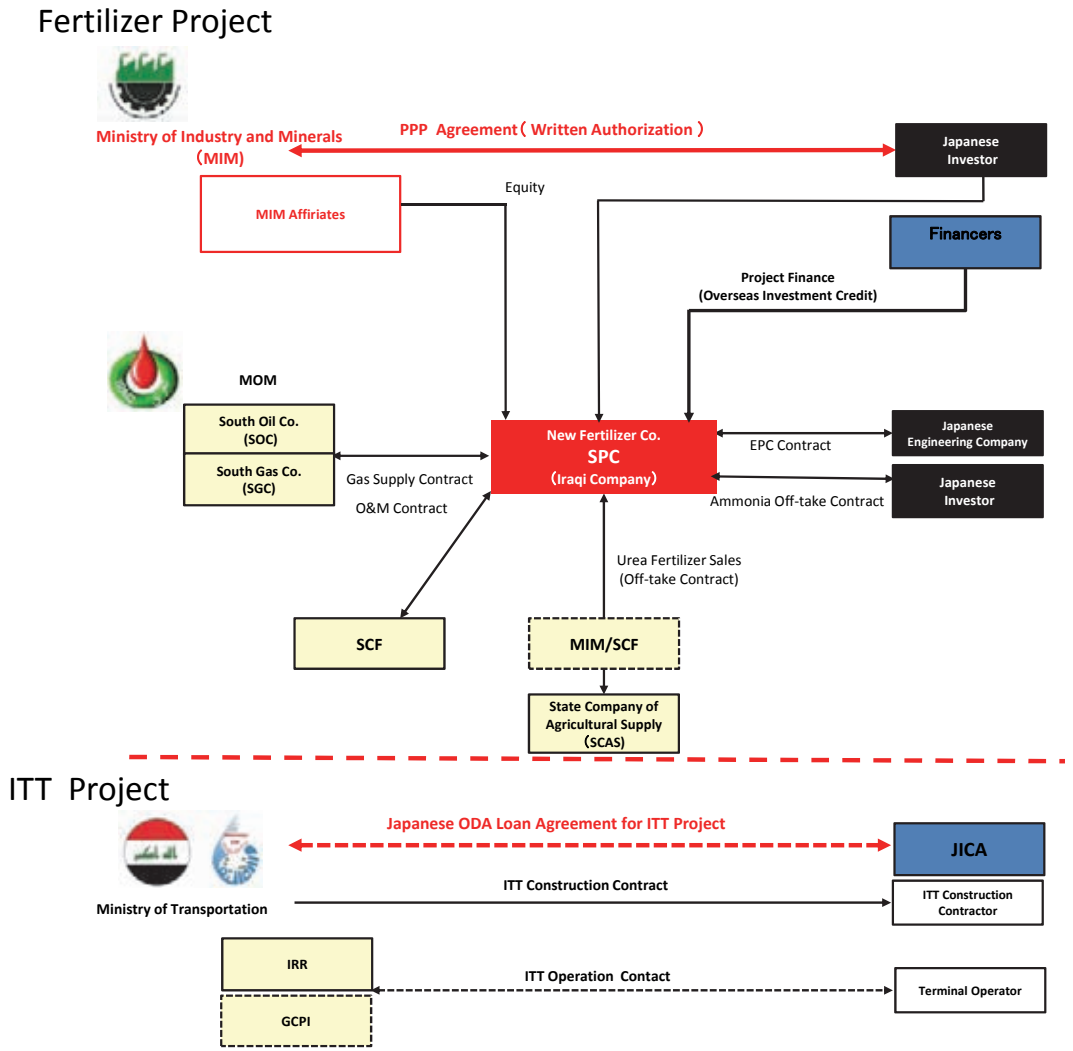
- Investment Regulation, No. 2 (of 2009)
- Industrial Investment Law, No. 20 (of 1998)
- Mineral Investment Law, No.91 (of 1988)
- Regulations for the First Amendment of the Regulations for Selling and Leasing the State and Public Sector Properties and Lands for Investment Purposes No. 7 for 2010
- Investment law No. 13 for the year 2006 and its amendments No.2 for the year 2009
- Commercial Agencies Law, No. 51 (of 2000)
- Law on Registration Agents, No. 4 (of 1991)
- Coalition Provisional Authority (CPA), No. 54: Trade Liberalization Policy

5.2 Project Structure

The Government of Iraq (GOI) has been promoting private investment for reconstruction and development of the infrastructure and industries in Iraq under the recommendations by the international institutions, such as World Bank, UNIDO and OECD. For the activation of the private investments in Iraq, GOI has been making continuous efforts to establish its policy and regulatory frame for PPP type of projects. MIM also have a strong intension for the early implementation of the MIM projects in PPP scheme with the cooperation with the private sector.

5.2.1 Project Structure of PPP PROJECT

The expected project structure of the PPP PROJECT is shown the following figure.



(source: survey team)

Figure 5-1: Project Structure of PPP Project

5.3 Finance

5.3.1 General

The Government of Iraq is currently under restriction of foreign borrowing under non-concessional long-term finance based on the stand-by arrangement by IMF. The restriction is to limit total amount of outstanding of the long-term loan at U.S.$2 billion, including loan based payment guarantees issued by the Government of Iraq. However, the restrictions are expected to be gradually relaxed due to rapid growth of the Iraqi economy. In the nearest future, export credit and other finance are expected to be utilized for projects in Iraq.

5.3.2 The Project Cost

(1) Fertilizer Project

The survey team estimated US$17.85 billion as the total investment cost of the Fertilizer Project as specified in the clause 6.2.1 of Chapter 6.

(2) ITT Project

The survey team estimated JP¥349million as the total investment cost of the Fertilizer Project as specified in the clause 4.2.4 of Chapter 4.

5.3.3 Financing Plan

The survey team understands that the financing for the ITT Project would be arranged at the Government of Iraq (MOT) and MOT is in a position to consider and study on the application for the Japanese ODA loan by JICA.

The following is the financing plan for the Fertilizer Project.

(1) Equity for the Fertilizer Project

The study team set the debt equity ratio as 70:30 with the consideration on the project feasibility and the capacity of the potential equity investors as specified in the clause 6.2.1 of Chapter 6 of this Report.

Japanese potential investor is considering its equity investment more than 50%, and Iraqi potential investor is considering its equity investment at 25-49% of the total amount of the equity.

(2) Project Finance

Since the Fertilizer Project is a project linked to international market for the natural gas, ammonia and urea, the project finance can be identified as a suitable finance scheme for the Fertilizer Project. The long-term supply contract of the natural gas and the long-term off-take contract of ammonia are expected to be core securities for the project finance for the Fertilizer Project.

(3) Important terms in Financing Agreement

It is the key for the structuring of project finance how to secure legally the project assets and rights assigned for the lenders. It is said that the preferable laws for project finance are the

laws of the State of New York and English law. However, we can find project finance examples for oil & gas projects and petrochemical projects in Saudi Arabia and Qatar, where are under the Islamic law system similar to Iraq.

The following is the important terms in the project finance agreement.

■ **Governing law**

Pursuant to the provisions of Article 25 of the Iraqi Civil Code, the governing law is usually the applicable laws in the signing place of the contracts. However, because the law does not impose restrictions on the choice of law, it is also possible to choose a law other than the law of Iraq by the mutual agreement of the contract parties. It is recommendable to sign the contract outside of Iraq, if the parties desire to adopt the governing law other than the law of Iraq.

■ **Jurisdiction**

Although there is no provision on the court of competent jurisdiction (Jurisdiction) in the Commercial Code and the Civil Code in Iraq, there may be different opinitons in Iraqi judicial authorities to use the foreign court of competent jurisdiction.

■ **Arbitration**

According to the provisions of Article 251-271 of the Iraq Civil Code, the arbitration of contract dispute has become a thing based on the arbitration provision. The contracting parties can select the arbitration in a foreign country. Today, not a few foreign companies, who conclude the business contracts for the business in Iraq such as interstate oil companies (IOC), selected arbitration place for the project in Singapore, Paris or Geneva.

(4) Security Arrangement for Project Finance in Iraq

The laws concerning the setting-lien mortgage in Iraq are as follows.

