

Republic of India

FY2019 Ex-Post Evaluation of Japanese ODA Loan Project

“Visakhapatnam Port Expansion Project”

External Evaluator: Chizuru Asahina, IC Net Limited

0. Summary

Visakhapatnam Port is one of the 13 major ports in India and boasts the largest export volume of iron ore in the country. However, with the increasing size of vessels worldwide, the port had not been able to accommodate vessels of 200,000 DWT (Deadweight Tonnage) or larger. In addition, because of the deterioration of port facilities, the efficiency of transportation capacity declined. For these reasons, this project came to be implemented to improve the iron ore transport capacity and efficiency by enhancing dredging and existing facilities, thereby contributing to the economic development of the country through the expansion of iron ore exports.

It is recognized that strengthening transportation capacity and modernizing port facilities through port expansion work are important in India's development policy from the time of the appraisal to the time of the ex-post evaluation. Although the export volume of iron ore, which was expected to increase at the time of the appraisal, was on a declining trend throughout the country, the need for improving transport capacity by accepting large vessels remained unchanged at the time of the ex-post evaluation and is consistent with development needs. This project is highly relevant as it is consistent with Japan's aid policy. Owing to the introduction of Public Private Partnership (PPP), the scope of the project was reduced and only the marine works were covered by the ODA loan. Thus, the project cost and period changed significantly from the time of the appraisal. The project cost was within the plan owing to a fluctuation in the exchange rate. During the project period, it took a long time to select a consulting company and a contractor, causing a major delay. Thus, efficiency was fair. Regarding operation and effect indicators, only the maximum deadweight tonnage and the number of large vessels were used as indicators and the targets were achieved. Regarding the improvement of the safety of vessel navigation, since larger vessels started entering the port after the implementation of this project and many captains are unfamiliar with the port, the safety has been secured by establishing a system of small vessels waiting and towing those entering vessels. In addition, the port user companies said that the port was relatively safe as it had been before the implementation of the project. Regarding the improvement of port efficiency, the berth occupancy rate and the average waiting time have exhibited certain effects, contributing to the improvement of transport capacity. Concerning the amount of cargo handled, the number of incoming vessels, and the tonnage of incoming vessels, all of which were expected to have a synergistic effect with the PPP project, no significant effect was shown. On the other hand,

although the export volume of iron ore is declining in India as a whole, it was found that the share of iron ore export at Visakhapatnam Port increased. In addition, no negative impact on the natural environment, resettlement, and land acquisition has been confirmed; thus, the effectiveness and impacts are fair. No major problem was seen with regard to the operation and maintenance systems, technical aspects, or financial aspects. Moreover, the division of roles is clear between the project and the companies that took part in the PPP components such as Essar Vizag Port Ltd. (EVTL) and Vedanta. Accordingly, it is fair to say that the sustainability is high.

Considering the above, this project is evaluated to be satisfactory.

1. Project Description



Project Location



Mooring dolphin constructed by this project

1.1 Background

In India, 200 ports in total, which consist of 13 major ports and 187 minor ones,¹ are operating. India's port cargo handling volume has grown rapidly because of the Open-Economy Policy of the country. In the five fiscal years from 2001 to 2005, the total cargo handling volume of the 13 major ports increased from 287.6 million tons to 423.4 million tons at a high growth rate of about 10% per year. Seventy-nine percent of the total cargo handled was related to petroleum products, iron ore, and coal resources. The volume of containers also increased from 37 million tons in 2001 to 51 million tons in 2003.

While the amount of cargo handled at the ports was growing rapidly, the ports' operational efficiency was generally low for the following reasons: the project to expand the ports was not fully implemented due to the lack of financial resources of the Port Trust, the facilities were deteriorating, and the overall productivity and service level of workers were low. Furthermore, it became an issue that the number of berths, lengths, and water

¹ The major ports refer to those under the jurisdiction of the central ministries; and the minor ones are those under the jurisdiction of the state governments.

depths of major ports in India were smaller than those in other countries as large-scale vessels such as container ships and bulk carriers came into use all over the world.

1.2 Project Outline

The objective of this project is to increase the iron ore transportation capacity and enhance the transportation efficiency by upgrading the existing iron ore handling facilities at the Visakhapatnam Port, one of India's major ports located in southern Andhra Pradesh state, thereby contributing to the country's economic development through expanding iron ore export quantity.

