

**North Refineries Co Company
Republic of Iraq**

**Preliminary Environmental and Social
Impact Assessment**

Baiji Refinery Upgrading Project

March 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

Japan Oil Engineering Co., Ltd

BAIJI REFINERY UPGRADING PROJECT

North Refineries Company



Preliminary Environmental and Social Impact Assessment

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ABBREVIATIONS

ANSI	American National Standard Institute
API	American Petroleum Institute
ASME	American Society Of Mechanical Engineers
ASTM	American Standard For Testing And Materials
BBL	Barrel
BPD	Barrel Per Day
BPSD	Barrel Per Standard Day
CO	Carbon Monoxide
DCS	Distributed Control System
EHS	Environment, Health And Safety
EMP	Environment Monitoring Plan
EPA	US Environment Protection Agency
EPC	Engineering, Procurement, Construction
ESD	Emergency Shut-Down
FCC	Fluid Catalytic Cracking
FEED	Front-End Engineering And Design
GHG	Green House Gas
H ₂	Hydrogen
H ₂ S	Hydrogen Sulfide
HC	Hydrocarbon
HDS	Hydro De-Sulfur Unit
HDU	Hydro De-Sulfur Unit
HSE	Health, Safety, Environment
HT	Hydrotreater
ID	Iraqi Dinar
IFC	International Finance Corporation
IFC	International Finance Corporation
IMP	Incident Management Plan
IPIECA	International Petroleum Industries Environment Conservation Association
ISA	Industry Standard Architecture
JBIC	Japan Bank For International Cooperation
JICA	Japan International Cooperation Agency
L.A.	Loan Agreement
LCO	Light Cycle Oil
LPG	Liquid Petroleum Gas
Ltr	Litter
MMscfd	Million Standard Cubic Feet

MOE	Ministry Of Electricity
MOEn	Ministry Of Environment
MOH	Ministry Of Health
MOO	Ministry Of Oil
MRC	Midland Refineries Company
N ₂	Nitrogen
NACE	National Association Of Corrosion Engineers
NEC	National Electrical Code
NFPA	National Fire Protection Association
NOC	North Oil Company
NO _x	Nitrogen Oxide(S)
NRC	North Refineries Company
ODA	Official Development Assistance
OGP	International Association Of Oil & Gas Producers
OSHA	US Occupational Safety And Health Administration
PM	Particle Matter
PPE	Persona Protective Equipment
RCR	Reduced Crude
RON	Research Octane Number
ROW	Right Of Way
SDU	Solvent De-Asphalt Unit
SOC	South Refineries Company
SO _x	Sulfuric Oxide(S)
SRU	Sulfur Recovery Unit
SSPC	Society For Protective Coatings
VDU	Vacuum Distillation Unit
VGO	Vacuum Gas Oil
VR	Vacuum Residue
VRT	Vacuum Residue Treater
WB	World Bank
WB	World Bank
WHO	World Health Organization
WMP	Waste Management Plan
dB(A)	Decibel (Scale A)
ppm	Part Per Million

Executive Summary

1 General

The Ministry of Oil (MOO) and North Refinery Company (NRC) of Republic of Iraq will initiate a project for the upgrading project (the Project) of Baiji Refinery located in the Salahuddin province in the northern region of the country through additional construction of Fluid Catalytic Cracking (FCC) Complex. The FCC Complex proposed by MOO consists of the main and auxiliary processing units, utilities and related offsite facilities such as intermediate product tanks and others.

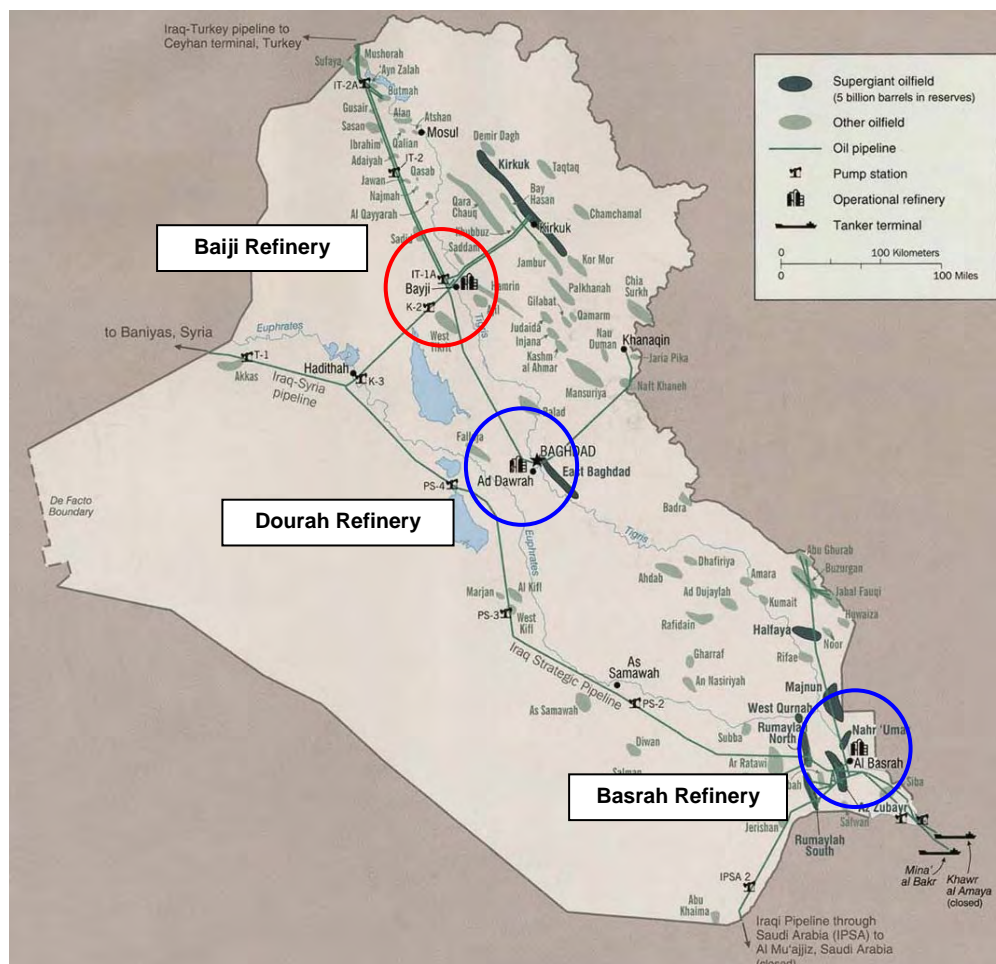


Figure 1 Location of Baiji Refinery

The proposed upgrading project for Baiji Refinery is aiming to be a successful achievement of the following new national development strategy through the possible effects derived from the implementation of the project.

- Improvement of supply-demand balance of the oil products such as gasoline, diesel, kerosene, etc for public use by installation of the new refinery process with high product yields
- Modernization of refineries in Iraq by the introduction of new refining technologies and operation practices
- Environmental effects through supply of high quality (low sulfur content) vehicle fuels
- Social and economic effects by the creation of new job opportunities and businesses in the region as well as reduction of national subsidies for importing the fuels from foreign countries due to gaps of supply-demand in Iraq

2 Environment Impact assessment (EIA)

The Environmental and Social Impact Assessment (EIA) is a formal and consultative process for assurance of integrity for the environmental and social considerations for the project activities. The EIA shall be implemented primarily in this study based on the environmental and social baseline information preliminarily investigated, the project activities planned conceptually, the potential effects on the respective receptors and protective or mitigation measures developed in this study.

The EIA exercise is an essential item for the feasibility study on the project subject to the preliminary approval of the Ministry of Environment (MOEn) in Iraq and it shall be implemented adequately in accordance with the procedure required by the applicable legislation of the country and the relevant international guideline practically referred by the oil sector in the world presently.

The procedure and methodology of the formal EIA should be in accordance with applicable international practices. The EIA process for the project incorporates a number of key steps as shown below.

- Project description
- Environmental setting
- Scoping and confirmation of key issues
- Environmental baseline study
- Identification of environmental impacts and assessment
- Consideration of protection/mitigation measures

The primary information and data of the above aspects to be utilized for the environmental and

social baseline study were collected primarily through investigation of literatures or articles published by the relevant international scientific institutes as well as information and data available through the internet. In addition, the information and data provided by NRC was further applied to the study.

Based on the environmental and social sensitivities in the area and the planned project activities, the expected effects on the sensitive receptors are assessed through preliminary analysis of the potential risks on environment, personnel health and safety (HSE) and social aspects arising from the project. According to the outcomes of the evaluation, appropriate protective or mitigation measures for the potential impacts shall be developed subsequently in accordance with relevant laws and regulations of Iraq and applicable international guidelines and practices.

Protection and/or mitigation measures for the impacts assessed are discussed dedicatedly in accordance with the applicable legislation, standards, guidelines and international practices. And when the high risk operation and activity are assessed, further mitigation measure is discussed to lower the risk to the acceptable level using “As Low As Reasonably Practicable: ALARP” philosophy.

3 Policy and Legal Framework

MOO/NRC states that a firm Health, Safety and Environment (HSE) policy for the Project should comprise as follows:

- *HSE protections are prioritized in the business activities.*
- *Accidents and injuries to personnel are preventable and unacceptable.*
- *Everyone is responsible for their own and their colleagues’ safety at work.*

In order to achieve the above goal, the both study teams agreed that the study is to be carried out taking into consideration of the following strategy for the Project.

- *To comply with the relevant laws, standards and regulations of Iraq*
- *To fully introduce the applicable international standards, guideline and practices to the project*
- *To ensure that environment, personnel health, safety (HSE) and social aspects are considered in the study*
- *To apply the feasible Best Available Technology for the prevention or mitigation of the impacts*

- *To contribute to the sustainable development of the region and the country*

The project must comply with the environmental standards and/or discharge limits set by the Ministry of Environment. Where numerical standards have not been specified by the Iraqi legislation or Iraqi standards are significantly lower than the international norm, the criteria which are defined by the international environmental guidelines and/or best international practice should be applied to the project.

