India

FY2021 Ex-Post Evaluation Report of

Japanese ODA Loan "Hyderabad Outer Ring Road Project Phase 1 and Phase 2" and Technical Assistance Project related to Japanese ODA Loan "The Assistance for the Introduction of ITS Related to Hyderabad Outer Ring Road Construction Project"

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0. Summary

Hyderabad Outer Ring Road (ORR) Project Phases 1 and 2 (the "Project") was implemented to respond to increasing road traffic demands through the construction of the ORR in the Hyderabad metropolitan area in India's southern state of Telangana,[1] thereby easing traffic congestion in the city center and promoting regional economic development. Connected to the Project, the Assistance for the Introduction of Intelligent Transportation System[2] (ITS) Related to Hyderabad Outer Ring Road Construction Project (Technical Assistance Project related to Japanese ODA Loan [TA]) was implemented. Integrated evaluation was conducted for the Japanese ODA Loan and TA projects.

Regarding relevance and coherence, the Project has been consistent with the policies and development needs of the Government of India and the Hyderabad metropolitan area at the times of both the appraisal and the ex-post evaluation. The Project design and approach are also confirmed to be appropriate. The Project was consistent with the ODA policy of Japan at the time of the project appraisal, and there was synergy among projects implemented using JICA schemes. Collaboration with other agencies exist, and some contributions are made in light of an international framework; therefore, relevance and coherence are high. The output of the ODA loan project was almost as planned, and the project cost was within the plan. However, there were delays in project duration because of court cases on procurement of the Toll Management System (TMS), an ITS component under the ODA loan project, and land acquisition. Therefore, the efficiency of the Project is moderately low. On effectiveness and impacts, the operation and effect indicators of the Project were mostly achieved. The project purpose of the TA was also partially achieved. No adverse impact on the natural environment during the construction and after the Project completion has been reported. Regarding land acquisition and resettlement, a compensation guideline was prepared for the Project, and proper compensation was provided according to the guideline. Therefore, effectiveness and impacts are high. On sustainability of the Project, the policy and system regarding the ORR were established. No issues are found in respect to the organizational arrangements and technical aspects of Hyderabad Growth Corridor Limited

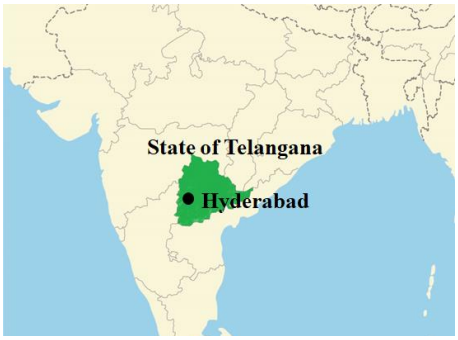
[1] At the time of the project appraisal, it was Andhra Pradesh, but some parts of the state including Hyderabad became Telangana after Andhra Pradesh was bifurcated in 2014.

[2] ITS consists of the Highway Transport Management System (HTMS) and TMS. TMS includes capturing the data on classification of vehicles passing through toll booths and statistical data on toll collection. HTMS operates automated traffic counters, emergency call boxes, meteorological monitoring, and operation of variable message boards.

(HGCL), the Executing Agency, as well as the contractors. The financial status of HGCL is also sound. No particular risk is identified on environmental and social aspects. Thus, sustainability of the Project effects is very high.

In light of the above, this Project is evaluated to be highly satisfactory.

1. Project Description



Project Location

ORR from the air (Source: HGCL)

1.1 Background

Road transport in India, along with railways, is an important means of transport that supports much of the country's logistics. At the time of the Project appraisal (2008), road passenger and freight traffic have grown by about 60 times over the past 45 years, at a rate of 9% per annum. On the other hand, the growth of road development was only about six times during the same period.

In addition to the increase in automobile traffic, India's urban population has grown from 217 million in 1991 (25.7% of the total population) to 285 million (27.8%) in 2001. Forecasts predicted that the country's total population would increase to 436 million (33.4%) in 2011 and 538 million (37.1%) in 2021.[3]

In the wake of such rapid urbanization, the number of registered vehicles and motorcycles in India had been growing at an average annual rate of 11% since 1997.[4] In addition, the share of public transport in urban mobility fell from 69% in 1991 to 55% in 2001.[5] On the other hand, owing to the lack of progress in the development of public transport infrastructure, traffic congestion due to the increase in vehicles and motorcycles has become a serious problem in India. As people's income continues to rise, it is expected that the number of private vehicles will increase, the ratio of public transportation will decrease, and the shift in ownership from motorcycles to four-wheeled vehicles will occur; thus, prompt action has been required. In

[3] Ministry of Urban Development, India.
[4] Same as above.
[5] Same as above.

particular, in India's large cities, including Hyderabad, economic losses due to traffic congestion and health issues arising from automobile pollution such as air pollution and noise became problems. Under these circumstances, to ease traffic congestion and prevent automobile pollution, it was necessary to develop large-scale urban transport systems such as mass rapid transit systems and ring roads based on urban development plans.

1.2 Project Outline

The objective of the Project is to respond to increasing road traffic demands through the construction of the northern section of the ORR and radial roads in the Hyderabad metropolitan area in India's southern state of Telangana, thereby easing traffic congestion in the city center and promoting regional economic development.

<Japanese ODA Loan Project>

Loan Approved Amount/ Disbursed Amount	41,853 million yen / 24,807 million yen (Phase 1) 42,027 million yen / 26,188 million yen (Phase 2)	
Exchange of Notes Date/ Loan Agreement Signing Date	March 2008 / March 2008 (Phase 1) October 2008 / November 2008 (Phase 2)	
Terms and Conditions	Interest Rate	1.2% (main), 0.01% (consulting service)
	Repayment Period (Grace Period	30 years 10 years)
	Conditions for Procurement	General untied
Borrower / Executing Agency	The President of India / Hyderabad Growth Corridor Limited	
Project Completion	March 2017 (Phase 1) March 2019 (Phase 2)	
Target Area	Hyderabad metropolitan area, State of Telangana	
Main Contractor(s) (Over 1 billion yen)	Somdatt Builders Pvt. Ltd. (India)/Ramky Infrastructure Ltd. (India), KNR Construction Ltd. (India)/GVR Infra Projects Ltd (India), Gayatri Projects Ltd. (India), United Gulf Construction Co. W.L.L (Kuwait), NCC Ltd. (India), Sri Sai Constructions Pvt. Ltd. (India), EFKON AG (Australia)/EFKON India Pvt. Ltd. (India)	

Main Consultant(s) (Over 100 million yen)	Egis Bceom International (France)/Egis India Consulting Engineers Pvt. Ltd. (India)/PADECO (Japan), Nippon Koei Co., Ltd. (Japan)/Nippon Koei India Pvt. Ltd. (India)/Aarvee Associates Architects & Consultants Pvt. Ltd. (India), Nippon Koei Co., Ltd. (Japan)/Nippon Koei India Pvt. Ltd. (India), Egis India Consulting Engineers Pvt. Ltd. (India)
Related Studies (Feasibility Studies, etc.)	Feasibility study in August 2006
Related Projects	<Japanese ODA Loan> Delhi Eastern Peripheral Expressway ITS Installation Project (March 2017) <SAPI study> Special Assistance for Project Implementation for Hyderabad ORR Project Phase I (September 2008 – May 2009) Special Assistance for Project Implementation for the Assistance for the Introduction of ITS on Road Network in Hyderabad Metropolitan Area (August 2011–March 2013)

<Technical Assistance Project related to Japanese ODA Loan>

Overall Goal		By responding to increasing road traffic demand through the construction of Outer Ring Road and major radial roads in the Hyderabad metropolitan area in India's southern state of Andhra Pradesh, traffic congestion in the city is eased and regional economic development is promoted.
Project Purpose		For the purpose of contributing toward smooth implementation and enhancing development effect of Hyderabad Outer Ring Road Construction Project, a smooth introduction of effective operation and maintenance (O&M) system and ITS to the relevant organizations are achieved.
Outputs	Output 1	By conducting necessary surveys/ studies regarding the optimal way of toll collection and smooth ITS introduction, problems related to operation & maintenance (O&M) issues and preparation of detailed operation charts are solved.

