EX-POST PROJECT EVALUATION 2013: PACKAGE II-6 (TURKEY, BULGARIA, ROMANIA)

JULY 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

SANSHU ENGINEERING CONSULTANT

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Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2011, and Technical Cooperation projects and Grant Aid projects, most of which project cost exceeds 1 billion JPY, that were mainly completed in fiscal year 2010. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

July 2014
Toshitsugu Uesawa
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations, the English translation of the original Japanese version, shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA. JICA is not responsible for the accuracy of English translation, and the Japanese version shall prevail in the event of any inconsistency with the English version.

Minor amendments may be made when the contents of this volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

Republic of Turkey

Ex-Post Evaluation of Japanese ODA Loan Project

Seismic Reinforcement Project for Large Scale Bridges in Istanbul

External Evaluator: Yasuhiro Kawabata, Sanshu Engineering Consultant

0. Summary

The objective of the project was to enhance quake resistance by conducting the reinforcement works to the existing major large scale bridges and their connecting major viaducts in Istanbul, thereby, contributing to securing the lifeline (transportation) and keeping up the socioeconomic activities in the event of disaster/emergency situations. The project has been highly relevant to the development plans and needs of Turkey, as well as Japan's ODA policies. Thus, its relevance is high. The standards for earthquake-resistance design applied are mostly consistent with the Japanese ones used until the Northeastern Pacific Ocean Earthquake occurred in 2011, and thus there is no problem with appropriateness of technical judgment at the appraisal stage. According to the executing agency, collapse of three bridges would be averted and the lifeline (transportation) would be secured in the event of large earthquakes because of enhancement of quake resistance to three bridges under the project. Thus, the project has largely achieved its objectives, and thus the effectiveness and impact is high. Although the actual project scope (output) was partially changed from the originally planned scope, changes made are considered appropriate. Although the project cost was lower than planned, the project period was significantly longer than planned. Therefore, efficiency of the project is considered fair. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

1. Project Description

Project Location

Mecidiyekoy Viaduct

1.1 Background

The target bridges on the First and Second peripheral highways in Istanbul are key and heavily-trafficked structures crossing the Bosphorus Strait and Golden Horn Bay, connecting Europe with Asia. Since there would be no equivalent alternative routes (highways) for crossing the Bosphorus Strait and Golden Horn Bay except crossing by ferries, in the event of collapse or fatal damages to these bridges: 1) both peripheral highways would completely lose their functions as trunk ring highways; 2) the rescue and restoration works after the disaster would be seriously obstructed; and 3) the socioeconomic activities of the country would be stagnated for a long time.

After earthquakes at Kocaeli in August 1999 and Duzce in November 1999, as a result of the subsequent investigations and research, new active faults were discovered under the Sea of Marmara near Istanbul, and high possibility of occurrence of the large earthquakes near Istanbul was pointed out. After the earthquakes in 1999, the investigation of the earthquake damages against the First and Second Bosphorus Bridges and the Golden Horn Bridge was made. As a result of the investigation, no serious damages were found, however, necessity of further seismic reinforcement for those bridges was discussed since those bridges were constructed with the seismic criteria valid at the time of construction. In September 2000, a preliminary study was conducted and in November 2000, a feasibility study was conducted.

In the Disaster Prevention Action Plan prepared by Istanbul City, securing transportation in the event of disaster/emergency situations was considered the top priority agenda. Then, designation of alternative routes for major trunk highways in the event of emergency situations was made. However, it was confirmed that there were no alternative routes for the bridge sections targeted under the project. Based on the above, in January 2001, the Government of Turkey submitted a request for Special Yen Loan for the subject project to the Government of Japan.

1.2 Project Outline

The objective of the project was to enhance quake resistance by conducting the reinforcement works to the existing major large-scale bridges and their connecting major viaducts in Istanbul, thereby, contributing to securing the lifeline (transportation) and keeping up the socioeconomic activities in the event of disaster/emergency situations. The location of the project site is shown in Figure 1.

Figure 1 Location of Project Site

Loan Approved Amount/ Disbursed Amount	12,022 million yen/11,936 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2002/July 2002
Terms and Conditions	For civil work: Interest Rate: 0.95%, Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied For consulting services: Interest Rate: 0.95% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower / Executing Agency(ies)	Government of the Republic of Turkey/ General Directorate of Highways (KGM), Ministry of Transport, Maritime Affairs and Communication
Final Disbursement Date	February 2012
Main Contractor (Over 1 billion yen)	IHI
Main Consultant (Over 100 million yen)	Japan Bridge and Structure Institute.
Feasibility Studies, etc.	Fact Finding Study: Infrastructure Development Institute (2000) Feasibility Study: Japan Bridge and Structure Institute (2000)
Related Projects	Technical Cooperation: ・ Basic Study for Istanbul Earthquake Prevention Plan by JICA, 2001-2003 ・ Earthquake Disaster Prevention Project by JICA, 2005-2008

	ODA Yen Loan: ・Golden Horn Bridge Construction Project (L/A signing: 1972) ・Second Bosphorus Bridge/Motorway Construction Project (I, II, III) (L/A signing: 1985, 1987, 1987) ・Golden Horn Bridge Rehabilitation/Widening Project (L/A signing: 1991) ・Emergency Disaster Reconstruction Project (L/A signing 1999) ・Bozuyuk-Mekece Road Improvement Project (L/A signing: 1999) Other International Organizations: ・Emergency Earthquake Recovery Loan (World Bank) ・Marmara Earth Emergency Reconstruction Loan (World Bank) ・Restructuring of Existing Loan (World Bank)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: September 2013 – August 2014

Duration of the Field Study: November 24 – 29, 2013, February 16 – 22, 2014

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance to the Development Plan of Turkey

The Five-Year Development Plan effective at the appraisal stage was the 8th Five-Year Development Plan (2001-2005). The development targets and priority agendas set in the Plan were: 1) achievement of sustainable high economic growth rates; 2) development of high-technology economy competitive with the global markets; 3) development of human capacity and increase of employment opportunities; 4) improvement of infrastructure and environmental protection; and 5) improvement of disparity between regions, promotion of rural development, reduction of poverty, and improvement of social disparity (source: Country Assessment Report by the Japanese Ministry of Foreign Affairs). The major development targets in the road/highway sector were: ensuring safe and economical transport of passengers and cargo, establishment of policies for reducing negative impacts to the environment, and enhancement of highway standards. In the Disaster Prevention Action Plan (2000), which was prepared by Istanbul Disaster Prevention Management Center, securing transport mode in the

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

[2] ③: High, ② Fair, ① Low

event of disaster/emergency was defined as one of top priority agendas.

In the current 9th Five-Year Development Plan (2007-2013) effective at the ex-post evaluation stage, the following agendas are defined as the development objectives and priorities: 1) increasing competitiveness; 2) increasing employment; 3) strengthening human development and social solidarity; 4) ensuring regional development; and 5) increasing quality and effectiveness in public services. In the Plan, “securing disaster prevention management in rural development and urban planning” is selected as an agenda, and preparation of hazard maps and quake resistant reinforcement works for buildings and infrastructure have been implemented according to the “National Earthquake Strategy and Action Plan (2012-2023)”, which was prepared by the Emergency Situation Management Agency under the Prime Minister's Office in April 2012.

As mentioned above, at appraisal (2002) and at ex-post evaluation, the implementation of the project conforms to the development policies of the Turkish Government.

3.1.2 Relevance to the Development Needs of Turkey

At the appraisal stage, three large scale bridges (First Bosphorus Bridge, Second Bosphorus Bridge and new and old Golden Horn Bridge) and their connecting viaducts under the project are life-line infrastructure for social/economic activities and citizen's life in Turkey, and are also part of major international trunk highways connecting between Europe and Asia. In Turkey, large scale earthquakes such as two earthquakes occurred in the northwestern Turkey in 1999 have actually taken place in the past. Accordingly, the possibility that large scale earthquakes would occur around Istanbul area in the near future, has been pointed out. Once the assumed large earthquake, which is equivalent to large scale earthquakes occurred in the northwestern Turkey has occurred, the earthquake motion, which exceeds the earthquake-resistance design standards set for subject bridges at the planning stage, would occur, and structures would be most likely destroyed. Thus, the necessity of earlier implementation of quake resistance reinforcement to the large scale bridges and viaducts has been noted.

Three large scale bridges and their connecting viaducts under the project are still lifelines for social/economic activities and citizen's life in Turkey and definitely part of international trunk highway system even at the ex-post evaluation stage. After large scale earthquakes in 1999 as mentioned above, another large scale earthquake with the magnitude of 7.2 occurred in Bingol Prefecture in the southeastern Turkey in May 2003, and also another large scale earthquake with the magnitude of 7.1 in Van Prefecture in the eastern Turkey in October 2011, which both resulted in a large number of victims. The vulnerability to the disaster has become high by expansion of urban area and sophistication of economic structures due to the recent remarkable economic growth. Under these circumstances, the financial assistance by the Turkish Government and other donors has aimed at disaster prevention focusing on main infrastructure

in Istanbul. At the same time, donors including JICA have been providing technical cooperation and assistance to the soft components such as training for disaster prevention and effective disaster risk management.

Implementation of the quake resistance reinforcement works for three major large scale bridges under the project, which was intended for securing a lifeline (transportation) in the event of disaster/emergency situations, conforms to the development needs of the Turkish Government, which has been addressing disaster prevention.

3.1.3 Relevance to Japan's ODA Policy

According to the Medium-Term Strategy for Overseas Economic Cooperation Operations, which was effective at the appraisal time, stabilization of the whole Middle East region including countries neighboring oil-producing countries was an extremely important agenda for Japan. Together with development of economic infrastructure, aid to vulnerable groups and rural development were priority sectors and priorities were to be given to assistance to environmental protection and social infrastructure. Thus, the subject project conformed to the assistance policies of the Japanese Government, and to countermeasures for a large scale disaster, which was one of sectors targeted under the Special Yen loans.

Accordingly, the project has been highly relevant with the Turkish development plan and needs, as well as Japan's ODA policies. Its relevance is therefore considered high.

3.2 Effectiveness[3] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The following indicators are listed up as operational and effect indicators at the time of appraisal: 1) through traffic volume; 2) number of persons killed or injured due to collapse of bridges; 3) number of damaged cars due to collapse of bridges; and 4) number of ferry services to be operated due to collapse of bridges. However, since no large earthquake which resulted in collapse of bridges has occurred after the project completion, application of all of these indicators is considered difficult. Thus, indicators except through traffic volume were not selected. Instead, appropriateness of the information (date of occurrence, seismic intensity and others) of the large earthquakes which occurred in the past, and design standards used for earthquake-resistance design were clarified and verified to examine the effectiveness under the ex-post evaluation.

[3] Sub-rating for Effectiveness is to be put with consideration of Impact.

(1) Through traffic volume

The actual through traffic volume on three large bridges under the project is shown in Table 1.

Table 1 Through Traffic Volume (Actual) on three Large Bridges

Unit: vehicles/day

	2000	2010	2011	2012	2013
First Bosphorus Bridge	186,600	191,000	190,000	196,000	230,000
Second Bosphorus Bridge	174,200	210,000	230,000	213,000	239,000
Golden Horn Bridge	233,300	200,000	-	-	-

Source: Project Completion Report, responses to the Questionnaire

Note 1: Since the Golden Horn Bridge section is not a toll road, traffic volume counting has not been undertaken for the past three years.

The through traffic volume of the First Bosphorus Bridge (3 lanes for one direction) and Second Bosphorus Bridge (4 lanes for one direction) has already exceeded their highway capacity as of 2000. The traffic volume has been increasing since then, and hours of traffic jam in a day have become longer, resulting in the continuous congestion during the day time. Regarding Golden Horn Bridge, since the Bus Rapid Transit system was introduced in the median strip of the bridge in 2008, the number of lanes for normal vehicles was decreased and the highway capacity as of 2010 is lower than that in 2000.

(2) Information of the large earthquakes which occurred in the past (date of occurrence, seismic intensity and others) and the earthquake description assumed in the project design

Since the large earthquake occurred twice in 1999 in the northwestern Turkey (both are more than 90km away from Istanbul), an earthquake with Magnitude 7.2 occurred in the southeastern Turkey in May 2003, and an earthquake with a Magnitude 7.1 in the eastern Turkey in October 2011. However, after completion of the project, no large earthquake has occurred in the vicinity of Istanbul.

The earthquake description assumed at the appraisal stage was also applied at the detailed design stage for the project.

- Magnitude : 7.4
- Epicenter : Marmara Faults (part of North Anatolia Faults, located 20km south from the central Istanbul)
- Occurrence probability : 62±15% (within 30 years counting from 2000)
- Distance the epicenter : 20-30km
- Basic ground acceleration : approximately 0.4G

(3) Design standards used for earthquake-resistance design (Ground Peak Acceleration and Structure Peak Acceleration)

Similarly on the earthquake description mentioned above, design standards used for earthquake-resistance design applied at the appraisal stage was also used at the detailed design stage for the project without any changes.