- Iraq Civil Code (No. 40, 1951)
- Real Property Registration Act Iraq (No. 43, 1971)
- Iraq Commercial Code (No. 30 of 1984)
- Iraq Companies Act (No. 21, 1997)

Chapter 6. Financial and Economic Analysis

6.1 Approach

This study is carried out under project development concept of PPP (Public-Private-Partnership) with assistance from Japan International Cooperation Agency (JICA). The structure to be applied to this study is that financial source for the Fertilizer Plant will be equity and debt under investment by MIM, Mitsui & Co., Ltd. and other governmental and private investors, and that ITT Transportation Terminal and associated facilities will be financed by JICA ODA Loan under a concept of Iraqi government project. Therefore, financial and economic analysis in this study is carried out to obtain internal rate of return as mentioned below.

1) Financial analysis of Fertilizer Plant (calculation of Financial Internal Rate of Return (FIRR))
2) Economic analysis of Fertilizer Plant (calculation of Economic Internal Rate of Return (FIRR))
3) Economic analysis of Transportation Terminal (calculation of Economic Internal Rate of Return (FIRR))

6.2 Financial and Economic Analysis

6.2.1 Fertilizer Plant Financial Analysis (FIRR)

(1) Assumptions

Financial analysis of the Fertilizer Plant assumes assumptions as mentioned as below:

Table 6-1: Assumption for Financial Analysis of Fertilizer Plant

1) Plant Capacity	Ammonia 2,700ton/day (feedstock for Urea 1,700ton/day and export 1,000ton/day)			
	Urea 3000ton/day			
2) Operation Factor	1st year (2018): 85%			
	From 2dn year(2019): 100%			
3) Plant Scope	Ammonia Plant, Urea Plant and all necessary on-site and offsite facilities, including such for feedstodk receiving, products shipment, power and energy plant, water supply and treatment as well as office building and stores.			
4) Intial Investment for Plant	**Total US$1,785 million**			
EPC cost	US$1,594million			
Pre-Operating Cost	US$80million	Including land preparation and other costs for pre-operation including lawyers fee, financial advisors fee and insurance premium		
Interest during Construction	US$111Million			
5) Operation Cost				
Fixed Cost	**US$8,712million/year**	Fixed labor cost and others		
Variable Cost	**US$18,929million/yea**	catalyst and others		
6) Reference	Plant cost under Chapter 3 and SRI PEP Report			
7) Construction	48 months from 2014			
8) Debt				
Debt and Equity Ratio	70% and 30%]			
Debt Amount	**US$1,283 million**			
Interest Rate	**8.28% p.a.**			
9) Revenue	US$467million/year	100%		
Unit Sales Price	Urea	**390**	US$/ton	ex-works
	Ammonia	**435**	US$/ton	FOB
10) Feedstock Purchase				
Natural Gas Consuption	**74**	mmCFD		
Natural Gas Price	**US$2.50**	/mmbtu		
11) Depreciation of Fixed Assets	15 years as weighted average of the whole facilities and equipments			
12) Corporate Income Tax	Tax exemption for the first 10 years, 11% from the 11th year			

(Source: Assumptions by the Study Team)

The debt is assumed to be provided in USD under OECD guidelines as mentioned as below;

i Loan Amount : U$1,283,000,000.00 (Equivalent to 85% of EPC cost plus interest during construction)

ii Disbursement Availability : 4years

iii Loan Repayment : 10 years (the first repayment after 6 months of plant completion)

iv Repayment : Semi-annual 20 equal principals repayment

v Interest rate : OECD guidline interest plus Iraqi risk premium plus project risk financing premium 3% as an example shown below (based on OECD CIRR as in February 15, 2013 to March 15, 2013)

CIRR 2.30%

Iraqi country risk premium	2.98%
Project Financing premium	3.00%
Borrowing Interest Rate	8.28%

(2) Financial Analysis Results

Results of Financial Analysis by the Study Team were as shown in Table 6-2.

Table 6-2 Financial Analysis Results on Fertilizer Plant Project

Project NPV at discout rate 10% until 10years after completion			US$2,526	million
Total Investment			US$1,785	million
Project IRR (UnLevered IRR)			**13.31**	**%**
Payback Period (Total Investment)		after completion	5	years
Total Equity Investment			US$502	million
Equity IRR (Levered IRR)			**22.45**	**%**
Payback Period (Equity)		after completion	4	years
Total Debt Amount			US$1,283	million
Debt Service Cover Ratio	(DSCR)	Minimum	1.34	1st Year
(Loan Repayment Period: 10 years)		Maximum	2.79	9th Year
Loan Life Cover Ratio	**(LLCR)**		**2.16**	

(Source : Analysis by the Study Team)

Details of financial analysis on Fertiler Plant Project are described in Appendix E.

6.2.2 Transportation Terminal Economic Analysis (EIRR)

(1) Assumptions

Calculation of EIRR for the Transportation Terminal assumes assumptions as mentioned as below:

1) Crop Production Increase

Increasing the role of domestic agricultural production is mentioned at the beginning of Vision under the Agriculture Sector's Challenges in the National Development Plan 2010-2014 (NDP 2010-2014). Production of major agricultural crops in 2010 was 3,352,000 ton according to the NDP 2010-21014. On the other hand, 7,260,000 ton is obtained as total in 2010 of agricultural import and production from FAOSTATO. Agricultural production increase is important. Current yield of crop production is estimated as 1.687kg/ha as mentioned at paragraph 3.1.4. Adequate use of fertilizer assumes an increase of 1,855kg/ha from 1,687kg/ha to 3,542kg/ha, which is equivalent to a agricultural yield level in Oman, Egypt and China.

Ministry of Agriculture (MOA) estimates annual fertilizer demand 2,145,000 ton during

2017 – 2021. Annual Production from this project being 1,000,000 ton (daily production 3,000 ton multiplied by 333 days operation) assumes to contribute to crop production increase at such ratio of 1,000,000 by 2,145,000 during 2017 – 2021.

Multiplying the estimate of agriculture land 2,343,000ha in 2018 as mentioned at paragraph 3.1.4 to the crop yield 1,855kg/ha, annual crop production increase is assumed as 4,346,265ton. Out of this 4,346,265ton, 2,026,231ton increase (according to the ratio of 1,000,000 by 2,145,000) is assumed as a contribution from this project. Assumed benefit 506,558,000 USD is assumed as economic benefit of production increase by multiplying 2,026,231ton increase with unit value 250USD/ton assumed under approach as below:

A) Import average unit price 252USD/ton of wheat in 2010 is calculated from FAOSTAT Iraq page of Country Pasture Profiles

(http://www.fao.org/ag/AGP/AGPC/doc/Counprof/regions/index.htm)

B) Reliable information about domestic price of barley was not obtained, and import of barley is small. Average price in the Table 6-3 is 343.1 USD/ton and is 274.9 USD/ton, if excluding Yemen.

C) Major crop in Iraq is wheat and barley. From A) and B), unit price USD250/ton is assumed for application of economic analysis.

In addition to bringing economic benefit 506,558,000 USD to agricultural sector, export of ammonia of 333,000 ton per year (ammonia production 1,000 ton x 333 days operation per year) contributes to benefit to Iraq. Applying unit export price 435USD/ton, annual export amount is assumed as 143,550,000 USD.

Without Situation assumes that agriculture production is lower than the with-situation, which supplies fertilizer 1,000,000 ton per year, and also that no export revenue from ammonia is obtained.

2) Capital Cost

The same amount is assumed as in financial analysis, but no interest during construction is assumed. Engineering, Procurement and Construction (EPC) cost is assumed as 1,594 million USD and pre-operation cost as 80 million USD. Total 1,674 million USD.

3) Operation and Maintenance Cost

The same amount is assumed as in financial analysis.

(2) Calculation of EIRR (Economic Internal Rate of Return)

Economic Internal Rate of Return (EIRR) is calculated as per 6-5 to be 22.1% per year.