Where numerical standards have not been specified by the Iraqi legislation or the Iraqi standards are significantly lower than the international norm, the International guidelines and/or best practice should be applied to the project such as

- The World Bank / IFC, Environmental, Health and Safety (EHS) Guideline (2007),
 - General EHS Guideline
 - Industry-Specific EHS Guidelines (Petroleum Refining)
- World Health Organization (WHO) Guidelines for ambient air quality
- Legislation of the USA¹ (EPA, OSHA, etc)
- Guidelines published by the oil and gas industries (API, IPIECA, OGP, etc)
- JICA environmental and social guideline

NRC provided preliminarily the environmental protection plan for the project, titled “Environmental Impact Assessment (EIA) for FCC Unit Project”, to Ministry of Environment (MOEn) for approval. The preliminary approval letter was issued by MOEn in July 2009.

4 Project Description

The Baiji Refinery under NRC, is a grass-root refinery constructed in 1978, and is located in the Baiji city of Salahuddin province, at the northern district of the country. The Baiji Refinery consisting of Baiji North and Baiji Salahuddin 1 & 2 Refinery plants are the largest refineries managed by NRC. The combined design capacity is 310,000 BPD in total.

The Ministry of Oil (MOO) will initiate a project for the upgrading of Baiji Refinery by installation of FCC Complex in order to increase production of such oil products as gasoline and diesel which could add product value further in the region. The FCC Complex proposed by MOO consists of the main and auxiliary processing units, utilities and related offsite facilities

¹ OSHA: Occupational Safety and Health Administration
EPA: Environmental Protection Agency

such as intermediate product tanks and others.

The main feed stock (Reduced crude: RCR) to the proposed FCC Complex is to be supplied from the existing refinery. The FCC Complex aims to produce high quality products such as approximately 28,300 BPSD of FCC gasoline with research octane number (RON) 90-91 and less than 10 ppm of sulfur content, diesel oil with less than 50ppm of sulfur content, fuel oil mix, LPG and other by-products.

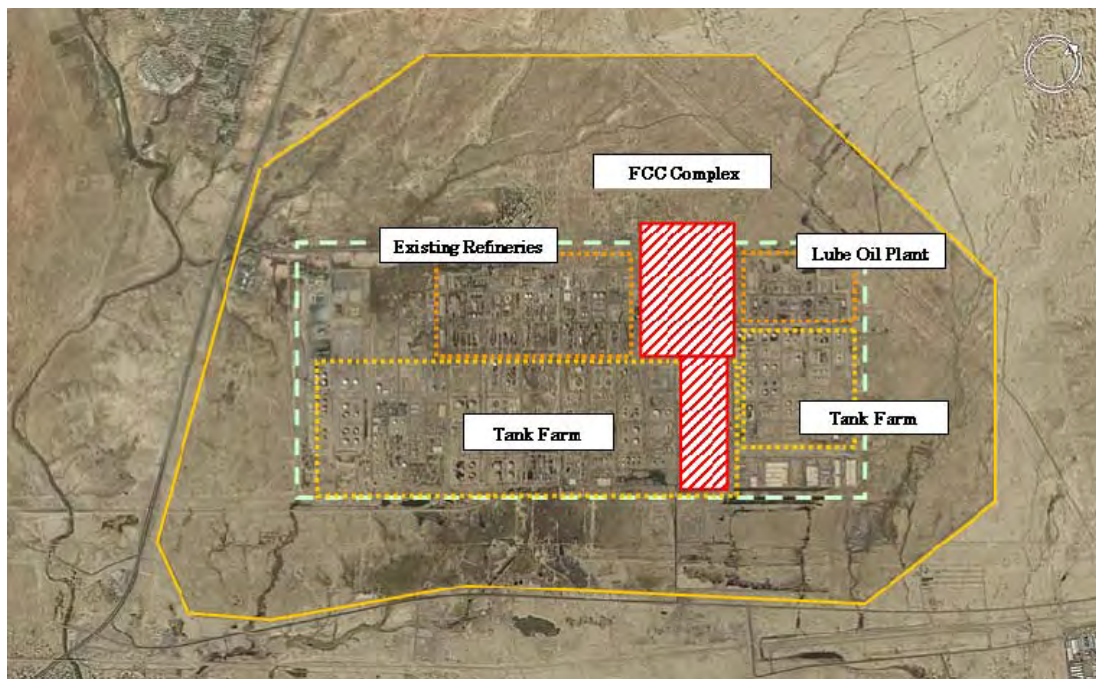


Figure 2 Project Site

The FCC Complex will consist of the main and auxiliary processing units, utility and related offsite facilities to be constructed within the battery limit of the Baiji Refinery.

The main and auxiliary process units as follows.

- Vacuum Distillation Unit (VDU)
- Vacuum Residue Treater (VRT)
- Hydro-Desulfur Unit (HDU)
- Fluid Catalytic Cracking Unit (FCC)
- FCC Gasoline Hydrotreater (HT)
- LPG Hydrotreater
- Sulfur Recovery Unit (SRU)
- Gasification Unit

The Project requires interface alignment between the existing facilities and the FCC Complex on the following interactive aspects: coordination of feedstock supply system, products transfer system, control and data communication system, etc. and modification/addition of existing related facilities including products storage tanks, blending system, loading facility, etc.

In addition, for sustainable and sound operation of the FCC Complex, it is essential to ensure sufficient and stable supplies of main utilities such as electrical power, industrial water and fuels from the certain internal/external resources.

The construction of the FCC Complex will be carried out by an experienced international contractor selected by MOO/NRC, who is responsible for the detailed engineering, procurement of the materials and construction of the proposed FCC Complex.

The construction of the FCC Complex will commence after completion of the FEED stage. It is estimated that the construction of the whole FCC Complex including the related facilities completely will take at least about 40 months. Details of the practical execution scheme and schedule for the successful completion of the project have not been finalized yet for the time being. The project execution scheme including the phasing of the construction will be discussed seriously in the subsequent phase according to the situation of the project such as operability of the entire refinery, technical capability of NRC for project management and operation, finance, market requirements, etc.

Details of the practical execution plan for the project will be developed appropriately in the subsequent phase of the project.

5 Project Alternative

If “no project option” is selected, the below effects of the project are not expected.

- Improvement of supply-demand balance of the oil products in the region according to the national development strategy,
- Promotion of modernization of refineries in Iraq,
- Environmental effects by supplying high quality (low sulfur) vehicle fuels, and
- Social and economic effects by increased employment opportunities in the region and reduction of national expenditure for importation of the vehicle fuels for filling up of the current supply-demand gaps.

The upgrading project of the existing Baiji refinery could very well achieve the targets of the

national development strategy within a shorter period of time and with lower budget amount, because the related existing processing facility could be utilized effectively and the project site is already available in the existing refinery boundary. Also with the upgrading option, it is expected that the additional environmental and social impacts of the project will be minimized. This is the main reason for the selection of upgrading project instead of the option of new construction.

The concept of optimum process configuration of the FCC Complex is highest yields of gasoline and diesel, minimum by-products, low project costs, high operability and maintainability of the facilities. The optimum process for the FCC Complex will be selected properly among several optional process schemes by MOO/NRC prior to the subsequent FEED phase.

6 Environment and Social Impacts and Mitigation Measures

(1) Physical Environment

In the construction phase, the well maintained construction equipment and vehicles mobilized for the works will reduce the emissions of the pollutants in the exhaust gases. Proper dust prevention measures such as water spraying and soil control will be provided at the site. The wastewater discharged by the construction activities will be properly controlled and flowed out to the existing drainage system of the refinery.

In the operation phase, the combustion equipment such as heaters, boilers, diesel engines, flare stack, etc. in the FCC Complex will be specified to comply with the standards for the emission of the harmful substances in the flue gas required by the relevant laws and/or the international guidelines. The closed oily drain system and vent gas system designed in accordance with the international practices will reduce the fugitive VOCs from the facility into the air.

The oily wastewater and the other wastewater discharged from the process and other facilities will be collected and treated by the wastewater treatment system provided in the FCC Complex in accordance with the water quality standards specified by the NRC which complied with the relevant laws and the international guidelines. The treated water is then discharge to the Tigris River through the water canals around the refinery.

It is expected that these measures will contribute to mitigate the impact on the air quality and water quality of the area in both the construction and operation phases of the project.

The project site will be located at the designated facilities area in the existing Baiji Refinery and the nearest residential area, the most sensitive area to the noise emitted from the construction and operation of the facilities, is located at approximately 3 km south from the project site. The extensive tank farm is laid out in between the plant area and the southern boundary of the refinery, which will buffer the noise from the facilities. The project will specify the source equipment of large noise to be equipped with the proper protection devices such as silencer, enclosure, housing, etc. so as to comply with the standards of the noise in the residential area. According to the above site location and the protective measures, the noise in the nearby residential area is expected to be mitigated to the acceptable levels.

(2) Ecology

The proposed FCC Complex will be located at the area prepared for future expansion in the boundary of the Baiji Refinery. Accordingly, the construction works including site preparation will not have direct impacts on ecology in terms of loss or damage of the wildlife habitats of the area. The proper protective measures for the gas emissions and wastewater discharges to the environment will mitigate the probable degradation of the environmental qualities of the habitats.

Therefore, it is expected that the project will not create significant impact on the ecological diversity in the region from the construction and operational activities.

(3) Socio-Economic

The major project activities such as the construction of the FCC Complex will be limited within the boundary of the existing Baiji Refinery. Therefore, the project will not need any land acquisition and the resettlement of the residents for the construction of the proposed facilities. However, for construction of the water intake and transfer system including the approximately 7 km of pipeline for the refinery, the land for the facility shall be acquired from the owner/user of the land. The project will develop the Land Acquisition Plan defining the procedure and formalities necessary for such acquisition of the land in accordance with the relevant legislation of Iraq and the environmental and social guideline of JICA/JBIC. Further, the appropriate compensation for the owners/users of the land shall be discussed seriously between MOO/NRC and JICA to ensure compliance with the requirements of both the relevant law in Iraq and the environmental and social guideline of JICA/JBIC in the subsequent FEED phase.

On the other hand, the project will create a new employment opportunities in the local community and promote various related businesses and services in the region. These activities

will contribute to activate the local and regional economy and improve the life and livelihood of the affected communities accordingly.

In order to mitigate the potential impact on the community, NRC will develop the suitable social management plans addressing the possible disturbances to the life and social activities of the local people arising from the project and operational activities of the refinery.