Table 2 Design Standards used for Earthquake-Resistance Design applied

Name of Bridge	Ground Condition	Distance from Fault (km)	Peak Acceleration (G)		
			Ground acceleration at the project commencement	Ground acceleration	Structure acceleration
First Bosphorus	Hard soil	20	0.1	0.316	0.791
Second Bosphorus	Ultra hard soil	26	0.15	0.270	0.690
Golden Horn Bridge	Hard soil	17	0.3	0.353	0.882

Note: The ground acceleration at the project commencement for Golden Horn Bridge is the design standards applied for the new Golden Horn Bridge

Design standards for earthquake-resistance design applied are mostly consistent with the Japanese ones used until the Northeastern Pacific Ocean Earthquake occurred in 2011, and thus there is no problem with appropriateness of technical judgment at the appraisal stage. However, in Japan, design standards were revised in March 2012 after the Northeastern Pacific Ocean Earthquake including the following: standard acceleration of ground motion for the large scale earthquakes (envisaged under the project), which seldom occur at the boundary of plates was increased by 1.2 to 2.0 times (depending on the foundation condition).

3.2.2 Qualitative Effects

(1) Protection of urban functions and assets from earthquake disaster in Istanbul

According to the executing agency (KGM), the quake resistance reinforcement work has been completed mostly as planned and the resistant level was increased. Moreover, collapse of three bridges reinforced under the project would be averted and the lifeline (transportation) would be secured in the event of large scale earthquakes.

(2) Enhancement of the quake resistance reinforcement technology and knowledge in Turkey

The executing agency recognizes that their quake resistance reinforcement technology and knowledge was enhanced through the project management during the implementation period and training provided by contractors. The local consultants, who were involved in review of detailed designs and construction supervision together with the Japanese consultants also recognize that their technological capacity and knowledge

was enhanced through the daily consulting service activities.

3.3 Impact

3.3.1 Intended Impacts

The executing agency believes that regarding three bridges, the lifeline (transportation) and social activities would be secured in the event of large earthquake and that the national anxiety was also lowered. It was heard that the KGM staff were satisfied with quake resistant reinforcement made with the aid from Japan, which is also prone to earthquakes and has more advanced technology.

3.3.2 Other Impacts

(1) Impacts on the natural environment

According to the Project Completion Report, monitoring on traffic noise and air/water pollution was undertaken during the project implementation. Since the project is a reinforcement work for the existing infrastructure, no particular environmental issue was observed. However, according to the executing agency, even though change of expansion joints at the abutment of the Second Bosphorus Bridge was not included in the original reinforcement work, expansion joints at both abutments were totally changed and noise protection facilities were installed since complaints on noise had been drawn. Some degree of protection effects was observed. Although it is technically difficult to completely protect the low frequency noise, KGM First Division is planning to undertake further protection measures (addition and improvement of noise protection facilities), since complaints on noise still has been drawn.

(2) Land Acquisition and Resettlement

No land acquisition and resettlement occurred under the project.

(3) Other Positive and Negative Impacts

None.

It is difficult to examine and assess the effectiveness and impact of the quake resistance reinforcement project for the existing infrastructure in quantitative terms since no large earthquake with the assumed scale/magnitude has occurred after the project completion. However, the executing agency (KGM) believes that collapse of three bridges would be averted and the lifeline (transportation) would be secured in the event of large earthquakes, since the resistance level of three bridges under the project was enhanced.

The project has largely achieved its objectives and thus the effectiveness and impact is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The original and actual output of the project is shown in Table 3.

The project scope to be implemented under the project is stated in the project appraisal related documents. However, the scope was defined based on the results of the feasibility study. Then, during the project implementation stage, the contractor awarded undertook the detailed designs taking into consideration the field conditions, and redefined the work and project scope to be prioritized. Therefore, the actual project scope (output) is partially changed from the originally planned scope. However, the work items and bill of quantity that are implementable within the originally planned budget were selected, among the work and scope on which the priority for resistance reinforcement work is high. Thus, changes made are considered appropriate.

Table 3 Output (original and actual)

Item	Project Scope at Appraisal Stage (main items)	Project Scope at Project Completion
Civil Work: Resistance reinforcement work for large bridges and viaducts	(1) Steel Bridges ・ First Bosphorus Bridge 1) Additional cable clamp 2) Shock absorber at tower 3) Reinforcement of wind bearing ・ First Bosphorus Bridge Approach Viaducts 1) Drop prevention device at abutment 2) Drop prevention device at tower 3) Reinforcement of pier structures ・ Second Bosphorus Bridge 1) Installation of center cable stay 2) Shock absorber at tower 3) Reinforcement of wind bearing ・ New and Old Golden Horn Bridge 1) Reinforcement of pier structures 2) Drop prevention device at abutment	(1) Steel Bridges ・ First Bosphorus Bridge 1) deleted 2) as planned 3) deleted Additional work: protective painting, reinforcement of lighting pole and bottom plate ・ First Bosphorus Bridge Approach Viaducts 1) as planned 2) as planned 3) as planned Additional work: elastomer support installation at anchorage, change of expansion joins at abutment, change of supports for tower, installation of main cable protection steel sheet, reinforcement of lighting pole and bottom plate ・ Second Bosphorus Bridge 1) deleted 2) as planned 3) deleted Additional work: change of expansion joins at abutment, protective painting of whole deck ・ New and Old Golden Horn Bridge 1) as planned 2) as planned

Item	Project Scope at Appraisal Stage (main items)	Project Scope at Project Completion
	3) Reinforcement of girders on each pier of old bridge	3) as planned Additional work: elastomer support installation at anchorage, change of expansion joins, expansion of pier footing, movement restricting device at the end (dumper), protective painting, change of parapet (new bridge), exchange of approach deck (new bridge)
	(2) Pre-stressed Concrete Bridge	(2) Pre-stressed Concrete Bridge
	・ Old Golden Horn Bridge Approach Viaduct 1) Reinforcement of pier structures	・ Old Golden Horn Bridge Approach Viaduct 1) as planned
	・ New Golden Horn Bridge Approach Viaduct 1) Reinforcement of pier structures	・ New Golden Horn Bridge Approach Viaduct 1) as planned Additional work: installation of drop prevention device, elastomer support installation at piers, movement restricting device at abutment (dumper), movement restricting device at mid piers (dumper), expansion of pier support, protective painting, expansion of parapet
	・ Ortakoy Viaducts (V408, V409) 1) Construction of structures 2) Expansion of pier footing 3) Reinforcement of pier top and drop prevention device	・ Ortakoy Viaducts (V408, V409) 1) as planned 2) as planned 3) as planned Additional work: movement restricting device (dumper), addition of new piers, exchange of expansion joints ・ Ortakoy Viaduct (V411) - additional work 1) Construction of structures 2) Expansion of pier footing 3) Reinforcement of pier top and drop prevention device ・ Mecidiyekoy Viaduct - additional work 1) reinforcement of piers 2) movement restricting device at piers (dumper) 3) reinforcement of pier top
Consulting services	・ Basic designs ・ Assistance for tendering ・ Review of detailed designs ・ Construction supervision ・ Implementation of training ・ Preparation of Public Relation Action Plan	Service scope is as planned.

Item	Project Scope at Appraisal Stage (main items)		Project Scope at Project Completion	
	Foreign Experts:	311 M/M	Foreign Experts:	429 M/M
	Local Experts:	294 M/M	Local Experts:	
	Technical Support Staff:	392 M/M	Technical Support Staff:	
	Administrative Staff:	236 M/M	Administrative Staff:	
	(Local Total	922 M/M)	(Local Total	1,029 M/M)

Source: Project Appraisal Documents, Project Completion Report, responses to the Questionnaire

Main revisions made on the scope of work during the detailed engineering stage are as follows:

1) Regarding Ortakoy Viaduct, the quake resistance reinforcement work (V411)[4] was added.
2) The quake resistance reinforcement work for Mecidiyekoy Viaduct was added.

Priority for the above mentioned 2 works was considered low compared with other viaducts at the feasibility stage. However, since both viaducts are located along the European Highway Network No. 5 (E-5) connecting between First Bosphorus Bridge and Golden Horn Bridge, and are lifelines for socioeconomic activities and citizen's life in Turkey, collapse of viaducts needed to be avoided in the event of earthquakes. Thus, during the project implementation, it was considered that the quake resistance reinforcement work needed to be done, and the reinforcement work was undertaken as an additional work.

New Golden Horn Bridge Reinforcement of piers (bound with steel plate)

First Bosphorus Bridge Reinforcement of support at abutment

[4] Same as items included in the contracts for V408 and V409 under Ortakoy Viaduct, the following items were included: construction of structures, expansion of pier footing, and reinforcement of pier top and drop.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The estimated project cost at appraisal was 14,199 million yen, of which the Japanese ODA loan was 12,022 million yen. The actual project cost was 14,082 million yen, of which the Japanese ODA loan was 11,936 million yen. The actual project cost was lower than planned, and is equivalent to 99% of the planned cost. The actual project cost was lower than the originally planned cost since KGM aimed to implement the project within the originally planned project cost. Even though additional work occurred, some originally planned items were deleted.

As mentioned above, the project was implemented utilizing the Special Yen Loan (SYL), and the customer satisfaction survey was conducted regarding SYL. The project executing agency (KGM) responded that while the bid price was higher than the government estimate, they were fully satisfied with contractor's construction quality. Regarding the technical transfer, they admit that the technical transfer to local contractors was highly satisfactory. Moreover, even now they can easily contact and expect full support from contractors on the maintenance work.

3.4.2.2 Project Period

The originally planned project period was from July 2002 (signing of the Loan Agreement) to October 2007 (civil work completion) with a total period of 64 months. The actual project period was from July 2002 (signing of the Loan Agreement) to August 2010 (civil work completion) with a total period of 98 months, or equivalent to 153% of the plan.

Table 4 Comparison of Project Period (Planned and Actual)

	Planned (at L/A signing)	Actual
Consultant selection	2002.05-2002.11	2002.05-2003.01
Basic designs	2002.12-2003.11	2003.01-2004.01
Consulting services (review of detail designs and supervision)	2004.10-2007.10	2004.01-2010.08
Bidding for civil work	2003.03-2004.11	2003.01-2006.03
Reinforcement work	2004.10-2007.10	2006.03-2010.08
Defect liability period	2007.11-2008.10	2010.08-2011.08

Source: Project appraisal documents, Project Completion Report, responses to the Questionnaire

Main reasons for delay of the project implementation and extension of the contract period are as follows:

1) Since the executing agency was not familiar with the JICA's procurement guidelines and process, it took longer time to undertake bidding for civil work, resulting in about one and half years delay.
2) Mecidiyekoy Viaduct, which was not included in the original project scope, was added as a part of the project. Construction work commenced in August 2008 and was

completed in August 2010. Due to this additional work, the project period was extended by about one and half years.

3.4.3 Results of Calculations of Internal Rates of Return (Reference only)

Since relevant data on costs and benefits needed to calculate financial internal rate of return (FIRR) and economic internal rate of return (EIRR) at completion of the project was not provided by the executing agency, both rates were not recalculated.

The actual project scope (output) was partially changed from the originally planned scope. However, changes were made by selecting the work and scope on which the priority for resistance reinforcement work is high, and which is also implementable within the originally planned budget, based on the results of detailed designs. Changes made are considered appropriate.

Although the project cost was lower than planned, the project period was significantly longer than planned. Therefore, efficiency of the project is considered fair.

Dampers[5] installed at Golden Horn Bridge

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

Units and Offices, which are responsible for operation and maintenance of the highway section of First Bosphorus Bridge and Second Bosphorus Bridge at the time of ex-post evaluation are: Department of Operations and Maintenance for Motorways, Bridges, and Viaducts (about 780 staff members), Chief Engineer's Office for First Bosphorus Bridge (about 50 staff members) and Chief Engineer's Office for Second Bosphorus Bridge (about 45 staff members) under the KGM First Division (about 1,600 staff members) in Istanbul. The First Division is in charge of operation and maintenance of 737km motorways, 2,101 km national roads, and 1,407km provincial roads, totaling 4,245km highway and road network in Istanbul.

[5] Devise which alleviates shock and prevents from transmitting vibration in the event of earthquakes.

Although in 2012 a plan to privatize operation of the bridge and highway section covered under the project was proposed, privatization has not been done until the time of ex-post evaluation.

The road maintenance for the Golden Horn Bridge section was transferred to Istanbul Municipal Office in 2004. However, since the specific technology and skills are required for the maintenance of equipment/device/infrastructure, which was installed or constructed for substructures under the project, it has been agreed between both parties that three offices under KGM First Division mentioned above would continue to be in charge.

Second Bosphorus Bridge

Damper installed at Mecidiyekoy Viaduct

3.5.2 Technical Aspects of Operation and Maintenance

Among 1,600 staff members of KGM First Division, 360 staffs have qualification of above university graduate, and 190 staffs have engineering degrees among 360 staffs. About 100 staffs have qualification of college graduate level, and the remaining staffs are field workers, technicians, and administrative staffs. The engineering and technical skills of technical staffs (managers, engineers, and technicians) of the First Division is considered appropriate and the number of staffs assigned are likely sufficient. Regarding the training of staff, new university graduates take training regularly, twice a year after employed. The internal training has been also undertaken for the staff assigned by each unit. The notable training module is the one on analysis of monitored results and its operations, offered to the staff in charge of the Structural Health Monitoring System, which was installed to First Bosphorus Bridge by First Division with its own fund. This module covers operations of bridges in the event of disaster/emergency situations (judgment on necessity of closure of bridge sections in the event of earthquakes) and risk management, and is a unique module, which is not observed in bridge construction projects in other countries.