	Output 2	Setup for the smooth procurement of necessary ITS components are completed.
	Output 3	Institutional setup for optimal operation and management of toll collection system for the ORR is promptly and firmly completed, and preparation for toll collection system is completed.
	Output 4	Trial experiments on ETC are conducted, and necessary proposals regarding full-scale operation of ETC[6] are made.
	Output 5	The development of HTMS operational structure is assisted.
Total cost (Japanese Side)		254 million yen
Period of Cooperation		January 2010–October 2013 (extended from June 2011)
Target Area		Hyderabad metropolitan area, State of Telangana
Implementing Agency		Hyderabad Growth Corridor Limited
Other Relevant Agencies/ Organizations		None
Consultant in Japan		ALMEC Corporation NEXCO East
Related Projects		Same as ODA Loan Project above

<Integrated evaluation>

This is an integrated evaluation of the ODA loan project (Phase 1 and Phase 2) and the TA. As both projects share the common objective of responding to the demand for road traffic in the Hyderabad Metropolitan Area, relevance, coherence and sustainability are evaluated together. As for effectiveness, since the inputs, outputs, and expected outcomes of each project are different, the two projects are separately studied. In addition, while evaluating effectiveness and impacts, since the impacts are common to both projects, the extent of the contribution by the TA was considered toward realizing the impacts of the ODA loan project. Regarding efficiency, the ODA loan project and the TA are separately studied; however, the performance of the TA is not taken into account for the sub-rating in accordance with the ex-post evaluation reference.

2. Outline of the Evaluation Study

2.1 External Evaluator

Yumiko Onishi, IC Net Limited

[6] Electronic Toll Collection system. A toll collection system aimed at alleviating traffic congestion at the toll plaza and improving convenience through cashless payment.

2.2 Duration of Evaluation Study

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

Duration of the Study: December 2021 – December 2022

Duration of the Field Study: February 20 – March 9, 2022, and May 8 – 21, 2022

3. Results of the Evaluation (Overall Rating: A[7])

3.1 Relevance/Coherence (Rating: ③[8])

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of India

To address the urban transport issues mentioned in "1.1 Background," the Eleventh Five-Year Plan (April 2007–March 2012), which was the development plan of the Government of India at the time of the appraisal in 2008, focused on the development of the urban transport sector. In addition to responding to the growing demand for transport accompanying the economic growth in recent years, the plan called for the development of a balanced nationwide road network. Specifically, in addition to the construction of new roads, the plan referred to the necessity of widening and reinforcing existing roads, replacing damaged bridges, strengthening road maintenance and management, introducing the principle of competition and public-private partnerships (PPPs), emphasizing safety, energy efficiency, and social and environmental protection, and aimed to realize smooth and integrated transport by improving access to airports and seaports.

India's National Urban Transport Policy, formulated in 2006 and revised in 2014, points out the importance of newly establishing laws and systems related to traffic management and urban transportation, including the use of ITS. The Hyderabad Metropolitan Development Authority (HMDA) developed a long-term strategy for the transport sector targeting 2041. The strategy calls for further development of road networks and metros, which require an investment of INR 1,758.3 billion. Furthermore, in the State of Telangana, based on the experience of the Project and future demand, the construction of a Regional Ring Road, located outside the ORR and connecting major cities, is planned.

As described above, from the time of the appraisal to the ex-post evaluation, the urban transport sector is regarded as an important area in the development plan of the Government of India. This situation is the same for the Hyderabad Metropolitan Area, and the importance of ITS has been recognized, especially in recent years. Therefore, the Project and the TA, which constructed the ORR and introduced ITS, are consistent with the development policy of India.

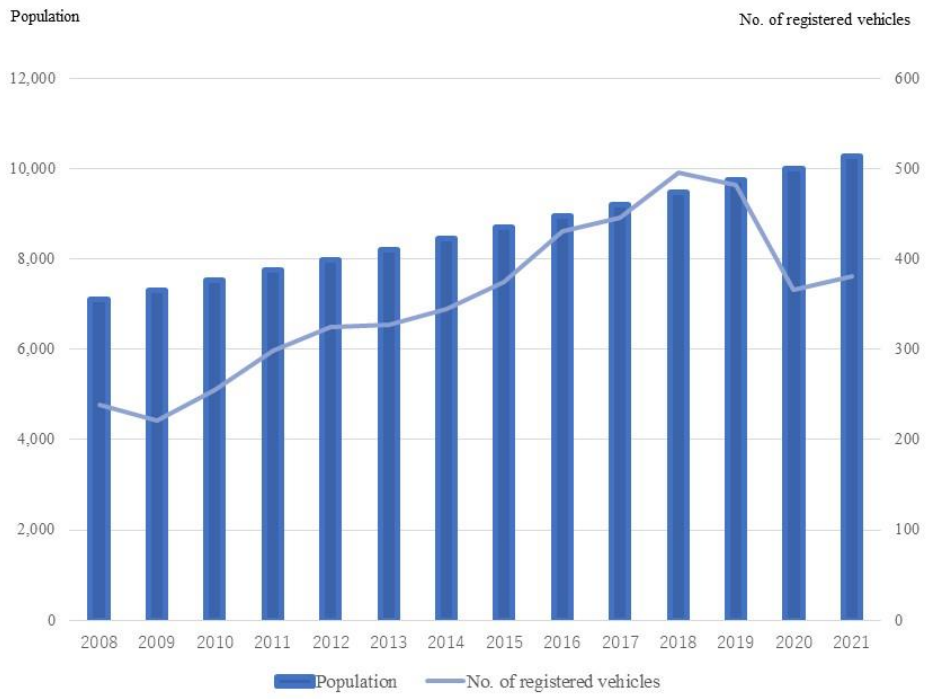
[7] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[8] ④: Very High,③: High, ②: Moderately Low, ①: Low

3.1.1.2 Consistency with the Development Needs of India

Between 1991 and 2001, the population of the Hyderabad metropolitan area increased from 4.67 million to 6.38 million. As a result, the number of vehicles increased from 590,000 to 1.45 million, and traffic congestion became severe. According to the projections at the time of the appraisal, the population was expected to reach 9.05 million in 2011 and 13.64 million in 2021, with the number of vehicles expected to increase by more than 7% per annum. In addition to the rapid increase in the number of private cars and buses for moving within the city, the city has also National Highway (NH) 7 (a north-south arterial road connecting Bangalore to India's northern parts such as Delhi), NH 9 (an east-west arterial road connecting Mumbai and Chennai in central India), and NH 202 (a highway connecting Hyderabad with Visakhapatnam Port, the largest cargo handling port in India) stretching from the city radially. This meant that the city was the intersection of India's main east-west and north-south highways, triggering serious traffic congestion where an average speed in the city was 12 km/hour.

At the time of the ex-post evaluation, traffic data of Hyderabad over the years were not available. Meanwhile, looking at the changes in Hyderabad's population and the number of registered vehicles since 2008 (Figure 1), the annual increase rate is 7% on average, as expected at the time of the appraisal, although there was a significant decrease in 2020 partly due to the impact of COVID-19.



Source: Population from the World Population Review and number of registered vehicles from the Hyderabad City Traffic Police

Figure 1: Changes in population and number of registered vehicles in Hyderabad

The population of the Hyderabad metropolitan area continues to increase because of inflows from all over India owing to the development of IT, finance, and pharmaceutical industries. As a result, the number of vehicles in the city also continues to increase. Metros and public buses are expanding the city's transport network, making mass high-speed transportation possible. The Project was located on the road network connecting Mumbai and Bangalore; and by developing an ORR, it enabled some vehicles to bypass the city. From the above, the implementation of the Project is in line with the development need of responding to the increasing transport demand in India, especially in the Hyderabad metropolitan area, at the times of both the appraisal and the ex-post evaluation.

3.1.1.3 Appropriateness of the Project Plan and Approach

In this section, the following points are studied: whether appropriate consideration, including alternatives, was given at the time of Project formation; whether the Project was planned with consideration for fair distribution of benefits based on the target beneficiaries as assumed at the time of the appraisal; and who were the actual beneficiaries of the Project.

Consideration for alternatives at the time of Project formulation

According to a Hyderabad metropolitan area official, at the time of Project formulation, it was decided to develop the ORR based on the urban plan so that Hyderabad could develop radially. As for the alignment of the ORR, three options were studied, and the current alignment was selected considering the topography and the scale of land acquisition. Thus, sufficient consideration was given.

Target beneficiaries

The beneficiaries of the Project were ordinary citizens and commercial road users from the outset; no specific population was targeted. However, at the time of the appraisal, it was assumed that buses, and two- and three-wheelers would be allowed on the ORR. Nevertheless, after the Project's commencement and the commercial opening of the ORR, buses, and two- and three-wheelers on the ORR became restricted. This was because the speed limit on the ORR was high, which could cause accidents. As a result, the use of the ORR is limited to private cars and trucks. Although beneficiaries differ from those envisaged at the time of the appraisal, there are service roads on the ORR, and two- and three-wheelers can safely travel on the service roads; thus, they are indirectly benefiting from the construction of the ORR.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

In the Country Assistance Program for India formulated by the Japanese government, "promotion of economic growth" was set as a priority goal. In response, JICA focused on the following: a) supporting sustainable economic growth through the development of economic infrastructure; b) providing assistance for economic growth with employment; c) assistance for poverty alleviation; and d) support for environmental and climate change measures. The Project is in line with these policies, and thus, consistent with Japan's ODA policy at the time of the appraisal.