Table 6-3: Calculation of EIRR for Fertilizer Plant

(Unit : 000 USD)

	Year	Capital Cost	Operation and Maintenance Cost	Ammonia Export Revenue	Benefit in Agriculture Production Increase	Net Benefit
-4	2014	-334,800				-334,800
-3	2015	-669,600				-669,600
-2	2016	-502,200				-502,200
-1	2017	-167,400				-167,400
1	2018		-121,593	144,855	506,558	529,820
2	2019		-121,593	144,855	506,558	529,820
3	2020		-121,593	144,855	506,558	529,820
4	2021		-121,593	144,855	506,558	529,820
5	2022		-121,593	144,855	506,558	529,820
6	2023		-121,593	144,855	506,558	529,820
7	2024		-121,593	144,855	506,558	529,820
8	2025		-121,593	144,855	506,558	529,820
9	2026		-121,593	144,855	506,558	529,820
10	2027		-121,593	144,855	506,558	529,820
11	2028		-121,593	144,855	506,558	529,820
12	2029		-121,593	144,855	506,558	529,820
13	2030		-121,593	144,855	506,558	529,820
14	2031		-121,593	144,855	506,558	529,820
15	2032		-121,593	144,855	506,558	529,820
16	2033		-121,593	144,855	506,558	529,820
17	2034		-121,593	144,855	506,558	529,820
18	2035		-121,593	144,855	506,558	529,820
19	2036		-121,593	144,855	506,558	529,820
20	2037		-121,593	144,855	506,558	529,820
21	2038		-121,593	144,855	506,558	529,820
22	2039		-121,593	144,855	506,558	529,820
23	2040		-121,593	144,855	506,558	529,820
24	2041		-121,593	144,855	506,558	529,820
25	2042		-121,593	144,855	506,558	529,820
26	2043		-121,593	144,855	506,558	529,820
27	2044		-121,593	144,855	506,558	529,820
28	2045		-121,593	144,855	506,558	529,820
29	2046		-121,593	144,855	506,558	529,820
30	2047		-121,593	144,855	506,558	529,820

(Source: Estimation by Study Team)

6.2.3 Transportation Terminal Economic Analysis (EIRR)

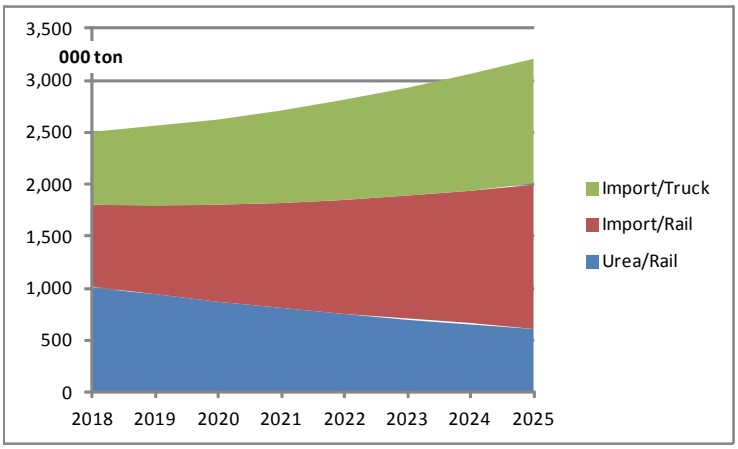
(1) Assumptions

Calculation of EIRR for the Transportation Terminal assumes assumptions as mentioned as below:

1) Cargo Volume

Cargo volume handled at Khor Al Zubair port in 2025 is estimated in Chapter 4.

Cargo volume for economic analysis is assumed as below, and the import cargo quantity from 2018 to 2025 is illustrated at.



(Source: Assumption by Study Team)

Figure 6-1: Transportation Terminal Cargo Handling Volume Assumption

2) Capital Cost

① With-Situation

The capital cost for the Transportation Terminal project in 2018 is assumed as 338 million USD, which is obtained at conversion of the cost estimation at the Table 4-9 at exchange rate 1USD = 100 JYen. The capital cost includes locomotives and wagons as well as rail yard at Khol Al Zubair and construction of rail at 7 crossing sections between Basra and Baghdad.

② Without-Situation

The without project case is to be road transportation by tucks for the same cargo volume equivalent to the rail transportation. For 2,000,000 ton transportation by trucks between Basra and Baghdad, number of trucks required is assumed as 666 trucks at calculation below:

a) Road distance assumption: 600km
b) Trip hours: 12 hours at average 50km/h
c) Return trip hours: 48 hours including stops for rests and margins
d) Average cargo weight 20 ton per truck

e) Annual cargo transportation by one truck* 3,000 ton in year
(20ton x 365days/2days x 82% operation factor)

f) Required number of trucks for
2,000,000 ton transportation* 666 trucks

Capital cost for the 20 ton truck is assumed to be 200,000 USD per one truck. Total capital cost is 133,200,000 USD, and the investment is assumed to be made for units required for cargo volume in each year under another assumption that the life 20 years.

3) Operation and Maintenance

-1. Fuel Cost

(A) With-Situation

As in February 2013, OPEC crude oil basket price is just over 110 USD per barrel. Therefore, diesel/gas oil used for the locomotives is assumed at 120 USD per barrel, including refining margin and transportation/delivery cost. 120 USD/bbl is equivalent to 754.72 USD/kilo liters Annual fuel cost for rail transportation consuming 9,042 kilo liters is calculated as 6,824thousand USD.

(B) Without-Situation

Fuel consumption of the 20 ton truck at full cargo load is assumed to be 2.5km/liter. The cost is estimated as 36,226 thousand USD per year, applying the same unit cost of diesel/gas oil.

-2. Maintenance Cost

Annual maintenance cost in average[1] for the Transportation Terminal is assumed as described in Table 6-4.

Table 6-4: Annual Maintenance Cost Assumption for Transportation Terminal

(Unit: USD)

Item	Capex	Maintenance Cost per year
Locomotive	30,000,000	900,000
Shunter	8,000,000	240,000
Wagon and Container	30,000,000	300,000
Terminal Equipment (Crane, Forklift, Generator)	116,000,000	1,160,000
Civil & Building	154,000,000	770,000
Total	338,000,000	3,370,000

(Source: Assumption by Study Team)

[1] Some maintenance works are required at longer period like 5 years. Tires replacement is not necessary every year. Average cost includes all the associated cost, and is expressed as annual average.

Maintenance cost for truck is assumed to be 10,000 USD per year in average[1] for a 20 ton capacity truck including repair, replacement of consumables and tires.

4) Economic Benefits of Cargo Handling at Transportation Terminal

Cargo handling at transportation terminal is expected to contribute to (a) time saving from efficient cargo handling and (b) time keeping under efficient cargo management system.

Calculation of economic value of the Transportation Terminal needs many data and information on the cargo, such as commodity name, quantity, cargo style and other information, including detailed design information on the terminal to evaluate time required for cargo handling. Simulation may be necessary for evaluating economic value of the Transportation Terminal. Inventory investment saving obtained by time saving is counted as benefit of the Transportation Terminal in cargo handling for calculation of an assured firm EIRR. Time saving in with-situation is assumed as 7 days from without-situation. The 7 days time-saving is assumed to inventory saving equivalent to 7 days (annual cargo value x 7 days/365 days).

(2) Calculation of EIRR (Economic Internal Rate of Return)

Life of the Transportation Terminal is assumed as 40 years, and life of trucks is as 20 years. Economic Internal Rate of Return (EIRR) is calculated as per Table 6-5： to be 14.5% per year. 14.5% is a calculation result under the approach to obtain an assured firm EIRR. Therefore, higher EIRR may be expected, if every factor is included in the calculation.

Table 6-5：Calculation of EIRR (Economic Internal Rate of Return)

(Unit： 000 USD)

Year		With-project Case (Terminal Exists)					Without- Project Case				Net Benefit of Project
		Capital Cost	Fuel Cost	Mainte-nance Cost	Benefit from Inventory Saving	**Total**	Capital Cost	Fuel Cost	Mainte-nance Cost	**Total**	
-2	2016	169,000				169,000				0	-169,000
-1	2017	169,000				169,000	119,880			119,880	-49,120
1	2018		6,142	3,033	-11,617	-2,443	-253	32,604	5,994	38,345	40,788
2	2019		6,129	3,027	-950	8,206	446	32,535	5,981	38,963	30,757
3	2020		6,152	3,038	-1,027	8,162	1,153	32,656	6,004	39,813	31,651
4	2021		6,211	3,067	-1,111	8,166	1,871	32,970	6,061	40,902	32,736
5	2022		6,306	3,114	-1,202	8,219	2,605	33,479	6,155	42,238	34,020
6	2023		6,440	3,180	-1,300	8,320	3,359	34,187	6,285	43,832	35,512
7	2024		6,612	3,265	-1,407	8,470	4,139	35,101	6,453	45,693	37,222
8	2025		6,824	3,370	-1,522	8,672	0	36,226	6,660	42,886	34,214
9	2026		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
10	2027		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
11	2028		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
12	2029		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
13	2030		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692