The standard manuals are prepared for toll collection, traffic control and management, maintenance work, support services and others, including Motorways Maintenance and Operations Technical Principals-2012, Motorways Maintenance Handbook-1998, and Highway Technical Specifications-2013. These manuals are utilized by the relevant staff.

3.5.3 Financial Aspects of Operation and Maintenance

The KGM budget is allocated from the nation's general budget and the budget for 2011 was 5.51 billion Turkish Lira, which is about 1.8% of the national budget. About 1.85 billion Turkish Lira was allocated to the First Division, and about 70% of expenditure was spent for new construction and rehabilitation work. The allocated amount to Department of Operations and Maintenance for Motorways, Bridges, and Viaducts of the First Division is 32 million Turkish Lira, but costs for operation and maintenance is also included in other budget items. No additional budget for routine maintenance of equipment/device/infrastructure installed or constructed under the project is needed. Maintenance costs needed for the periodic maintenance work can be also covered under the budget currently allocated to the First Division.

Regarding the First Bosphorus Bridge, completed in 1973 and the Second Bosphorus Bridge, completed in 1988, as part of normal maintenance work, implementation of major rehabilitation work is planned. The work is to be commenced in early 2014 and to be completed by summer of 2015. The total project cost is about 247 million Turkish Lira (about 25 billion Japanese yen) and the contact has been made with the Japanese and Turkish joint venture entity. The highlight of rehabilitation work is to change the current skew hanger cables of First Bosphorus Bridge to vertical hanger cables.

3.5.4 Current Status of Operation and Maintenance

According to the executing agency, regarding the regularly undertaken maintenance on equipment, device and infrastructure installed or constructed under the project, as part of the routine maintenance, existence or non-existence of abnormality has been checked by ocular inspection. The regular inspection on structures is to be undertaken every 5 years after completion of the project.

In order to collect the data, which would be basis for determination on traffic operation and management on bridge sections in the event of earthquake, KGM has installed the monitoring system to both First and Second Bosphorus bridges with its own fund. With respect to First Bosphorus Bridge, the Structural Health Monitoring System, which monitors the bridge condition has been installed. Censors and devices including accelerometers, tilt meters, force transducers, strain gauges, laser displacement, and GPS have been installed at 168 locations. The information and data collected by these censors and devices is transmitted to the field management offices of both bridges and is used for analysis and judgment (for closure of bridges in the event of earthquake) at the management offices.

The current maintenance management system is well organized and the number of staff assigned is considered appropriate. There are no particular issues on implementation of training and manuals prepared and thus, there are no technical issues in order to sustain the effectiveness

of the project. The maintenance budget has been properly allocated and thus, there is no issue in financial aspects. Regarding the equipment and infrastructure installed or constructed under the project, no major damage nor defect were observed by ocular inspections during the field visit.

In light of the above, no major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is considered high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the project was to enhance quake resistance by conducting the reinforcement works to the existing major large scale bridges and their connecting major viaducts in Istanbul, thereby, contributing to securing the lifeline (transportation) and keeping up the socioeconomic activities in the event of disaster/emergency situations. The project has been highly relevant to the development plans and needs of Turkey, as well as Japan's ODA policies. Thus, its relevance is high. The standards for earthquake-resistance design applied are mostly consistent with the Japanese ones used until the Northeastern Pacific Ocean Earthquake occurred in 2011, and thus there is no problem with appropriateness of technical judgment at the appraisal stage. According to the executing agency, collapse of three bridges would be averted and the lifeline (transportation) would be secured in the event of large earthquakes because of enhancement of quake resistance to three bridges under the project. Thus, the project has largely achieved its objectives, and thus the effectiveness and impact is high. Although the actual project scope (output) was partially changed from the originally planned scope, changes made are considered appropriate. Although the project cost was lower than planned, the project period was significantly longer than planned. Therefore, efficiency of the project is considered fair. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered 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

None.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

None.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Output 1) Civil Work	(1) Steel Bridges ・ First Bosphorus Bridge 1) Additional cable clamp 2) Shock absorber at tower 3) Reinforcement of wind bearing	(1) Steel Bridges ・ First Bosphorus Bridge 1) deleted 2) as planned 3) deleted Additional work: protective painting, reinforcement of lighting pole and bottom plate
	・ First Bosphorus Bridge Approach Viaducts 1) Drop prevention device at abutment 2) Drop prevention device at tower 3) Reinforcement of pier structures	・ First Bosphorus Bridge Approach Viaducts 1) as planned 2) as planned 3) as planned Additional work: elastomer support installation at anchorage, change of expansion joins at abutment, change of supports for tower, installation of main cable protection steel sheet, reinforcement of lighting pole and bottom plate
	・ Second Bosphorus Bridge 1) Installation of center cable stay 2) Shock absorber at tower 3) Reinforcement of wind bearing	・ Second Bosphorus Bridge 1) deleted 2) as planned 3) deleted Additional work: change of expansion joins at abutment, protective painting of whole deck
	・ New and Old Golden Horn Bridge 1) Reinforcement of pier structures 2) Drop prevention device at abutment 3) Reinforcement of girders on each pier of old bridge	・ New and Old Golden Horn Bridge 1) as planned 2) as planned 3) as planned Additional work: elastomer support installation at anchorage, change of expansion joins, expansion of pier footing, movement restricting device at the end (dumper), protective painting, change of parapet (new bridge), exchange of approach deck (new bridge)
	(2) Pre-stressed Concrete Bridge ・ Old Golden Horn Bridge Approach Viaduct 1) Reinforcement of pier structures ・ New Golden Horn Bridge Approach Viaduct 1) Reinforcement of pier structures	(2) Pre-stressed Concrete Bridge ・ Old Golden Horn Bridge Approach Viaduct 1) as planned ・ New Golden Horn Bridge Approach Viaduct 1) as planned

Item	Original	Actual
		Additional work: installation of drop prevention device, elastomer support installation at piers, movement restricting device at abutment (dumper), movement restricting device at mid piers (dumper), expansion of pier support, protective painting, expansion of parapet
	・ Ortakoy Viaducts (V408, V409) 1) Construction of structures 2) Expansion of pier footing 3) Reinforcement of pier top and drop prevention device	・ Ortakoy Viaducts (V408, V409) 1) as planned 2) as planned 3) as planned Additional work: movement restricting device (dumper), addition of new piers, exchange of expansion joints ・ Ortakoy Viaduct (V411) - additional work 1) Construction of structures 2) Expansion of pier footing 3) Reinforcement of pier top and drop prevention device ・ Mecidiyekoy Viaduct - additional work 1) reinforcement of piers 2) movement restricting device at piers (dumper) 3) reinforcement of pier top
2) Consulting Services	・ Basic designs ・ Assistance for tendering ・ Review of detailed designs ・ Construction supervision ・ Implementation of training ・ Preparation of Public Relation Action Plan Foreign Experts: 311 M/M Local Experts: 294 M/M Technical Support Staff: 392 M/M Administrative Staff: 236 M/M (Local Total 922 M/M)	Service scope is as planned. Foreign Experts: 429 M/M Local Experts: Technical Support Staff: Administrative Staff: (Local Total 1,029 M/M)
2. Project Period	July 2002 - October 2007 (64 months)	July 2002 - August 2010 (98 months)
3. Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 7,623 million yen 6,576 million yen 14,199 million yen 12,022 million yen 1 yen = 10,802 TK Lira (as of December 2001)	 N/A N/A 14,083 million yen 11,936 million yen 1 yen = 0.02082 new TK Lira (as of January 2014)

Republic of Bulgaria

Ex-Post Evaluation of Japanese ODA Loan Project

Sofia Metro Extension Project

External Evaluator: Masami Tomita, Sanshu Engineering Consultant

0. Summary

This project aimed at streamlining the city's transportation system by constructing tunnels and stations from the seventh to the ninth station, as part of Phase 2 (from the seventh to the sixteenth station of metro Line 1) of the Metro Line Construction Plan that existed at the time of project appraisal (covering approximately 19 km in total extension, from the first to the sixteenth station of metro Line 1) in Sofia, the capital of Bulgaria.

Relevance of this project is high, as the project is consistent with priority areas of Bulgaria's development plans and Japan's ODA policy, and moreover development needs for the project are high. The actual figure of daily passenger ridership at two years after project completion is approximately 80% of the figure estimated during the Mid-Term Review, and other indicators such as the number of running trains, operation interval, annual operational revenue and net profit of Metropolitan Company, which is responsible for operation and maintenance (O&M) of metro, showed an improvement to a large extent, compared with those at the time of appraisal. According to the result of beneficiary survey, travelling time became shortened since beneficiaries started using metro Line 1 and traffic congestions on roads along Line 1 and air/traffic noise pollutions were reduced after project completion. Thus, effectiveness and impact of the project are high. Efficiency of the project is fair, as actual project period largely exceeded planned period, while actual project cost was within the planned cost. Sustainability of the project is high, as no major problem has been observed in institutional, technical and financial aspects of O&M.

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

1. Project Description

Project Location

Platform at the Ninth Station

1.1 Background

Sofia city is situated in a basin and it is geographically difficult to expand the city, and thus the city has a high population density[1]. At the time of project appraisal, the city was faced with serious traffic congestions due to generally very narrow roads and an increase in the number of vehicles (doubled over the past 10 years)[2]. Moreover, public transportation systems in the city including tramcars, trolley buses, and buses were deteriorated, as necessary public investment had not been provided under the former socialist regime, and these systems were not consistent with passenger mobility needs in the city[3]. Aiming at modernizing its urban functions, Sofia city intended to streamline the city's transportation system that were intricately intertwined and redundant and reduce traffic congestions, through reorganization of its transportation system centering on metros and partial removal and/or realignment of tramcars and other existing routes[4]. Sofia city also focused on landscape improvement in the name of "Beautiful Sofia Campaign", as Bulgaria aimed at increasing foreign currency revenues from tourism industry. Construction of metro, as well as reorganization of ground public transportation, was regarded important, since it is the transport mode that does not defile cultural properties in the city center[5]. Therefore, the city began a study on metro projects in 1972, then from the first to the sixth stations of Line 1 were completed in 1998 and the seventh station was completed in 2000. However, these segments only linked the western residential area with part of the downtown area, and it was necessary to extend the existing route for reorganization of the city's overall public transportation system[6]. This project was implemented under such situation.

1.2 Project Outline

The objective of this project is to streamline the city's transportation system by constructing tunnels and stations from the seventh to the ninth station (approximately 2 km) as part of Phase 2 (the segment covering approximately 11 km from the seventh to the sixteenth station of metro Line 1) of the Metro Line Construction Plan (covering approximately 19 km in total extension, from the first to the sixteenth station), thereby contributing to the strengthening of urban functions and enhancing convenience for citizens in Sofia, the capital of Bulgaria.

Figure 1 below shows the project site map.

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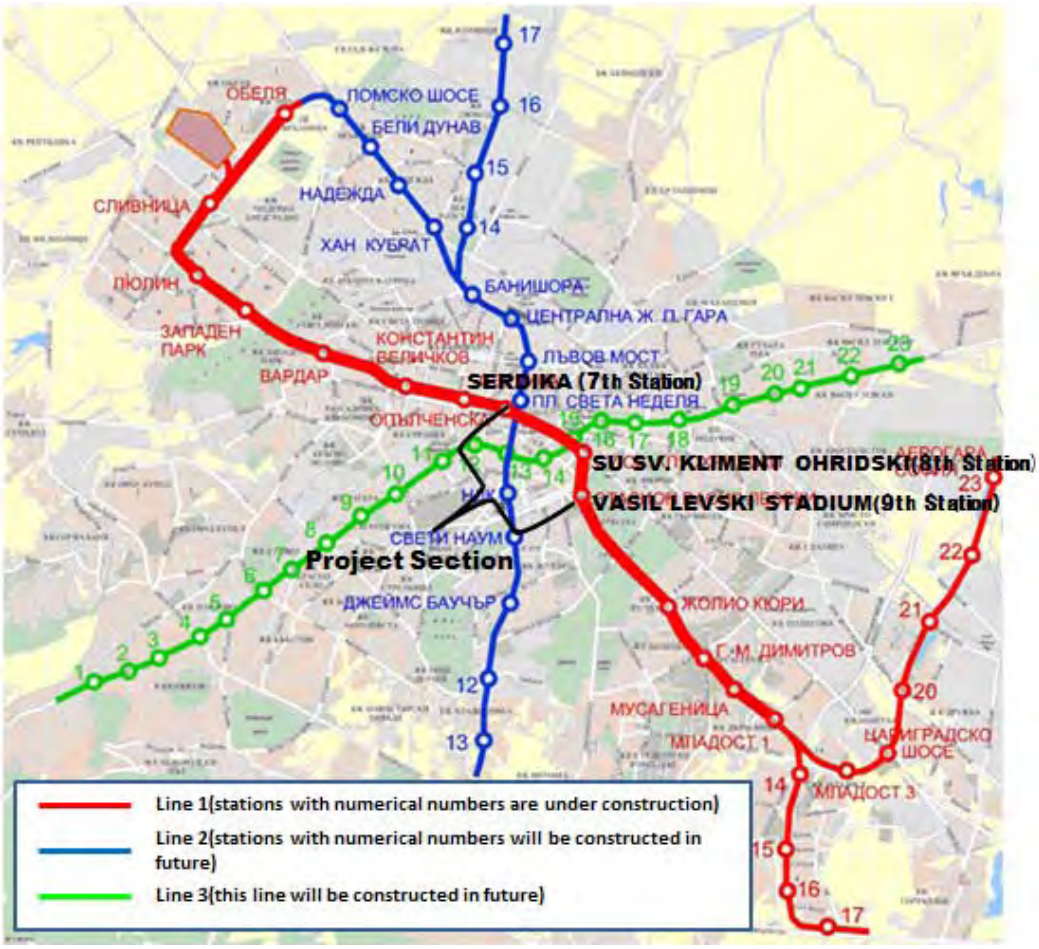
1 Source: JICA appraisal document
2 Source: same as above
3 Source: same as above
4 Source: same as above
5 Source: same as above
6 Source: same as above