3.1.2.2 Internal Coherence

In the Project, synergy effects between the ODA loan and the TA were expected. In addition, two SAPI studies were conducted and ITS experts were dispatched. Of the two SAPI studies, one that started in 2011 formulated a master plan for ITS to improve the transportation system in Hyderabad, as ITS was being introduced in the Project.

In this way, to introduce and operate ITS smoothly on the ORR, JICA's cooperation schemes were used from various aspects, and indispensable support was provided for the achievement of the project goals. The synergy between the ODA loan project and the TA is described in the Effectiveness and Impacts section.

3.1.2.3 External Coherence

The Project falls under SDG 11, which is "Make cities and human settlements inclusive, safe, resilient and sustainable." As described in "3.3.2.1 Intended Impacts," the Project contributed to reducing traffic volume in Hyderabad and delivering widely the benefits of economic development to the Hyderabad metropolitan area.

In the Hyderabad metropolitan area, the Unified Metropolitan Transport Authority (UMTA) was established in 2008 to coordinate among various modes of transportation. As a result, collaboration and coordination were made for plans and development of route networks that would eventually allow people to travel to the radial road bound for the ORR using the metro, from where they would be able to transfer to the suburbs by using buses.

In addition, the ORR was made possible with funding from ODA loans, PPPs, and the Telangana State government, depending on the section. As different funds were used to complete one project, it is fair to say that there was coherence.

At the times of both the appraisal and the ex-post evaluation, consistency with the policies and development needs of the Government of India and the Hyderabad metropolitan area regarding

urban transportation are confirmed. Appropriateness of the project plans and approaches were also confirmed. The Project is also in line with Japan's ODA policy at the time of the appraisal, and there has been synergy effects among the multiple types of support brought by the JICA schemes. There was collaboration with other agencies as well, and some contribution was made in light of an international framework. Therefore, the Project's relevance and coherence are high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

ODA Loan

Of the ORR whose total length is 158 km, Phase 1 (ID-P 193) of the ODA loan covered 38 km of Legs 4–6, and Phase 2 (ID-P 198) covered 33 km of Legs 7–9. Legs 1–3 were funded by the state government (borrowed from commercial banks), and Legs 10–12 by PPP, and both were opened in stages between 2008 and 2012. Generally, as the ORR project as a whole, Legs 1–3 that are not part of the ODA loan project is referred to as Phase 1, and the other sections are referred to as Phase 2. To avoid confusion with the name of the ODA loan project, Phase 1 of the ODA loan project will be referred to as ID-P 193 and Phase 2 as ID-P 198 in this report. The sections of the ORR implemented by each project are shown in the figure below along with the major national highways. The ODA loan sections of the ORR were commercially opened in stages from 2013 to 2016.

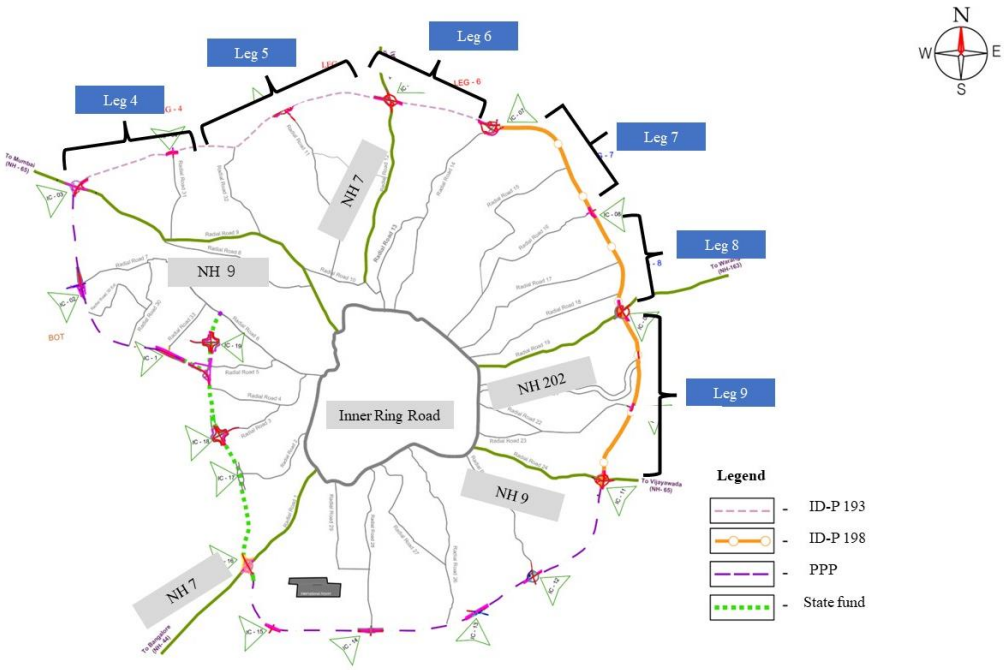


Figure 2: Overview of Hyderabad ORR

In addition to the construction of the ORR, the Project scope included service roads, interchanges, toll booths, introduction of ITS equipment, and the development of radial roads. Moreover, the scope covered HIV/AIDS prevention activities at construction sites and consulting services.

Changes in the scope of the ODA loan project from the plan included the design of the interchanges, underpasses, the number of toll booths, and the cancellation of bus bays. As for the interchanges, mainly rotary interchanges were originally planned, but the changes were made because a SAPI study proposed the double trumpet type as kilometer-based toll collection had not been taken into account. Regarding the bus bays, it was originally assumed that buses would also use the ORR; however, since only long-distance buses use the ORR, bus bays were removed from the scope. Such changes in the scope appear to be appropriate, mainly based on proposals from the SAPI study and considering the situation on the ground after the Project began. According to interviews with HGCL, the Executing Agency, there was no significant impact on Project costs and the implementation period due to these changes. Moreover, as described in "3.2.2.1 Project Cost," there was a significant amount of unused funds in the Project. To make good use of such funds, additional radial roads, city ITS,[9] construction of toll administrative buildings, illumination on non-ODA loan sections, and greening of the median were added. Moreover, the consulting services were executed as planned.

Measures taken during construction

In the Project, strict safety at the construction sites and HIV/AIDS prevention activities for the workers were planned during the construction.

a) Safety measures

Safety measures during construction were included as obligations in the contracts of the consultants and contractors. To protect the safety and health of workers and people living nearby, the contractors had to formulate a project safety plan for each site; and based on the plan, they were required to take such measures as assigning safety engineers, conducting safety management training, safety inspections, and reporting accidents. Although thorough safety plans were in place, there were two fatal accidents in the Project.[10] After the accidents, instead of increasing the number of new initiatives and inspections, existing measures were followed through more strictly to prevent future accidents. Moreover, the Project included construction in close proximity to

[9] Although preparations were made for procurement in the Project, it took time to complete the tendering process. As a result, the city traffic police procured it with its own funds, and it was eventually removed from the scope of the Project.

[10] One accident occurred when a rebar collapsed during the installation. The accident may have been triggered by the ground loosened by the rain on the previous day. The other incident occurred at a pipe culvert construction site when an embankment collapsed.

operational railway lines. In this regard, in coordination with Indian Railways, the risk was reduced by working outside of business hours.

b) HIV/AIDS prevention activities

The Project was a large-scale construction project where many construction workers including migrant workers living alone would gather in one place, raising the risk of HIV/AIDS infection. Therefore, it was planned to hire an NGO and implement occupational health and safety measures for the workers, including HIV prevention activities, in cooperation with the health department. Cooperation with HIV prevention activities was included in the consultant's work and the contractors' contracts. Social development experts from the consultant team prepared a concept paper on HIV prevention activities, based on which activities such as peer education, distribution of condoms, introduction of HIV and sexually transmitted disease testing and counselling services, and advocacy were implemented. In HIV prevention activities, there were issues such as contractors not being proactive and activities not continuing due to trained peer educators changing their jobs or their contracts expiring. At the same time, the experience revealed that not only construction workers but also site staff of contractors are similarly at risk, and it is important to include peer educators in the scope of activities and to regularly recruit peer educators.

TA Project

The TA project provided support to establish operational arrangement and procurement of ITS, the system procured by the ODA loan. To achieve the following outputs, related activities were planned (see "3.3.1 Effectiveness" for details on achievement of the outputs). Table 1 presents the activities related to each output and changes during the TA project.