(4) Personnel Safety and Health

For assurance of the facilities safety, the international standards and practices as well as the procedure for the risk analysis recognized by the refinery sector in the world will be applied to the engineering and design of the proposed facilities. NRC will develop the safety procedure addressing the operational and maintenance works of the new facilities including the consideration for the conditions/environment of the work places, protection measures, permit to work system, training, etc. In addition, NRC will provide the incident management plan to respond properly and effectively on the unexpected emergency event possibly occurred during operation of the facilities.

These considerations will contribute to mitigate the risk of the personnel safety and health associated with the project.

(5) Cumulative Impacts

The proposed FCC Complex will be operated together with the existing refinery plants in the Baiji Refinery, so that, the cumulative environmental impact derived from the entire operations of the Baiji Refinery consisting of the existing and new facilities shall be assessed adequately.

According to the environmental monitoring records of the existing Baiji Refinery, both the air quality at the boundary of the refinery and the water quality of the wastewater discharged from the refinery are well within the requirements of the relevant standards. The environmental protection measures for air emissions and water quality of the proposed FCC Complex will be developed appropriately in compliance with the applicable laws of the country and the international guidelines.

Accordingly, it is expected that the cumulative impacts of the entire operations of the refinery will also satisfy the requirements. However, it is needed to predict the possible cumulative impacts of the respective environmental aspects on the sensitive areas of the region through the use of reliable modeling exercises in the subsequent phase of the project. The environmental aspects subject to the exercises shall include air emissions, water quality and noise at least.

7 Environmental and Social Management Plans

The implementation of the environmental protection measures including personnel health and safety (HSE measures) and social considerations in the project will be managed properly and effectively in accordance with the scheme developed in the environmental management system provided by NRC. Prior to operation of the FCC Complex, NRC will enhance and improve the current HSE management system and then the HSE plans for the FCC Complex will be integrated into the system.

The improved HSE management system (HSE-MS) for the upgraded Baiji Refinery shall be structured essentially in accordance with the international standards (ISO 14000 series for environmental management and OHSAS 18000 series for occupational health and safety management) or the equivalent practices widely introduced to the refinery sector in the world. The framework of the HSE-MS includes;

- HSE policy and goals/targets
- HSE plans and measures/procedures
- Organization and resources
- Responsibilities for implementation

The HSE plans and procedures which address the respective HSE aspects shall be established properly to ensure that the HSE policy and the goals/targets of NRC are achieved seriously in the operations of the refinery.

8 Conclusion and Recommendations

8.1 Conclusions

The preliminary EIA exercise carried out in this phase concludes that the potential environmental and social impacts of the project activities in both construction and operational phase are expected to be mitigated properly in compliance with the requirements of the relevant laws and standards in Iraq and the applicable international guidelines through implementation of the environmental and social measures discussed in the study.

8.2 Recommendations

(1) Environment Impact Assessment (EIA)

The preliminary EIA (this document) for the project has been drawn out preliminarily based on the project plan developed by the conceptual design of the proposed FCC Complex and the limited information and data collected by the literature investigations for the environmental and social baselines of the project region without any site survey. The potential environmental impacts derived from the project activities and operations were assessed primarily and qualitatively using such limited information so as to scope the HSE items to be focused in the subsequent phase of the project.

For further assessment of the potential impacts identified by this EIA, the items to be undertaken by the EIA study in the subsequent FEED phase of the project are proposed as follows.

- Detailed identification of the project based on the project and facilities plans defined by the basic engineering of the project
- Collection of further environmental and social baseline data for proper impact assessment of the project
- Introduction of the numerical modeling studies for quantitative assessment of the impacts of gas emissions, wastewater discharges as well as noise emissions to the sensitive areas including the potential cumulative impacts of such environmental aspects
- Re-assessment of the environmental impacts according to the findings of the above investigation and studies and proper feed-back of the results of the assessment to the engineering and design of the facilities

(2) Environmental Management System

The improved HSE management system (HSE-MS) for the upgraded Baiji Refinery will be structured essentially in accordance with the international standards (ISO 14000 series for environmental management and OHSAS 18000 series for occupational health and safety management) or the equivalent practices widely introduced to the refinery sector in the world.

According to the HSE management system, NRC shall provide the plans showing below which address the HSE and social aspects assessed by the EIA exercise in the subsequent phase and

other plans necessary for achieving the goals/targets in accordance with the HSE policy of NRC.

- HSE and social plans for protection and mitigation of the potential impacts of the project
- Environmental monitoring plans aiming to demonstrate compliance with the requirements, assess the environmental impacts of the project and evaluate the effectiveness of the measures undertaken
- Incident management plan (IMP) for response to the unexpected accidental events such as fire, explosion, toxic gas release, oil spill, injury and fatality of personnel.

**

1 Introduction

1.1 Project Background

The Ministry of Oil (MOO) and North Refinery Company (NRC) of Republic of Iraq will initiate a project for the upgrading project (the Project) of Baiji Refinery, which is the grass-roots refinery located in the Salahuddin province in the northern region of the country, through additional construction of Fluid Catalytic Cracking (FCC) Complex. The FCC Complex proposed by MOO consists of the main and auxiliary processing units, utilities and related offsite facilities such as intermediate product tanks and others.

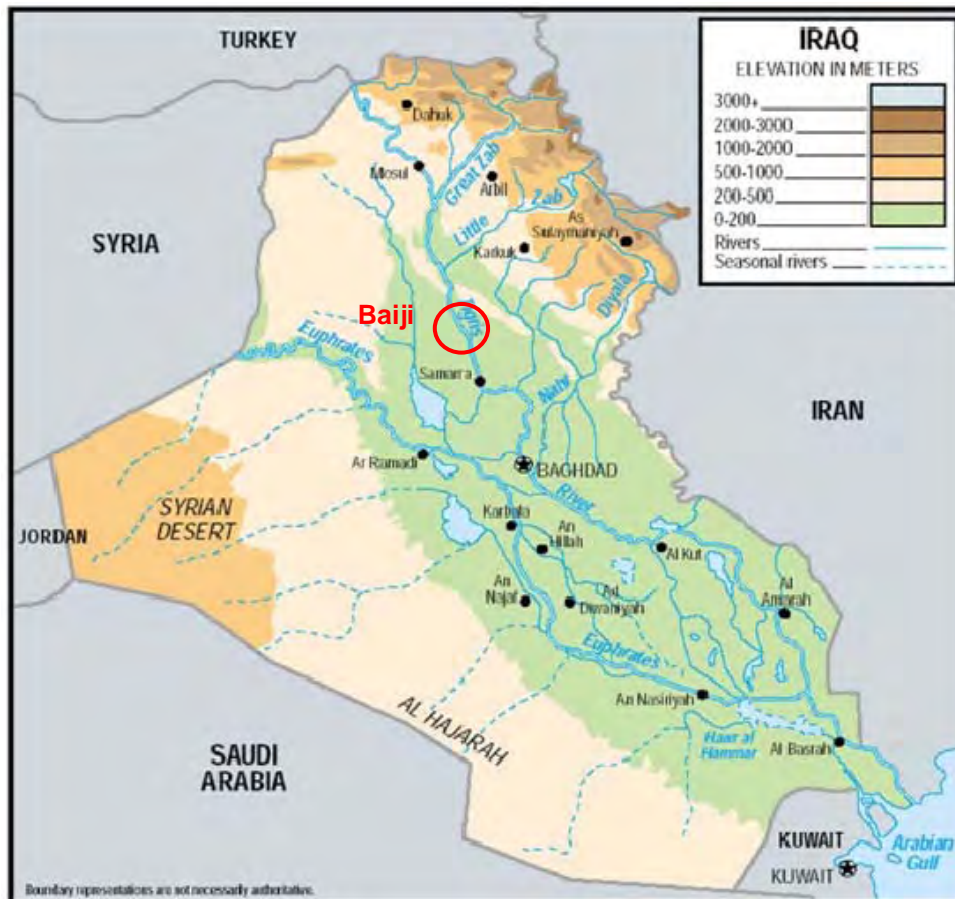


Figure 1.1 Project Location

The proposed upgrading project for Baiji Refinery is situated on one of the major development projects of the refinery sector in Iraq, and is aiming to be a successful achievement of the following new national development strategy through the possible effects derived from the

implementation of the project.

MOO/NRC plans to implement the project using the Official Development Assistance (ODA) loan from Japanese Government through Japan International Cooperation Agency (JICA)

(1) Improvement of supply-demand balance of the oil products

Ministry of Oil (MOO) in Iraq has established an improvement plan for the future supply-demand balance of the major oil products i.e. gasoline, kerosene and diesel for public use by 2015. For achieving such target successfully, MOO gave priority to the upgrading projects of the existing major refineries in the country through the introduction of modern processes that provides high yield of light products over the alternative solutions including construction of new refinery plants.

(2) Modernization of refineries in Iraq

The FCC Complex to be newly introduced by the project comprises of FCC unit and other associated process units. These production facilities and equipment will be designed, constructed and operated by employing the latest technologies and philosophy in the world, which the refineries in Iraq have not experienced before.

The upgrading projects, as a model case for modernization, also aim to promote in the refineries in Iraq the new technologies which are already recognized worldwide including technical and career developments of the engineering and operational personnel of the refinery sector in Iraq.

(3) Environmental effects

The proposed FCC Complex is envisioned to supply high quality oil products such as low sulfur gasoline (less than 10 ppm) and diesel (less than 50 ppm) that complied with the international standards, and which have not been available in Iraq so far. Broad distribution and utilization of these high quality oil products in the country will contribute and play an important role in the mitigation of environmental pollutions arising from public consumption of the fuels in the regions.

(4) Social and economic effects

The completion of the upgrading project will result in the increased domestic production of oil

products, and thus will contribute in the reduction of the large current national expenditures on the importation of gasoline and diesel from foreign countries for filling up the supply-demand gaps and governmental subsidies for the consumer prices of such products.

In addition, it is largely expected that the project will activate the regional economy through employment of local people directly and indirectly as well as procurement of the construction and operational services and materials from the local markets. Accordingly, the activated local economy will bring prosperity and improvement of the life and livelihood of the people of the region generally.