Year		With-project Case (Terminal Exists)					Without- Project Case				Net Benefit of Project
		Capital Cost	Fuel Cost	Mainte-nance Cost	Benefit from Inventory Saving	**Total**	Capital Cost	Fuel Cost	Mainte-nance Cost	**Total**	
14	2031		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
15	2032		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
16	2033		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
17	2034		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
18	2035		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
19	2036		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
20	2037		6,824	3,370	0	10,194	119,627	36,226	6,660	162,514	152,320
21	2038		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
22	2039		6,824	3,370	0	10,194	446	36,226	6,660	43,333	33,139
23	2040		6,824	3,370	0	10,194	1,153	36,226	6,660	44,039	33,845
24	2041		6,824	3,370	0	10,194	1,871	36,226	6,660	44,757	34,563
25	2042		6,824	3,370	0	10,194	2,605	36,226	6,660	45,491	35,297
26	2043		6,824	3,370	0	10,194	3,359	36,226	6,660	46,246	36,052
27	2044		6,824	3,370	0	10,194	4,139	36,226	6,660	47,025	36,831
28	2045		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
29	2046		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
30	2047		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
31	2048		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
32	2049		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
33	2050		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
34	2051		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
35	2052		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
36	2053		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
37	2054		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
38	2055		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
39	2056		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692
40	2057		6,824	3,370	0	10,194	0	36,226	6,660	42,886	32,692

EIRR Calculation result was that Transportation Terminal Project produce benefit at EIRR 14.5% per year.

(Source: Estimation by Study Team)

Current diesel oil price in Iraq by state oil company is 450 Iraqi Dinar/liter equivalent to 386.3 USD/kilo liters. When calculation is carried out in application of diesel/gas oil price at 386.3 USD/kilo liters, EIRR 9.2% is obtained. The study team's opinion is that the domestic diesel oil price is subsidized price, and EIRR 14.5% per year is suitable as EIRR to express economic benefits of Iraq as consolidation of all Iraqi people and organizations including government.

6.3 Risk Analysis

6.3.1 Risk Analysis on the Fertilizer Plant Project

Risk analysis for Fertilizer project by the Study team is described as follows;

Table 6-6: Risk Analysis of Fertilizer Plant

Risk Category	Risk Item		Magni-tude	Comments Level	Comments Note	Measures	Evaluation on Measures	
Force Majeure and Political Risk								
Political Risk								
	War & Riots		L	M	Despite some improvement in the security climate, it is still not low. The Basra area is relatively lower in comparison with other areas in Iraq.	Depending on its nature.		NEXI can provide Investment Insurance for Japanese investors to cover some extent of investors loss.
	Compulsory Acquisition		L	L	It may be not so high, as encouragement of foreign direct investment is an important policy of the Iraqi government.	Letter of guarantee from the Iraqi government not to make compulsory acquisition and to support the project.		
	Change of Law		L	M	It may be low that new laws will be legislated to prevent the business, but be possible that taxation and other law changes may cause some impacts.	Sakes or purchase contracts cover adequate adjustment clauses for change of laws.		
	Foreign Exchange		L	M	At present foreign exchange is basically free. In future, laws may be enacted, and some regulations and procedure for approval including some control by Central Bank of Iraq may be introduced.	NEXI can provide Investment Insurance for Japanese investors that can insure some parts of risks relating to foreign exchange.		
Natural Events								
	Earthquake		L	L	It is considered that risks in Basra area is not high.	Damages during construction may be covered by construction insurance. It needs some studies on insurance coverage during operation.		
	Storm and Flood		L	M	It is considered that risks in Basra area is not high.			
Others								
Commercial Risks								
Construction Risks								
	Plant Performance	Quality	L	L	Selection of reliable EPC contractor under such contract as to guarantee performance of the plant under compensation clause for non performance liquidated damages.			In general, risks are managed by contractual arrangement by the parties.
		Quantity	L	L				
		Efficiency	L	L				
	Delay in Completion		M	M	Can be headed to Contractor, if it causes the delay.	If not fault by Contractor, absorbed by cost overrun contingency.		
	Cost Overrun		L	M				
Operation Risks								
	Feedstock Supply		L	L	Supply contract under guarantee by the government			全体としては、運転リスクは負担可能な範囲である。
	Utility Supply	Electricity	L	L	Generating facility is installed in the plant.			
		Water	L	M	Arrangement in consensus with the government of Basra province			
	Operation		L	L	Selection of reliable contractor to provide operation and maintenance under long term contract as to guarantee its obligations. Support by Japanese competent company will increase reliability.			
Sales Risks								
	Sales	Ammonia	L	S	Long term contract with Japanese company			尿素の販売リスク
		Urea	L	M	Guarantee by MOA and export guarantee in case of excess supply			
Economic Risks								
	Feedstock Price		S	M	Some linkage works between market prices of ammonia and urea and of natural gas.	Pricing mechanism is one of important issues.		
	Ammonia and Urea Price		L	M				
	Labor and other operation cost		S	H	May increase under future development	percentage of labor cost in total being small, Its impact will be low.		
	Debt interest rate		M	H	May increase as current market level is low.	Hedging arrangement may absorb some risks.		
					Low Risk ⟷ High Risk			
	Issue may need study.							

(Source: by the Study Team)

6.3.2 Risk Analysis on the ITT (Transportation Terminal) Project

Risk analysis for ITT project by the Study team is described as follows;

Table 6-7: Risk Analysis of ITT (Transportation Terminal) Project

Risk Category	Risk Item		Magni-tude	Comments Level	Comments Note	Measures	Evaluation on Measures	
Force Majeure and Political Risk								
Political Risk								
	War & Riots		**Project will be invested by Iraqi government or its agencies and companies including IRR and GCPI under MOT.**					
	Compulsory Acquisition							
	Change of Law							
	Foreign Exchange							
Natural Events								
	Earthquake		L	L	It is considered that risks in Basra area is not high.	Damages during construction may be covered by construction insurance. It needs some studies on insurance coverage during operation.		
	Storm and Flood		L	M	It is considered that risks in Basra area is not high.			
Others								
Commercial Risks								
Construction Risks								
	System Performance	Quality	L	L	Risks may be low. However, selection is important of reliable consultants, contractors and suppliers having good experiences.			In overall , risks may be not so high.
		Quantity	L	L				
		Efficiency	L	L				
	Delay in completion		M	H	When many contractors/suppliers are involved, a part of delay may cause delay in commencing the facility as a system.	Some parts are better to be arranged as turn-key contract.		
	Cost Overrun		M	M	May exist some risks including soil conditions.			
Operation Risks								In early years after completion, cargo volume is supposed to be lower than the facility capacity.
	Cargo Handling Volume by Terminal		L	M	Market analysis is important. Price should be managed to a willing to pay (WTP) level for handling planned volume of cargo.	Service should meet price under the tariff.		
	Cargo Handling Volume by rail		L	H	Large parts depend on Iraqi rail operation under its capacity and punctuality.	Need arrangement and agreement with IRR.		
	Utility		L	H	Energy generators should be installed.			
	Non operation		M	L	Labor Strike			
	Workers	Technical	M	M	High quality works may be limited.			
		Manpower	M	M	Generally low.			
Economic Risks								
	Tariff		M	M	Under such situation that transportation needs will continue to increase in Iraq, demand increase is supposed to provide			
	Labor and other operation cost		M	L	may be within a control and manageable extent.			
	Interest Rate		**Assumes government borrowing.**					
					Low Risk ◄——► **High Risk**			
	Issue may need study.							

(Source: by the Study Team)

Chapter 7. Social and Environmental Impact

7.1 Overview

The sites of new fertilizer complex and new transportation terminal will be selected in such locations, distance of which is not so long distance like within 1 km. The location will be near from Khor Al Zubair port, and also near from the existing Khol Al Zubair fertilizer plant of SCF.

The site, under the foregoing criteria, will be selected in the industrial zone of Khl Al Zubair, where exist several large plants including fertilizer plant, steel plant, power plant and refinery. Cargo handling volume of export and import will still continue to increase at Khol Al Zubair port and Umm Qasr port located at 16 km south of Khol Al Zubair. The transportation terminal is expected to increase handling volume and transportation efficiency.

In the industrial zone, few people lives, including engineers and staffs to work at those plants. No resettlement of people and houses will be involved. Environmental impact from the project will be controlled to an acceptable level, when adequate design is applied for necessary mitigation and management. The transportation terminal is expected to bring increased cargo handling volume at higher efficiency.