Table 1: Activities of the TA Project

Output	Activity	Change
By conducting necessary surveys/ studies regarding the optimal way of toll collection and smooth ITS introduction, problems related to operation & maintenance (O&M) issues and preparation of detailed operation charts are solved.	1-1. To conduct surveys and fix the appropriate toll rate 1-2. To review the ITS components to be introduced 1-3. To review the status of ITS trials conducted by the Ministry of Road Transport & Highways, the Government of India 1-4. To proposed effective ways of promoting Touch & Go[11] and ETC 1-5. To provide assistance on the preparation of detailed operation process of ITS introduction 1-6. To prepare and conduct seminar in Japan for Indian officials and staff regarding the toll collection and ETC	Activity 1-6 was added after the commencement of the TA.

[11] Contactless IC card for toll payment.

Setup for the smooth procurement of necessary ITS components are completed.	2-1. To provide assistance for preparing tender documents including evaluation for procurement of ITS contractor 2-2. To supervise TMS implementation on the southern section of ORR 2-3. To provide assistance for preparing tender documents including evaluation for ITS consultants to supervise implementation of ITS 2-4. To provide assistance for preparing tender documents including evaluation for O&M of ITS system 2-5. To provide assistance and deliver lectures on capacity building related to technical evaluation of ITS contractor 2-6. To provide assistance and deliver lectures on capacity building related to technical evaluation of ITS consultant	Activity 2-2 was cancelled while 2-5 and 2-6 were added in 2013.
Institutional setup for optimal operation and management of toll collection system for the ORR is promptly and firmly completed, and preparation for toll collection system is completed.	3-1. To conduct additional survey on institutional setup for optimal operation and management of toll collection system and HTMS for the ORR including southern and western areas 3-2. To provide assistance for establishment of toll collection system for the ORR (including Touch & Go and ETC) 3-3. To prepare operation manual for toll collection (including ETC) 3-4. To supervise TMS implementation on the southern section of ORR 3-5. To conduct monitoring and evaluation of toll collection	Activities 3-4 and 3-5 were cancelled in 2010. They were added again in 2011, but cancelled in 2013.
Trial experiments on ETC are conducted, and necessary proposals regarding full-scale operation of ETC are made.	4-1. To prepare and conduct trial experiments of ETC 4-2. To promote understanding on the introduction of ETC by relevant organizations 4-3. To distribute OBU and T&G cards for the trial experiment and to manage overall installation operation 4-4. To monitor and evaluate ETC trial experiment 4-5. To present necessary proposals regarding full-scale introduction and operation of ETC	Activities 4-1 and 4-3 were cancelled in 2010. They were added again in 2011 and cancelled in 2013. Activities 4-4 and 4-5 were deleted in 2013.
The development of HTMS operational structure is assisted.	5-1. To prepare HTMS operation manual 5-2. To support selection of HTMS operators (preparation of bid documents) 5-3. To propose organizational setup among agencies related to HTMS operation 5-4. To propose for information exchange with City ITS	All the activities related to this output were added in 2013.

Source: Materials provided by JICA.

In the TA, activities aimed at smooth introduction of ITS, which was to be procured through the ODA loan project, were planned. Therefore, the progress of such activities depended on the progress of the ODA loan project, and 3-4, 3-5, 4-1, and 4-3 among them were once removed

from the TA's activity plan in 2010, but the cooperation period was extended by adding them again in the following year. However, in response to the delay in the procurement of TMS in the ODA loan project, these activities were removed again in 2013 along with 2-2, 4-4 and 4-5, and activities related to supporting the establishment of an HTMS operation system were added (the delay in TMS procurement is explained in "3.2.2.2 Project Period").

In the TA, adding training in Japan after the start of the cooperation provided a valuable opportunity for Indian stakeholders to understand the importance of ITS and practical cases.

The flexible changes in the contents of the TA according to the progress of the ODA loan seems to have been appropriate in providing lateral support to the ODA loan project.

3.2.2 Project Inputs

(Refer to "Comparison of the Original and Actual Scope of the Project" for details at the end of the report)

3.2.2.1 Project Cost

Table 2 presents the planned and actual costs of each project.

Table 2: Planned and Actual Project Costs

	Plan	Actual	Achievement
ID-P 193	Total project cost JPY 54,165 million, of which JPY 41,853 million is ODA loan (JPY 3,947 million in foreign currency and JPY 37,906 million in local currency)	Total project cost JPY 40,851 million, of which JPY 24,807 million is ODA loan (JPY 380 million in foreign currency and JPY 27,253 million in local currency)	Total project cost 75%, ODA loan 59%
ID-P 198	Total project cost JPY 54,046 million, of which JPY 42,027 million is ODA loan (JPY 7,297 million in foreign currency and JPY 34,730 million in local currency)	Total project cost JPY 39,590 million, of which JPY 26,188 million is ODA loan	Total project cost 73%, ODA loan 62%
TA	JPY 190 million	JPY 254 million	134%

The actual Project cost of the ODA loan was within the plan. The main reason why it remained at about 70% of the plan was the impact of the appreciation of the yen during the Project period. The exchange rates for ID-P193 and ID-P198 at the time of the appraisal were JPY 2.85 and JPY 2.54 per INR 1; but in 2010, the average exchange rate was already below JPY 2 against INR due to the appreciation of the yen. In response, as mentioned above in the Output section, HGCL made several requests for additional scope to use the unused ODA loan, and a portion of the requests was included in the Project. According to an interview with HGCL, there were no problems with the financing and flow of funds on the Indian side.

The actual project cost of the TA was 134% compared to the plan, mainly owing to the increase in the person-month of experts arising from the extension of the project period and the increase in travel expenses along with it.

3.2.2.2 Project Period

The planned and actual project periods are indicated in Table 3.

Table 3: Planned and Actual Project Periods

	Plan	Actual	Achievement
ID-P 193	March 2008 (L/A signing)–February 2013 (5 years 0 month, 60 months)	March 2008 (L/A signing)–March 2017 (9 years 1 month, 109 months)	182%
ID-P 198	November 2008 (L/A signing)–August 2013 (4 years 10 months, 58 months)	November 2008 (L/A signing) –March 2019 (10 years 5 months, 125 months)	215%
TA	January 2010–June 2011 (1 year 6 months, 18 months)	January 2010–October 2013 (3 years 10 months, 46 months)	256%

As mentioned above, the Project periods of the ODA loan significantly exceeded the plan. The definition of completion of an ODA loan is the completion of construction work and consulting services (including the defect liability period). In the Project, some scope were added as described above during the implementation, but no delay was caused by these scope. The main reasons for the delays and the approximate period of each delay are as follows:

- Litigation over the selection process of a TMS contractor (42 months)
- Re-tendering due to the non-performance of a contractor (36 months)
- Disputes related to land acquisition (24 months)
- Procedures for the reallocation of ODA loan funds for ITS consulting service contracts (approximately 12 months)

Since this Project was a large-scale construction, in addition to taking time to acquire the land, the tender related to the installation of TMS resulted in a lawsuit and caused significant delays.[12] Therefore, considering the output, it is difficult to say that a significant extension of the Project period was necessarily appropriate.

[12] One of the technically disqualified bidders filed a lawsuit to appeal the results of the evaluation. In the meantime, another bidder who was also disqualified requested for a re-evaluation of technical proposals. At the direction of the high court, the technical proposals were re-evaluated. As a result, both of these litigant companies cleared technical evaluation, and a third bidder filed a case over the opening of the financial bid. Eventually, the financial proposal was opened at the direction of the high court.

The cooperation period of the TA was also significantly extended. The project added and removed activities through multiple contract amendments, but the main reason for the extension of the cooperation period was not an increase in the content of the activities, but an impact on related activities owing to disputes over the selection process of a TMS contractor.

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

At the time of the appraisal, the financial internal rates of return (FIRR) and economic internal rates of return (EIRR) for ID-P 193 and ID-P 198 were calculated. However, due to the lack of details on the calculation of the internal rates of return at the time of appraisal and the information at the time of ex-post evaluation, both the FIRR and EIRR cannot be recalculated for ID-P 193. The EIRR of ID-P 198 cannot be recalculated due to a lack of information at the time of ex-post evaluation. Although there is information on the FIRR of ID-P 198 at the time of ex-post evaluation, the internal rates of return of the Project should be considered integrally in the entire section of the Project, not only in the target section of ID-P 198. Considering that it is not helpful to show the FIRR of only a part of the section. Accordingly, the report does not recalculate the FIRR and EIRR of ID-193 and ID-198.

To summarize the efficiency of the Project, the output of the ODA loan project was almost as planned. Although the Project costs were within the plan owing to the appreciation of the yen, there was a significant delay in the Project period caused by the litigation related to TMS procurement and land acquisition. Therefore, the efficiency of the Project is moderately low.