1.2 Project Status

The Ministry of Oil (MOO) and the North Refinery Company (NRC) has conducted the study on the development of practical basic project plan including conceptual design of the facilities of the FCC Complex and feasibility of the project as the first step of the project implementation. The project will be proceeded to the subsequent phase of Front-End Engineering and Design (FEED) for further project development upon formal authorization of the government.

1.3 Objectives and Scope of EIA

The objectives of this preliminary Environmental Impact Assessment (EIA) study for the conceptual design of the proposed Baiji Refinery Upgrading Project is to initially identify and assess any potential adverse impacts of the project activities on personnel health, safety and environmental (HSE) and local communities, and to recognize at an earlier stage any further protection and/or mitigation measures which shall be discussed in the subsequent FEED phase of the project.

The potential HSE and social impacts of the activities in all project lifecycle from construction to operation and de-commissioning of the facilities are subject to the EIA. However, the EIA in this phase is to be carried out coarsely based on the project plans developed conceptually in the earliest phase of the Project. Therefore, the study in this phase aims to review preliminarily, which and where the potential critical HSE and social aspects will be expected in the project execution, and to provide necessary information for HSE and social considerations, facility plan and design, construction measures, HSE management plans, emergency plans, etc. to be developed in Front-End Engineering Design (FEED), the subsequent phase of the project.

1.4 Environmental and Social Requirements

The assessment of the potential environmental and social impacts of the project and the discussions for the protection and/or mitigation measures for the impacts in the EIA study shall be made dedicatedly in accordance with the requirements in the relevant laws and regulations of the country. In addition to the Iraqi legislation, the international guideline and practices such as World Bank Group/International Finance Corporation (IFC) should be referred appropriately, where the items being not specified by the Iraqi legislation.

2 Study Methodology

The Environmental and Social Impact Assessment (EIA) is a formal and consultative process for assurance of integrity for the environmental and social considerations for the project activities. The EIA shall be implemented primarily in this study based on the environmental and social baseline information preliminarily investigated, the project activities planned conceptually, the potential effects on the respective receptors and protective or mitigation measures developed in this study.

The EIA exercise is an essential item for the feasibility study on the project subject to the preliminary approval of the Ministry of Environment (MOEn) in Iraq and it shall be implemented adequately in accordance with the procedure required by the applicable legislation of the country and the relevant international guideline practically referred by the oil sector in the world presently.

2.1 EIA Process

The procedure and methodology of the formal EIA should be in accordance with applicable international practices. The EIA process for the project incorporates a number of key steps as shown below.

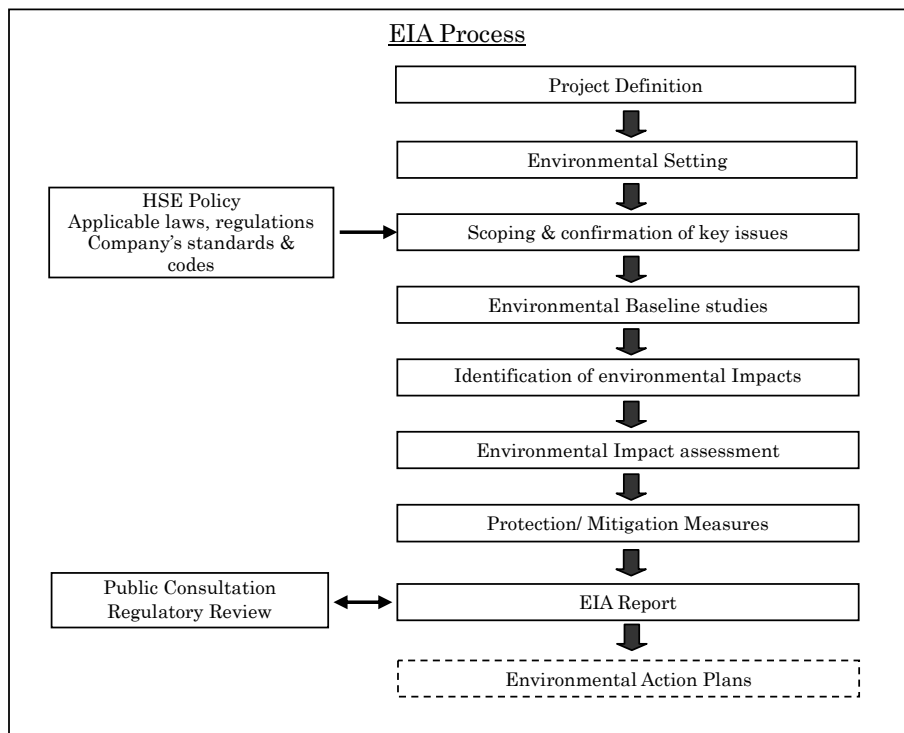


Figure 2.1 EIA Process

- (1) The EIA process starts by defining the nature of the project primarily, i.e. type and scope of the project, facilities to be installed, locations, works involved, duration, etc.
- (2) An earlier EIA process involves developing a preliminary understanding of the features of the environmental conditions surrounding the project area which is likely to be affected by the project.
- (3) According to the nature of the project and features of the environment of the surrounding area, potential key environmental aspects associated with the project are recognized preliminarily. Based on above findings, the HSE policy and legal requirements to be applied to the project, a scoping exercise of key issues to be focused on HSE considerations of the project is conducted.
- (4) An environmental baseline investigation for the project and surrounding areas is executed for detailed understanding of the features and characteristics of the current environmental conditions of the project area and surrounding areas through actual field survey and literature survey including scientific investigation, which covers natural and physical environment, socio-economic aspect of the communities, historical and cultural heritages, etc.
- (5) According to the features and contents of the proposed project (e.g. facilities design, construction and operation methods, etc.) and the findings of the environmental baseline study, potential hazards to the environment and personnel throughout the project lifecycle, i.e. construction, operational and decommissioning/ abandonment phase are identified comprehensively.
- (6) The potential hazards identified and probable impacts on the environment and personnel are assessed dedicatedly. The impact assessment is made through the studies on the potential risk of the hazards such as possibilities, affecting time duration and severities/ consequences of the impacts. Significant impacts, which require proper protection and/ or mitigation measures are revealed through this assessment study.
- (7) Based on the results of the above assessment, effective protection and/ or mitigation measures for the significant impacts are developed adequately. The protected/ mitigated impacts are re-assessed together with the effectiveness of the measures. The measures are then fed back to the project plan and subsequently reflected to the facilities design, where required.
- (8) The results of the above studies are consolidated into an EIA report. The draft EIA report is disclosed and reviewed by the stakeholders, upon necessary. The final EIA report is provided incorporating comments of the authority if any and eventually submitted to the authority for approval.

- (9) The EIA report proposes the effective protection and/ or mitigation measures for the potential environmental impacts associated with the project. In accordance with the result of the EIA study, the project shall develop practical action plans to ensure that the proposed protection and/ or mitigation measures will be implemented properly in the project and operation.

Throughout this procedure, suitable protection and mitigation measures for potential environmental and socio-economic aspects are developed and reflected in the design, construction and operation plans of all phases of the project.

2.2 Environmental and Social Baseline

An understanding of the features of the current environmental and social conditions of the project site and adjacent area is necessary in order to draw out the proper consideration of the environmental and social aspects. Being well aware of the area's situation would contribute to the factual identification of the environmental and social resources and/or receptors that could be affected by the project and as a result will help recognize the issues to be developed properly for the protective or mitigation measures to be considered in the project plan.

The baseline conditions to be understood preliminarily consist of the following items.

(1) Physical Environmental Conditions

- Terrain and geological conditions
- Hydrology and water conditions (surface and ground water, etc.)
- Climate
- Atmospheric conditions (air quality and emission) and noise
- Water quality of Tigris River, which is the source of industrial water of the refinery
- Emission inventories of pollutants from the existing refinery

(2) Biological Conditions

- Terrestrial flora and fauna
- Biota and habitats in surface water body and marshes
- Rare, threatened and endangered species, if any

(3) Socio-economic Conditions

- Population and livelihood in the communities
- Economic activities in the region (industries, agriculture, livestock, etc.)
- Infrastructure and land use
- Historical and cultural heritages

- Landscape and visual impacts
- Stakeholders including local communities, central and regional governmental authorities, NGOs, etc.

The primary information and data of the above aspects to be utilized for the environmental and social baseline study were collected primarily through investigation of literatures or articles published by the relevant international scientific institutes as well as information and data available through the internet. In addition, the information and data provided by NRC was further applied to the study.

Note that according to the current security situation in the project region and the limited study period, the baseline study was conducted using the information collected through the literatures and the other sources publicly available.

2.3 Identification and Assessment of Impacts

2.3.1 Potential Environmental and Social Impacts

Based on the environmental and social sensitivities in the area and the planned project activities, the expected effects on the sensitive receptors are assessed through preliminary analysis of the potential risks on environment, personnel health and safety (HSE) and social aspects arising from the project. According to the outcomes of the evaluation, appropriate protective or mitigation measures for the potential impacts shall be developed subsequently in accordance with relevant laws and regulations of Iraq and applicable international guidelines and practices. The potential environmental and social impact aspects associated with the refinery project to be assessed and the possible causes of such impacts are described as follows.