Loan Approved Amount/ Disbursed Amount	4,129 million yen / 1,888 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2007 / March 2007
Terms and Conditions	Interest Rate 0.75% Repayment Period 15 years (Grace Period 5 years) Conditions for Procurement General untied
Borrower / Executing Agency	President of India / Visakhapatnam Port Trust
Project Completion	October 2016
Target Area	Andhra Pradesh, South India
Main Contractor (Over 1 billion yen)	International Seaport Dredging (India)
Related Studies (Feasibility Studies, etc.)	Feasibility Study by Visakhapatnam Port Trust (F/S) (2005)
Related Projects	[ODA Loan] Tuticorin Port Dredging Project (December 1997 - March 2002)

2. Outline of the Evaluation Study

2.1 External Evaluator

Chizuru Asahina, IC Net Limited

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: July 2019 – August 2020

Duration of the Field Study: November 17–30, 2019; February 20, 2020 – March 5, 2020

2.3 Constraints during the Evaluation Study

As described later in “3.1.4 Appropriateness of the Project Plan and Approach,” after the signing of the ODA loan agreement, only the marine works were covered by the ODA loan for this project, and other works were implemented under PPP. It was decided at the time of the scope change that the project should be evaluated as a whole, including the PPP components, in order to ensure that the project generates the intended effects. However, because there was a time lag between the marine works and the PPP components, the latter not monitored, and therefore it is difficult to obtain detailed information on the PPP components. For this reason, there are constraints on the evaluation of the entire project including the PPP components. Therefore, only the marine works that were covered by the ODA loan after the project scope was changed were assessed in the ex-post evaluation.

3. Results of the Evaluation (Overall Rating: B²)

3.1 Relevance (Rating: ③³)

3.1.1 Consistency with the Development Plan of India

At the time of the appraisal, the *Tenth Five-Year Plan* (2002-2007) and the *Eleventh Five-Year Plan* (2007-2012) recognized the need to move towards increasing the cargo handling capacity of ports and modernizing port facilities. In addition, the *National Maritime Development Program* issued by the Ministry of Shipping in July 2005 announced to implement 219 projects, including this one, in the subsequent 10 years, focusing on expansion and rehabilitation of major ports and business development such as dredging and improvement of access to ports.

At the time of the ex-post evaluation, in the *Twelfth Five-Year Plan* (2012-2017) and the *Three-Year Action Agenda* (2017-2019), emphasis was placed on strengthening the cargo handling capacity for receiving large vessels and large containers, improving efficiency at facilities equipped with IT, improving efficiency by reducing waiting time, and creating job opportunities through trade. From April 2005 to May 2012, a total of 276 projects were implemented, including the repair of port facilities planned by the Ministry of Shipping’s *National Maritime Development Program*. Subsequently, the *Sagarmala Policy*, which the Ministry issued in 2016 focusing on port development, stressed on the following points.

- Capacity enhancement and efficiency improvement of the existing ports
- Efficient transportation of port cargo by rail, road, and inland water

² A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

³ ③: High, ②: Fair, ①: Low

- Port- and ship-related industry promotion
- Economic uplift of underdeveloped waterfront areas as a whole through job creation

As mentioned above, it can be seen that, at the times of both the appraisal and the ex-post evaluation, the Government of India attached great importance to improving transport capacity by accommodating large vessels in ports and improving efficiency by refurbishing equipment. At the time of the ex-post evaluation, there were no external factors that would cause the project to lose relevance that it had at the beginning, and the project is highly consistent with India's development plan.

3.1.2 Consistency with the Development Needs of India

India's 5,560 km coastline has 13 major ports, and Visakhapatnam Port is operated as one of them. The port's annual cargo handling volume in 2005 was 55.8 million tons, making it the largest port in India. In particular, the port was positioned as a major export port for high-grade iron ore mined from the Bailadila mine, and the amount of iron ore handled at the time of the appraisal was 16.0 million tons. The amount of iron ore handled at the outer harbor reached 15.7 million tons in 2012, and it was expected that vessels entering the port would also become larger. However, because only vessels up to 150,000 tons were able to enter the port, there was a growing need to expand the port facilities that could accommodate large vessels of 200,000 tons or larger. As for cargo handling equipment, it was installed in 1976 and deteriorated significantly. Thus, it was necessary to renew the equipment.

In addition, at the time of the appraisal, India was the third largest iron ore exporter to Japan, and the Metals and Minerals Trading Corporation of India (MMTC) and Nippon Steel Corporation kept renewing a contract every five years since 1958. In 2018, they concluded a three-year contract and export 3 to 4.3 million tons per year. On the other hand, according to the materials obtained at the time of the ex-post evaluation, the export volume of iron ore at Visakhapatnam Port has been declining since 2011. However, the country's iron ore export volume is also decreasing at the same time, and Visakhapatnam Port's share in India's iron ore export volume as a whole is increasing (see the "Effectiveness and Impacts" section below for details). From the time of the appraisal, it was necessary to strengthen the capacity of freight transportation and renew aging equipment; thus, the needs of this project were high.