3.3 Effectiveness and Impacts[13] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

In the ODA loan project, having a certain amount of traffic volume and saving on travel time were set as operation and effect indicators. The explanation on and the extent of achievement for each indicator are presented below.

Operation indicator: annual average daily traffic

For this indicator, the target values set at the time of the appraisal were revised. The values used as targets at the time of the appraisal were based on the estimates made at the time of the detailed project report in 2006. When the values were studied in the ex-post evaluation, it was found that the traffic volume of the ORR was overestimated in the first place assuming that it would not be a toll road. After the Project began, the inappropriateness of adopting the estimates

[13] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

for the Project was pointed out. In 2008, the Indian Institute of Technology at Chennai (IIT Chennai) recalculated the future traffic volume, and the validity of its calculation was recognized by HGCL and in a SAPI study of JICA. Therefore, after consulting with HGCL and the JICA India Office during the ex-post evaluation, IIT Chennai's forecast value was taken as the target value. The target values in Table 4 are the revised figures.

Table 4: Achievement of Annual Average Daily Traffic[14]

Annual average daily traffic (PCU[15]/day)	Target value (Two years after Project completion)	Actual value (2021)	Achievement value
ID-P 193			
Leg 4 (Patancheru –Narsapur)	23,026	68,138	296%
Leg 5 (Narsapur – Medchal)	37,509	50,712	135%
Leg 6 (Medchal – Shamirpet)	40,927	55,340	135%
ID-P 198			
Leg 7 (Shamirpet – Keesara)	51,244	41,505	81%
Leg 8 (Keesara – Ghatkesar)	55,362	41,478	75%
Leg 9 (Ghatkesar – Amberpet)	58,170	44,610	77%

Source: HGCL

The traffic volume is measured at the mid-block point of each section (leg). The actual figures show the traffic volume in 2021, which is two years after the completion of the Project. The actual values of all sections achieved more than 70%. In 2020 and 2021, the impact of the lockdown due to COVID-19 and the restrictions on movement was significant, and it is estimated that traffic was reduced by about 15%; without the impact of COVID-19, it is likely that the actual traffic volume would have exceeded 80% in all the sections. In addition, while Legs 4 to 6 recorded the traffic volume exceeding the target values, Legs 7 to 9 is only 70 to 80% of the target value. The probable reasons for this are as follows: the area around Legs 4 and 5 is economically developing as an industrial area while in Legs 7 to 9, it was initially expected that cargo trucks from distant places would enter the Hyderabad metropolitan area using NH 202, but the development of roads outside the metropolitan area progressed, and the road network connecting regional cities made it possible to travel without passing through the ORR from NH 202.

Table 5 shows the actual traffic volume from 2019 to April 2022 and a forecast for the sections of the ORR under the ODA loan. As mentioned earlier, there are sections that had less traffic than

[14] There is no baseline value because the ORR was newly constructed.

[15] Passenger car unit. It is the number equivalent to the one of passenger cars.

in 2020 and 2021 than 2019 because of COVID-19. The traffic volume is expected to increase at an annual rate of 5% based on the growth rate of the number of registered vehicles in the Hyderabad metropolitan area.

Table 5: Actual Traffic Volume and Forecast (PCU/day)

	Leg 4	Leg 5	Leg 6	Leg 7	Leg 8	Leg 9
2019	65,936	61,614	49,159	36,870	38,204	44,261
2020	50,026	41,722	40,029	30,022	29,467	34,838
2021	68,138	50,712	55,340	41,505	41,478	44,610
2022	73,108	56,808	61,045	45,784	46,705	54,599
2023	76,763	59,649	64,097	48,073	49,040	57,329
2024	80,601	62,631	67,302	50,476	51,492	60,196
2025	84,631	65,763	70,667	53,000	54,067	63,205
2026	88,863	69,051	74,200	55,650	56,770	66,366
2027	93,306	72,503	77,910	58,433	59,608	69,684
2028	97,971	76,128	81,806	61,354	62,589	73,168
2029	102,870	79,935	85,896	64,422	65,718	76,826
2030	108,013	83,932	90,191	67,643	69,004	80,668

Source: HGCL

Effect indicators: saving on travel time

This indicator compares the travel time of three road sections defined at the time of the appraisal wherein traveling through the city before the Project and travel using the ORR after the Project. As for the pre-Project routes, it targeted NH 9 Junction (Jct) – NH 7 Jct via BHEL – Miyapur – Bachupally – Mysamma Temple, NH 7 Jct – NH 202 Jct via Bowenpally – Tarnaka – Uppal Cross Road – Boduppal, NH 202 Jct – NH 9 Jct via LB Nagar and Uppal Cross Road.

Table 6: Achievement in Travel Time Saving

Travel time saving (min)	Target value (Two years after Project completion)	Travel time before the Project (2008)	Travel time after the Project (2022)	Actual value[16] (travel time saving)	Achievement value[17]
NH 9 Jct – NH 7 Jct	60	80	22	58	97%
NH 7 Jct – NH 202 Jct	60	76	22	54	90%
NH 202 Jct – NH 9 Jct	30	38	11	27	90%

Source: HGCL

[16] Calculated by subtracting the travel time required after the Project from the travel time required before the Project is implemented.
[17] Calculated by dividing the actual value by the target value of the travel time saving.

The above actual values are for 2021. Based on the difference in time required (shortened time) before and after the implementation of the Project, the degree of achievement is 90% or more in all three sections. When the target values were set at the time of the appraisal, the speed limit of the ORR was set at 120 km/h; however, since it is 100 km/hour now, this could be the reason the actual time saved is slightly less than the initial target.

<Column 1> Promoting the use of the ORR

HGCL has taken various measures to bring more traffic on the ORR. Here are a few examples.

· Introduction of appropriate toll policies: The fare structure initially considered by the TA was first based on the idea of inducing traffic volume rather than business profitability.

· Systematic development of radial roads: To connect the ORR with the inner ring road, the widening and rehabilitation of 33 radial roads is being implemented in stages.

· Urban development plan around the ORR: The 1 km on both sides of the ORR is designated as a growth corridor according to the government's notification, and development for multi-purpose use such as commerce and residential areas is being promoted in conjunction with the development of a grid road.

· Other measures: Free distribution of ETC cards; prohibition of trucks driving into the city (during the day); emergency systems and patrols are provided to make it comfortable to use the ORR. In the future, the improvement of the ORR's service areas is also planned.

3.3.1.2 Qualitative Effects (Other Effects)

TA

The TA was expected to smoothly introduce the effective operation system for the toll collection system (TMS) and the highway traffic control system (HTMS). By realizing the smooth introduction of the Intelligent Transportation System (ITS), the Project Purpose was expected to be achieved. Table 7 shows the Project Purpose and the Outputs, as well as their achievement status.

Table 7: Achievement Status of the Project Purpose of the TA

Project Purpose/Output	Indicator	Achievement Status
Project Purpose: Smooth introduction of effective operation system (TMS and HTMS)	Smooth introduction of ITS is actualized.	Partially achieved: Although ITS was not introduced within the cooperation period, the preparation for the procurement of ITS and operational management system were established

		after the project.
Output 1: By conducting necessary surveys/ studies regarding the optimal way of toll collection and smooth ITS introduction, problems related to operation & maintenance (O&M) issues and preparation of detailed operation charts are solved.	a) The preparation necessary for operational management system is completed. b) The preparation necessary for the introduction of ITS is completed.	Both a) and b) achieved: Fare structure was determined based on a willingness-to-pay survey conducted in April and May 2010. ITS components were studied and the basic plans for TMS and HTMS were set. A detailed schedule for introduction of ITS was made.
Output 2: Setup for the smooth procurement of necessary ITS components are completed.	a) The preparation for the procurement (including tender document and evaluation) of toll collection concessionaire, ITS consultant, and ITS contractor is completed. b) The preparation for the supervision of the implementation of toll collection system is completed.	a) was achieved while b) was partially achieved: By the time of Project completion, the preparation for the procurement of ITS components was made, including TMS and HTMS installation and operation, and a HTMS contractor. After the Project, an ITS consultant was hired in July 2015, and ITS for the ORR was established.
Output 3: Institutional setup for optimal operation and management of toll collection system for the ORR is established, and preparation for toll collection system is completed.	a) Establishment of toll collection system (including Touch & Go and ETC) is completed. b) All operation manual for the operation of toll collection (including ETC) is completed. c) Toll collection staff become capable to work properly based on the results of training.	a) and c) were not achieved while b) was achieved: Although the tendering process for TMS started, the procurement process was not completed within the Project duration owing to court cases. However, a TMS operation manual was prepared, and the TMS contractor was selected in December 2014.
Output 4: Trial experiments on ETC are conducted, and necessary proposals regarding full-scale operation of ETC are made.	The preparation for full-scale operation of ETC is completed.	Achieved: The TA introduced ETC system and T&G technologies to HGCL along with technical advice for operationalizing. A trial of ETC was omitted from the Project because TMS contractor had yet to be selected. The trial was conducted thereafter in August 2018 and the toll operation started in December 2018.
Output 5: The development of HTMS operational structure is assisted (added in 2013).	No indicator	Achieved: An HTMS operation manual was prepared and institutional arrangements were proposed. In September 2016, an HTMS contractor was selected in accordance with the

		above. The Project also made suggestions in information exchange mechanism between the ORR and City ITS.