Table 2.3-1 Environmental and Social Impacts and Causes of Refinery Project

	Potential Impacts	Possible Causes/ Sources
1	Environmental pollutions	
	(1) Air quality	<ul style="list-style-type: none"> • Flue gas from construction vehicles and equipment • Dusts from construction site • Flue gas from heater/furnace, boiler, engine, turbine, etc. • Flare stack • Vent and fugitive gas • Oil and gas leak/ release
	(2) Water quality	<ul style="list-style-type: none"> • Storm/ rain water • Industrial waste water discharge

	Potential Impacts	Possible Causes/ Sources
		<ul style="list-style-type: none"> • Cooling water discharge • Oil/ chemical spill • Hazardous wastes
	(3) Wastes	<ul style="list-style-type: none"> • Construction works • Operation and maintenance • Office and camp (Including garbage, non-hazardous and hazardous/ toxic wastes)
	(4) Soil/ land	<ul style="list-style-type: none"> • Industrial waste water discharge • Oil/ chemical leak • Hazardous wastes
	(5) Noise and vibration	<ul style="list-style-type: none"> • Construction vehicles and equipment • Construction work • Operation of facility and equipment
	(6) Odor	<ul style="list-style-type: none"> • Flue gas • Flare and vent stacks • Fugitive gas • Waste water and wastes • Oil and gas leak/ release
2	Degradation of natural environment	
	(1) Ecology	<ul style="list-style-type: none"> • Loss or damage of habitats by construction (site clearing, reclamation, excavation, etc) • Environmental pollution • Collecting and hunting
	(2) Surface and underground water bodies	<ul style="list-style-type: none"> • Construction work (reclamation of river, pond, lake, wetland) • Construction of dike, water gate, dam, etc. • Extraction of river, lake water • Extraction of underground water • Discharge/release of water
	(3) Topography and geology	<ul style="list-style-type: none"> • Construction work (reclamation, excavation, leveling, etc.) • Construction of canal, pond
3	Social environment	
	(1) Loss of land, property, resettlement, etc.	<ul style="list-style-type: none"> • Land acquisition (project site, temporary yard and road, etc.) • Restriction/ control of land use (cultivation, grazing, fishing, etc.)
	(2) Life and livelihood	<ul style="list-style-type: none"> • Interruption of local traffic by construction work • Traffic accident due to increased vehicles • Conflicts with migrated construction workers • Activation of local economy • Inflation of goods at local markets
	(3) Historical and cultural heritage	<ul style="list-style-type: none"> • Damage or loss due to construction • Restriction to access by construction work
	(4) Landscape	<ul style="list-style-type: none"> • Installation of large temporary facility during construction • Permanent large/ tall facility • Light and illumination
	(5) Ethnic minorities and	<ul style="list-style-type: none"> • Land acquisition (project site, temporary yard and

	Potential Impacts	Possible Causes/ Sources
	indigenous people	road, etc.) <ul style="list-style-type: none"> • Restriction/ control of land use (cultivation, grazing, fishing, etc.)
4	Personnel health and safety	
	(1) Injury and death	<ul style="list-style-type: none"> • Construction works • Operation and maintenance works • Accidents (fire, explosion, toxic gas leak/ release, etc.) • Interruption by 3rd party
	(2) Health	<ul style="list-style-type: none"> • Working conditions and environment • Living condition of office and camp (hygiene, etc.) • Infectious disease • Foods and water

2.3.2 HSE and Social Assessment Sheet

Identification and assessment of the potential environmental and social impacts as well as personnel health and safety hazards will be examined dedicatedly using an HSE and Social Impact Assessment Sheet in this study.

Table 8.3.2-2 HSE and Social Impact Assessment Sheet

No.	Activities/ Works	Impact Receptor													Justification & Mitigation Measures				
		Physical Environment					Biological			Safety		Social							
		Atmosphere	Surface Water	Underground water	Soil	Topography	Landscape	Flora	Animals/Reptile/Fis	Birds	People	Assets	Life/ Livelihood	Land use	Local economy	Cultural heritage	Liability/ Reputation		
1	Land acquisition	FCC Complex site																	
		Auxiliary facility site (Offsite of NRC)																	
2	Site preparation	Site clearing & Civil works																	
3	Construction	Installation & erection																	
		Machines & vehicles operation																	
		Noise & vibration																	
		Construction effluent																	
		Construction wastes																	
4	Transportation	Materials & workers																	
5	Migration of workers	Construction camps																	
6	Employments	Direct & indirect																	

The project activities and possible impact aspects associated with the activities are listed in vertical columns. The potential receptors of the impacts from the project activities are also listed

in a horizontal column of the sheet, which include the elements of physical and natural environment, health and safety, and social impacts in the project site and surrounding areas.

Potential impacts of the activities on each receptor are discussed and identified in the sheet primarily and the expected risk levels of the respective impacts identified are assessed subsequently.

Features of the expected impacts, justification of the assessment results and the protection and/or mitigation measures to be undertaken are described in the right column of the sheet.

2.3.3 Risk Assessment

Significance of the risk of the impact and hazard is evaluated by both severity (strength, extent and duration of the impact) and probability (frequency) of occurrence and the potential risks on the respective aspects identified in the previous step of the study are assessed qualitatively using the Risk Matrix shown below.

Table 8.3.2-3 Risk Matrix

			Probability				
			A	B	C	D	E
			Practically Impossible	Not Likely to Occur	Possibility of Occurring Sometime	Possibility of Isolated Incidents	Possibility of Repeated Incidents
Severity	1	Slight	LOW			MEDIUM	HIGH
	2	Minor					
	3	Moderate	HIGH				
	4	Major					

Possibility Definitions

- A : Once in 100 or more facility lives
- B : Once in 10 of facility lives
- C : Once in facility life
- D : 5 times in facility life
- E : 25 or more times in facility life

Severity Definitions

Category	Impact Aspects			
	Environment	Safety & Health	Assets	Social
1	Slight effect	Slight injury or health effect	Zero or slight damage	Zero or slight impact
2	Minor effect	Minor injury or health effect	Minor damage	Minor impact
3	Local effect	Major injury or health effect	Local major damage	Considerable impact
4	Major effect	One or more fatality or permanent total disability	Major or extensive damage	Major domestic or worldwide impact

Definitions of each risk level are as follows:

- High Risk : Major Hazard, Unacceptable. Action must be taken immediately to lower the risk.
- Medium Risk : Acceptable, but must be managed at ALARP *. Risk reduction measures must be planned
- Low Risk : Acceptable without requiring further action

* ARARP : As Low As Reasonably Practicable. The residual risk shall be as low as reasonably practicable. For a risk to be ALARP, it must be possible to demonstrate that the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained.

The outcomes of risk assessment for respective impact and hazards identified are indicated as “L”, “M” or “H” in the Environmental and Social Impact Assessment Sheets.

Where the activity is assessed as “H” on the specific element of the receptor, effective protection or mitigation measure must be developed to reduce the risk to acceptable level.

Where assessed as “M”, further mitigation measure should be re-considered to reduce the impact, if applicable.

2.3.4 Protection/Mitigation Measures

Protection and/or mitigation measures for the impacts assessed are discussed dedicatedly in accordance with the applicable legislation, standards, guidelines and international practices. And when the high risk operation and activity are assessed, further mitigation measure is discussed to lower the risk to the acceptable level using “As Low As Reasonably Practicable: ALARP” philosophy. Justification of the risk assessment and applicable protection and/or mitigation measures to be undertaken for the risks are described in the right columns of the HSE and Social Impact Assessment sheet.

3. Policy and Legal Framework

3.1 Environmental and Social Policy of the Project

MOO/NRC states that a firm Health, Safety and Environment (HSE) policy for the Project should comprise as follows:

- *HSE protections are prioritized in the business activities.*
- *Accidents and injuries to personnel are preventable and unacceptable.*
- *Everyone is responsible for their own and their colleagues' safety at work.*

The environmental and social study aims to provide appropriate environmental and social considerations including countermeasures to be undertaken throughout the project's life-cycle i.e. construction, operation and decommissioning/ disposal phases. The study includes necessary discussions that could suitably prevent or minimize the impacts of the project on the environment as well as local communities in and adjacent to the project site.

In order to achieve the above goal, the both study teams agreed that the study is to be carried out taking into consideration of the following strategy for the Project.

- *To comply with the relevant laws, standards and regulations of Iraq*
- *To fully introduce the applicable international standards, guideline and practices to the project*
- *To ensure that environment, personnel health, safety (HSE) and social aspects are considered in the study*
- *To apply the feasible Best Available Technology for the prevention or mitigation of the impacts*
- *To contribute to the sustainable development of the region and the country*

3.2 Legal Framework

3.2.1 Environmental Administration

The Environment Protection and Improvement Directorate (EPID), which was set up in 1986 under the Ministry of Public Health was initially responsible for environmental protection of Iraq. However in 2003, the Ministry of Environment (MOEn) was established and has taken over the environment protection related responsibilities from EPID. The responsibilities of

MOEn include environmental standard setting, policy formulation, mainstreaming, protection and conservation, which are defined by the Modified Law of Environment Protection and Improvement, as follows (Article 12):

(Article 12)

1. Putting annual, middle and long-term plans of environment protection and improvement presented to the Council to certify them.
2. Suggesting the limits and disciplines of environmental pollutions, supervising the execution and presenting them to the Council to be confirmed.
3. Studying the environmental problems and suggesting solutions in coordination with the concerned authorities.
4. Following up the current and suggested usages of natural resources within the Government policy in a way that prevents the environmental damages in coordination with concerned authorities.
5. Following up and improving the environment and workers safety through examination of matters related to environmental pollutions, workers' safety, the factors that affect the environment in coordination with the concerned authorities.
6. Conducting environmental surveys in coordination with the concerned authorities.
7. Studying the validity of the projects' sites with respect to the environmental aspect, putting disciplines for these sites, and coordinating with planning departments for this purpose.
8. Making and supporting studies and researches concerning the environment protection and improvement.
9. Specifying the environmental subjects that can be studied by the researchers and postgraduate students in the universities and scientific institutions to be applied.
10. Coordinating and cooperating with the institutions of the Ministry of Higher Education and Scientific Research to find centers for environmental researches and primary or higher studies in the field of the environment.
11. Working on spreading the environmental awareness.
12. Making and encouraging training sessions and courses in respect with the environment protection and improvement.
13. Following up the Arabic, regional and international activity in the fields on environment protection and improvement and suggesting cooperation agreements in this field to be shown to the Council to make the decision.
14. Coordinating with the environmental formations in the ministries and with the non-ministerial authorities to ask for data and information.
15. Following up the execution of the plans put by departments of environment protection and improvement in the governorates.
16. Giving the Councils opinions about the decisions and recommendations of the governorates' Councils.
17. Putting annual report about the environment.

18. Studying and confirming reports about the environmental effect that are presented by the authorities responsible for suggested and current projects.
19. Working on protecting the nature and establishing environmental compounds in coordination with the relevant authorities.
20. Establishing and maintaining environmental data bases.
21. Dealing with offices, consultative parties and laboratories to make studies, analyses and measurements in the field of environment protection and improvement.
22. Working on providing a healthy environment of work, insuring the workers' health and safety in all the economical activities, and specifying the nature of hazards and infection in every job according to scientific ways to stop work accidents.
23. Using all the necessary means to protect the human beings and environment from the danger of ionic radiation.
24. Preparing a general budget for the Department to be shown to the Council.
25. Following up the execution of the Council's decisions.