7.2 Laws, Regulations and Standards

7.2.1 National Development Plan for the Years 2010-2014

National Development Plan for the Years 2010-2014 of the Iraqi Government, at Chapter 10, states to seek strategic vision for the environmental sector by adopting eight (8) objectives and means of achieving them. The eight (8) objectives are (i) Promoting Sustainable Development, (ii) Monitoring the Environmental Reality, (iii) Protecting Air Quality, (iv) Protecting Water from Pollution, (v) Ending Desertification, (vi) Environmental Awareness, (vii) Reinforcing and International Cooperation and (viii) Developing and Building Environmental Capabilities.

The four (4) objectives from (i) to (iv) are considered more important in this project except few items such as the means such as promulgating legislations. This project shall be designed, constructed and operated to seek these objectives.

7.2.2 Environmental Regulations and Standards

The instruction No. 3 published in the Iraq Gazette No. 4225 of 9 January 2012 introduced some safety regulations for certain industries including animal factories, threaded production factories, chemical industries and medical industries. The industries under Article 5 of the Instruction No. 3 include Chemical fertilizer plant, and the requirements are such of that the

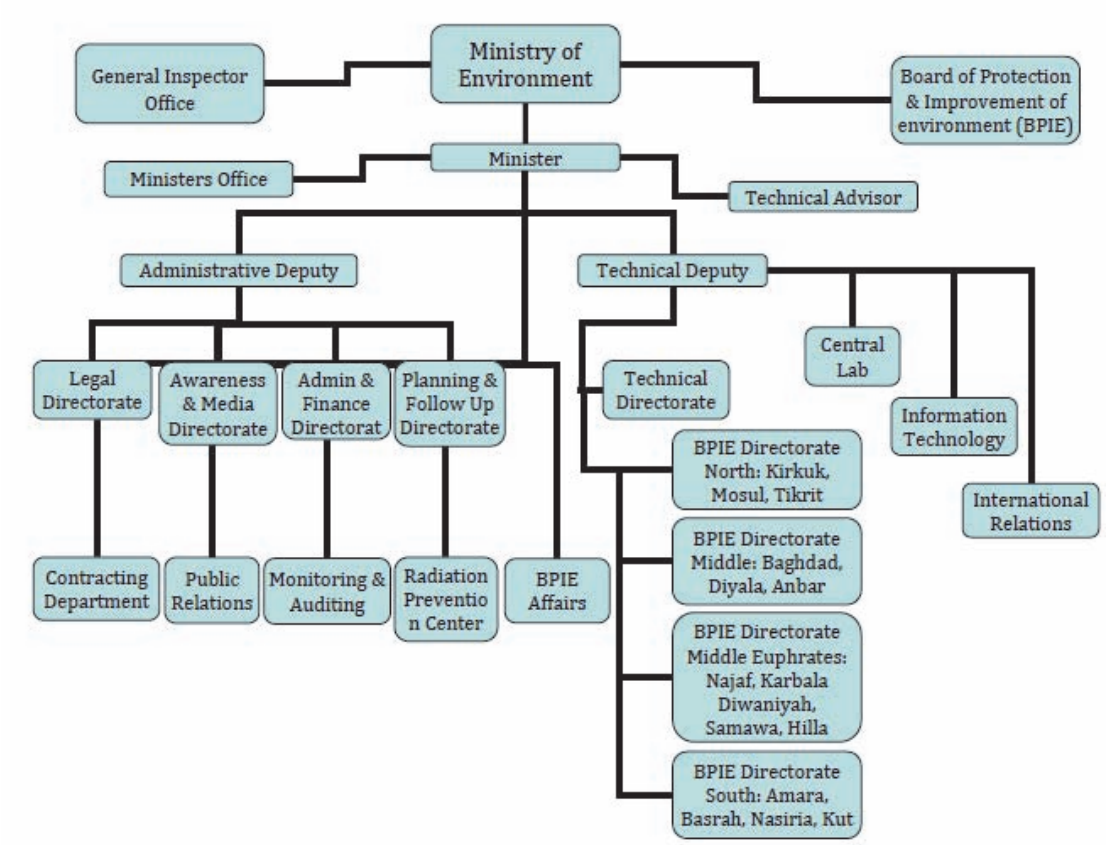
plant shall be located with a distance of not less than 10 km from boundaries of residential zone, and also with a distance of not less than 1 km from main roads, and high efficiency water treatment facility shall be furnished for reducing pollutants concentration so as to maintain water resources.

7.3 Institutional Bodies

7.3.1 Ministry of Environment

Until 1997 from 1975, the Supreme Council for the Protection and Improvement of the Environment was charged with creating environmental policies in Iraq. In September 2003, Ministry of Environment (MOEN) was established and began to gradually replace the environment department structure in the Ministry of Health, with concerted cooperation between the two ministries. Law No. 37 of 2008 strengthened the structure of MOEN with power to execute formal ministerial instructions and orders, to create environmental policy and to initiate compliance and deterrence mechanisms

The structure of MOEN approved in October 2008 under the Law No. 37 of 2008 is as shown in Figure 7-1.



(Source: Iraqi Forth National Report to the Convention of Biological Diversity)

Figure 7-1: Structure of Ministry of Environment

7.3.2 Board of Protection & Improvement of Environment (BPIE)

Board of Protection & Improvement of Environment (BPIE) is established pursuant to the Law No. 27 of 2009, associated with MOEN. The structure in the Figure 7-1 includes BPIE, which is represented by the Chairman being Minister of Environment. The BPIE is held, at least once in two months, to implement the activities as mentioned as below:

a) To make advices on the proposed environmental issues,

b) To give opinion about the environmental matters of plans, projects and national programs that are introduced by ministries and departments concerned before approval and following up the implementations,

c) To coordinate with relevant ministries and authorities to prepare local programs for environmental protection and follow up their implementations,

d) To give opinion on the Arab and international relations related to environmental affairs,

e) to express an opinion on the national agenda and plans of ministries for emergency and environmental disasters

f) To coordinate activities of the ministries and the departments concerned with environmental protection and evaluation,

g) To give opinion on legislations related to environment or projects,

h) To evaluate the activities of the Provincial Boards of Protecting and Improving the Environment,

i) To cooperate with the ministries and the relevant entities to prepare a list of the historical, natural and cultural places to nominate to the World Heritage List, and

j) To give opinion on the annual report on the environment in the Republic of Iraq before submitting it to the Council of Ministers.

7.3.3 Provincial Government and Local Units of MOEN

In each province, Provincial Board of Protecting and Improving the Environment is established. Chairman of the Provincial Board is the governor of the Province, and the members are appointed by the Chairman. Activities and operations are determined by the Provincial Board.

MOEN has regional directorates and offices in each province. Technical directorates at each provincial office generally consists of air monitoring unit, water monitoring unit, solid waste and chemical hazardous management unit, biodiversity unit, marshland unit, EIA unit, desertification and land use unit, and industrial activities monitoring unit.

7.4 Environmental Assessment Requirements

7.4.1 Environmental Assessment under Iraqi Law

The Law No. 27 of 2009, Environmental protection and improvement law legislated on 13 December 2009, set out the provisions relating to environmental assessment.

The Law No. 27 of 2009 aims to protect and improve environment by removing and controlling damages, which may cause impacts and influences to public health and natural resources, biodiversity, cultural and natural heritage in cooperation with the competent authorities to ensure sustainable development and to achieve international and regional cooperation.

Article 10 of the Law No. 27 of 2009 set out that the owner of any project should submit a Environmental Impact Assessment Report (EIA Report) prior to starting project, and at second paragraph, provides that technical and economic feasibility study of any project shall contain EIA Report. EIA is defined as study and analysis of the environmental feasibility of proposed projects that may affect residence or exercise of activities on human health, safety of the environment at present and in future.

Article 11 of the Law No. 27 set out that any project causing environmental impact shall not be implemented unless getting an approval from MOEN. Both the Fertilizer Plant and the Transportation Terminal need to submit EIA Report to MOEN.

7.5 Baseline Environmental Conditions

7.5.1 Geographical Features

The project site, Khor Al Zubair, about 35 km south of Basra is near to Gulf being southern-eastern end of the land of Iraq. The site coordinates are 30 deg 10'N and 47 deg 50'E. The site elevation is around 2-3 meter.