In the introduction of ITS, Outputs 2 and 3 were only partially achieved owing to difficulties in the TMS procurement procedure. Therefore, the achievement of the Project Purpose within the TA's duration was partial. The TA made it possible to smoothly introduce ITS later by establishing procurement procedures and operation systems. As can be seen in the use of HTMS and TMS described in <Column 2>, the use of safe and comfortable roads is being promoted and an efficient toll collection system is in place, thus responding to the increasing demand for road traffic.

The TA was designed in such a way that it would contribute to achieving the objective of the ODA loan project. In addition, through training in Japan and daily communication, the TA contributed to deepening the understanding of the importance of ITS among those involved in implementing ITS and led to the smooth operation of ITS.

ODA Loan

The qualitative effects of the Project were expected to be a) improvement of safety and comfort of road traffic, and b) improvement of convenience by ensuring punctuality of movement. For the former, in addition to providing information using HTMS, for an accident or emergency on the ORR, an emergency call box for SOS is installed every 1 km, and road users can contact ambulances and patrol teams through the call center. A trauma care center is attached to each interchange of the ORR, where road users can receive first aid and be transported to nearby hospitals. The trauma center is operated in partnership with a major hospital in India.

Emergency call box installed on the ORR


Inside the Trauma Care Center

Initially, motorcycles were allowed to travel on the ORR and the speed limit was 120 km; thus, accidents were frequent. To reduce accidents, two- and three-wheelers were subsequently banned and the speed limit was lowered to 100 km in 2018. In addition, the installation of lighting at night

has significantly reduced the number of accidents.[18] In this way, safety is promoted on the roads. For details, refer to <Column 2>.

With regard to improving convenience by ensuring the punctuality of movement, the ORR does not cause a situation in which the travel time cannot be foreseen owing to heavy traffic congestion, as in the case of the city road network, and the travel time has been reduced. When the residents and business establishments around the ORR were interviewed during the ex-post evaluation, most of the respondents who regularly travel to other areas within the Hyderabad metropolitan area said that the travel time became shorter than before.[19] Some of them stated that, although a toll fee must be paid to use the ORR, since there was no traffic jam and the travel time to the destination would be predicted fairly accurately, some people would use the ORR for daily travel rather than the general roads. Thus, it seems fair to say that the ORR has led to the improvement of convenience.

[18] In 2016 and 2017, there were more than 1,500 accidents per year; however, since 2018, the number of accidents has been 600 to 700 per year.
[19] In the qualitative survey, interviews were conducted with 20 residents and 10 business establishments around the ORR.

<Column 2> Application of ITS

Use of HTMS: Through the variable message system (VMS), road users are reminded of accidents on the ORR and safe driving. VMS also disseminates information on bad weather such as heavy rain and dense fog. The ORR itself is rarely congested with traffic. According to HGCL's ITS personnel, the information on vehicles on the ORR is obtained from automated traffic counters. This information apparently is used for road maintenance and management.

Use of TMS: Information on vehicles is collected lane-wise at the toll plazas. There are two types of toll collection: cash and FASTag (ETC card) payment using RFID (contactless automatic reading). By promoting the use of ETC, the time taken for transaction at each toll booth is reduced. Problems with ETC card payments have also been detected, and the introduction of TMS has made it possible to prevent fraud and non-collection of tolls.

Toll plaza

VMS

3.3.2 Impacts

3.3.2.1 Intended Impacts

The expected impact of the Project was to reduce traffic congestion in the city center and contribute to the development of the regional economy. The Project was also expected to alleviate traffic pollution by easing traffic congestion. Although there is no quantitative information on easing traffic congestion in the city center, the population and the number of registered vehicles in the city are increasing each year. Under these circumstances, since it has become possible to bypass the city by using the ORR, the Project is considered to be contributing in no small part to reducing traffic congestion in the city center. Thus, by preventing a certain influx of traffic into the city, it is fair to say that the Project is contributing to the mitigation of air pollution in the city.[20]

As for the development of the regional economy, between 2017 and 2021, 603 new residential,

[20] Based on an interview with HGCL.

commercial, and industrial permits were issued solely within the growth corridor along the ORR. Revenues from these new registrations amounted to INR 7.8 billion.[21] With the construction and opening of the ORR, development has been observed in many areas. However, the degree of development varies from region to region, and although there have been significant changes from the northwest to the north section of the ORR under the ODA loan, the advance of industry in the northeast is limited. Because of its proximity to the airport, the western part of the city was developed as a financial district, turning into a business district with a concentration of finance and IT companies. In the north, there is a warehouse and medical equipment industrial zone, which was developed in conjunction with the construction of the ORR. The region-wise changes revealed from interviews with residents and business establishments (qualitative surveys) are shown in Table 8.

Table 8: Changes in the Regional Economy of Hyderabad

Region	Summary of finding
Northwest (along NH 9)	Owing to NH 9 heading toward Mumbai, the area has more traffic than before. The construction of the ORR further increased traffic and caused more dust. At the same time, the number of stores and offices increased. Employees of IT companies have moved into newly constructed apartments and residences.
North (along Radial Road 11)	With the construction of the ORR, the traffic volume of RadialRoad 11 increased. The traffic most likely consists of commuters from the suburbs to the city. Many shops and residences were established. As the population of the area grew, so did the number of customers and businesses; thus, business profits increased.
Northeast, Yadagappally village (between Shamirpet and Keesara)	Along with the construction of the ORR, the Institute for Defense Studies and Research was established nearby, which gave many people in the village employment opportunities. Staff from the institute have moved into the village. Previously, there was much traffic with vehicles using the roads in the village as a bypass, but this was reduced with the coming of the ORR. Although there was no economic development similar to other areas, rising land prices led to a trend for villagers to sell part of their land and build permanent housing.

Owing to the construction of the ORR, the land prices along the road have increased. In the qualitative survey, many people said that the land price became fivefold before and after the

[21] HMDA

construction of the ORR, and in some areas it became 20 to 40 times. Even in undeveloped areas along the ORR, based on expectations of future economic development, real estate agents setting up offices on vacant plots were visible. Interviews with residents and business establishments indicated that the construction of the ORR and the accompanying rise in land prices were largely well received.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Natural Environment

The Project was classified as Category A because it was in the road sector and had the characteristics that are likely to have an impact as listed in the Japan Bank for International Cooperation's "Guidelines for Confirmation of Environmental and Social Considerations" (April 2002).

Environmental monitoring during the implementation of the Project was included in the work of the project management consultant. Moreover, Jawaharlal Nehru Technical University in Hyderabad was commissioned to regularly monitor air and water quality (surface and underground) at nine locations falling under the ODA loan sections. Wastewater was not monitored because there was no contaminated water discharge from the construction sites. Other compliance conditions set out in the Environmental Monitoring Plan such as providing camps and fuel for the workers and measures to prevent soil erosion were taken. As the construction sites were far from residential areas, soundproof walls were not required, and thus not installed.

After the completion of the ORR, HMDA has been conducting monthly environmental monitoring at 21 locations along the ORR to monitor air and water quality. In addition, if any parameters are exceeding the permissible level, a notice is issued to the business establishments that are the source of contamination.

In the course of the Project, 3,379 trees were felled. Since the land acquisition for the Project included forest land, alternative land was prepared in Nalgonda District outside the Hyderabad metropolitan area, and compensatory afforestation was implemented in the alternative site and the ORR (see the next section on land acquisition for the size of the land acquired). Two trees were planted for each tree felled. Vegetation of alternative plantation sites was confirmed through Google Earth; before 2008–2011, the plots were degraded or had sparse vegetation, but they are now in a state where the existence of trees can be confirmed. Trees planted for greening along the ORR road are not counted in compensatory afforestation.[22]

Appropriate measures were taken for environmental monitoring and compensatory afforestation during the Project and up to the present. No objections or complaints have been confirmed thus far from NGOs or civil society groups concerned about the impact on the

[22] The number of trees planted along the ORR (the ODA loan sections) is 2,647,771, including trees planted in the road median and interchanges.

environment.