Source: edited based on BAGTC (Bulgarian Association for Geotechnical and Tunnel Construction) HP

Figure 1: Project Site Map

Loan Approved Amount/ Disbursed Amount	12,894 million yen / 12,833 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	February, 2002 / February, 2002
Terms and Conditions	Interest Rate 2.2% (1.8% for Consulting Service) Repayment Period 30 years (Grace Period) (10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency(ies)	Municipality of Sofia Guarantor: Government of Bulgaria
Final Disbursement Date	July, 2011
Main Contractor (Over 1 billion yen)	Taisei Corporation (Japan)
Main Consultant (Over 100 million yen)	PADECO (Japan) / Oriental Consultants (Japan) (JV)
Feasibility Studies, etc.	Feasibility Study (Oriental Consultants, 1998) Special Assistance for Project Formation (SAPROF) for Sofia Subway Extension Project (2001)
Related Projects	Dispatch of JICA experts (2004-2005) JICA training in Japan (2007)

2. Outline of the Evaluation Study

2.1 External Evaluator

Masami Tomita, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: September, 2013 – August, 2014

Duration of the Field Study: November 16 – November 24, 2013/ February 10 –February 17, 2014

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

3.1 Relevance (Rating: ③[8])

3.1.1 Relevance to the Development Plan of Bulgaria

At the time of project appraisal, enhancing the urban functions of Sofia city, which is a capital of Bulgaria, was necessary, as EU accession was the most important policy issue for the country, and this project was stated as one of major projects to be implemented in Sofia regions in "National Plan for Regional Development (2000-2006)"[9].

At the time of ex-post evaluation, "Operational Programme on Transport (OPT): 2007-2013" of Bulgaria, which stipulates that the country will develop its transport infrastructures in a manner that conforms to the EU's transportation policy, states that projects such as metro extension are necessary for development of sustainable urban transportation systems, friendly to the environment, in Sofia, and extension of metro Line 1 to the nineteenth station and construction of Line 2 are stated as priorities[10]. Moreover, daily passenger ridership is estimated to increase from 75,000 (at the time of formulation of OPT) to 580,000 and the share of metro among public transportation is expected to increase to 45% when the metro line construction plan (Line 1 to 3) is completed[11].

Therefore, metro construction in Sofia is emphasized in Bulgaria's national development plans both at the time of project appraisal and ex-post evaluation, and the project is consistent with national policies.

3.1.2 Relevance to the Development Needs of Bulgaria

At the time of project appraisal, as explained above, Sofia had very narrow roads and was faced with serious traffic congestions due to an increasing number of vehicles, and the city aimed at streamlining the city's transportation system and reducing traffic congestions by partial removal and re-routing of existing tram routes based on re-organization of public transportation

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

8 ③: High, ② Fair, ① Low

9 Source: JICA appraisal document

10 Source: Operational Programme on Transport: 2007-2013

11 Source: same as above

centering on metro. Metro lines in operation at the time of appraisal was Line 1 only from the first to the seventh stations, and in order to make metro serve as a core of the city's transportation system, it was necessary to construct the Phase 2 portion (approximately 11km from the seventh to the sixteenth station) and extend it through the downtown area to as far as the eastern residential area. However, construction of the segment from the seventh to the ninth station (approximately 2km) required the use of shield tunneling method, and since Bulgaria did not have experience in this method, technical support from Japan was necessary[12].

At the time of ex-post evaluation, as shown in Table 1, the number of registered vehicles (total of cars, trucks, buses, trolley buses and trams) in Sofia has been increasing steadily from approximately 650,000 in 2004 to approximately 740,000 in 2012 (increasing rate: 14%), though it is not a substantial increase[13].

Table 1: Changes in the Number of Registered Vehicles in Sofia

(Unit: vehicle/year)

	2004	2012
Car	581,995	643,015
Truck	61,580	87,492
Bus	6,389	5,544
Trolley Bus	146	150
Tram	336	309
Total	650,446	736,510

Source: Bulgaria's National Statistical Agency

Existing public transportation routes such as buses and trams have been partially removed and re-routed[14], and a study on optimization of public transportation has been on-going for extension of metro[15]. Moreover, at the time of ex-post evaluation, Line 1 (16 stations in total) and 2 (11 stations in total) are in operation, and these lines are connected at Obelya station and they are operated practically as one line. Currently, construction works for further extension of Line 1 to south-east of Sofia are on-going and construction works for the extension to Sofia Airport is planned to be completed in mid-2015[16]. According to the latest metro construction plan in Sofia, a total of 62km and 63 stations will be constructed in Line 1, 2 and 3, and 1.1 million passengers will be transported daily after completion[17]. The share of metro among public transportation in Sofia was 5% only in 2004, which increased to 14% in 2012, and it has

12 Source: JICA appraisal document

13 Source: Bulgaria's National Statistical Agency

14 For example, Bus No.51 which used to be operated parallel to the section between Station 0 and 1 of metro Line 1 and Tram No.21 which used to be duplicated with Tram No.20 and 22 were closed (source: answers to the questionnaire).

15 Source: answers to the questionnaire

16 Source: same as above

17 Source: same as above. According to the latest metro construction plan, Line 1 will be composed of a total of 29km and 27 stations, Line 2 will be composed of a total of 17km and 17 stations, and Line 3 will be composed of a total of 16km and 19 stations.

been steadily increasing[18].

Therefore, needs for metro extension for reduction of traffic congestions and streamlining the city's transportation system are high both at the time of project appraisal and ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

According to "Official Development Assistance (ODA) Country Data Book (2002)", transition to a market economy, environmental protection, and development of economic infrastructures were priority areas of Japan's ODA policy in Bulgaria, and this project was to contribute to development of economic infrastructures. Moreover, according to JICA Country Operation Policy (2001), priority areas for assistance were; 1) environmental fields in which both legal and operation systems were required to be largely improved to meet EU accession criteria; 2) transport sector in which it was demanded by EU to develop infrastructures based on the Pan-European Transport Corridors Framework[19]; and 3) agricultural and agricultural product processing fields which used to be Bulgaria's strength and had a potential to grow more. This project was to contribute to 2) above and consistent with Japan's ODA policy[20].

This project has been highly relevant to Bulgaria's development plan, development needs, as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness[21] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

3.2.1.1 Passenger Ridership

An estimated figure and actual figures of passenger ridership on the project section (Line 1) are shown in Table 2.

Table 2: Passenger Ridership on Line 1

(Unit: 10,000 people/day)

2001 (Baseline)	2006 (Actual at mid-term review)	2010 (Estimated at mid-term review)	2009 (Actual at project completion)	2010 (Actual at 1year after completion)	2011 (Actual at 2years after completion)	2012 (Actual at 3years after completion)
5.7	7.0	20.4	11.7	16.9	16.1	17.6

Source: estimated: JICA internal document, actual: answers to the questionnaire

Note: the section up to the seventh station was in operation at the time of mid-term review (2006) and the section up to the thirteenth station was completed in 2009. The section from the fourteenth to the seventeenth station (a branch of Line 1) is under construction and the section between eighteenth and nineteenth station started operation in 2012.
While the baseline figure in 2001 is written as 69,000 in JICA appraisal document and the actual figure in 2006 is written as 80,000 in JICA internal document, correct figures are 57,000 in 2001 and 70,000 in 2006, according to Metropolitan Company.

[18] Source: same as above

[19] This is a framework aiming at connecting EU countries and central and east Europe via corridors.

[20] Source: JICA appraisal document

[21] Sub-rating for Effectiveness is to be put with consideration of Impact.

While a target (estimated) figure was set for passenger ridership at the time of project appraisal, it was revised during mid-term review due to a delay of project implementation etc., and thus the revised figure is used as a target figure in this ex-post evaluation. The figure 204,000 people per day estimated during mid-term review is considered to be an estimated figure of ridership for the section from the station 0 to 13 at two years after project completion, and comparing the estimated figure with the actual figure in 2011, a target achievement rate is approximately 80%. The reason for the actual figure falling below the estimated figure by approximately 20% is that it has not been long since project completion and it takes time to materialize a modal shift[22], according to Metropolitan Company, which is an operation and maintenance agency of this project.

3.2.1.2 Number of Running Trains

Actual figures of the number of running trains on Line 1 at the time of project appraisal and after project completion are shown in Table 3.

Table 3: Number of Running Trains on Line 1

(Unit: number per day, number per peak hour)

	2001 (Baseline)	2009 (Actual at project completion)	2010 (Actual at 1year after completion)	2011 (Actual at 2years after completion)	2012 (Actual at 3years after completion)
Daily	268	281	354	358	392
Peak 1 Hour	10	14	15	15	18

Source: answers to the questionnaire

While a target figure was not set for the number of running trains at the time of project appraisal, this is used as an evaluation indicator here, as this is a basic indicator to evaluate a railway project. Actual figures of the number of running trains on Line 1 at the time of ex-post evaluation show a steady increase since the time of project appraisal.

3.2.1.3 Operation Interval

Actual figures of operation interval during peak hour on Line 1 at the time of project appraisal and after project completion are shown in Table 4.

Table 4: Operation Interval during Peak Hour on Line 1

(Unit: minutes)

2001 (Baseline)	2009 (Actual at project completion)	2010 (Actual at 1year after completion)	2011 (Actual at 2years after completion)	2012 (Actual at 3years after completion)
6.0	4.5	4.0	4.0	3.5

Source: answers to the questionnaire

[22] A modal shift in this context means to shift a mode of transportation from road transportation to railway (metro).

While a target figure was not set for operation interval at the time of project appraisal, this is used as an evaluation indicator here, as this is a basic indicator to evaluate a railway project. Operation interval on Line 1 at the time of ex-post evaluation was steadily shortened compared with that at the time of project appraisal.

3.2.1.4 Operating Rate of Rolling Stocks

Actual figures of operating rate of rolling stocks on Line 1 at the time of project appraisal and after project completion are shown in Table 5.

Table 5: Operating Rate of Rolling Stocks on Line 1

(Unit: %)

2001 (Baseline)	2009 (Actual at project completion)	2010 (Actual at 1year after completion)	2011 (Actual at 2years after completion)	2012 (Actual at 3years after completion)
83	78	81	81	83

Source: answers to the questionnaire

While a target figure was not set for operating rate of rolling stocks at the time of project appraisal, this is used as an evaluation indicator here, as this is a basic indicator to evaluate a railway project. Actual figures of operating rate of rolling stocks have been approximately 80% since the time of project appraisal and no major problem is seen. According to Metropolitan Company, the rest of approximately 20% are under regular inspection and repair and standby preparing for emergencies such as a sudden accident.

3.2.1.5 Annual Operational Revenues of Metropolitan Company

An estimated figure and actual figures of annual operational revenues of Metropolitan Company, which is an operation and maintenance agency of this project, are shown in Table 6.

Table 6: Annual Operational Revenues of Metropolitan Company

(Unit: million leva)

2001 (Baseline)	2006 (Actual at mid-term review)	2010 (Estimated at mid-term review)	2009 (Actual at project completion)	2010 (Actual at 1year after completion)	2011 (Actual at 2years after completion)	2012 (Actual at 3years after completion)
7.6	12.4	30.0	23.5	37.6	36.8	44.8

Source: estimated: JICA internal document, actual: answers to the questionnaire

While a target (estimated) figure was set for annual operational revenues of Metropolitan Company at the time of project appraisal, it was revised during mid-term review due to a delay of project implementation etc., and thus the revised figure is used as a target figure in this ex-post evaluation. The actual figure in 2011 (two years after project completion) exceeds the figure estimated at the time of mid-term review. The reason is considered to be that a metro fare

was increased from 0.3 leva for a single trip at the time of project appraisal to 1.0 leva at the time of ex-post evaluation, while the actual number of passengers was a little below the estimated figure[23].

3.2.1.6 Net Profit of Metropolitan Company

Actual figures of net profit of Metropolitan Company since the time of project appraisal are shown in Table 7.

Table 7: Net Profit of Metropolitan Company

(Unit: million leva)

2001 (Baseline)	2006 (Actual at mid-term review)	2009 (Actual at project completion)	2010 (Actual at 1year after completion)	2011 (Actual at 2years after completion)	2012 (Actual at 3years after completion)
0.009	▲0.055	0.821	5.977	2.580	0.843

Source: answers to the questionnaire

Note: the actual figures are written as 0.002 million leva in 2001 and 1.663 million leva in 2006 in JICA internal documents, however, according to Metropolitan Company, correct figures are 0.009 million leva in 2001 and -0.055 million leva in 2006. JICA internal documents also state that net profit written in these documents does not take into account depreciation cost of assets such as station buildings which were handed over from Sofia Municipality to Metropolitan Company in 2003, and that if the depreciation cost is taken into account, net profit in 2006 is in deficit.