Iraq covers an area in excess of 430,000 km^2. Four main geographical zones have been recognized. These are described briefly as:

a. Desert plateau: Approximately 40% of Iraqi territory. A broad, stony plain with scattered stretches - of sand, lying west and southwest of the Euphrates River and sparsely inhabited by pastoral nomads. A network of seasonal watercourses (or wadis) runs from the border to the Euphrates River.

b. Northeastern highlands: Covering approximately 20% of Iraqi territory. This region extends south of a line between Mosul to Kirkuk towards the borders with Turkey and Iran, where mountain ranges reach up to 3,600m in altitude.

c. Uplands region: About 10% of Iraq. A transitional area between the highlands and the desert plateau, located between the Tigris north of Samarra and the Euphrates north of Hit, and forming part of a larger natural area that extends into Syria and Turkey. Much of this zone may be classified as desert because watercourses flow in deeply cut valleys, making irrigation far more difficult than in the alluvial plain.

d. Alluvial plain: Approximately 30% of Iraq. Formed by the combined deltas of the Tigris and Euphrates Rivers. This region begins north of Baghdad and extends to the Persian Gulf. The once-extensive wetlands of the region have been decimated by damming and diversion of the Euphrates in Turkey and Syria, and by large-scale drainage works.

The project site is at the southern part of Alluvial plain.

7.5.2 Protected Area

Protected areas under international conventions in Iraq are Hawizeh Marsh under Ramsar Convention on Wetlands and three UNESCO World Heritage cultural sites, Hatra in Ninewa Province, Ashur (Aql'at Sherqat) and Samarra Archaeological City, both in Salah Ad Din Province. No site in Iraq is listed in Global list of Biosphere reserves.

7.5.3 Mesopotamian Marsh

Hawizeh Marsh Ramsar Site designated on October 17, 2007 with an area of 137,700h at the coordinates of 31 deg25'N and 47 deg38'E.

MOEN is working to designate Iraq's first National Park in the Central Marshes. To date no protected areas management actions have taken place in Hawizeh and no national legislation has been passed to strengthen protection of this area.

The Mesopotamian Marshlands of southern Iraq are one of the most important features of the freshwater & brackish water ecosystems of Iraq, and are found in the terrestrial ecoregion of Tigris-Euphrates alluvial salt marsh. It is comprised of a large network of interconnected wetlands covered with extensive Phragmites australis reed beds created as the rivers reach the lower Mesopotamian plains, meander and form an extensive inland delta above the head of the Gulf. Three primary marsh ecosystems make up the Mesopotamian Marshlands: the Central Marshes; the Hammar Marshes (Hor al Hammar); and the transboundary Hawizeh Marshes (Hor Hawizeh). There are numerous other smaller wetland systems (permanent and seasonal,

freshwater and brackish water) around these three major systems (e.g. Auda Marsh, Dalmaj Marsh, Sinnaf Marsh, etc.).

During the 1970s, the marshes covered an area of up to approximately 12,000 to 15,000 km^2 making them the third largest wetland ecosystem in the world. These marshes have always been subject of seasonal drying effect but in the 1990s faced a major campaign of intentional desiccation under the Saddam regime conducted for largely political reasons. The result was that the two major marshes that were a part of this complex, the Central & Hammar marshes, were completely dry for over 10 years and the third transboundary marsh, the Hawizeh Marshes on the border between Iraq and Iran, were partially dried (it could not be fully drained because of waters entering the marsh from Iran).

7.6 Preliminary Environmental Scoping

7.6.1 Preliminary Environmental Scoping

In the next stage as a part of detailed feasibility study, it is necessary to complete an Environmental Impact Assessment Report (EIA Report), as mentioned at paragraph 7.4, in accordance with the Iraqi Law No. 27 of 2009 and pursuant to requirements from lenders, investors, institutions and agencies to provide supports and assistances to the project as well as for people and communities to which the project may cause any environmental impact.

Some information useful for environmental impact assessment will be obtained from MOEN Basra office and provincial government of Basra, including social and community information. Mitigation for influence, impacts and risks from the project, including to human health and safety, natural habitats and cultural resources, can be discussed with them for developing the most suitable solutions.

This paragraph describes a preliminary environmental scoping as a reference for the next stage to prepare EIA Report. The preliminary environmental scoping is made for the fertilizer plant at paragraph 7.6.2 and for the transportation terminal at 7.6.3. The scoping described in this Section is preliminary, and shall be reviewed, modified and developed in the next stage.

7.6.2 Fertilizer Plant

The environmental issues are summarized in Table 7-1, together with preliminary evaluations and their reasons and views on each issue. All the issues are expected as possible to be mitigated or compensated to an acceptable level. At this moment that data and information are not enough to make proper evaluation and assessment, the evaluation in エラー! 参照元が見つかりません。 is preliminary. Several issues are pointed out as “A minus” and as “C”, for which the measures are important for mitigation to prevent or to compensate possible adverse

environmental impacts and risks.

In the next stage, a comprehensive environmental assessment shall be carried out to evaluate project's potential environmental risks and impacts in its area of influence, and to identify ways of improving and implementation of preventing, minimizing, mitigating or compensating for adverse environmental impacts throughout the project implementation. EIA Report to describe the assessment shall be presented.

Table 7-1: Preliminary Environmental Risk Evaluation on Fertilizer Plant

Item	Issue		Evaluation	Reason and View
1	Air Quality	Const-ruction	B-/C-	Construction activities will involve emission of dust and exhaust from construction machineries and vehicles. Construction management shall be established to minimize pollution of air.
		Ope-Ration	A-/C-	Plant operation will involve emission to air causing negative impact, unless mitigation measures are taken. The mitigation measures including for boilers are technically possible to a level required. In the next step, design and information shall be provided for assessment.
2	Water Intake	Ope-ration	D	No impact is expected, as far as water is taken from Shatt Al Basra. No damage to Mesopotamian Marsh will be obtained.
3A	Water Discharge (during Construction)	Const-ruction	B-/C	An adequate arrangement is expected to mitigate environmental impact. Construction management plan should include provisions for water.
3B	Water Discharge (from Plant Process)	Ope-ration	A-/C	Wastewater from plant process contains contaminant concentrations in excess of ambient water quality. Wastewater treatment is expected to manage the discharging water at required standards. Design and information shall be provided for assessment.
3C	Water Discharge (from Desalination and Cooling Tower)	Ope-ration	B-/C	Salinity content of the discharging water is higher than ambient water (sea water of Shatt Al Basra). Data, information and analysis shall be provided. Evaluation and assessment is necessary.
4	Noise and Vibration	Const-ruction	B-/C	Construction activities generate noise and vibration. Data and information together with construction environmental management plan should be provided.
		Ope-ration	B-/C	The Plant shall be designed to secure required noise level. Data and information shall be provided.

Item	Issue		Evaluation	Reason and View
5	Solid Waste	Const-ruction	B-/C	Construction activities generate some kinds of solid wastes. Solid waste management plan should be established.
		Ope-ration	B-/C	An adequate waste management plan including all kinds of wastes generated in operation should be planned and implemented.
6	Hazardous Material	Const-ruction	A-/C	Good management is necessary to be established. Study and checking are necessary.
		Ope-ration	A-/C	It may cause significant impact, if not handled adequately. Management plan including handling manuals should be established.
7-1	Resettlement	Const-ruction	D	Resettlement will not be required.
		Ope-ration	D	Resettlement will not be required.
7-2	Impact to Local Community	Const-ruction	B-	Negative impact is expected to be minimized by an adequate construction plan and management.
		Ope-ration	C+	Adequate mitigation measures will minimize negative impact. Employment chance will increase.
7-3	Land Acquisition	Const-ruction	D	The plant will be built at the government land. No land acquisition from other owner.
		Ope-ration	D	The plant will be built at the government land. No land acquisition from other owner.
7-4	Impact to Natural Habitat	Const-ruction	D	Though survey is necessary, this project is not expected to cause threat to natural habitats.
		Ope-ration	D	Though survey is necessary, this project is not expected to cause threat to natural habitats.
7-5	Physical Cultural Resources	Const-ruction	D	Though survey on cultural resources is necessary, possibility will be low in the site that is in industrial zone.
		Ope-ration	D	Though survey on cultural resources is necessary, possibility will be low in the site that is in industrial zone.

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected.