2) Resettlement and Land Acquisition

Initially, the scale of the land acquisition for the Project was set at a total of 1,064 ha, including ID-P193 and ID-P 198. At the end, the total area of 1,345 ha was acquired. The actual size of land acquisition increased owing to slight changes in ORR alignment after the start of the Project. Moreover, the acquisition of adjacent land was not initially included in the land acquisition by the Project, but some adjacent lands were acquired together as the pieces of land belonged to the same owner. Table 9 summarizes the planned and actual number of resettled households required. Fifty-seven households lost their homes for the Project, and were relocated to other places.[23]

Table 9: Scale of Resettlement (households)

Village	Plan	Actual
Ramapallydayara	1	0
Yadagarpally East	53	42
Dilwaruguda	5	0
Kistareddyped	20	15
Total	79	57

For Yadagarpally East, an alternative site (R&R Layout) was prepared nearby, and project affected people (PAP) were assigned plots in R&R Layout. However, because it took time to prepare R&R Layout, PAP did not set up new houses there, but secured another land or residence in the village with the compensation, and still live there. PAP have kept the allotted land as an asset.

Fifteen households in Kistareddyped were to be provided with land and funding for housing at a nearby location by another government housing scheme for low-income families. However, at the time of the ex-post evaluation, it was found that, although the plots had been allocated from the housing scheme, there was a complaint on the part of the PAP regarding insufficient funds for the construction of the house. Thus, house construction has not been started, and the relocation is not yet complete.[24] These 15 households are still living in the original location. Thus, it is necessary to coordinate among the relevant agencies and complete the relocation at the earliest.

[23] To confirm the reason for the number of PAP decreasing from the plan, the records of land acquisition was checked at the time of the ex-post evaluation. It seems that barns and sheds were included at the time of the appraisal instead of buildings such as residence.

[24] Although resettlement is not complete, service roads have been completed and are in use, except for some short distance. Currently, people who need to use service road must take a detour. Given the current traffic volume, there are no problems with the use of the service road; however, when the traffic increases in the future on the service road, it may become inconvenient for the road users. The service road in question is not part of the ODA loan.

The land to be relocated is about 200 meters from the current place of residence, and risks such as affecting livelihoods are not assumed.

During the ex-post evaluation, three households that had lost only their land[25] and two households in Yadagarpally East who had lost their homes were interviewed. The interviews revealed that a prior consultation with PAP was organized by the Project, and that the PAP were generally satisfied with the contents of the compensation. There was also no economic damage to households from the land acquisition, and there were no reports of a decline in income. In particular, many households that had lost only their land had been living in central Hyderabad or outside the Hyderabad metropolitan area even before the land acquisition.

A compensation guideline dedicated to the Project were issued by the government order in 2006.[26] The guideline divides the types of land acquired by the Project into four categories, and stipulates compensation by category.[27] The land needed for the ORR is usually just a portion of any owned land, and it has been many years since the construction of the ORR was announced and the land price has already risen, and the compensation package reflects these situations. Thus, consideration was given so as not to create unfavorable conditions for the PAP. All PAP, with the exception of those in Kistareddyped, were given plots in the R&R Layout prepared by HMDA. Furthermore, by presenting an attractive compensation package in the Project, a mechanism to speed up the land acquisition was created. If the compensation package is not accepted and the case turns into court cases, a compensation above the market price will no longer be applied. In the case of land acquisition in large-scale public works projects in India, it is not uncommon to have appeal against the amount of compensation in the court; however, the measures discussed above in the Project made it possible to avoid unnecessary litigations.

On the other hand, with regard to R&R Layout, the same guideline states that the plots are to be handed over to the PAP within two years along with the development of basic infrastructure. However, in reality, it took time to secure the land for R&R Layout, and the handing over is still in process at the time of the ex-post evaluation.

To summarize the effectiveness and impacts, regarding operation and effectiveness indicators, the expected effects of the Project were largely achieved. The Project Purpose of the TA was also partially achieved, and measures such as improving the safety and comfort of road traffic were taken. No adverse impact on the natural environment of the Project was confirmed during road construction or after the completion of the Project. With regard to land acquisition and resettlement, a compensation guideline for the Project was prepared and appropriate

[25] Land owners of Koheda, Bonguluru, and Celebrity Colony.
[26] The guideline applies to the entire portion of the ODA loan and part of the non-ODA loan sections. Land acquisition for other sections had already been completed at the time of the notification of the guideline.
[27] Categories are as follows: a) agricultural land, b) HUDA approved plot, c) assigned land, and d) houses and institutional land.

compensation seems to have been provided in accordance with the guideline. As described above, the Project has mostly achieved its objectives. Therefore, effectiveness and impacts of the Project are high.

3.4 Sustainability (Rating: ④)

3.4.1 Policy and System

The Government of India updated *National Urban Transport Policy* in 2014 and demonstrated the importance of traffic management, including the application of ITS, and the development of laws and structures related to urban transport. This is a sign of political commitment in the urban transport sector. Given the multiple laws and agencies involved in the sector, as well as the overlap and lack of adequate coordination between the roles, the policy recommends the establishment of an organization responsible for comprehensive development of the urban transport sector. In response, India's first UMTA was established in Hyderabad in 2008. UMTA is involved in planning, policy development, coordination among agencies responsible for various modes of transport, and promoting the use of non-motorized vehicles such as bicycles. It is also striving to integrate bus and metro networks.

One kilometer on both sides of the ORR is designated as a growth corridor, and development is being implemented in accordance with land use regulations. Regarding the toll fee for the ORR, the Telangana State government issued a notification in 2012 that the toll would be reviewed every year, and the toll has been revised systematically.

3.4.2 Institutional/Organizational Aspect

HGCL is a special-purpose vehicle established in December 2005 under the Companies Act of India (1956) with the capital from the Hyderabad Urban Development Authority[28] (HUDA) and the Andhra Pradesh Infrastructure Development Corporation for the construction and operation of the ORR including the section of the Project.

As expected at the time of the appraisal, HGCL is in charge of the operation and maintenance of the ORR after its opening. The collection of tolls for the use of the ORR, the maintenance of the road, and the ITS are outsourced. The radial roads are managed by the Road and Building Department of the Telangana State government.

As of February 2022, HGCL has 58 employees. Led by the Managing Director, an Indian Administrative Service member, the senior management is staffed by HMDA employees. Others are on deputation from other government organizations or contracted employees. The term of deputation is usually five years, and the contract staff are sent from a national institution specialized in construction management and research, and there are no vacancies in HGCL. Although HGCL is a lean organization, its departments are divided into fields such as ITS and

[28] In 2008, HUDA was restructured and became HMDA.

civil work, and duties are segregated.

Toll collectors for the ORR have a wealth of experience in toll collection operations in other cities in India. By securing more personnel than necessary, the operator is able to cope with sudden staff absences or an increase in traffic volume on holidays. In addition, by hiring staff from the vicinity of each toll plaza, it has made it convenient for female employees to commute to work and can take necessary measures in the event of an emergency.

For outsourcing road maintenance, TMS and HTMS, the structure and personnel are in place as specified in each contract. In particular, with regard to ITS, based on the proposals of the TA, ITS consultants and HTMS operation system were established.

Thus, the organization in charge of operation and maintenance has not changed from the time of the appraisal, and there are no problems regarding institutional arrangements and personnel within HGCL or among the contractors.

3.4.3 Technical Aspect

HGCL does not have a regular training system, and employees on secondment and contract are trained at their parent organization to improve their knowledge and skills. The staff involved in operation and maintenance are from organizations in charge of such tasks as road maintenance, and have academic background and qualifications mainly in engineering. In TMS and HTMS, there is a clause on training in the contract, and the contractor conducts training for HGCL and its staff according to the contract. For example, in the case of HTMS, training on system operation includes courses such as system management, emergency call box operation, CCTV operation, traffic control and other systems. Regarding toll collectors, monthly training is provided to the staff of the toll plazas in order to train new recruits and ensure that the existing employees are fully aware of the contents of their work.

For operation and maintenance, a TMS manual, a HTMS manual, and a toll collection system manual are available. The toll collection system manual is updated annually. According to interviews with HGCL and contractors, the manual was used appropriately and no issues were reported.

Inspection and maintenance records are also kept. If there is an abnormality during the inspection of the road, it can be reported to the concerned parties using WhatsApp along with a photograph.

The technical level of the staff of both HGCL and the contractors seems to be appropriate for conducting the operation and maintenance. Various manuals have also been prepared and updated as necessary, and there are no particular technical issues.

3.4.4 Financial Aspect

Table 10 shows the balance sheets of HGCL from fiscal year (FY) 2016 to 2020.