The goal of the MOEn is to assure that the people of Iraq and their heirs have a clean and healthful environment and it sets the following key elements¹:

- To educate the people and industry as to the components of a sound, clean and stable environment.
- To adopt and maintain a system of environmental laws, regulations and procedures that provides the basis for education of the people and industry as to the proper respect for and use of our natural resources.
- To develop a system of environment enforcement.
- To advocate and promote programs to develop biodiversity.
- To prevent further degradation of the environment and to adopt a program to deal with the existing hazardous substances affecting the environment.

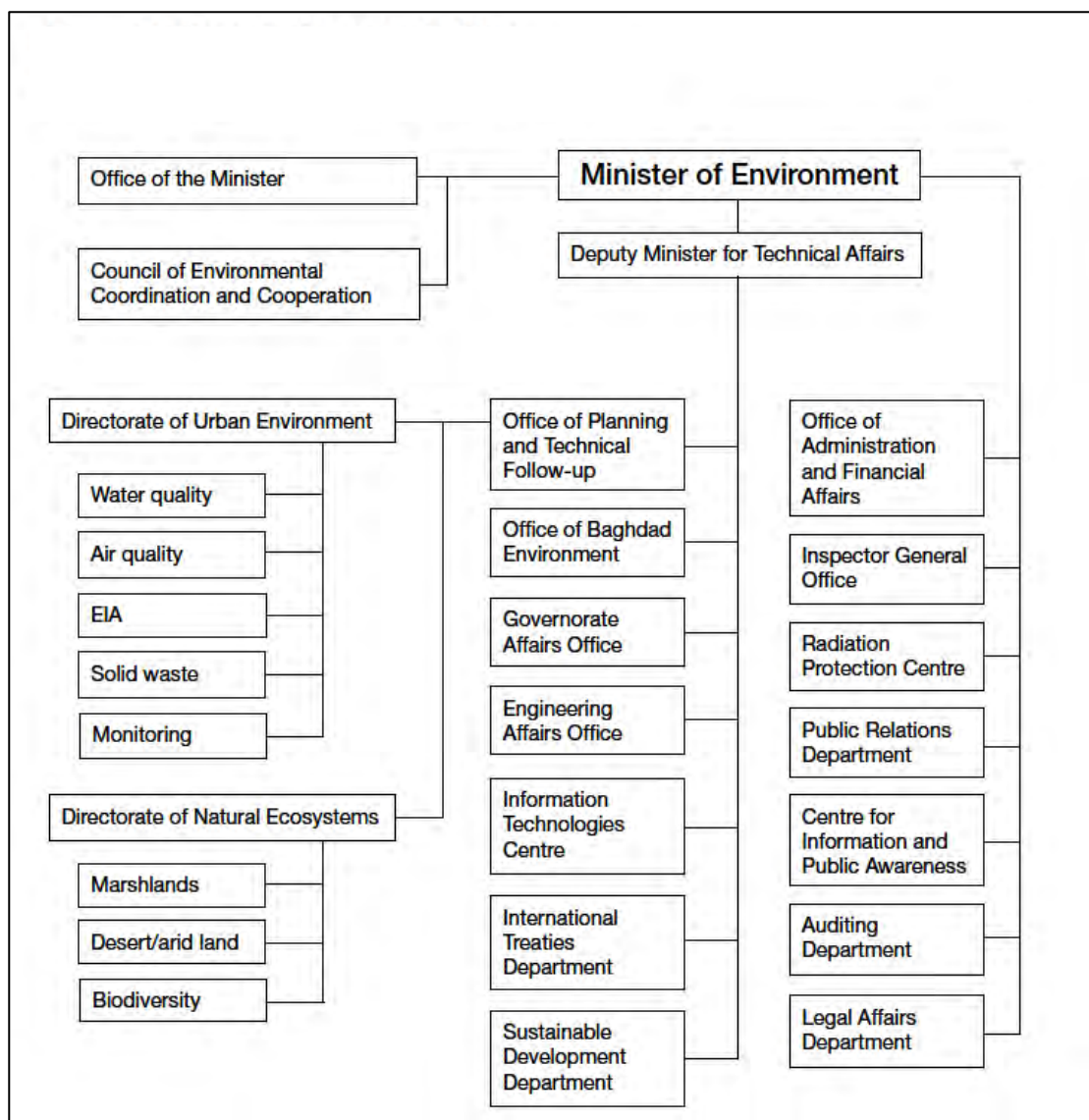
The main topics which the MOEn is currently dealing with are;

- Biodiversity
- Wetland Management
- Solid Waste Management
- Hazardous Chemical Waste Management
- Reforestation
- Air and Water Quality

¹ Iraqi Ministry of Environment Mission Statement, Draft

- Land Use
- Desertation and Agricultural Uses
- Sanitation
- Environmental Legislation
- Raising Awareness

The organizational structure of The ministry is presented in Figure 3.2.1-1. Issues related to the environmental impact assessment are to be administrated by the EIA Department, Directorate of Urban Environment.



Source: Iraq Institutional Capacity Assessment Report, June 2006, UNEP)

Figure 3.2.1-1 Organization Char of the Ministry of Environment of Iraq

3.2.2 Regulatory Framework

(1) Environmental Laws and Regulations

Iraq has developed the national environmental governance and monitoring system since 1960s and some of the environmental regulations and standards set up at that time are still in effect. After the constitution of the Ministry of Environment in 2003, reform and/or improvement of the administrative organization and legislative framework is now proceeding.

- 1965 – Law No. 64 for Cities Land Use
- 1966 – Law No. 21 for Noise Prevention
- 1967 – Law No. 25 System of Rivers and Other Water Resources Protection (Include of 45 Pollutants)
- 1980 – Law No. 99 for Ionized Radiation
- 1981 – Law No. 89 for Public Health (Drinking Water Provision, Sanitation and Environmental Monitoring)
- 1986 – Law No. 79 for Protection and Improvement of Environment
Environment Protection Center (EPC) was established.
- 1987– Act No. 71 promulgating the Labor Code (LC)
- 1990 – Environmental Criteria for Agricultural, Industrial and Public Service Projects
- 1997 – Law No. 3 for Protection and Improvement of Environment
The EPC was transformed into the Environment Protection and Improvement Directorate (EPID).
- 2001 – Law No. 2 for Water Systems Protection
- 2001 – Modified Law of Environment Protection and Improvement No. 3 of the year 1997 and No. 73 of the year 2001
The Environment Protection and Improvement Council (EPIC) was set up.
- 2003 – CPA Order #44 for Establishing the Iraqi Ministry of Environment
The EPID was transformed into the Ministry of Environment (MOEn)

(2) International/Regional Conventions and Agreements

Before the 1980s, Iraq was a party to most international conventions and regional organizations. Now that Iraq is returning to the international community, it is proceeding to re-join Multilateral Environmental Agreement and regional organizations. The following table lists the status of major international and/or regional conventions in Iraq.

Table 3.2.2-1 Status of International / Regional Conventions

Title	Entered into force/ Status
Atmosphere	
▪ Vienna Convention for the Protection of Ozone Layer, 1985 http://ozone.unep.org	2008
▪ Montreal Protocol on Substances that Depleting Ozone Layer, 1987	2008
▪ Framework Convention on Climate Change, 1992 : FCCC http://unfccc.int/	Observer
▪ Kyoto Protocol	2008
Waste Management	
▪ Basel Convention on the Transboundary Movements of Hazardous Wastes and their Disposal, 1989 http://www.basel.int/	Under review by SCC**
Natural Conservation	
▪ Convention on Biological Diversity, 1992 : CBD http://www.cbd.int/	2009
▪ Convention on Wetlands of International Importance Especially as Waterfowl Habitats, 1971 (Ramsar Convention) http://www.ramsar.org/	2008
▪ Convention on the Protection of the World Cultural and natural Heritage, 1972 http://whc.unesco.org/en/conventiontext/	1974
▪ Convention on International Trade In Endangered Species of Wild Fauna and Flora, 1973 : CITES http://www.cites.org/	Process by Sub-committee*
▪ Convention on Migratory Species of Wild Animals, 1979 : CMS http://www.cms.int/	Process by Sub-committee*
▪ United Nations Convention to Combat Desertification, 1994 http://www.unccd.int/	Under review by SCC**
Marine Pollution	
▪ United Nations Convention on the Law of the Sea, 1982 : UNCLOS http://www.un.org/Depts/los/index.htm	1985
▪ IMO Convention http://www.imo.org/	1973
– International Convention on the prevention of Marine Pollution by Dumping of Wastes and Other Matters, 1972 : LONDON	-
– International Convention for the Prevention of Pollution from Ships, 1973/1978 (MARPOL 73/78)	-
– International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990 (OPRC Convention)	-
Regional Agreements	
▪ ROPME Sea Area (Kuwait) : Regional Organization for the Protection of the Marine Environment (ROPME) http://www.ropme.com/default.asp	2006

Notes:

The symbol * and ** denotes conventions which are in process in accession in Iraq by;

* Sub-committee for each Multilateral Environmental Agreement: Headed by the relevant minister, and many members from each relevant ministries

** SCC: State Consultant Council, affiliated to Ministry of Justice

(3) Oil and Gas Law (Draft)

Under the new Constitution adopted in 2005, Iraq Government is now in the process of establishing a new legislation for Oil and Gas Development. A draft oil and gas law was prepared by the Council of Ministers Oil and Energy Committee in 2007. In its preamble, it declares that “the development of the petroleum sector must be closely coordinated and harmonized with the development of the society and the national economy in a manner that maintains sustainable development for the economy and the environment”.

A detail provisions are provided in Article 31, Environmental Protection and Safety, summarized below:

- Iraq National Oil Company (INOC) and other holders of Exploration and Production rights shall conduct Petroleum Operations in accordance with environmental and other applicable legislation to prevent pollution of air, lands and waters.
- They shall conduct Petroleum Operations so as to comply with the environmental management standards of the ISO 14000 series.
- INOC and other holders of rights shall:
 1. Prepare and submit to the relevant authorities an environmental impact assessment for approval, including environmental impact mitigation measures ;
 2. Notify the Ministry and other specified authorities immediately in the event of an emergency or accident affecting the environment;
 3. Control the flow and prevent escape or loss of Petroleum discovered or produced;
 4. Avoid damage to Petroleum Reservoir;
 5. Avoid Destruction to land, the water table, trees, crops, buildings or other infrastructure and goods;
 6. Clean up the sites after the closure of Petroleum Operations and comply with the environmental resolution requirements;
 7. Ensure the health and safety of personnel in the planning and conducts of Petroleum Operations, and take preventive measures if their physical safety would be at risk;
 8. Report to the competent entity within the government on the amount of operational and accidental discharge, leakage and waste; and
 9. Provide compensation for damages to State and private property in accordance with the applicable laws and regulations.