After the ODA loan was provided, the project focused on improving the transport capacity through the introduction of PPP. The need to strengthen transport capacity remains the same at the time of the ex-post evaluation. Accordingly, the project is highly consistent with the development needs of India.

3.1.3 Consistency with Japan's ODA Policy

The Government of Japan stated in the *Medium-Term Strategy for Overseas Economic Cooperation Operations Country Assistance Strategy* that “improving the foundation for sustainable growth” was the overall priority area, and that “improving economic infrastructure” was the priority area of the country policy for India. Furthermore, in the *Country Assistance Policy for India* in 2006, the transportation sector, including ports, was positioned as a major sector to support in India, and the support policy for the sector was “to support the development of infrastructure that contributes to efficient logistics.” Thus, at the time of the appraisal, Japan's ODA policy was highly consistent with this project.

3.1.4 Appropriateness of the Project Plan and Approach

After signing the ODA loan agreement, around 2010, there was a transition toward PPP in all infrastructure projects in India. Considering technical and economic efficiency, only marine works with highly public nature were covered by the ODA loan, and it was decided to transfer other components to PPP. Based on this, the project scope of the marine works was changed. This change was difficult to foresee at the time of project planning, but it was an approach that flexibly responded to Indian public policy.

From the above, although there was a problem that the project was not fully monitored owing to the transition of some undertakings to PPP, this project has been highly relevant to India's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Initially, after the signing of the loan agreement (L/A) for this project, the ODA loan covered civil works, marine works, mechanical and electrical works, social development, and consulting services. However, in 2008, there was a growing movement in India to implement through PPP overall infrastructure projects including ports, and PPP guidelines were established. The table below summarizes the project scope at the time of the signing of the L/A and the change in the scope (for details, see “Comparison of the Original and Actual Scope of the Project” on the last page of the report).

Table 1 Project Scope Comparison at the Time of L/A Signing and Scope Change

At the Time of L/A Signing	After the Scope Change
1 Civil Engineering Works 1.1 Stockyard Preparation 1.2 Transfer Tower and Galleries	Implemented through PPP.

1.3 Train Siding (New Tracks) 1.4 Train Siding (Dismantling Existing Tracks)	
2 Marine Works 2.1 Mooring Dolphin Construction 2.2 Dredging	Implemented through ODA loan, but partially implemented through VPT's internal funds
3 Mechanical and Electrical Works 3.1 Mechanical Works 3.1.1 Ship loader 3.1.2 Reclaimer 3.1.3 Stacker 3.1.4 Belt Conveyor System 3.2 Electrical Works	Implemented through PPP
4 Innovative Social Intervention Component	Implemented through PPP
5 Consulting Services	Implemented through PPP

Considering technical and economic efficiency, the scope of the project was changed. As a result, only marine works, which are highly public in nature, were covered by the ODA loan, and other works were carried out under PPP. Therefore, in this ex-post evaluation, as described in 2.3, only marine works are targeted for evaluation. The executing agency, Visakhapatnam Port Trust (VPT), carried out marine works including the construction of mooring dolphins and dredging of the channel and the anchorage without delay. The table below presents the original and actual scope of this project.

Table 2 Comparison of Scope (Original and Actual)

	Original	Actual	Differences
Marin Works			
Mooring dolphin	An additional mooring dolphin for 200,000 DWT	An additional mooring dolphin for 200,000 DWT	No change. It was implemented through VPT's internal funds.
Amount of dredged soil	2.35 million m ³	2.35 million m ³	No change. It was implemented partially through VPT's internal funds.
Dredging of channel	Water depth 22 m	Water depth 22 m	
Dredging of anchorage	Water depth 21 m	Water depth 21 m	
Dredging of approaches to iron ore berth	Water depth 20 m	Water depth 20 m	

3.2.2 Project Inputs

3.2.2.1 Project Cost

In 2011, the scope was changed, and the amount of marine works budget was revised. In this project, all the components except marine works were moved to PPP, and there was no

detailed information on the PPP components; thus, it is impossible to make a comparison using the total project cost. Therefore, instead of using the total project cost, only the project costs of marine works covered by the ODA loan is used for comparison. The comparison was first made between the planned amount at the time of appraisal and after the scope change, then between the planned amount after the scope change and the actual cost.

