Japanese ODA Loan

Ex-Ante Evaluation

Middle East Division II, Middle East and Europe Department

Japan International Cooperation Agency

1. Name of the Project

Country: The Republic of Iraq (hereinafter referred to as “Iraq”)

Project: Basrah Refinery Upgrading Project (II)

Loan Agreement: June 16, 2019

2. Background and Necessity of the Project

(1) Current State and Issues of the Oil Sector in Iraq

The oil sector is the largest industry, accounting for more than 50% of the GDP and about 90% of the government revenue, and the single most important source of foreign exchange earnings in Iraq. The country has proven crude oil reserves of approximately 150 billion barrels (OPEC, 2017). Its crude oil production reached 4.42 million barrels per day (BPD) in 2016 and is projected to further increase.

Iraq’s petroleum refining sector consists of 14 refineries run by a national refinery company under the control of the Ministry of Oil. In total, these refineries have a design capacity of about 900,000 barrels per stream day (BPSD)[1]. However, they are running at a low capacity as their capacity has fallen significantly due to wartime damage and deterioration over years of service. In addition, many refineries located in northern and western Iraq have been suspended due to attacks by Islamic State of Iraq and the Levant (ISIL) since June 2014. These factors have limited the country’s oil refining capacity, resulting in huge supply-demand imbalances in the consumer petroleum product markets. For example, the supply-demand gap reached approximately 55,000 BPD in the gasoline market and approximately 35,000 BPD in the kerosene and diesel oil market in 2015. In fact, despite being an oil producer, Iraq has been forced to import petroleum products, which costs the country 4.5 billion dollars per year. Given the massive reconstruction and development needs after the Iraq War, it is essential to invest in the petroleum refining sector not only to reduce the import of petroleum products to stop foreign exchange outflow but also to increase the production and export of petroleum products to raise foreign

[1] Refers to the capacity of a refinery, which is calculated by dividing the annual processing capacity by the number of operating days.

exchange earnings in the future. Nevertheless, fluctuating oil prices have made it difficult to maintain stable public investment in the sector. Moreover, political instability and security risks have discouraged the private sector from investing in the sector.

In light of these supply-demand imbalances, the Ministry of Oil of the Republic of Iraq has determined as its policy to rehabilitate existing large refineries and build new large refineries. However, many of the refinery development projects, including the Baiji Refinery Upgrading Project for which Japan's Engineering Service (E/S) Loans had been approved, have been put on hold due to attacks by ISIL and financial difficulties caused by recent oil price falls. Therefore, more importance has been placed on this Project, located in the safer southern area of the country, though it was originally identified as one of the highest priority projects in the petroleum refining sector in Iraq.

The National Development Plan 2013-2017, published by the Ministry of Planning of the Republic of Iraq in 2013, indicated that the declining refining capacity had widened the supply-demand gap in the petrochemical industry and increased the country's dependency on imported petrochemical products, resulting in growing public subsidies on petroleum products including imported ones, and straining public finances. While most refineries are running at a lower capacity than designed for, the National Development Plan 2018-2022 aims to increase the country's refining capacity from 600,000 BPD in 2012 to 900,000 BPD by 2022. In addition to boosting the production of petroleum products, the new plan aims to improve product quality to meet international environmental standards.

This Project will procure and install fluid catalytic cracking (FCC) and other units to increase the production of high-quality consumer petroleum products that meet environmental standards to boost foreign exchange earnings as well as raise the supply of gasoline, gas oil, and the like to promote economic reconstruction in Iraq. Therefore, this Project is in line with the development policies of Iraq.

(2) Development Policies for the Oil Sector in Iraq and the Priority of the Project

Japan's Country Development Cooperation Policy for the Republic of Iraq (July 2017) identifies the "development and diversification of industries for economic growth" as a priority area and cites the "crude oil, gas and petroleum products sector development" as a development challenge.

In this sector, JICA has so far implemented the following four ODA Loan projects with a total approved loan amount of 97.2 billion yen: the Crude Oil Export Facility Reconstruction Project; the Basrah Refinery Upgrading Project (E/S); the Baiji Refinery Upgrading Project (E/S) (hereinafter referred to as the "Baiji E/S"); and the Basrah Refinery Upgrading Project (I) (Loan Agreements were signed in January 2008 for the first three projects and in October 2012 for the fourth project). The Baiji E/S was cancelled in 2017 based on the request from the Government of Iraq because ISIL attacks had made it difficult to proceed with the project.

In light of the above, this Project conforms to the cooperation policies of Japan.

(3) Other Donors' Activities

This sector has received no assistance from other donors.