It is expected that this Oil and Gas Law (Draft) will be approved by the government in the near future.

(4) Labor and Working Conditions

Act No. 71 promulgating the Labor Code of 27 July 1987 (LC) continues in effect, being the primary source of labor legislation in Iraq. The Iraqi Ministry of Labor drafted a new law in 2004, in coordination with the International Labor Organization (ILO), however, the draft has not yet to be adopted.

The provision of the Labor Code apply to all workers employed in the private, mixed and co-operative sectors; and to enterprises and other workplaces in which one or more workers are employed (section 8 of Part I, LC). The contents of the LC are shown bellow.

Contents of Labor Code, 1987

Part I. Basic Principles
Part II. Placement and Vocational Training
Chapter I. Placement
Chapter II. Vocational Training
Part III. Labor Relations
Part IV. Wages
Chapter I. Wages and Wage Supplements
Chapter II. Wages - Fixing and Protection of Wages
Part V. Hours of Work and Leave
Chapter I. Hours of Work
Chapter II. Leave
Part VI. Labor Protection and Workers' Protection
Chapter I. Protection of Women Workers
Chapter II. Protection of Minors
Chapter IV. Occupational Safety Measures
Chapter V. Labor Inspection
Part VII. Internal Organization of Work
Chapter I. Duties
Chapter II. Discipline
Part VIII. Dispute Resolution)
Chapter I. Labor Disputes
Chapter II. Labor Courts
Part IX. General and Final Provisions

The LC covers the general requirements of IFC Performance Standard 2, Labor and Working Conditions listed below;

- Working Condition and Management of Worker Relationship (Human Resources Policy, Working Relationship, Working Conditions and Terms of Employment, Workers' Organizations, Non-Discrimination and Equal Opportunity, Retrenchment, Grievance Mechanism
- Protecting the Work Force (Child Labor and Forced Labor)
- Occupational Health Safety
- None-Employee Workers
- Supply Chain

The project must provide the workers, including contractors, a safe and health work environment. The NRC shall take the necessary measures to ensure the on-the-job protection of workers against hazards and dangers, furnish means of protection, and provide first aid (section 108 of Chapter IV, Part VI, LC).

3.3 Applicable Environmental Standards

The project must comply with the environmental standards and/or discharge limits set by the Ministry of Environment. Where numerical standards have not been specified by the Iraqi legislation or Iraqi standards are significantly lower than the international norm, the criteria which are defined by the international environmental guidelines and/or best international practice should be applied to the project.

3.3.1 National Standards in Iraq

Many of the Iraqi national environment standards and discharge limit were set up in 1960s and are still in effect. These criteria which are to be applied to the Project are as follows.

Figure 3.3.1-1 Iraqi National Standards for Ambient Air Quality

No	Pollutants	Measurement Method	Standards (ppm)	Standards ($\mu\text{g}/\text{m}^3$)	Guideline Value* ($\mu\text{g}/\text{m}^3$)
1	Sulfur Dioxide (SO ₂)	1 hr 24 hrs 1 year	0.1 0.04 0.018		- 20 -
2	Carbon Monoxide (CO)	8 hrs 1 hr	10 35		
3	Nitrogen Dioxide (NO ₂)	24 hrs 1 year	0.05 0.04		1 hr : 200 1 year : 40
4	Ozone (O ₃)	1 hr	0.06		8 hrs : 100
5	Suspended Particle Matters < 10 μ (PM ₁₀)	24 hrs		150	
6	Suspended Particle Matters < 25 μ (PM ₂₅)	24 hrs 1 year		65 15	50 20
7	Total Suspended Particles (TSP)	24 hrs 1 year		350 150	
8	Dust	30 days		10 ton/km ² /month in residential area 20 ton/km ² /month in industrial area	
9	Hydrocarbon (HC)	3 hrs	0.24	160	
10	Lead (Pb)	24 hrs 3 months 1 year		2 1.5 1	
11	Benzene	1 year		0.003 mg/m ³	
12	Dioxin	1 year		0.6 Bg/m ³	

Source: NRC 2009

* IFC EHS General Guideline (April 2007)/ WHO Guideline

Table 3.3.1-2 Iraqi National Water Quality Standards

	Parameter (unit: mg/l)	Water Source			
		A-1 Rivers	A-2 Streams	A-3 Lakes	A-4 Springs
1	Color (-)	Normal	Normal	Normal	Normal
2	Temperature (deg C)	-	-	-	-
3	Suspended Solid	-	-	-	-
4	pH (-)	6.5-8.5	6.5-8.5	6.5-8.5	-
5	Dissolved Oxygen	>5	>5	>5	-
6	BOD	<3	<3	<3	-
7	COD (CrO method)	-	-	-	-
8	Cyanide CN ⁻	0.02	0.02	0.02	0.02
9	Fluoride F ⁻	0.2*	0.2*	0.2*	0.2*
10	Free Chlorine	Trace	Trace	Trace	Trace
11	Chloride Cl ⁻	200*	200*	200*	200*
12	Phenol	0.005	0.005	0.005	0.005
13	Sulphate SO ₄ ²⁻	200*	200*	200*	200*
14	Nitrate NO ₃	15	15	15	15
15	Phosphate PO ₄	0.4	0.4	0.4	0.4
16	Ammonium NH ₄ ⁺	1	1	1	1
17	DDT	nil	nil	nil	nil
18	Lead	0.05	0.05	0.05	0.05
19	Arsenic	0.05	0.05	0.05	0.05
20	Copper	0.05	0.05	0.05	0.05
21	Nickel	0.1	0.1	0.1	0.1
22	Selenium	0.01	0.01	0.01	0.01
23	Mercury	0.001	0.001	0.001	0.001
24	Cadmium	0.005	0.005	0.005	0.005
25	Zinc	0.5	0.5	0.5	0.5
26	Chromium	0.05	0.05	0.05	0.05
27	Aluminum	0.1	0.1	0.1	-
28	Barium	1.0	1.0	1.0	1.0
29	Boron	1.0	1.0	1.0	1.0
30	Cobalt	0.05	0.05	0.05	0.05
31	Iron	0.3	0.3	0.3	0.5
32	Manganese	0.1	0.1	0.1	0.1
33	Silver	0.01	0.01	0.01	0.01
<p><u>Water Source Category:</u> A-1 Rivers, Branches A-2 Streams, aqua ducts, water courses and their original and secondary branches A-3 Lakes, Basins and other water bodies A-4 Springs, wells and underground water</p> <p><u>Notes:</u> *) Quality standard are to be set in the listed value or more according to what is existed naturally in the source.</p>					

Source: The New Limits of the Regulation of the Protection of Rivers and Public Waters for a Year 1967, Ministry of Health, Directorate General of Human Environment

Table 3.3.1-3 Iraqi National Wastewater Discharge limit Standards

	Parameter (unit : mg/l)	Wastewater Discharged to			
		B-1 any water source	B-2 public sewers	B-3 drainage	B-4 marshes
1	Color (-)	-	-		
2✓	Temperature (deg C)	< 35	45		
3✓	Suspended Solid	50	750		
4✓	pH (-)	6-9.5	6-9.5		
5	Dissolved Oxygen	-	-		
6✓	BOD	<40	1000		
7✓	COD (CrO method)	<100	-		
8✓	Cyanide CN ⁻	0.05	0.5		
9	Fluoride F ⁻	5	10		
10✓	Free Chlorine	Trace	100		
11	Chloride Cl ⁻	*a) <1% *b) < 600 mg/l *c)			
12✓	Phenol	0.01-0.05	5-10		
13	Sulphate SO ₄ ²⁻	**a) <1% **b) < 400 mg/l **c) < 200 mg/l	300		
14	Nitrate NO ₃	50	-		
15✓	Phosphate PO ₄	3	-		
16	Ammonium NH ₄ ⁺	-	-		
17	DDT	Nil	-		
18✓	Lead	0.1	0.1		
19	Arsenic	0.05	0.05		
20✓	Copper	0.2	-		
21✓	Nickel	0.2	0.1		
22	Selenium	0.05	-		
23✓	Mercury	0.005	0.001		
24✓	Cadmium	0.01	0.1		
25	Zinc	2.0	0.1		
26✓	Chromium	0.1	0.1		
27	Aluminum	5.0	20		
28	Barium	4.0	0.1		
29	Boron	1.0	1.0		
30	Cobalt	0.5	0.5		
31✓	Iron	2.0	15.0		
32	Manganese	0.5	-		
33	Silver	0.05	0.1		
34✓	Total Hydrocarbons and its compounds	Note ***	Note ***	Note ***	Note ***
35✓	Sulphide S ²⁻	-	3.0		
36	Ammonia	-	10.0		
37	Ammonia gas	-	6.0		
38	Sulphur Dioxide	-	7.0		
39	Petroleum Alcohol	-	Not		

			permissible		
40	Calcium Carbonate	-	Not permissible		
41	Organic Solvent	-	Not permissible		
42 ✓	Benzene	-	0.5		
43	Chlorobenzene	-	0.1		
44	TNT	-	0.5		
45	Bromine	-	1-3		
Wastewater: Category:					
B-1	Waste water discharged to any water source				
B-2	Waste water discharged to public sewers - Special conditions should be defined taking in consideration the limits mentioned in item B-1.				
B-3	Waste water discharged to drainage - Special conditions should be defined taking in consideration the limits mentioned in item B-1.				
B-4	Waste water discharged to marshes - Special conditions should be defined taking in consideration the limits mentioned in item B-1.				
Notes:					
* Item 11- Chloride Cl ⁻					
**Item 13- Sulphate SO ₄ ²⁻					
*a) When the ratio of the amount of the discharged water to the source water is (1:1000) or less					
*b) When the ratio of the amount of the discharged water to the source water is more than (1:1000)					
*c) When the ratio of the amount of the discharged water to the source water is less than 200 mg/l, then each case should be studied by the responsible authority for executing this regulation.					
***Item 34- Total Hydrocarbons and its compounds					
It is allowed to discharge to the water sources A1 & A2 according to the concentration limits that are shown below.					
It is not allowed to discharge any hydrocarbons to water sources A3 & A4.					
1) 10 mg/l					
a) When the ratio of the amount of the discharged water to the source water is (1:1000) or less					
b) The river should be flowing.					
2) 5 mg/l					
a) When the ratio of the amount of the discharged water to the source water is (1:500) or less					
b) The river should be flowing.					
3) 3 mg/l					
a) When the ratio of the amount of the discharged water to the source water is (1:300) or less					
b) The river should be flowing.					