Net profit has largely increased since project completion compared with that at the time of project appraisal, however, net profit in 2012 was decreased from that of the previous year, as material cost, utility cost, consumables expense, personnel cost and depreciation cost etc. increased accompanying the opening of Line 2 in 2012.

3.2.2 Qualitative Effects

3.2.2.1 Travelling Time in Certain Sections

Travelling time by metro between the seventh station (Sofia city center) and the thirteenth station (southeast part of the city) of Line 1 is approximately 14 minutes. On the other hand, when the evaluator travelled a road which runs parallel to the section between the seventh and thirteenth station by a car (sedan) during the field survey (9:00 am on Thursday, November 21, 2013), travelling time was approximately 24 minutes in both directions. While it cannot be generalized as the survey for travelling time was conducted for part of roads only in Sofia city, travelling time by road transport is approximately 1.7 times of that by metro for the above section, and thus metro has more advantage than road transport.

[23] Consumer price indices (CPI) in Bulgaria increased by 1.67 times from 2002 (at the time of project appraisal) to 2013 (at the time of ex-post evaluation)(source: National Statistical Agency), however, metro fare increased by 3.3 times, whose increasing rate is higher than consumer price increase rate.

3.2.2.2 Qualitative Effects Identified from the Beneficiary Survey

The beneficiary survey was conducted in the ex-post evaluation in order to see qualitative effects of the project[24]. The overview of the results of the survey is shown below.

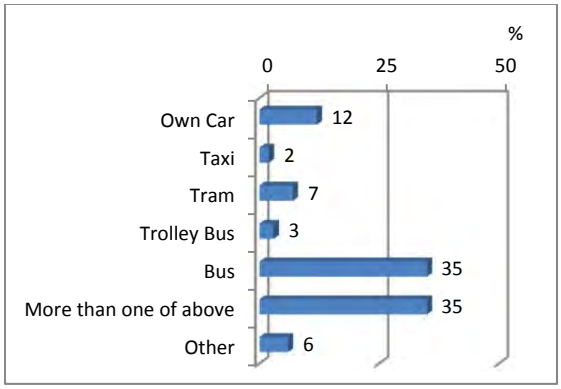

Figure 2: Transport Mode Used before Beneficiaries Started Using Line 1

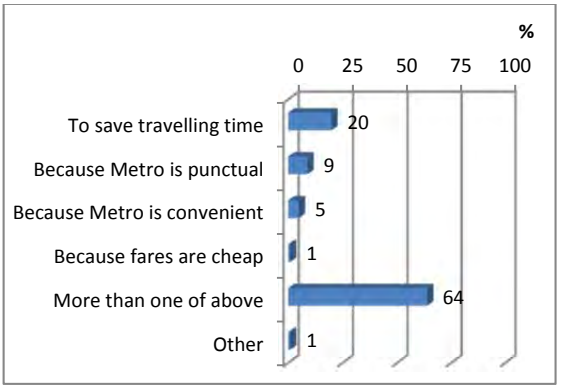

Figure 3: Reasons for Using Line 1

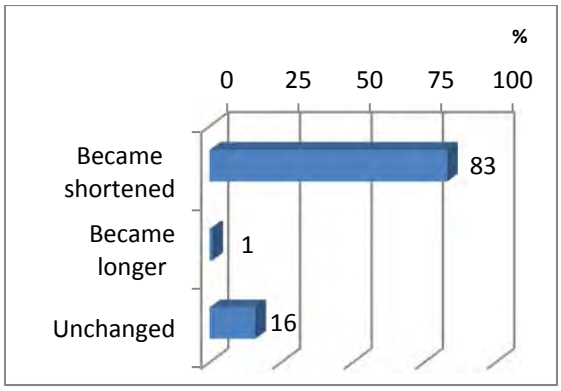

Figure 4: Changes in Travelling Time after Beneficiaries Started Using Line 1

Among those who answered that travelling time was shortened, 53% said reduced time was 10 to 20 minutes and 31% said reduced time was 20 to 30 minutes.

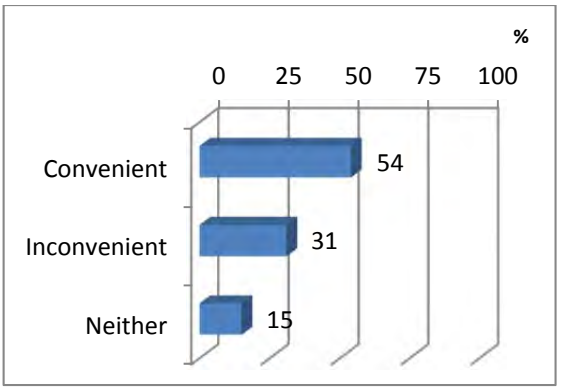

Figure 5: Connection of Line 1 with Other Modes of Transportation

As explained above, the passenger volume on Line 1 at the time of ex-post evaluation is 176,000 people per day, and the result of the beneficiary survey above suggests that the transport mode that was used the most by beneficiaries before they started using Line 1 was buses, and converting the passenger volume of Line 1 into the number of buses (assuming 15 passengers per vehicle on average) results in approximately 12,000 buses per day, which suggests that the project contributed to reduction of traffic volume on roads to some extent.

[24] The beneficiary survey was conducted in the following manner. Time: December 2013, the number of samples: 100 in total (48 at the eighth station and 52 at the ninth station (male: 43 and female: 57)), method: questionnaire survey

Moreover, reasons for using Line 1 are that beneficiaries can save time and metro is punctual and convenient etc., and over 80% of beneficiaries answered that travelling time was reduced after they started using Line 1.

In light of the above, this project is considered to have contributed to streamlining Sofia city's transportation system to a certain extent. However, approximately 30% of beneficiaries feel that the connection of Line 1 with other modes of transportation is inconvenient as shown above, and in addition, approximately 60% feel that Line 1 is overcrowded and a little less than 40% want operation interval to be further shortened. Thus these aspects need to be taken care of in order to promote a modal shift from a road transport to metro further.

3.3 Impact

3.3.1 Intended Impacts

3.3.1.1 Changes on Traffic Congestions on Roads and Environment after Project Completion

The results of the beneficiary survey on changes on traffic congestions on roads and environment (traffic noise and air pollution) along Line 1 after project completion are shown below.

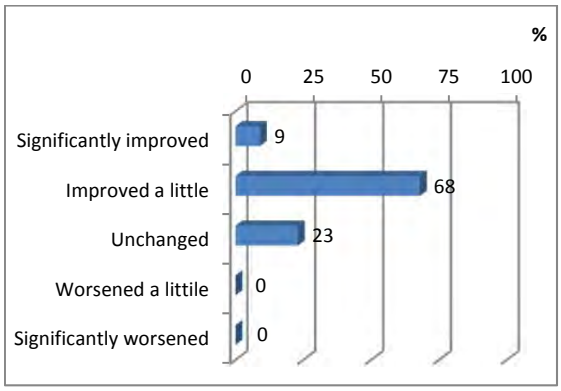

Figure 6: Traffic Congestions on Roads along Line 1

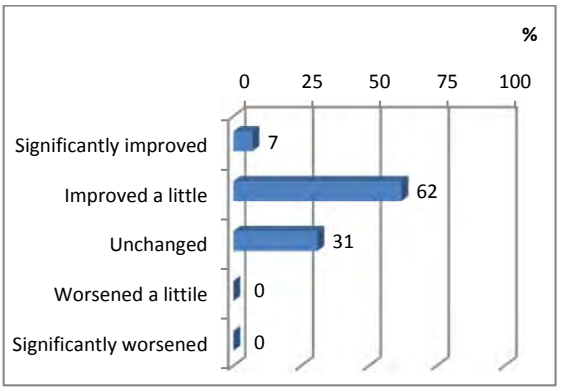

Figure 7: Traffic Noise in Areas along Line 1

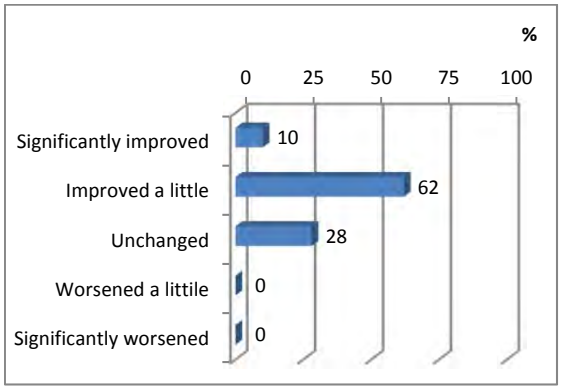

Figure 8: Air Pollutions in Areas along Line 1

Nearly 80% of beneficiaries feel that traffic congestions on roads were improved after project completion and approximately 70% feel that traffic noise and air pollutions were reduced. Therefore, this project is considered to have contributed to improvement of traffic congestions on roads and urban environment to a certain extent, which further contributed to enhancing convenience for citizens and strengthening urban functions of the capital to a certain extent.

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

At the time of project appraisal, the project section was expected to pass through a part of cultural property protection areas (around the seventh station), and the environmental protection law of Bulgaria obliged stakeholders of all railway projects to conduct two steps environmental impact assessment (EIA)[25]. The first EIA was approved by the Ministry of Environment in December 2000, and the second EIA was to be conducted as soon as after completion of a basic design and before procurement of contractors[26].

At the time of ex-post evaluation, all EIA procedures by the Ministry of Environment were completed (the second EIA was completed in 2002), and cultural remains were not found around the seventh or eighth stations, which thus did not affect construction works[27]. However, in 2005, it became necessary to cut down some trees in the park near the eighth station, and an NGO opposed this, and then the Sofia Municipality presented a solution whereby it would transplant the trees to a different location and replant the trees in their original locations after completion of construction works, and the issue was solved[28]. Moreover, construction works were considered to cause some cracks in the historical Military Club building, which was located near the construction site, however, restoration and enforcement works were conducted by contractors and the issue was solved[29]. According to the executing agency, while some problems were seen as above, monitoring of EIA procedures was properly conducted and necessary environmental measures were taken by consultants in cooperation with contractors during project implementation.

3.3.2.2 Land Acquisition and Resettlement

There was no land acquisition or resettlement under this project[30].

This project has largely achieved its objectives. Therefore its effectiveness and impact is high.

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25 Source: JICA appraisal document
26 Source: same as above
27 Source: JICA internal document and answers to the questionnaire
28 Source: JICA internal document
29 Source: same as above
30 Source: answers to the questionnaire

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

Outputs of the project (planned and actual) are shown in Table 8.

Table 8: Comparison of Outputs (Planned/ Actual)

Item	Planned	Actual
Construction Works/ Procurement	・ Construction of tunnels from the seventh station to the ninth station (1.83km per direction x 2 = 3.66 km in total) * ・ Construction of stations at the eighth and the ninth stations (110m each) ・ Construction of turn-back facilities ・ Signal, telecommunication, power supply works	・ Construction of tunnels from the seventh station to the ninth station (1.74km per direction x 2 = 3.48km in total) * ・ Construction of stations at the eighth and the ninth stations (110m each) ・ Construction of turn-back facilities ・ Signal, telecommunication, power supply works
Consulting Service	1) Engineering Consultant ・ Review of bidding documents and assistance for selection of contractors and suppliers ・ Design of shield tunnel and construction supervision ・ Environmental management (coaching on environmental impact during construction works) etc. 1,664M/M in total 2) Management Consultant ・ Establishment of new financial structures of Metropolitan Company ・ Institutional building of management and operation of Metropolitan Company ・ Provision of staff trainings etc. 72M/M in total	1) Engineering Consultant ・ Review of bidding documents and assistance for selection of contractors and suppliers ・ Design of shield tunnel and construction supervision ・ Environmental management (coaching on environmental impact during construction works) etc. 1,731M/M in total 2) Management Consultant ・ Establishment of new financial structures of Metropolitan Company ・ Institutional building of management and operation of Metropolitan Company ・ Provision of staff trainings etc. 344M/M in total

Source: planned: JICA appraisal document, actual: answers to the questionnaire

* Note: As tunnels from the seventh to the ninth station were twin shield tunnels with single track, the length of the tunnels was calculated by a length per direction x 2.

Actual outputs are almost as planned, and the actual period of consulting service was extended due to a delay of project implementation.

Platform at the Eighth Station

Remote Control and Surveillance System

3.4.2 Project Inputs

3.4.2.1 Project Cost

The planned project cost at the time of project appraisal was 17,192 million yen (foreign currency: 8,661 million yen, local currency: 8,531 million ten), of which Japanese ODA loan portion was 12,894 million yen[31]. On the other hand, the actual project cost was 12,901 million yen (foreign currency: 12,821 million yen, local currency: 80 million yen), of which Japanese ODA loan portion was 12,833 million yen[32], and it was lower than planned (75% against the plan)[33]. The actual project cost does not include value-added tax (VAT) which was refunded after project completion, however, the refunded amount of VAT was not identified in ex-post evaluation. Then, comparing the actual cost with the planned cost excluding taxes (15,770 million yen) results in 82% against the plan, which is still lower than planned. The reason for the actual cost being lower than the planned cost is considered to be because the planned cost was calculated taking into account risks of cost overrun, as actual project cost turned out to be more than planned cost in the past Japanese ODA loan projects in Bulgaria.