The plan at the time of the appraisal was 1,101 million yen for the entire marine works. When the scope was changed, the cost of the construction of mooring dolphins was revised to 46 million rupees (98 million yen) and the dredging of channels and anchorages to 1,144 million rupees (2,288 million yen), resulting in a total project cost of 2,386 million yen.

The following are the reasons why the construction cost at the time of the scope change became twice the one at the time of the appraisal: (1) the inflation rate became 9.5%; (2) the estimated cost of dredging at the time of the appraisal was 300 rupees/m², but when the scope was changed, the successful bid was 471 rupees/m², (3) as a result of the survey at the time of the scope change, hard dredging such as shaving rocks, was found to be necessary for construction work that was thought to be only soft dredging to dig up soft sand, and the cost increased due to the procurement of hard dredging equipment for this purpose.

The actual costs of the project were 94 million rupees (160 million yen) for the construction of mooring facilities and 1,180 million rupees (1,926 million yen) for channel and anchorage dredging, for a total of 2,086 million yen. Of this amount, 1,888 million yen was funded by ODA loans, and the remaining 198 million yen was covered by VPT's internal funds.

Comparing the planned and the actual, the project cost was within the plan as a whole (87% compared to the plan). Although the actual value exceeded the planned one by about 10% on the Indian rupee basis, it was reduced by the yen appreciation of around 30% on the yen basis.

3.2.2.2 Project Period

The planned period was from March 2007 (when the L/A was signed) to September 2012 (5 years and 6 months = 66 months), and the actual one was from March 2007 to October 2016 (9 years and 7 months = 115 months). As a result, the ratio of the actual period to the planned one was 174%. This was because, as mentioned in the Output section, the Government of India proposed the transition to PPP after the ODA loan was provided, and it took time for coordination. The table below shows the planned and actual periods of marine works.

Table 3 Planned and Actual Periods of Marine Works

Marine Works	Plan	Scope Change	Actual
Mooring dolphin construction	February 2009-March 2010	June 2011-August 2012 (1 year and 2 months)	July 2015-October 2016 (1 year and 3 months)
Dredging of channel and anchorage	May 2009-March 2010	May 2011-September 2012 (1 year and 4 months)	October 2013-March 2014 (6 months)

Comparing each project period, the construction of the mooring dolphin was delayed by about one month, but the dredging was completed in about half the planned period. The reason for the delay in the start of marine works was the delay in the Indian government's approval to transfer some components of the project to PPP. When the scope was changed, the construction of the mooring dolphin was scheduled to start a month after the dredging. This was for selecting a consulting company and a contractor separately from the dredging because the construction of the mooring dolphin was going to be carried out with the internal funds of VPT. However, it took time for VPT to select a consulting company and a contractor, which delayed the start of mooring dolphin construction. In addition, the direct hit by a major cyclone in October 2014 had a significant impact. Although the construction itself did not take long, it took much time to coordinate the transition to PPP and start the construction work for the mooring dolphin. Thus, the period of the whole marine works exceeded the plan.

3.2.3 Results of Calculations for Internal Rate of Return (Reference Only)

Most components of this project were transferred to PPP after signing the loan agreement, and it is difficult to provide the necessary basis for calculating the financial internal rate of return (FIRR) and the economic internal rate of return (EIRR). The calculation method of FIRR/EIRR when the scope was changed was also unclear. Therefore, FIRR/EIRR is not recalculated.

Based on the above, although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of the project is fair.

3.3 Effectiveness and Impacts⁴ (Rating: ②)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

As explained in “2.3 Constraints during the Evaluation Study” and “3.1.4 Appropriateness of the Project Plan and Approach,” although the entire project including

⁴ Sub-rating for Effectiveness is to be put with consideration of Impacts.

the components transferred to PPP were targeted for evaluation and either the objective or the indicators were not changed, the PPP components were not monitored by JICA. Thus, the overall evaluation could not be done due to the lack of information. It cannot be said that only the marine works component has direct effects on the amount of cargo handled, the number of ships entering the port, the tonnage of ships entering the berth, the berth occupancy rate, and the average waiting time. Although it may contribute to these indicators, there are many other factors such as the upgrading of facilities and equipment through PPP that could have more direct influence on them. It is hard to say that there is a correlation that marine works directly produced these effects. Therefore, the initially assumed indicators and contributions to the achievement of project objectives shall be verified as impacts; and it is appropriate to say that only the maximum deadweight tonnage entering the port and the number of large vessels with the maximum load of 160,000 DWT or more, which is a direct effect of marine works, are used as the indicators of effectiveness.