Source: The New Limits of the Regulation of the Protection of Rivers and Public Waters for a Year 1967, Ministry of Health, Directorate General of Human Environment

Notes that the columns with ✓ in Table 3.3.1-3 indicate the items where the guideline of the World Bank / IFC sets up the standard value (refer to Section 3.3.2).

3.3.2 International Standards

Where numerical standards have not been specified by the Iraqi legislation or the Iraqi standards are significantly lower than the international norm, the following International guidelines and/or best practice should be applied to the project:

- The World Bank Group/ IFC, Environmental, Health and Safety (EHS) Guideline (2007)
 - General EHS Guideline
 - Industry-Specific EHS Guidelines (Petroleum Refining)
- World Health Organization (WHO) Guidelines for ambient air quality
- Legislation of the USA (EPA, OSHA, etc)
- Guidelines published by the oil and gas industries (API, IPIECA, OGP, etc)

In addition, JICA/ JBIC Environmental and Social Guideline shall be applied seriously to the project to be implemented using ODA loan of JICA.

(1) Ambient Air Quality

Table 3.2.2-1 Ambient Air Quality

Parameter		Guideline Value* (Unit: $\mu\text{g}/\text{m}^3$)
SO ₂	Maximum 24-hour average	Interim target 1: 125 Interim target 2: 50 Guideline: 20
	10 minutes average	500
NO ₂	1-year average	40
	1 hour average	200
PM ₁₀	1-year average	Interim target 1: 70 Interim target 2: 50 Interim target 3: 30 Guideline: 20
	24-hour average	Interim target 1: 150 Interim target 2: 100 Interim target 3: 75 Guideline: 50
PM _{2.5}	1-year average	Interim target 1: 35 Interim target 2: 25 Interim target 3: 15 Guideline: 10
	24-hour average	Interim target 1: 75 Interim target 2: 50 Interim target: 37.5 Guideline: 25
Ozone	8-hour daily maximum	Interim target: 160 Guideline: 100

Source: * IFC EHS General Guideline (April 2007)/ WHO Guideline

Table 3.2.2-2 Air Emissions

Pollutant	Guideline Value* (Unit: mg/Nm ³)
NO _x	450
SO _x	150 for Sulfur recovery units 500 for other units
Particle Matter	50
Vanadium	5
Nickel	1
H ₂ S	10

Source: * IFC EHS Guideline for Petroleum Refining (April 2007)

(2) Waste Water Quality

Table 3.2.2-3 Waste Water Limitation

Pollutant	Project Limitation*	Guideline Value**
pH	6.5 – 8.5	6 - 9
BOD	30 ppm	30 mg/L
COD	150 ppm	150 mg/L
TSS	40 ppm	30 mg/L
TDS	1500 ppm	
Oil & Grease	10 ppm	10 mg/L
Chromium (total)		0.5 mg/L
Copper		0.5 mg/L
Iron	2 ppm	3.0 mg/L
Total Cyanide		1.0 mg/L
Cadmium	0.2 ppm	
Lead	0.1 ppm	0.1 mg/L
Nickel	0.2 ppm	0.5 mg/L
Mercury	0.005 ppm	0.02 mg/L
Vanadium		1.0 mg/L
Phenol		1 mg/L
Benzene		0.05 mg/L
Sulfide	400 ppm	1 mg/L
Total Chlorine	0.7 – 1.0 ppm	
Total Nitrogen		10 mg/L
Total Phosphorus		2.0 mg/l
Temperature	Less than 33°C	Increase < 3°C

Source:

*: Project criteria set by Baiji Refinery

** : IFC EHS Guideline Petroleum Refining (April 2007)

(3) Noise

Table 3.2.2-4 Noise Level Guideline

Receptor	Maximum Allowable Value* (Unit: dBA)	
	Daytime (07:00 - 22:00)	Nighttime (22:00 - 07:00)
Residential, institutional, educational area	55	45
Industrial, commercial area	70	70

Source: * IFC EHS General Guideline (April 2007)

(4) Waste Management

- IFC EHS General Guidelines and Petroleum Refining

(5) Safety and Fire

- American Petroleum Institute (API) Standards
- National Fire Protection Agency in USA (NFPA) Regulation

(6) Emergency Response

- International Petroleum Industry Environmental Conservation Association (IPIECA) Report Series on Oil Spill (For oil spill response plans)

(7) Occupational Health and Safety

- Occupational Safety and Health Administration (OSHA) Regulations
- IFC EHS General Guideline and EHS Guideline for Petroleum Refining
- World Health Organization (WHO) standards
- United State Environmental Protection Agency (EPA) standards

3.3.3 Environmental Permit

The scheme for the environmental permit to be applied to the projects including the refinery sector is not established clearly in the relevant legislation by MOEn and the regional authority for the time being.

Despite of such situation, NRC submitted voluntarily the preliminary environment protection plan for the project, which was titled “Environmental Impact Assessment (EIA) for FCC Unit Project, to Ministry of Environment (MOEn) on June 22, 2009. The plan presents that the project will fully apply the national and the relevant international standards and guidelines to the environmental protections for the project. The plan was approve preliminarily by MOEn on

July 5, 2009. The copy of the approval letter is shown below.

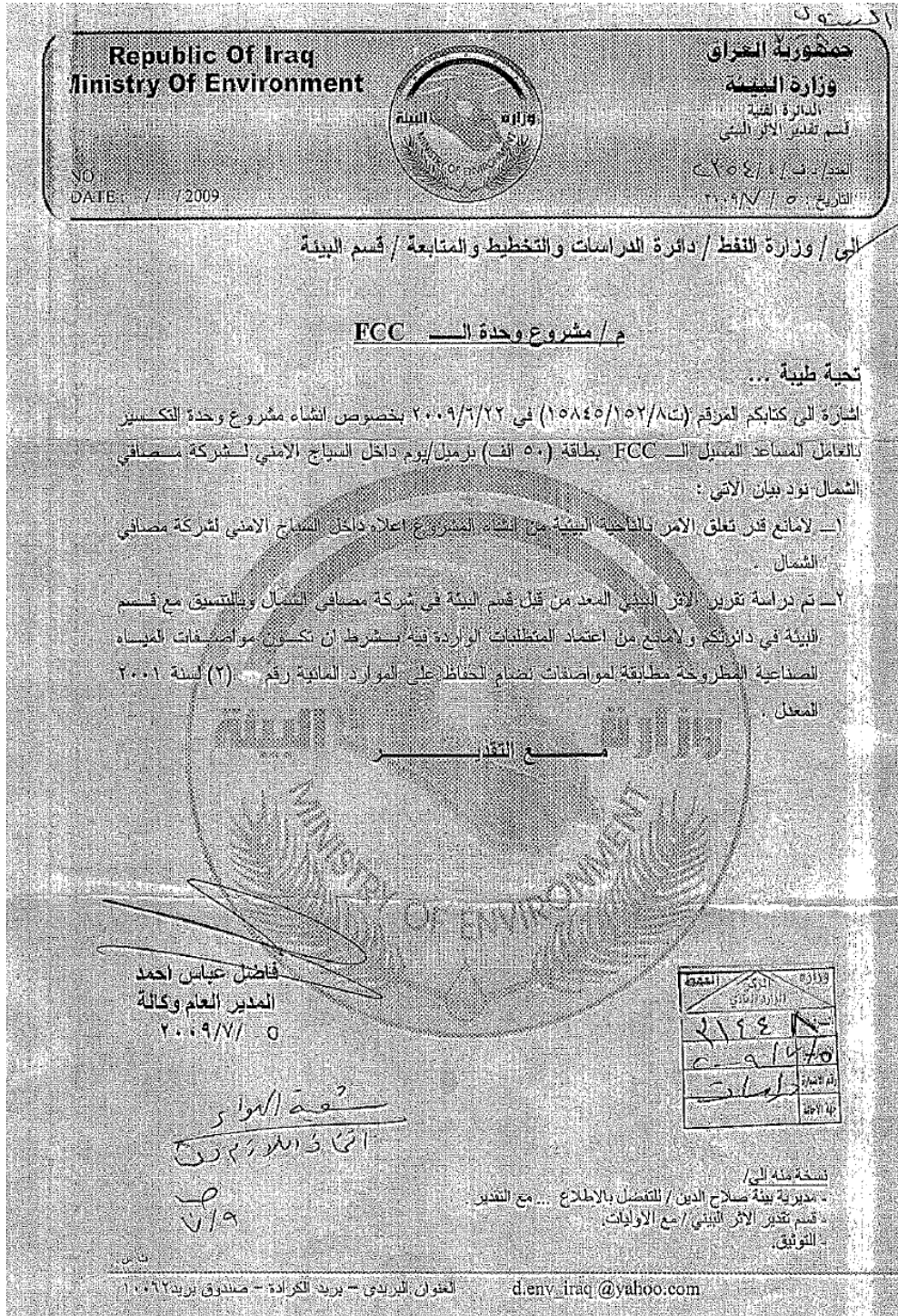


Figure 3.3.3 Approval Letter for FCC Unit Project

As indicated in the figure 3.2.1-1, the EIA Department is established in the Directorate of Urban Environment. Of MOEn which is responsible for administration of the environmental impact assessment (EIA) for the various projects to be implemented in the country.

The process and methodology for the EIA study and the applicable procedure for the evaluation and approval of the EIA are now being developed dedicatedly by the EIA Department.

The formal EIA which will be provided in the subsequent FEED phase of the project shall be submitted to MOEn for the approval according to the process developed by the authority, upon finalization of the EIA regulation.