3.4.2.2 Project Period

The planned project period at the time of project appraisal was 56 months in total from February 2002 (signing of the loan agreement) to September 2006 (completion of construction works)[34]. On the other hand, the actual project period was 92 months in total from February 2002 (signing of the loan agreement) to September 2009 (completion of construction works)[35], and it was significantly longer than planned (164% against the plan). The reasons for the actual project period significantly exceeding the planned period were; 1) regarding a selection of contractors, a long time was required for correction of pre-qualification (P/Q) documents prepared by the executing agency, clarification of P/Q criteria and correction of bidding documents etc., and in particular, the Sofia Municipality did not have an experience of implementing a large scale project with overseas borrowing and was unaccustomed to required procedures, which required inquiries from the Municipality several times; 2) while the Municipality requested JICA of concurrence to bidding results, in which 3 out of 5 companies passed technical evaluation, some deficiencies were found in the evaluation report and thus re-evaluation was required, and as a result 1 company out of the above 3 companies became disqualified, which also required a long time; 3) a selection of sub-contractors by contractors

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31 Source: JICA appraisal document

32 Source: answers to the questionnaire and JICA internal document

33 The actual project cost above is different from the amount written in the Project Completion Report, however, according to Metropolitan Company and the engineering consultant, the above figure provided by Metropolitan Company is the correct figure.

34 Source: JICA appraisal document

35 Source: JICA internal document

was delayed and a change to specification of a tunnel boring machine and segment (blocks that consist of segmented tunnels) was required; and 4) a long time was required for re-design of the connection point with the seventh station and for a change of location of vertical shaft, as the structure of common duct (which contains essential utilities such as electricity, gas and water), which was located near the seventh station, was deteriorated more heavily than expected[36].

Table 9: Comparison of Planned and Actual Project Period

Content	Planned	Actual
Selection of Consultant	January 2002 - June 2002 (6 months)	Unknown - August 2002
Selection of Contractor	April 2002 - September 2003 (18months)	September 2002 - November 2004 (27months)
Construction Works/ Procurement	October 2003 - September 2006 (36months)	November 2004 - September 2009 (59months)
Consulting Service	July 2002 - September 2006 (39months)	September 2002 - December 2010 (100months)

Source: planned: JICA appraisal document, actual: JICA internal document
Note: according to JICA appraisal document, the planned period of consulting service does not seem to include a defect liability period, however, the actual period includes a defect liability period.

3.4.3 Results of Calculations of Internal Rates of Return (Reference only)

3.4.3.1 Financial Internal Rate of Return (FIRR)

The precondition written in the SAPROF (Special Assistance for Project Formation) report and the actual situation is different (a passenger volume was calculated in the report based on an assumption that a passenger volume between each station is calculable, for example, the volume from the first to the seventh station is estimated to remain constant and the volume from the eighth to the tenth station is estimated to increase after opening of the thirteenth station. However, at present, a passenger volume between each station is not calculable), and thus FIRR cannot be correctly calculated.

3.4.3.2 Economic Internal Rate of Return (EIRR)

EIRR cannot be calculated, as necessary data was not available.

Although the project cost was within the plan, the project period exceeded the plan. Therefore efficiency of the project is fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance (O&M)

At the time of project appraisal, the transportation system in Sofia city was managed under a

[36] Source: same as above

system in which the Sofia Municipality (the Transportation Bureau headed by the deputy mayor of transport) makes policy decisions and in the case of metro, Metropolitan Company (a special governmental corporation which is wholly owned by the Municipality and is entrusted by the Municipality to operate and manage metro exclusively) implements the policy decisions, and in the case of other public transportation such as buses and trams, the respective O&M agencies implement the policy decisions[37]. There is no change to this system at the time of ex-post evaluation, and management, operation and maintenance of metro are conducted by Metropolitan Company. The total number of employees of the company at the time of ex-post evaluation is 1,403, of which 923 employees are in charge of O&M of Line 1[38].

Table 10: Breakdown of the Number of Employees in Charge of O&M of Line 1

Section	Number
Management	42
Depot	288
SCADA and Communication System	74
Power Supply	67
Traffic Operation	337
Electro-mechanics	47
Rail Tracks and Infrastructure	68
Total	923

Source: answers to the questionnaire

O&M of almost all facilities except for a few special electro-mechanics is conducted by own employees in Metropolitan Company[39]. The number of employees in charge of O&M of Line 1 was estimated to be approximately 1,000 in 2015 (when Line 1 was expected to be extended to the sixteenth station) in the SAPROF report, and as a nearly equal number of employees are currently assigned, there seems to be no problem regarding the number of employees.

3.5.2 Technical Aspects of Operation and Maintenance

Among 923 employees in charge of O&M of Line 1, 305 are engineers, 104 are university graduates (not engineers) and 317 are graduates of secondary technical schools[40]. Maintenance manuals for rolling stocks, tracks, ventilation and air-conditioning systems, and water supply and sewerage systems are in place, and O&M is conducted based on these manuals[41]. During project implementation, various trainings were provided for train drivers (4 months), experts of security equipment including SCADA system and CCTV (2 months), energy experts (40 days), experts of rail tracks and switch-points (30 days), by recruiting experts from inside and outside

37 Source: JICA appraisal document
38 Source: answers to the questionnaire
39 Source: interviews with Metropolitan Company
40 Source: answers to the questionnaire
41 Source: interviews with Metropolitan Company

of Metropolitan Company, and even after project completion, trainings are conducted at least once a year, which end up with exams to check the level of understanding[42]. Sufficient number of technical staff is assigned, various maintenance manuals are in place, and trainings are regularly conducted, and thus there seems to be no problem regarding technical aspects of O&M.

3.5.3 Financial Aspects of Operation and Maintenance

At the time of project appraisal, Metropolitan Company recorded profit in its income statement in the financial year of 2000, however, the company was not able to accurately count the number of passengers and thus it could not efficiently formulate an operation and investment plan for the future (as commutation tickets for metro are commonly used for buses and trams as well, Sofia Public Transport Company-Holding sold these tickets to passengers and distributed profit to each operating agency)[43]. Thus, under this project, a dispatch of JICA experts and an implementation of training in Japan were planned for management improvement of the company, and management consultants employed for the project were to analyse management and financial problems faced by the company and formulate and implement a future improvement plan so that the company could establish a corporate management to reduce financial burdens on Sofia Municipality[44].

During project implementation, 3 short-term experts in total were dispatched from JICA to the Municipality (a transportation system advisor: 3 months, a public sector finance advisor: 6 months and an advisor for streamlining and promoting the transportation system: 7 months), and an economist from Metropolitan Company attended the “railway management course” held in Tokyo in January and February 2007[45]. Moreover, as explained in “3.4.1 Project Outputs”, management consultants employed under the project provided support for establishment of new financial structures of and institutional reform of Metropolitan Company (for example, centralized information management of ridership and ticket sales, optimization of the number of employees and expenses etc.). As a result, at the time of ex-post evaluation, the number of passengers is correctly counted by automatic ticket gates installed at each station. However, only incoming number of passengers is able to be counted and exiting number of passengers at each station is not yet able to be counted. A fare of metro is currently 1.0 leva for a single trip regardless of distance, which is the same for other public transportation system, however, tickets for 10 single trips (8.0 leva) and monthly tickets (35.0 leva per month) etc. are also available. Fare revenues of Metropolitan Company consist of 1) direct ticket sales to passengers and 2) a

[42] Source: answers to the questionnaire
[43] Source: JICA appraisal document
[44] Source: same as above
[45] Source: JICA internal document

revenue distributed by Sofia Urban Mobility Center (similarly as at the time of project appraisal, commutation tickets for metro are commonly used for other public transport, and the Center sells these tickets to passengers and distributes profit to each operating agency in accordance with operating distance)[46]. Financial data of Metropolitan Company in recent three years are shown below.

Table 11: Income Statement of Metropolitan Company

(Unit: million leva)

	2010	2011	2012
Sales (Operational Revenue)	**37.615**	**36.804**	**44.827**
Services (Fares)	36.795	35.781	40.567
Others	0.820	1.023	4.260
Cost of Sales	**9.641**	**11.428**	**15.965**
Raw-materials, Goods, Consumables	5.951	7.039	9.500
Hired Services	3.690	4.389	6.465
Gross Profit	**27.974**	**25.376**	**28.862**
Selling, General and Administrative Expenses	**28.401**	**29.890**	**39.513**
Wages and Social Securities	15.082	16.568	22.038
Depreciation Costs	8.541	9.200	13.262
Others	4.778	4.122	4.213
Operating Profit	**▲0.427**	**▲4.514**	**▲10.651**
Non-Operating Income	**7.269**	**7.830**	**12.150**
Non-Operating Expense	**0.021**	**0.011**	**0.030**
Extraordinary Profit	**0.000**	**0.000**	**0.000**
Extraordinary Loss	**0.374**	**0.433**	**0.532**
Tax	**0.470**	**0.292**	**0.094**
Net Profit	**5.977**	**2.580**	**0.843**

Source: prepared based on answers to the questionnaire

Note: "Others" in "Sales (Operational Revenue)" includes revenues from advertisement, rents and service fees paid from Sofia Municipality for construction management. "Non-Operating Income" includes government grants etc.

Table 12: Balance Sheet of Metropolitan Company

(Unit: million leva)

	2010	2011	2012
Assets			
Long-Term Assets	1,032.871	1,340.148	1,702.078
Current Assets	52.614	50.232	67.231
Total Assets	1,085.485	1,390.380	1,769.309
Equity and Liabilities			
Equity	14.746	15.596	16.439
Long-Term Liabilities	1,000.897	1,342.127	1,690.309
Current Liabilities	69.842	32.657	62.561
Total Equity and Liabilities	1,085.485	1,390.380	1,769.309

Source: answers to the questionnaire

[46] Source: answers to the questionnaire and interviews with Sofia Municipality and Metropolitan Company

Table 13: Cash Flow Statement of Metropolitan Company

(Unit: million leva)

	2010	2011	2012
Cash Flows from Operating Activities	▲6.425	76.088	65.323
Cash Flows from Investing Activities	▲245.050	▲427.525	▲442.933
Cash Flows from Financing Activities	252.509	354.037	376.824
Net Increase in Cash and Cash Equivalents	1.034	2.600	▲0.786
Cash and Cash Equivalents at the Beginning of the Year	4.784	5.818	8.418
Cash and Cash Equivalents at the End of the Year	5.818	8.418	7.632

Source: answers to the questionnaire

O&M cost of Line 1 in recent three years is approximately 18-27 million leva per year (approximately 1,200-1,800 million yen per year), of which O&M cost of the project section (between the seventh station and the ninth station) is approximately 1.8-2.6 million leva per year (approximately 120-180 million yen per year)[47].

As shown above, sales (operational revenue) of Metropolitan Company have steadily increased, and while operating profit is in deficit due to depreciation cost, net profit is in surplus due to government grants etc. According to the company, it makes a plan for a necessary amount of grants and submits to the Municipality and the amount is allocated every year. The current ratio of the company in recent years is over 100%, which suggests no major problem on short-term liquidity, and cash flow is positive. Material cost, utility cost, consumables expense, personnel cost and depreciation cost etc. increased accompanying the opening of Line 2 in 2012, which resulted in a decrease of net profit in 2012 compared with that of the previous year, and the future trends should be monitored, however, O&M cost of the project facilities is sufficiently covered by sales, and there seems to be no major problem regarding financial aspects of O&M.

3.5.4 Current Status of Operation and Maintenance

As for rolling stocks, regular inspection, functional verification and change of spare parts in accordance with running distance as well as daily inspection and cleaning are conducted, and moreover, maintenance is conducted for tracks, ventilation and air-conditioning facilities, and water supply and sewerage systems based on maintenance manuals[48]. According to Metropolitan Company, there is no problem on facilities and equipment provided by the project. Stations and a depot (this was not covered by the project) were visited during the field survey, and all facilities were well maintained and no particular problem was seen.

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

[47] Source: answers to the questionnaire

[48] Source: interviews with Metropolitan Company

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed at streamlining the city's transportation system by constructing tunnels and stations from the seventh to the ninth station, as part of Phase 2 (from the seventh to the sixteenth station of metro Line 1) of the Metro Line Construction Plan that existed at the time of project appraisal (covering approximately 19 km in total extension, from the first to the sixteenth station of metro Line 1) in Sofia, the capital of Bulgaria.