Table 4 Quantitative Effects (Operation and Effect Indicators)

	Baseline	Target	Actual		
	2006	2013	2016	2017	2018
		2 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion
Maximum Deadweight Tonnage (DWT ⁵)	151,982	200,000	200,000	200,000	200,000
Number of Large Vessels ^{*1}	0	N/A	21	21	14

Source: Project Completion Report, VPT's answers to a questionnaire

Note 1: Here, to measure the effect of dredging work, a vessel with the maximum load of 160,000 DWT or more is designated as a "large vessel."

The maximum deadweight tonnage achieved the target because the dredging work enabled large vessels to enter the port. Before the project was implemented, 150,000 DWT was the maximum deadweight tonnage in the port, but this project enabled large vessels up to 200,000 DWT to enter the port. Since 2016, after the completion of the project, 21 large vessels of more than 160,000 DWT have entered the port. It can be seen that due to the dredging work at the outer harbor and the construction of mooring dolphin, large vessels can now enter the port and are actually in operation.

⁵ DWT is the abbreviation of deadweight tonnage. It is a unit that represents the loading capacity of a sailing vessel or the amount of cargo they can safely carry.

3.3.1.2 Qualitative Effects (Other Effects)

Mentioned in the Impacts section.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact of this project at the time of the appraisal was "creating employment opportunities in the hinterland." There were seasonal workers who engaged in the marine works, but no large impact on "creating employment opportunities" after implementing the project was confirmed. Moreover, the external evaluator tried to interview PPP-related companies as the scope was changed to only the marine works, but no information was provided. Thus, in relation to "creating employment opportunities in the hinterland," the impact of this project including the components transferred to PPP was not confirmed.

This section analyzes "safety improvement of vessel navigation" and "improvement of port efficiency" of this project as impacts after the scope change.

- Safety Improvement of Vessel Navigation

According to an interview with VPT, after the dredging, large vessels started entering the port, but many of their captains are unfamiliar with the port. Thus, a system that small vessels wait for large vessels and tow them has been established. This not only ensures safety but also contributes to improving port efficiency in such aspects as shortening waiting time. In the interviews with five user companies, it was recognized that the safety assurance had been in place and that it was maintained by VPT, rather than improved after the construction. With regard to safety, user companies have high confidence in VPT.

- Improvement of Port Efficiency

Out of the five user companies of the outer harbor, EVTL (iron ore) and Vedanta (coal), which implemented civil engineering, mechanical and electrical work through PPP, stated that the transport capacity has increased because large vessels can enter the port. According to EVTL, cargo handling time has been reduced thanks to the new mooring dolphin installed at the iron ore berth that allowed larger vessels to enter the port, coupled with the impact of the upgraded cargo handling facilities and equipment from the mechanical and electrical work carried out through PPP. Vedanta has said that it can transport cargoes efficiently by using one of the five Indian ports that can accommodate large vessels.

The table below summarizes the indicators of traffic volume at Visakhapatnam Port.

Table 5 Indicators on Traffic Volume at Visakhapatnam Port

Indicator	Baseline Value (2006)	Target Value (2013: 2 years after project completion)	Actual Value (2017)	Actual Value (2018: 2 years after project completion)	Actual Value (2019)
Berth Occupation Rate (%)	81	54	65	53 (98.1%)	82
Average Waiting Time (Hour) ^{*1}	N/A ^{*2}	N/A ^{*2}	0.79	1.84 (149%)	1.65
Total Cargoes (MT, iron ore related in outer harbor)	13.7	15.7	9.6	9.64 (61.4%)	6.81
Number of Vessels	225	172	119	119 (69.1%)	131
Total Gross Tonnage (MT)	8.91	9.07	6.35	5.87 (64.7%)	4.33、

Note 1: The definition of the average waiting time is "the time it takes from the time the vessel is determined to be ready to dock after submitting all the required documents to the time it is actually anchored.

Note 2: As the average waiting time is an additional indicator, the baseline and target values are not shown.

The dredging work has allowed larger vessels to enter the port, which has resulted in a berth occupancy rate of 53% in 2018 and 75% in 2019, from 81% in 2006. The berth occupancy rate is the ratio of the actual operating hours (converted to the number of days) to the annual usable days (365 days) of the berth. Therefore, the waiting time of the vessels tends to be longer when the berth occupancy rate becomes higher than the appropriate value.

With regard to the average waiting time, it was 1.84 hours in 2018, which is less than one-third the baseline value of 5.65 hours in 2007. One of the reasons for this is that the number of vessels itself has decreased as it became possible for large vessels to enter the port.

On the other hand, the decrease in the number of vessels entering the port was below the expected value. As it is hard to obtain information on the transaction status of user companies, it is not possible to determine the factors involved. However, VPT points out that the number of user company transactions using the outer harbor is decreasing. The same applies to the volume of cargoes handled and the tonnage of ships entering the port.