7.6.3 Transportation Terminal

The environmental issues are summarized in Table 7-2, together with preliminary evaluations and their reasons and views on each issue. All the issues are expected as possible to be mitigated or compensated to an acceptable level. At this moment that no data and no information are available to make evaluation and assessment, the evaluation in the 7-2 is preliminary.

In the next stage, a comprehensive environmental assessment will be carried out to evaluate project's potential environmental risks and impacts in its area of influence, and to identify ways of improving and implementation of preventing, minimizing, mitigating or compensating for adverse environmental impacts throughout the project implementation. EIA Report to describe the assessment shall be presented.

Table 7-2: Preliminary Environmental Risk Evaluation on Transportation Terminal

Item	Issue		Evaluation	Reason and View
1	Air Quality	Const-ruction	B-/C-	Construction activities will involve emission of dust and exhaust from construction machineries and vehicles. Construction management shall be established to minimize pollution of air.
		Ope-ration	B-/C-	Terminal operation will involve emission from engine exhaust of vehicles including forklifts, tractors and trucks, and of power generators. Emission level and numbers of vehicles and engines are not known. In the next step, plan and information as well as emission estimation shall be provided for assessment.
		Ope-ration	A+	Transportation energy saving, expected to be obtained by Modal Shift from road to rail, will provide positive impact for reducing emission of PM and NOx from diesel engines.
2	Water Intake	Const-ruction Ope-ration	D	No impact is expected, if RO desalination is applied.
3	Water Discharge (during Construction)	Const-ruction	B-/C	An adequate arrangement is expected to mitigate environmental impact. Construction management plan should include provisions for water.

Item	Issue		Evaluation	Reason and View
	Water Discharge (from Plant Process)	Ope-ration	B-/C	If wastewater treatment is installed to manage the discharging water at required standards, no significant impact will arise. Design and information shall be provided for assessment.
4	Noise and Vibration	Const-ruction	B-/C	Construction activities generate noise and vibration. Data and information together with construction environmental management plan should be provided.
		Ope-ration	B-/C	The Plant shall be designed to secure required noise level. Data and information shall be provided.
5	Solid Waste	Const-ruction	B-/C	Construction activities generate some kinds of solid wastes. Solid waste management plan should be established.
		Ope-ration	B-/C	An adequate waste management plan in operation should be planned and implemented.
6	Hazardous Material	Const-ruction	A-/C	Good management is necessary to be established. Study and checking are necessary.
		Ope-ration	A-/C	Handling cargo may contain hazardous material to cause significant impact. Those should be handled properly. Management plan including handling manuals should be established.
7-1	Resettlement	Const-ruction	D	Resettlement will not be required.
		Ope-ration	D	Resettlement will not be required.
7-2	Impact to Local Community	Const-ruction	B-	Negative impact is expected to be minimized by an adequate construction plan and management.
		Ope-ration	B+	Adequate mitigation measures will minimize negative impact. Employment chance will increase.
7-3	Land Acquisition	Const-ruction	D	The Terminal will be built at the government land. No land acquisition from other owner.
		Ope-ration	D	The plant will be built at the government land. No land acquisition from other owner.
7-4	Impact to Natural Habitat	Const-ruction	D	Though survey is necessary, the Terminal is not expected to cause threat to natural habitats.
		Ope-ration	D	Though survey is necessary, this Terminal is not expected to cause threat to natural habitats.

Item	Issue		Evaluation	Reason and View
7-5	Physical Cultural Resources	Const-ruction	D	Though survey on cultural resources is necessary, possibility will be low in the site that is in industrial zone.
		Ope-r ation	D	Though survey on cultural resources is necessary, possibility will be low in the site that is in industrial zone.

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected.

Chapter 8. Project Evaluation

8.1 Project evaluation as a PPP project

The following two projects were originally planned to be developed as a combined project in Iraq.

1) A large-scale fertilizer plant in the KAZ area in Iraq to produce urea fertilizer to be supplied to the Iraqi agricultural sector.
2) A logistics terminal that can distribute the above urea fertilizer and the cargos imported at KAZ Port to whole Iraq.

The above combined project was expected to be developed with the concept of PPP (Public Private Partnership) scheme under Iraqi/ Japanese Governmental agencies and Japanese private investor.

By this survey, it was confirmed that the combined project was the most suitable to be developed in the PPP cooperation scheme as follows.

(1) Iraqi MOM and MIM have basically agreed to supply stable natural gas as the feedstock with significant preferential price for the Fertilizer Project, in which the Japanese private company has an intension for its investment.

(2) Iraqi MOT and its affiliates, IRR and GCPI, started seriously their study on the ITT Project with the possibility of the financial assistance of JICA.

(3) The PPP PROJECT shall closely be integrated to the rehabilitation project of KAZ Port and the rehabilitation of the existing fertilizer plant of SCF, both of which projects have been developed by the Iraqi Government with the cooperation with JICA.

(4) It becomes also clear that the PPP PROJECT may be related to the following projects in the future, which Iraqi Government is currently promoting.

- Effective utilization plan of natural gas by the Office of the Deputy Prime Minister in Iraq
- Development Plan of the petrochemical complex in KAZ area by the MIM. (PPP scheme is also expected by MIM)
- Rehabilitations and development plan of railways in the Iraqi southern region by IRR.

For financing needs of industrial development and of infrastructure development being enormous in Iraq, funding source in international assistance and state budget of Iraq cannot provide necessary amounts, and the Iraqi government decided its policy to promote those

projects by the maximum utilization of the capacity of the private investments.

8.2 Project Evaluation by SWOT Analysis

The following is the evaluation by SWOT analysis for both the Fertilizer Project and ITT Project. The SWOT analysis is one of the typical tools used in the strategic planning for the project development, to evaluate Strengths, Weaknesses, Opportunities, and Threats.

8.2.1 SWOT Analysis on Fertilizer Project

SWOT analysis is shown at Table 8-1 for Fertilizer Plant.

Table 8-1: Fertilizer Project SWOT Analysis

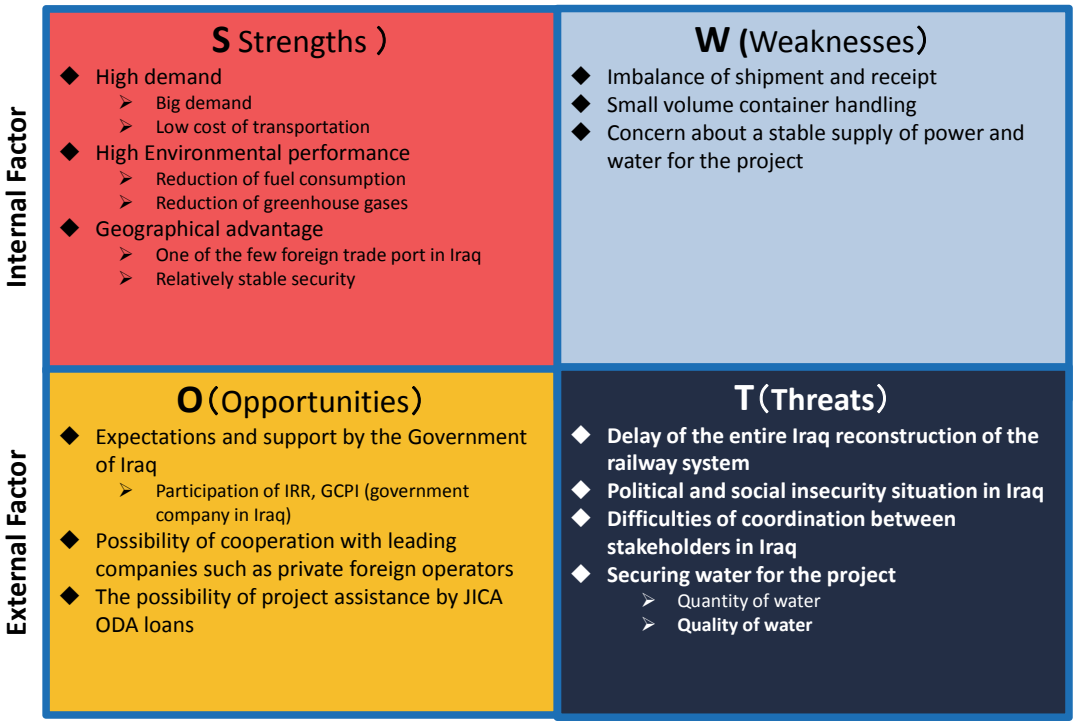
Internal Factor	**S (Strengths)** ◆ High economic efficiency and competitiveness ➢ **Low cost raw materials** ➢ Large-scale plants with the latest technology with excellent unit consumption ◆ Cooperation by the experience of the project ➢ Participation of Japanese companies with project experience ➢ Participation of companies with experience in projects of Iraq ◆ Access to the market of comparative advantage ➢ Domestic in Iraq ➢ China, India and Africa
	W (Weaknesses) ◆ Relatively costly equipment investment ➢ **Security cost in Iraq** ◆ Domestic shortage of engineers and skilled workers ➢ Stagnation of industry and education by the ravages of war ◆ Securing water for the project ➢ Quantity of water ➢ **Quality of water**
External Factor	**O (Opportunities)** ◆ Participation and support to the project by the Government of Iraq ➢ Support by MIM and MOO ➢ Investment incentives ◆ Consistent to the Government policy of Iraq ➢ Industry Promotion Policy ➢ Promotion of private investment ➢ Expansion of agricultural production ◆ Increased demand for food and fertilizer in the neighborhood ➢ Domestic in Iraq ➢ China, India, neighboring Arabic and African countries
	T (Threats) ◆ **Political and social instability in Iraq** ➢ Security issue ➢ Political and religious conflict ◆ **Inadequate business environment Iraq** ➢ Delay of licensing ➢ Inadequate banking system ◆ **Inadequate infrastructure** ➢ Electric power ➢ Water