3. Project Description

(1) Project Objective

This Project aims to improve the quality and productivity of petroleum products, reduce the supply-demand gap, decrease the environmental load, and transfer related technologies, by installing a new fluid catalytic cracking (FCC) Complex with relevant units at Basrah Refinery in Basrah Governorate in the southern part of Iraq, thereby contributing to economic and social reconstruction in Iraq.

(2) Project Site / Target Area

Basrah City in the Governorate of Basrah

(3) Project Components

1) Construction Works and Procurement of Equipment

i) Detailed design
ii) Procurement of facilities and equipment (see Table 1 below)
iii) Construction works
iv) Test running
v) Transfer of technologies (in relation to project management, detailed design, test running, operation, maintenance / management, and HSE[2])

[2] Health, safety, and environment

Table 1. FCC Complex Facilities and Equipment

	Facilities and Equipment
1	Processing units (1) Vacuum distillation unit(s) (VDU)[3] (2) Vacuum gas oil hydrotreating unit(s) (VGOHDT)[4] (3) Fluid catalytic cracking unit(s) (FCC)[5] (4) Hydrogen production unit(s)(HPU) (5) Sulfur recovery unit(s) (SRU) (6) Sour water stripper(s) (SWS) (7) Amine regeneration unit(s) (ARU) (8) Visbreaking unit(s) (VIS)[6] (9) LPG oligomerization unit(s) (LOU) (10) Light gas oil hydrotreating unit(s) (LGOHDT)
2	Utility facilities Steam-generator(s) (boiler(s)), water treatment facility(ies), cooling water facility(ies), plant / instrument air generator(s), nitrogen generator(s), power-receiving facility(ies), and fuel gas facility(ies)
3	Off-site and storage facilities Intermediate product storage tank(s), water tank(s), flare gas recovery unit(s), wastewater treatment facility(ies), fire hydrant facility(ies), connecting pipe system with the existing refinery(ies), buildings, etc.

2) Consulting Services / Soft Components

i) Bidding assistance for EPC contractor selection

ii) Project management support

(a) Consulting services for reviewing the detailed design

(b) Consulting services for procuring facilities and equipment

(c) Consulting services for construction works

[3] Used for vacuum distillation of residual oil from the atmospheric distillation process at an existing oil refinery to produce gas oil to be used for manufacturing of FCC gasoline

[4] Used to remove sulfur as hydrogen sulfide from the gas oil produced through vacuum distillation by reacting it with hydrogen

[5] Used to produce high-octane gasoline (FCC gasoline) through catalytic thermal cracking of the desulfurized gas oil

[6] Used to produce heavy oil, gas oil, and naphtha through thermal cracking of residual oil from the vacuum distillation process

(d) Consulting services for test running
(e) Consulting services for environmental and social considerations

iii) Transfer of technologies (in relation to project management and detailed design)

(4) Estimated Project Cost (Loan Agreement)

402,674 million yen (Loan amount in this phase: 110,000 million yen)

(5) Schedule

October 2012 to April 2025 (total 151 months). This Project will be deemed complete when commercial operation starts (planned in April 2024).

(6) Project Implementation Structure

1) Borrower: The Government of the Republic of Iraq
2) Guarantor: None
3) Executing Agency: The Ministry of Oil
4) Operation and Maintenance Agency: The Ministry of Oil and South Refineries Company (SRC)

(7) Collaboration and Division of Roles with Other Projects and Donors

1) Japan's Assistance Activities

None in particular.

2) Other Donors' Assistance Activities

None in particular.

(8) Environmental and Social Consideration / Poverty Reduction / Social Development

1) Environmental and Social Consideration

i) Category A
ii) Reason for Categorization: This Project falls under the petroleum refining sector as defined in the JBIC Guidelines for Confirmation of Environmental and Social Considerations (published in April 2002; hereinafter referred to as the "Environmental Guidelines").
iii) Environmental Permit: The Environmental Impact Assessment (EIA) report related to this Project, including the additional component, was approved by the Ministry of the Environment of the Republic of Iraq in

December 2017.

iv) Anti-Pollution Measures: Air pollutants emitted during construction and after operation commences will be kept below the national and international limits (e.g. the Environmental, Health and Safety (EHS) Guidelines of the International Finance Corporation (IFC)) by installing a tail gas treatment unit and a sulfur recovery unit. Water and soil pollution caused by wastewater from the FCC complex after it is put into operation will be reduced by using double pumps and reusing the wastewater after it is treated to meet the national and international standards. Hazardous waste generated during construction and after operation commences, such as chemicals and fluorescent lights, will be properly treated at dedicated facilities or hazardous waste treatment plants. The impact of noise pollution during construction is likely to be limited because it is curbed by using noise suppressors and low-noise equipment as well as because the refinery is approximately 2.8 km away from the nearest residential areas.