Table 10: Balance Sheets of HGCL

Unit: INR million

FY	2016	2017	2018	2019	2020
Revenue	1,100	1,918	3,162	2,916	2,299
Expenditure	86	274	175	271	220
Balance	1,014	1,644	2,987	2,645	2,079

Source: HGCL

All HGCL revenues consist of toll collection, without budget allocations from the central or state governments. The toll collection for the ORR has been steadily increasing since the opening, and the revenue from it has been sufficient to cover the cost of operation and maintenance. As mentioned above, the toll fee structure is reviewed every year. Toll fees are revised based on the Consumer Price Index. Current toll fees are determined by the type of vehicle and travel distance.

According to interviews with HGCL and contractor engaged in toll collection, there has been a temporary decline in toll revenue owing to the suspension of economic activity and movement restrictions due to COVID-19. Since the contractors pay HGCL a fixed amount every month based on the revenue from the toll collection agreed at the time of the contract, there was no significant impact of COVID-19 on HGCL's revenue.

3.4.5 Environmental and Social Aspect

The environmental monitoring plan recommended the following measures to prevent and mitigate any adverse impact on the natural environment and surrounding areas after the opening of the ORR.

- Planting and maintaining roadside plantation to reduce air pollution and noise
- Formulation of development plans and enforcement of regulations on activities along the ORR to prevent unplanned development
- Removal of labor camps set up on construction sites after the completion of the Project
- Traffic accident monitoring
- Installation of an appropriate number of road signs
- Installation of soundproof walls in sections where noise is a concern

When confirmed during the ex-post evaluation, everything except the installation of soundproof walls was complied with. As for soundproof walls, they were not found necessary because there were no residences in the area within 150 m from the ORR, which was designated as a buffer zone.

Status of land acquisition and PAP are presented in "3.3.2.2 Other Positive and Negative

Impacts." Interviews with residents and business establishments revealed that economic development accelerated in the areas around the ORR. The degree to which the areas have benefited from economic development varies, but no negative impact has been confirmed.

3.4.6 Preventative Measures to Risks

Although the existence of any unexpected risks was checked with HGCL during interviews and the field survey, there were no risks to the operation and maintenance of the ORR or to the surrounding areas.

3.4.7 Status of Operation and Maintenance

During the field survey, the entire ORR, including the non-ODA loan sections, was driven to confirm the status of use and maintenance of motorways, service roads, interchanges, toll plazas (including toll administrative buildings), and radial roads. There was no damage to the roads or other facilities, and they were kept in good condition to this day. The roads are cleaned daily and inspected through patrols. Road structural assessments are also conducted regularly, and maintenance is carried out based on the assessment results. Overlay work on the roads is to be carried out every six years, and the sections constructed by the ODA loan are to be re-paved in the future.

Thus far, there have been no major problems with the ORR. For accidents that occur on the road on a daily basis, a system is in place for patrol teams and the traffic police to rush to the scene. As mentioned above, to be able to respond in the event of an emergency, a trauma care center equipped with an ambulance is attached to each toll plaza.

With regard to ITS, the systems in the HTMS and TMS sections established in the traffic control center at the HGCL headquarters, as well as in the toll administrative building at each toll plaza were checked. Both HTMS and TMS were running normally. The maintenance of HTMS and TMS is included in the contract with a third party, and the contractor takes appropriate measures.

To summarize sustainability, the policies and systems concerning the ORR have been established, and there are no problems with the institutional arrangements and technical aspects of HGCL and contractors including ITS. HGCL's financial status is also not a problem. In addition, there are no environmental and social risks. Sustainability of the Project effects is very high.

4. Conclusion, Lessons Learned, and Recommendations

4.1 Conclusion

Regarding relevance and coherence, the Project was consistent with the policies and development needs of the Government of India and the Hyderabad metropolitan area both at the times of the appraisal and the ex-post evaluation. The Project design and approach were also

confirmed to be appropriate. The Project was consistent with the ODA policy of Japan at the time of the project appraisal, and there was synergy among the projects implemented using JICA schemes. Collaboration with other agencies existed, and some contributions were made in light of an international framework; therefore, relevance and coherence are high. Output of the ODA loan project was almost as planned, and the project cost was within the plan. However, there were delays in project duration because of court cases on procurement of TMS and land acquisition. Therefore, the efficiency of the Project is moderately low. On effectiveness and impacts, the operation and effect indicators of the Projects were mostly achieved. The project purpose of TA was also partially achieved. No adverse impact on the natural environment during the construction and after the Project completion has been reported. Regarding land acquisition and resettlement, a compensation guideline was prepared for the Project, and proper compensation was provided according to the guideline. Therefore, effectiveness and impact are high. On sustainability of the Project, the policy and system regarding the ORR were established. No issues are found in respect to organizational arrangements and technical aspects of HGCL as well as the contractors. The financial status of HGCL is also sound. No particular risk is identified on environmental and social aspects. Therefore, sustainability of the Project effects is very high.

In light of the above, this Project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Continuation of safety management during construction

In the Project, as a safety measure during construction, safety management obligations were clearly stated in the contracts of the consultants and contractors. Moreover, a project safety plan was formulated, engineers in charge of safety were assigned, and both safety management training and safety inspections were conducted. In the event of an accident, an accident investigation was conducted, and recommendations for subsequent preventive measures were made. In addition to practicing daily safety management at construction sites, it is fair to say that many accidents were most likely prevented by confirming that such safety management was thoroughly implemented through regular monitoring, and by establishing a response system (accident reporting, investigation, future preventive measures) for accidents. As new interchanges will be built on the Hyderabad ORR in the near future, it is recommended that accidents be prevented in the same way by thoroughly implementing the safety management measures at the construction sites during the implementation of the Project.

Coordination for completing resettlement

Although the land acquisition for the Project and the compensation for the PAP were completed, 15 households living in Kistareddyped have not completed resettlement that was to take place

under other schemes. To complete the resettlement, funding for the construction of housing is necessary. HGCL needs to coordinate with housing corporations and the local administration to secure the necessary funding and work to complete the resettlement at the earliest possible opportunity.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Development of a clear compensation guideline with compensation packages to accelerate land acquisition

Although the Project was a large-scale infrastructure development project, considering its sheer scale, there were relatively few complaints and lawsuits related to the land acquisition. There are two factors contributing to this. One is that the scope and content of compensation were clarified according to the classification (land use) of the land to be acquired, and the government issued the guideline for compensation. As a result, the compensation guideline became clear to the parties concerned and transparency was ensured. Second, the compensation was made more attractive on the condition that PAP agreed to a compensation package presented under the guideline, thereby preventing lawsuits as much as possible. If a case went to the court, it would take a significant amount of time to settle it. Thus, taking these steps allowed the Project to expedite the process of land acquisition (especially in the case of India, where some people take frivolous legal action in an attempt to increase compensation). Furthermore, providing R&R Layout with basic infrastructure near the ORR made the PAP understand that the value of R&R Layout will increase in the future, and it is reasonable to conclude that many PAP agreed to the compensation as a future asset.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	a) Civil and electric work and equipment for road construction (highway, service road, interchange, toll plaza, introduction of ITS [ID-P 198 only]) and radial roads	As planned
	b) Social development (HIV/AIDS prevention activities)	As planned
	c) Consulting services (construction supervision, support for strengthening the O&M system)	As planned
2. Project Period	ID-P 193 March 2008–February 2013 (60 months) ID-P 198 November 2008–August 2013 (58 months)	ID-P 193 March 2008–March 2017 (109 months) ID-P 198 November 2008–March 2019 (125 months)
3. Project Cost	ID-P 193	ID-P 193
Amount Paid in Foreign Currency	JPY 6,282 million	JPY 2,918 million
Amount Paid in Local Currency	JPY 47,883 million (INR 16,801 million)	JPY 37,933 million (INR 21,431 million)
Total	JPY 54,165 million	JPY 40,851 million
ODA Loan Portion	JPY 41,853 million	JPY 24,807 million
Exchange Rate	INR 1＝JPY 2.85 (As of October 2007)	INR 1＝JPY 1.77 (Average between January 2008 and December 2019)
	ID-P 198	ID-P 198
Amount Paid in Foreign Currency	JPY 9,496 million	JPY 1,867 million
Amount Paid in Local Currency	JPY 44,550 million (INR 17,539 million)	JPY 37,723 million (INR 21,312 million)

Total ODA Loan Portion Exchange Rate	JPY 54,046 million JPY 42,027 million INR 1＝JPY 2.54 (As of June 2008)	JPY 39,590 million JPY 26,188 million INR 1＝JPY 1.77 (Average between January 2008 and December 2019)
4. Final Disbursement	March 2016 (ID-P 193) February 2020 (ID-P 198)	