Relevance of this project is high, as the project is consistent with priority areas of Bulgaria's development plans and Japan's ODA policy, and moreover development needs for the project are high. The actual figure of daily passenger ridership at two years after project completion is approximately 80% of the figure estimated during the Mid-Term Review, and other indicators such as the number of running trains, operation interval, annual operational revenue and net profit of Metropolitan Company, which is responsible for operation and maintenance (O&M) of metro, showed an improvement to a large extent, compared with those at the time of appraisal. According to the result of beneficiary survey, travelling time became shortened since beneficiaries started using metro Line 1 and traffic congestions on roads along Line 1 and air/traffic noise pollutions were reduced after project completion. Thus, effectiveness and impact of the project are high. Efficiency of the project is fair, as actual project period largely exceeded planned period, while actual project cost was within the planned cost. Sustainability of the project is high, as no major problem has been observed in institutional, technical and financial aspects of O&M.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency (Sofia Municipality)

As explained above, a fare is a flat-rate in all public transportation systems in Sofia for convenience of passengers, and revenues from indirect ticket sales are distributed from Sofia Urban Mobility Center to each operating agency according to operating distance. While no major problem is seen regarding financial aspects of O&M at the time of ex-post evaluation, fares should be determined reflecting actual number of passengers and actual O&M cost. As O&M cost of metro is more expensive than other public transports in general, fares should be set utilizing a zoning system, for example, based on actual number of passengers and actual O&M cost in future.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Necessity to manage risks when providing a Japanese ODA loan to an executing agency for the first time: During project implementation, a selection of contractors and construction works were overly delayed and as a result, the actual project period largely exceeded the planned period. JICA should consider how to deal with these problems during project appraisal if there is a risk of delay because borrowers or executing agencies are unfamiliar with Japanese ODA Loan procedures. For example, the World Bank prepares a procurement assessment report for a new project during appraisal based on the country procurement assessment report, and the Bank assesses executing agencies' capabilities and risks related to procurement and formulates a detailed project implementation plan based on the report, which could be one of the options.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	・ Construction of tunnels from the seventh station to the ninth station ・ Construction of stations at the eighth and the ninth stations ・ Construction of turn-back facilities ・ Signal, telecommunication, power supply works	As planned
2. Project Period	February 2002 – September 2006 (56 months)	February 2002 – September 2009 (92 months)
3. Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 8,661million yen 8,531million yen (148 million leva) 17,192million yen 12,894million yen 1 leva = 57.65 yen (As of June 2001)	 12,821million yen 80million yen (1.2 million leva) 12,901million yen 12,833million yen 1 leva = 69.09 yen (Average between February 2002 and July 2011)

Romania

Ex-Post Evaluation of Japanese ODA Loan Project

Road Improvement Project

External Evaluator: Yasuhiro Kawabata, Sanshu Engineering Consultant

0. Summary

The objective of the project was to alleviate traffic congestion by constructing bypasses around heavy-trafficked Timisoara and Craiova areas, and widening/improving the existing road between Timisoara and Lugoj along National Road No.6, thereby contributing to activation of the regional economic activities. The project has been highly relevant with the development plans and needs of Romania, as well as Japan's ODA policies. Thus, its relevance is high. Regarding alleviation of traffic congestion, which is the project objective, the current traffic volume of the Timisoara - Lugoj road is about the volume as estimated, and the traffic volume of Craiova Bypass has reached about 70% of the highway capacity for the 2-lane highway in 6 years after open to traffic (2013). The beneficiary survey reveals that 77-85% of beneficiaries recognize the project contributes substantially or fairly to activation of the regional economic activities. This project has largely achieved its objectives. Therefore, its effectiveness and impact is high. Although the actual project scope (output) was partially revised from the originally planned scope, revisions made are considered appropriate. The project cost was higher than planned, and the project period was significantly longer than planned. Therefore, efficiency of the project is considered low. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

1. Project Description

Projection Location

Timisoara Bypass

1.1 Background

The total length of road network in Romania as of 1994 was 73,000km, among which 15,000km was national roads, which cover the whole country. The pavement ratio of national roads was 98%. However, since priority had been given to the railway sector under the socialism regime, improvement[1] and upgrading[2] of roads had not been undertaken for a long time so that the road standards did not meet the traffic condition at that time. Since the lane width and shoulders were narrow, overtaking was not possible and thus roads were congested. Moreover, strength of pavement and bridges was insufficient so that the maximum weight of cargo trucks was limited to less than 10 tons resulting in less efficiency in transportation.

Due to increase of traffic volume, particularly cargo trucks in the urban area, the government commenced improvement and upgrading of main national roads. As one of improvement programs, the Romanian government requested the Japanese government to finance some sections of National Road No.6, which connects between capital city, Bucharest and the border town, Cenad to the west via Craiova in 1992. Among the sections to be improved, three sections[3], which were more trafficked and had high economic potential were selected to be financed by the Japanese ODA Loan.

1.2 Project Outline

The objective of the project was to alleviate traffic congestion by constructing bypasses around Timisoara and Craiova areas, and widening/improving the existing road between Timisoara and Lugoj along National Road No.6, thereby contributing to activation of the regional economic activities. The location of the project site is shown in Figure 1.

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1 "Improvement" means work involving partial modification of road alignments, pavement of road surface, installation of drainage, and slope protection and others.

2 "Upgrading" means improvement which involves upgrading the road/highway standard to higher standards such as upgrading from an ordinary road to an expressway or a motorway, or new construction of an expressway.

3 Features of three cities included in the project road sections are as follows: Timisoara (Romanian 4th largest and major industrial city close to the border with Serbia), Lugoj (an old fortress city located about 60km away from Timisoara to the east), Craiova (Romanian 6th largest and major commercial city located to the west of Bucharest)

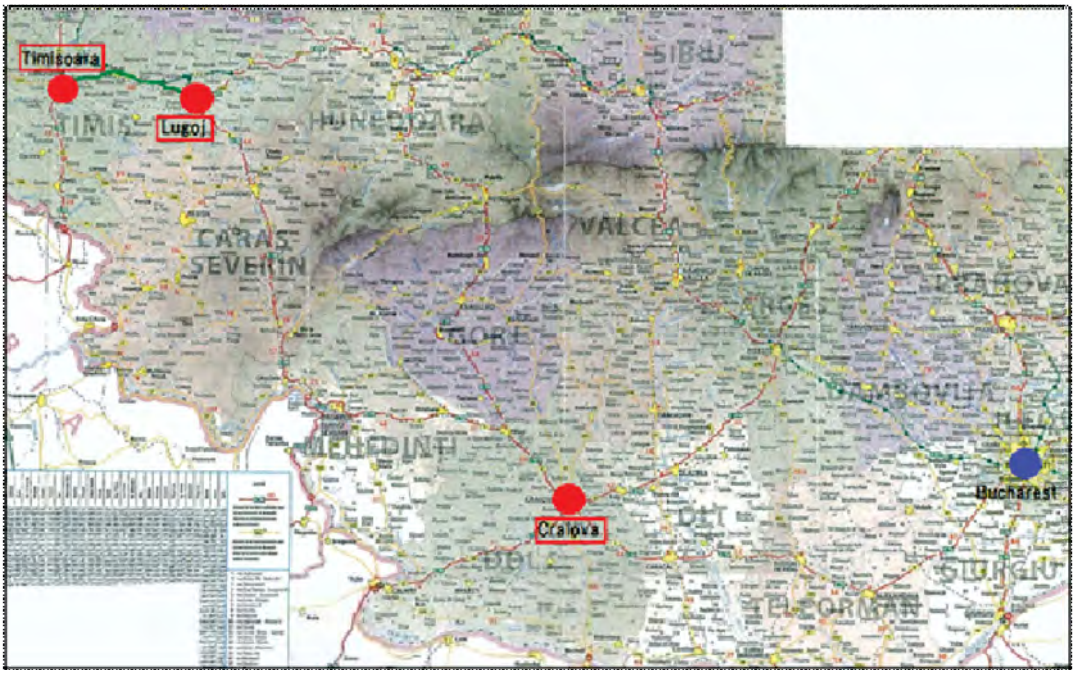


Figure 1 Location of Project Site

Loan Approved Amount/ Disbursed Amount	9,189 million yen/8,983 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	July 1997/February 1998
Terms and Conditions	For civil work and procurement: Interest Rate: 2.70%, Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General untied For consulting services: Interest Rate: 2.30% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower / Executing Agency(ies)	Ministry of Public Finance of Government of Romania /Romanian National Company for Motorways and National Roads (RNCMNR)
Final Disbursement Date	Original date: September 25, 2004 After 1st revision: June 25, 2007 After 2nd revision: July 2011
Main Contractor (Over 1 billion yen)	Efklidis (Greek)/Aegek (Greek)/Konoike-gumi JV (January 2003 - November 2006), SC Romstrade SRL/SC Vectra Service SRL (Romania) JV and F.C.C Construction (Spain) (February 2008 - April 2010) for Timisoara Bypass and Timisoara-Lugoj Road, and Italstrade P.A./Astaldi SPA (Italy) JV for Craiova Bypass.
Main Consultant (Over 100 million yen)	Construction Project Consultant (April 2000 - May 2009), Egis Romania (August 2009 - January 2014)
Feasibility Studies, etc.	Pre-feasibility Study by IPTANA S.A. (1995) Feasibility Study by Louis Berger/SPEA (1996) Special Assistance for Project Formation (SAPROF) (1997)
Related Projects (if any)	Second Roads Project by the World Bank (L/A was signed in 1997)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: September 2013 – August 2014

Duration of the Field Study: November 16 – November 23, 2013, February 11 –February 14, 2014

3. Results of the Evaluation (Overall Rating: B[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Relevance to the Development Plan of Romania

After the change of political system in 1989, Romania has aimed at joining European Union (EU) as a national target and pursuing development of the market economy system and stabilization of macro-economy. Thus, in 1990's priority was given to development of economic policies, and no comprehensive national development plan including other sectors such as road and transport sectors was developed. However, at the appraisal time (1997), "the1997-2000 Governance Program (Management Plan)", which became a basis for the three-year investment plan (including a project list), had been issued in December 1996. Among the infrastructure sector in the Program, significance of transport sector together with energy and telecommunication sectors were recognized, and rehabilitation of national highway and railway network was particularly listed as the most priority agenda.

In National Development Plan 2007-2013, which was effective at the post evaluation stage, six priorities were defined as priority agendas for development including the followings: 1) increasing economic competitiveness and developing the knowledge-based economy referring to the European experience; 2) development and modernization of transport infrastructure; 3) environment protection and improvement; 4) development of human resources, promotion of employment and social inclusion, and strengthening of the administrative capacity; 5) development of the rural economy and increase of agricultural productivity and 6) reducing regional development disparity. Regarding development and modernization of transport infrastructure, since Romania joined European Union (EU) in January 2007, rehabilitation and development of infrastructure based on the EU standards was particularly the agenda to be urgently tackled.

At the appraisal time, significance of the transport sector was recognized in Romania, and particularly rehabilitation of highway and railway networks was listed as the first priority agenda. At the ex-post evaluation, rehabilitation and development of infrastructure based on the

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

[5] ③: High, ② Fair, ① Low

EU standards is the agenda to be urgently tackled. Thus, the project conforms with the Romanian development policies.

3.1.2 Relevance to the Development Needs of Romania

In Romania, according to the railway-first policy under the socialist regime, improvement and upgrading of highways had not been implemented for a long time, and only minor maintenance had been undertaken to the existing national highway network, which was constructed during the socialist regime period. Entering into 90's, demand to road transport and transportation had increased due to motorization and development of the market economy system in Romania. (The average growth rate of daily traffic in the national highways during 1990 - 1995 was 5%.) Thus, the existing national road network could not cope with the increased traffic volume and vehicles growing to a large size. Particularly, in larger cities, where widening of existing roads/highways was not feasible, traffic noise and congestion caused by passage of large vehicles had created problems, and necessity of construction of bypasses was noted.

After joining EU in 2007, road/highway development has been promoted in Romania. Particularly, rehabilitation of arterial roads/highways, focusing on national roads, which are overlapping sections of the European Motorway Network[6], has been implemented, and pavement condition has been improved. Rehabilitation work of Lugoj - Craiova section along National Road No. 6 (European highway No. 70), which includes the project roads under the project has been completed. However, a plan to rehabilitate and/or upgrade to a motorway after 2020 is now being considered. Even at the ex-post evaluation, development of road infrastructure is one of the top priority agendas for the Government. In the event of heavy snow in January/February 2012, snow removal could not catch up with snow fall, and economic activities and citizen's life were severely affected. The Government intends to tackle further enhancement of logistical environment in both soft and hard components and aspects.

At the appraisal time, in larger cities, where widening of existing roads/highways is not feasible due to increased traffic volume and vehicles growing to a large size, necessity of construction of bypasses was noted. Development of road infrastructure to enhance logistical environment in both software and hardware aspects is still one of the top priority agendas for the Government. Thus, the project conforms with Romanian development needs.

3.1.3 Relevance to Japan's ODA Policy

In the Strategy for Overseas Economic Cooperation Operations (issued in December 1999), it is stated that the European region (central and eastern European countries and former Soviet

[6] International highway network in Europe, which expands crossing over borders. Routing is defined by European Economic Commission.

Union countries) are in the transition period to the democratic and market economy states, and thus, lack of maintenance of socio-economic infrastructure and environmental problems were recognized and became apparent in the transition stream from the old regime. Responding to the diversified development needs of each country, priority was given to the assistance for rehabilitation and development of socioeconomic infrastructure and environmental protection measures and others. Thus, project conforms with the Japanese assistance policies.

Accordingly, the project has been highly relevant with the Romanian development plan and needs, as well as Japan's ODA policies. Its relevance is therefore considered high.

3.2 Effectiveness[7] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

Since no operation and effect indicators but only Economic Internal Rate of Return (EIRR) was listed at the appraisal stage, the difference between the projected traffic volume and the actual volume, and change of travel time before and after the project were selected as operation and effect indicators under this evaluation.

(1) Daily Traffic Volume

The average daily traffic volume of the project roads is shown in Table 1.