The table below indicates the export volume of iron ore at Visakhapatnam Port and in India as a whole.

Table 6 Export Volume of Iron Ore at Visakhapatnam Port and in India

Year	Export Volume of Iron Ore at Visakhapatnam Port (MT) ^{*1}	Export Volume of Iron Ore in India (MT) ^{*2}	Share of Visakhapatnam Port (%)
2007-08	13.93	104.27	13%
2008-09	13.70	105.87	13%
2009-10	12.14	100.00	12%
2010-11	12.28	46.90	26%
2011-12	10.02	47.20	21%
2012-13	9.58	18.00	53%
2013-14	6.79	16.00	42%
2014-15	5.76	16.30	35%
2015-16	5.45	30.48	18%
2016-17	8.42	-	-
2017-18	9.50	30.73	31%
2018-19	9.68	24.19	40%

*1 Source: Questionnaire to VPT

*2 Source: Statista

(<https://www.statista.com/statistics/268653/indian-iron-ore-exports-since-2006/>)

Although the export volume of iron ore at Visakhapatnam Port has been on the decline since 2011, Table 6 indicates that the export volume of India as a whole has also been decreasing because of the impact of the world economy. The rate of decrease in iron ore export at Visakhapatnam Port is small compared to the decrease in India's total export. Furthermore, it can be said that there is an increasing trend after the completion of this project in 2016. In addition, the total ratio of Visakhapatnam Port's iron ore export to that of India is on the rise, and the port's economic contribution to the entire country can be seen.

3.3.2.2 Other Positive and Negative Impacts

Impacts on the Natural Environment

This project was classified under category A because it fell under the port sector, which was listed as one of the sectors that were likely to have an impact on the environment in the *JBIC Guidelines for Confirmation of Environmental and Social Considerations* (established in April 2002). In November 2006, the Environmental Impact Assessment (EIA) report was approved by the Ministry of Environment and Forests. Regarding sewage and waste generated in the port, they were to be processed in such a way that meets domestic standards based on VPT's own standards and the *Marine Pollution Control Convention*, etc., and such standards were adhered to even after the transition to PPP. The

dredged soil was dumped on the seabed about 3 km away from the outer harbor, which is an appropriate method recommended on the basis of the results of a study by a research institute called Central Water Power Station. Environmental monitoring and measurement equipment were installed at three locations near the VPT facility and Visakhapatnam Port to record environmental data. No major environmental impact by this project has been confirmed.

After the project started, there were complaints mainly from residents in neighboring areas about air pollution during the construction of the belt conveyor connecting the iron ore yard with the cargo handling area and the construction of the mooring dolphin at the outer harbor. For this reason, the environmental measures team headed by the Deputy Director of the Transportation Section of VPT conducts monitoring twice a day at the port between 6 a.m. and 10 p.m. In addition, chaired by Professor Prasada Rao of Andhra University, the Environmental Monitoring Committee is held once every two months with VPT, port user companies, and neighboring residents.

As dust is apt to fly around the conveyor and the stockyard of coal and iron ore, water is sprinkled every few hours daily, and the coal and iron ore in the stockyard is covered with vinyl sheets. As the green belt activity,⁶ afforestation is being carried out on the main roads leading to the port and roads in the port.

VPT works hard on measures against environmental problems, and has won the Greentech Award for organizations, companies, and groups in India sponsored by the Greentech Foundation for four years in a row. Visakhapatnam Port is an environmental model for the city of Visakhapatnam.



Watering by sprinklers



Tree planting near a conveyor

Resettlement and Land Acquisition

There was no resettlement and land acquisition for dredging and mooring dolphin construction at Visakhapatnam Port.

⁶ A green belt refers to a greenery area created on median roads and by urban planning.

Other Positive/Negative Impacts

At the time of the appraisal, construction workers were to be seasonal workers from rural areas, and there was a plan to carry out an HIV prevention activity for workers and neighboring residents. However, it was decided not to implement this activity in this project when the scope was changed. There was a report from Vedanta that they did not implement the activity through PPP.

At the school located near the container terminal of the port, there was a concern about traffic accidents involving children going to school as the volume of trucks carrying containers increased after the project. At the request of the school, the Environmental Monitoring Committee has taken measures to prevent accidents, such as banning vehicles on the road in front of the school when children are going to school (8:00-8:45).

According to the Union Director of the fishing port next to the port, because the boundary between the fishing area and the route of vessels entering Visakhapatnam Port is clear, there was no major issue either during the dredging work or at the time of the ex-post evaluation, and there has been no pollution of seawater by user companies at the port so far.