v) Natural Environment: This Project is likely to have a minimal adverse impact on the natural environment since the project site is not located in sensitive areas or their vicinity, such as national parks.

vi) Social Environment: This Project will not involve land acquisition or involuntary resettlement because it is located within land owned by the executing agency.

vii) Other / Monitoring: During construction, air and water quality, waste, noise, and other environmental factors will be monitored by the EPC contractors under the supervision of the executing agency. After operation commences, air and water quality, waste, and other environmental factors will be monitored by the executing agency.

2) Cross-Cutting Issues

i) Climate Change-Related Project: None in particular

ii) Poverty Reduction and Considerations: None in particular

iii) HIV/AIDS and Other Infectious Disease Control: None in particular

iv) Participatory Development: None in particular

v) Disability Accommodation, etc.: None in particular

3) Gender Classification: Not subject

Reason for Classification: As a result of consultation with the Office for Gender Equality and Poverty Reduction, it has been determined that this

Project is not “gender informed.”

(9) Other Important Issues:

Since this Project is eligible for Special Terms for Economic Partnership (STEP), it is expected that Japan’s advanced engineering service know-how will be used for the FCC complex developed through this Project.

4. Targeted Outcomes

(1) Quantitative Effects

1) Performance Indicators (Operation and Effect Indicators)

Indicator	Baseline (2015)	Target (2026) [Expected value 2 years after project completion]
Gasoline production (BPD)	0	18,767
Gas oil production (BPD)	0	35,919
Heavy oil production (BPD)	0	40,738
Wild naphtha[7] production (BPD)	0	2,117
LPG production (tons per day)	0	4,344
Rate of operation (percent)	0	95.9

(2) Qualitative Effects

Increased productivity for petroleum products, reduced demand-supply gap, reduced environmental burdens, and economic and social reconstruction in Iraq

(3) Internal Rate of Return

Based on the conditions indicated below, the Economic Internal Rate of Return (EIRR) of this Project is calculated at 9.4%, and the Financial Internal Rate of Return (FIRR) at -11.7% (This is because gasoline prices have been kept low by the Government of Iraq).

[EIRR]

Cost: Project costs and operation and maintenance expenses (excluding taxes)

Benefit: Exports of petroleum products increased as a result of this Project

Project life: 30 years

[7] Produced as an intermediate product.

[FIRR]

Cost: Project costs and operation and maintenance expenses

Benefit: Sales of petroleum products

Project life: 30 years

5. Prerequisites and External Factors

(1) Prerequisites: None in particular

(2) External Factors: The security situation will not be much worse than it is now.

6. Lessons Learned from Past Projects

Among the lessons learned from past projects in the energy sector, Knowledge Lesson 11 (Relationship with Outside Business) indicates that when the project facility is closely related to another existing facility, the connection plan should be fully examined in advance because the completed project facility alone may not deliver full output. In addition, Knowledge Lesson 12 (Smooth Implementation of the Project) suggests that a dedicated project team should be formed within the executing agency and serve as a one-stop liaison in order to minimize any delay in the project.

Based on these lessons learned, this Project was designed by determining the roles of the Japanese and Iraqi sides in the connection plan for the existing oil refinery and the FCC complex to ensure that the Iraqi side will fulfill its responsibilities outside the scope of this Project. As of November 2015, all the pipes within the existing oil refinery had been arranged. The Ministry of Oil and SRC will continue to supervise and perform construction works based on the basic plan developed in the E/S phase to connect the existing oil refinery and the FCC complex, and the Project Management Team of this Project will follow up on their progress.

7. Evaluation Results

This Project is consistent with the development issues and policies of Iraq as well as the cooperation policies and analysis paper of Japan and JICA. While the oil sector is considered as the most important industry of the Iraqi economy, this Project aims to increase the production of consumer petroleum products to boost foreign exchange earnings and raise the supply of gasoline to promote economic recovery and contribute to resolving political and social concerns in Iraq. In addition, this Project is expected to contribute to the Sustainable Development Goals 7 (ensure access to affordable, reliable, sustainable and

modern energy for all) and 9 (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation). Therefore, it is highly necessary for JICA to support the implementation of this Project.

8. Plan for Future Evaluation

(1) Indicators to be Used

Per 4. (1) – (3)

(2) Timing

Ex-post evaluation: 2 years after project completion