(Source: Iraq survey team)

8.2.2 SWOT Analysis on ITT Project

SWOT analysis is shown at Table 8-1 for Fertilizer Plant.

8-2: ITT Project SWOT Analysis



(Source: Survey Team)

8.2.3 Expected Benefits

Benefits from this Project are expected as mentioned as follows.

- Fertilizer production effect: : Double the current production capacity of Iraq
- Improving agricultural productivity and food production effects : Improvement of crop yield
- Effect of foreign exchange savings : Foreign currency savings by reducing food imports
- Improvement of logistics capacity : Contribution of transportation and logistics improvement for more efficient industrial activities and for improvement of living standards of the Iraqi people

8.3 Benefit and Public Contribution

8.3.1 Summary of Benefit from the project

PPP type of the projects produce various indirect benefits including development of new project implementation methods and increasing financing arrangement varieties. The following is the summary of the benefit expected from this PPP PROJECT evaluated by the survey team.

Table 8-3: Benefit effects of the project

		Fertilizer Project	ITT Project
JOB Creation	**Construction Stage**	Effect (L) More than 1000 labors required in the peak of the construction	Effect (L) More than several hundreds labors required in the peak of the construction
	Operation Stage	Effect (S) The required engineers and labors in the operation of the fertilizer plant is limited	Effect(M) The ITT Project is expected to create many jobs especially in the services
Contribution to Other Sectors		Effect (L) The fertilizer productions shall largely contribute to the Agricultural sector	Effect (L) The enhancements of the logistics shall largely contribute to various sectors
Regional Activation		Effect (S) The contribution of the fertilizer production for the region shall be limited	Effect(M) The enhancements of the logistics shall largely contribute to various sectors in the region
Improving Lives of Iraqi People		Effect(M) The benefit by the increase of food production in Iraq	Effect(M) The benefit by the development of the logistics for Iraqi people
Other Effects	**Earning/Saving of Foreign Currency Reserve**	Effect (L) The befit from the earnings by the ammonia export and from the saving by the decrease of food import	Effect(M) The benefit from the increase of the foreign trade
Effect (L)		Large effects	
Effect(M)		Medium effects	
Effect (S)		Small effects	

(Source: Survey Team)

8.3.2 Public Contribution by the Fertilizer Project

The fertilizer production directly linked to food issues and the development of agriculture contributes to public with large benefits. The project is to be promoted with the cooperation among the relevant ministries such as MOO, MIM and MOA. MOO already confirmed to provide adequate volume of the natural gas to the Fertilizer Project with the best preferential

price.

In the current the agricultural sector of Iraq, dependence on imported food is still high due to the long war and conflict, and food self-sufficiency rate of grain production has been significantly reduced. In such circumstances, it is a high public benefits to increase grain harvest under increase of the fertilizer production.

8.3.3 Public Contribution by the ITT Project

The logistics route from Umm Qasar – Khor Al Zubai – Basra - Bagdad is the most important transportation artery in Iraq. By collaborating with other projects, such as rehabilitation plan of the ports in Umm Qasar and Khor Al Zubair, the ITT Project can achieve a greater contribution to the transportation system in Iraq. Since the ITT Project could transport the goods (imported at KAZ port) along with the fertilizer to inside Iraq smoothly and efficiently, it is the high public benefits project that contributes to industrial development and sustainability of the Iraqi society.

8.4 Consistency with Iraqi Government Policy

NDP 2010-2014 mentions that required amount of investment for the period is planned as US$ 186,000 million, which includes private investment in US$ 86,000 million. Private invesntment and participation is one of the important policies by the Iraqi government. The survey team understands that it meets this Iraqi Government policy to establish the large scale of the PPP PROJECT with the private sector investment.

While Iraqi is currently dependent on the oil sector for more than 90% of the revenue of the government, industrial development is important in the field of non-oil and gas sectors for Iraq. The PPP PROJECT is expected to encourage agricultural production and industrial development of the manufacturing industry. The PPP PROJECT can contribute significantly to the development plan of the Iraq.

8.5 Consistency with Policy of Assistance by the Government of Japan

The PPP PROJECT is understood to meet the assistance policy for the Republic of Iraq by the Japanese Government and JICA. In particular, The PPP PROJECT is to meet the details of the policy, such as "Strengthen the foundations of agricultural and industrial sectors" and "Development of transport and communication infrastructure", which have been expressed in the "Assistance policy for the Republic of Iraq" by the Ministry of Foreign Affairs of Japan.

The survey team understands that there is a consistency with the assistant policy of the Government of Japan to establish the Fertilizer Project in the cooperation with the Japanese private company(s).

8.6 Remarks on Environmental and Social Impacts

Since the expected location for the PPP PROJECT being in the area adjacent to the existing SCF plant and KAZ port, environmental and social issues from the project (issues such as for nature inhabitants, cultural heritages, impacts on ecosystem and local people) would be limited. In recent years, change and modifications in laws, regulations and standards on environmental and social aspects are made in Iraq. It is important to check those laws and regulations necessary for implementation to establish a project to comply environmental standards for contribution to and development of Iraq.

Table 8-4: Challenges and the schedule of the Fertilizer Project

Challenges	Parties in Charge	2013			2014				2015	2016	2017	2018
		2Q	3Q	4Q	1Q	2Q	3Q	4Q				
Fert. (1) MOU for the Next	Japanese potential Investor(JPI)/MIM			(Investment Agreement) / Detail FS								
Fert. (2) Governmental Approvals	MIM											
Fert. (3) Final Selection of Project Site	JPI/MIM and Ministry of Finance and Basrah Governorates(BG)											
Fert. (4) Detail study on Water-Intake	JPI/MIM MOEn and BG											
Fert. (5) Detail Study on Ammonia storage and	JPI/MIM											
Fert. (6) Discussion with Basrah Governorates	MIM and BG											
Fert. (7) EIA	MIM and MOEn											
Schedule of Fertilizer Project												
Schedule ①	Site Preparation											
Schedule ②	Plant Construction			(Tender)	(EPC)							
Schedule ③	Commercial Operation										(Test run)	

(Source: Survey Team)

Table 8-5: Challenges and the schedule of the ITT Project

Challenges		Parties in Charge	2013			2014				2015	2016	2017	2018	2019
			2Q	3Q	4Q	1Q	2Q	3Q	4Q					
ITT (1)	Clarification on Department in Charge in MOT	MOT/IRR/GCPI												
ITT (2)	Discussion with JICA	JICA/MOT												
ITT (3)	Final Selection of Project Site	MOT												
ITT (4)	Detail study on Integration with IRR lines	MOT/IRR												
ITT (5)	Discussion with Basrah Governorates	MOT and BG												
ITT (6)	EIA	MOT and MOEn												
ITT Project Schedule														
Schedule ①		FS												
Schedule ②		JICA ODA Loan												
Schedule ③		Construction							(PMC)		(Tenders)			
Schedule ④		Commercial Operation												

(Source: Survey Team)

Attachment A : Schedule