Based on the above, it is fair to say that this project has achieved its objectives to some extent. Therefore, the effectiveness and impacts of the project are fair.

3.4 Sustainability (Rating: ③)

3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

The operation and maintenance of the entire Visakhapatnam Port are overseen by the Mechanical Engineering Department of VPT. Because PPP was introduced in this project, VPT established a PPP unit in the Mechanical Engineering Department's third section, and this unit oversees coordination and cooperation with PPP-related companies. VPT's staff in charge conduct inspections of the outer and inner harbors daily and maintain them. Regarding the entry of vessels, the Traffic Management Division is in charge. The division grasps the entry schedule of vessels and the usage status of berths and coordinates with each company.

Each company is responsible for the operation and maintenance of its own berth and the sea area within a radius of 5 km from the berth. Vedanta has established a facility operation and maintenance manual for its personnel and always informs them of necessary matters at the time of daily shift changes.

Therefore, the following division of roles is clear: VPT is responsible for the operation and maintenance of the entire port, and private companies operate and maintain each

terminal. There is no problem with the operation and maintenance system.

3.4.2 Technical Aspect of Operation and Maintenance

Many VPT managers are involved in port operation and maintenance. Because there is a unit in charge of ISO (International Organization for Standardization) and it operates according to the standards, there is no particular problem. Regarding maintenance, maintenance dredging is planned and implemented based on a survey by a specialized organization. Regarding the management of vessels entering the port, the Traffic Management Division manages the schedule and distribution of berths collectively, ensuring the safety of the port.

Regarding Vedanta, it was confirmed that the company complied with ISO and there was no major issue.

3.4.3 Financial Aspect of Operation and Maintenance

Below is the transition of revenue and expenditure of Visakhapatnam Port.

Table 7 Revenue and Expenditure of Visakhapatnam Port
(Unit: million INR)

Year	Revenue	Expenditure
2010	8,163	6,422
2011	17,713	12,763
2012	8,895	8,524
2013	9,497	9,716
2014	9,622	8,588
2015	12,494	12,237
2016	10,402	9,949

Source: Annual Accounting Report of Visakhapatnam Port

Revenues declined temporarily in the fiscal year 2012 but have been on an increasing trend since then. Even from the latest financial statements, the balance of final profit and loss is not in deficit, and there seems to be no problem with the financial aspect of operation and maintenance.

3.4.4 Status of Operation and Maintenance

Regarding the dredging part of marine works, maintenance dredging is conducted every December based on the maintenance plan. Before the ocean current reaches the dredged area, a hole (0.7 million m³) is dug so that the dredged area will not be buried by the sand carried by the ocean current. The dirt from the hole is used to reclaim a seaside park just beyond the port. As a result, the dredged area can maintain a constant water depth. The

mooring dolphin is currently used only at EVTL's iron ore berth, so EVTL operates and maintains it. Regarding the berth of each company, a PPP business contract stipulates that each company is responsible for the maintenance dredging of its own terminal, and interviews have revealed that Vedanta performs maintenance dredging once every two years.

No major problems have been observed in the institutional/organizational, technical, financial aspects and the current status of the operation and maintenance system. Therefore, the sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

Visakhapatnam Port is one of the 13 major ports in India and boasts the largest export volume of iron ore in the country. However, with the increasing size of vessels worldwide, the port had not been able to accommodate vessels of 200,000 DWT (Deadweight Tonnage) or larger. In addition, because of the deterioration of port facilities, the efficiency of transportation capacity declined. For these reasons, this project came to be implemented to improve the iron ore transport capacity and efficiency by enhancing dredging and existing facilities, thereby contributing to the economic development of the country through the expansion of iron ore exports.

It is recognized that strengthening transportation capacity and modernizing port facilities through port expansion work are important in India's development policy from the time of the appraisal to the time of the ex-post evaluation. Although the export volume of iron ore, which was expected to increase at the time of the appraisal, was on a declining trend throughout the country, the need for improving transport capacity by accepting large vessels remained unchanged at the time of the ex-post evaluation and is consistent with development needs. This project is highly relevant as it is consistent with Japan's aid policy. Owing to the introduction of Public Private Partnership (PPP), the scope of the project was reduced and only the marine works were covered by the ODA loan. Thus, the project cost and period changed significantly from the time of the appraisal. The project cost was within the plan owing to a fluctuation in the exchange rate. During the project period, it took a long time to select a consulting company and a contractor, causing a major delay. Thus, efficiency was fair. Regarding operation and effect indicators, only the maximum deadweight tonnage and the number of large vessels were used as indicators and the target was achieved. Regarding the improvement of the safety of vessel navigation, since larger vessels started entering the port after the implementation of this project and many captains are unfamiliar with the port, the safety has been secured by establishing a system of small

vessels waiting and towing those entering vessels. In addition, the port user companies said that the port was relatively safe as it had been before the implementation of the project. Regarding the improvement of port efficiency, the berth occupancy rate and the average waiting time have exhibited certain effects, contributing to the improvement of transport capacity. Concerning the amount of cargo handled, the number of incoming vessels, and the tonnage of incoming vessels, all of which were expected to have a synergistic effect with the PPP components, no significant effect was shown. On the other hand, although the export volume of iron ore is declining in India as a whole, it was found that the share of iron ore export at Visakhapatnam Port increased. In addition, no negative impact on the natural environment, resettlement, and land acquisition has been confirmed; thus, the effectiveness and impacts are fair. No major problem was seen with regard to the operation and maintenance systems, technical aspects, or financial aspects. Moreover, the division of roles is clear between the project and the companies that took part in the PPP components such as Essar Vizag Port Ltd. (EVTL) and Vedanta. Accordingly, it is fair to say that the sustainability is high.

Considering the above, this project is evaluated to be satisfactory.

4.2 Recommendation

4.2.1 Recommendations to the Executing Agency

Companies such as EVTL and Vedanta deal with industries that easily affect the environment, such as iron ore, coal, oil and gas, and daily efforts are required. As an example of measures with room for improvement, during the repair of the conveyor carried out under the PPP components, the conveyor was covered on three sides to prevent dust from scattering, but the trees planted near the conveyor were discolored because of the dust leaking from the product, meaning that some scattering was not prevented. As the neighborhood of the conveyor is a residential area that has schools, it may lead to the health damage of its residents if the leak continues. It is recommended that VPT work with companies such as EVTL and Vedanta to enclose the conveyor with something like a pipe to prevent dust from leaking.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

Monitoring the entire project after introducing PPP

In this project, the Government of India started actively promoting the PPP mode after the ODA loan was provided, so only marine works, which were of a highly public nature,

were covered by the ODA loan, and other works were transferred to PPP. In view of the overall purpose of this project, there was a plan to monitor the PPP components to confirm the synergistic effects synergistic effects with the ODA loan project. However, monitoring of the whole project was not conducted because the arrangements on monitoring were unclear between VPT and JICA, and because of such factors as the change of the person in charge and the delay in starting the PPP components. Therefore, it was not possible to confirm the effects of this project as a whole, including the components covered by PPP, on the improvement of the transport capacity and efficiency of Visakhapatnam Port, as well as its contribution to the economic development of India. At the same time, although some components of this project have been moved to PPP, the impact of those components on the environmental and social aspects such as air pollution and water pollution cannot be considered separately. The impacts on environmental considerations of this project and PPP components were confirmed because the Environmental Monitoring Committee consisting of experts, hinterland residents, and related organizations continued to monitor the entire port.

The number of projects introducing PPP is expected to increase in various sectors in the future; but considering the difficulty of sharing information with private companies, it is realistic to focus on ODA loan-assisted parts of the project in principle for ex-post evaluation. However, with regard to a project that aims to produce synergy between an ODA project and PPP, if it is necessary to confirm the manifestation of such synergy effect, then it is desirable to discuss in advance among the executing agency, JICA, and the PPP member companies the necessity and implementation method of project monitoring, and agree on as much detail as possible. In addition, if some components of the ODA loan project are converted to PPP and the environmental and social considerations are still deemed interconnected, it is desirable to continue monitoring the entire project.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1. Marine works 1.1 Construction of mooring dolphin Construction of an additional mooring dolphin for 200,000 DWT 1.2 Dredging 2.35 million m ³	As planned As planned
2. Project Period	March 2007 – September 2021 (66 months)	March 2007 – October 2016 (115 months)
3. Project Cost		
Amount Paid in Foreign Currency	0 yen*	198 million yen
Amount Paid in Local Currency	2,386 million yen (1,190 million rupees)	1,888 million yen (1,135 million rupees)
Total	2,386 million yen	2,086 million yen
ODA Loan Portion	2,386 million yen	1,888 million yen
Exchange Rate	1 rupee = 2 yen (As of May 2011)	1 rupee = 1.6956 yen (Average between October 2013 and October 2016)
4. Final Disbursement	January 2016	

* At the time of the scope change, no foreign currency amount was set because the marine works were scheduled to be implemented only through an ODA loan.