Table 1 Average Daily Traffic Volume

Unit: passenger car unit (vehicles/day)

	Base line	Actual/Projected volume	
	1995	2010	2013
Timisoara - Ghiroda 4-lane section (2.6km section)	11,200	23,300 (22,600)	24,900 (25,400)
Recas - Lugoj 2-lane section (32.2km section)	6,500	13,000 (13,000)	14,000 (14,600)
Craiova Bypass	-	11,000 (n.a)	12,740 (n.a)
Timisoara Bypass	-	5,030 (5,430)	5,700 (5,900)

Source: Project appraisal documents, SAPROF report, Responses to the Questionnaire
Note 1: Traffic volume between Ghiroda and Recas is not available.
Note 2: Numbers in ( ) are projected volume by SAPROF.
Note 3: Nation-wide traffic counts for arterial roads are undertaken every five years.
Automatic traffic counting device is installed at some points along the Timisoara-Lugoj section.
Note 4: Passenger car unit (vehicles/day) is the unit derived by converting actual number of all the kinds of vehicles to number of passenger cars.
Note 5: Regarding the actual traffic volume of both Craiova and Timisoara Bypasses as of 2013, the peak-hour traffic was counted in end-November 2013 for the study and converted to the daily traffic volume.
Note 6: The completion date of Timisoara-Lugoj Road and Timisoara Bypass is 2010 and that of Craiova Bypass is 2007.

[7] Sub-rating for Effectiveness is to be put with consideration of Impact.

The traffic volume of 4-lane and 2-lane sections of Timisoara - Lugoj road is about the volume as projected as of 2010 and 2013 (three years after completion). The traffic volume of Craiova Bypass has increased by about 5.1% per year for the past three years, and it has reached about 70% of the highway capacity of 2-lane highway (generally considered to be about 18,000 vehicles /day) as of 2013 (six years after open to traffic). Thus, it reveals that the Bypass has been used as an alternative route of the existing road. The traffic volume of Timisoara Bypass has increased by about 4.4% per year for the past three years, and the current traffic volume is about equivalent to projected volume. The reason for not large increase (about 30% of the highway capacity) of traffic, comparing with traffic volume of Craiova Bypass is that the ring road including the bypass has not been completed and the highway network has not been established yet.

(2) Travel Time

Changes of travel time are shown in Table 2.

Table 2 Change of Travel Time

Unit: minutes

Road	Base line	Actual/Projected volume	
	1995	2010	2013
Timisoara - Lugoj	63	47	60
Craiova Bypass (new construction)	-	18	23
Timisoara Bypass (new construction)	-	22	30

Source: Responses to the Questionnaire

The average travel time between Timisoara and Lugoj before the project was 63 minutes and was shortened to 47 minutes in 2010, right after the project completion. However, as traffic volume increases with the economic development, traffic congestion was worsened and thus, the average travel time was elongated to 60 minutes as of 2013. Beneficiaries recognize that it became more maneuverable and the highway safety was enhanced because of widened carriageway of the road. The average travel time of Craiova and Timisoara Bypasses has been elongated as traffic volume has increased with the economic development like Timisoara - Lugoj road.

3.2.2 Qualitative Effects

In order to examine the qualitative effects (streamlining/activation of regional economic activities and improvement of environment such as noise and air pollution) by the project, the beneficiary survey[8] was conducted in the following manner.

[8] Number of samples: total 120 (40 samples each for three project roads, drivers (31%), transport company employees (26%), businessman (10%), others (33%)); male (68%), female (32%); method: interview with a Questionnaire

Results of Beneficiary Survey:

(1) Streamlining/activation of Regional Economic Activities

The assessment result by residents on improvement of access is shown in Figure 2 and that on shortening of travel/commuting time in Figure 3.

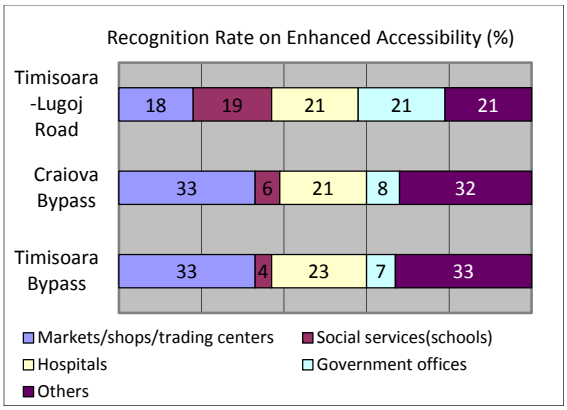


Figure 2 Improvement of Access[9]

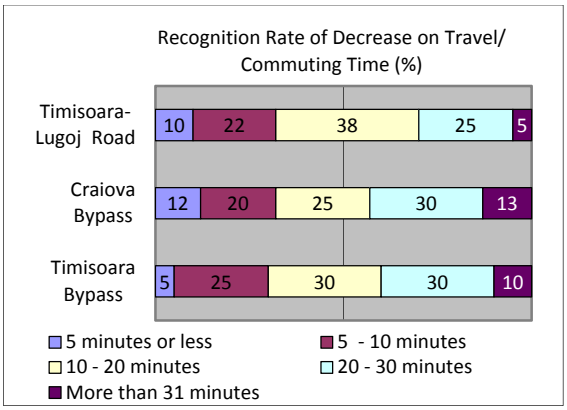


Figure 3 Shortening of Travel/ Commuting Time

Regarding the improvement of access, road users of the intercity Timisoara - Lugoj road and residents along the corridor evaluate that access to all the facilities and services was improved. Road users of Craiova and Timisoara Bypasses and residents along the road recognize that particularly, access to markets/shops/trading centers and hospitals was improved.

Regarding shortening of travel/commuting time, road users of the intercity Timisoara - Lugoj road and residents along the corridor admit that travel time was shortened by 15 minutes in average. Road users of Craiova and Timisoara Bypasses and residents along the corridors recognize that it was shortened by 17 - 18 minutes in average. Thus, the project seems to contribute to streamlining/activation of regional economic activities

(2) Improvement of Environment

The assessment results by residents on alleviation of traffic congestion, improvement of air pollution and reduction of traffic noise improvement of access are shown in Figures 4, 5 and 6, respectively.

[9] The question asks whether or not improvement was made regarding the accessibility to every facilities. Multiple answers are allowed.

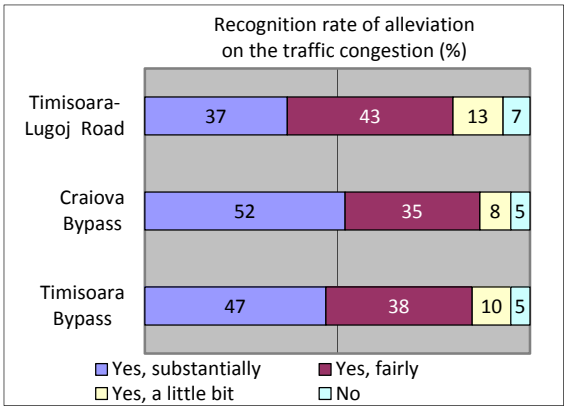


Figure 4 Alleviation of Traffic Congestion

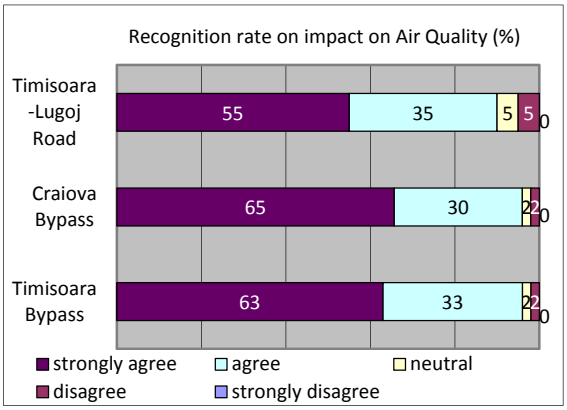


Figure 5 Improvement of Air Pollution

Regarding contribution of three project roads to alleviate traffic congestion, about 80-87% of respondents admit that its contribution is “substantial” or “fair”.

Regarding the question on contribution of the project to improvement of air pollution, about 90-96% of respondents admit or strongly admit its contribution. It should be noted that particularly, while the project scope was to widen and improve the existing road, improvement of air pollution along Timisoara - Lugoj road is recognized because of alleviation of traffic congestion.

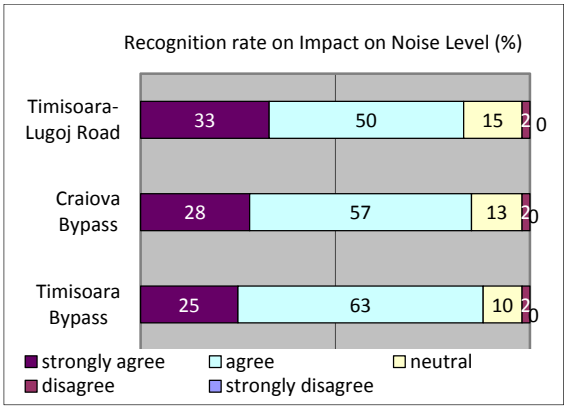


Figure 6 Reduction of Traffic Noise

Regarding contribution of three project roads to reduce traffic noise, about 83-88% of respondents admit or strongly admit its contribution because of alleviation of traffic congestion.

3.3 Impact

3.3.1 Intended Impacts

In order to examine contribution of the project to the regional economic development, the number of approval for new installation of advertising panels along the corridor for Timisoara - Lugoj road, and the number of approval for agricultural exploitation along the corridor of Craiova Bypass were observed during the field study. Findings are summarized in Table 3 and Table 4.

Table 3 Number of Approval for Installation of Advertising Panels along the Corridor

Number of Approval for Installation of Advertising Panels	2009	2010	2011	2012	2013
	4	2	10	2	8

Source: Responses to the Questionnaire

Along Timisoara - Lugoj road, there were 10 application/ approval for installation of advertising panels in 2011, right after the project completion and 8 application/ approval in 2013. These numbers suggest that private enterprises recognize the potential for the economic development in the region.

Table 4 Number of Approval for Agricultural Exploitation

Number of Approval for Agricultural Exploitation	2008	2009	2010	2011	2012
	3	5	4	-	3

Source: Responses to the Questionnaire

Along Craiova Bypass, there were a few application for agricultural exploitation every year after the project completion, except 2011. It seemed that the potential for the economic development along the corridor has been recognized since access was improved and thus it became more convenient to transport agricultural products to urban cities.

The survey on the enterprises which moved into the bypass corridors after completion of the project was undertaken. Along Timisoara Bypass, a manufacturer producing automobile headlamps, showrooms for Ford and Land Rover cars, a logistic and transportation firm, and two gas stations have moved into the area. Along Craiova Bypass, a motel, a hotel (with a swimming pool), a window/door fabrication/sales firm, a warehouse for agricultural product and processing, and a logistic/warehouse/distribution firm have been established.

From the beneficiary survey, the following results on recognition of contribution of the project to the regional economic development were found.

(1) Activation of Economic Activities

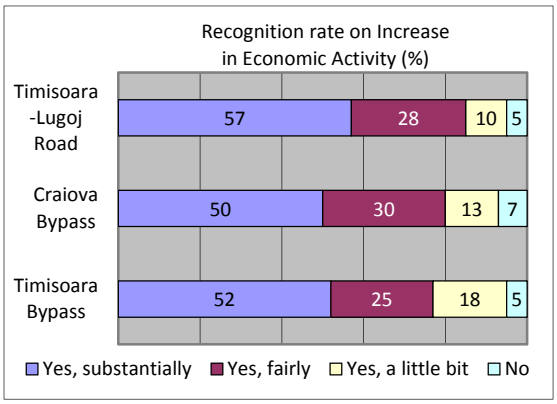


Figure 7 Activation of Economic Activities

Regarding contribution of three project roads to activation of economic activities, about 77-85% of respondents admit that its contribution is “substantial” or “fair”.

(2) Increase of Business Chances

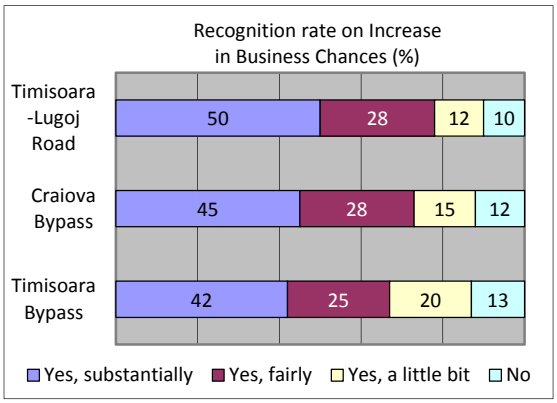


Figure 8 Increase of Business Chances

Regarding contribution of three project roads to increase of business chances, about 67-78% of respondents admit that its contribution is “substantial” or “fair”.

(3) Activation of Land Use

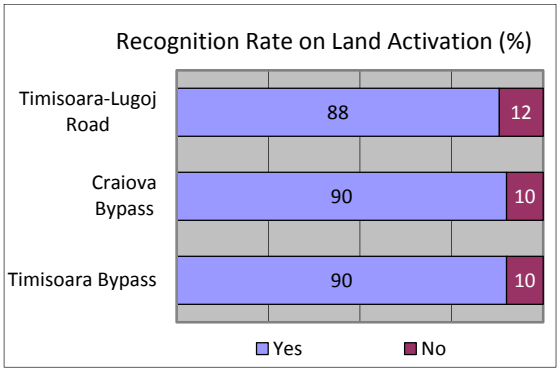


Figure 9 Activation of Land Use

Regarding contribution of three project roads to activation of land use, about 90% of respondents admit its contribution.

3.3.2 Other Impacts

(1) Impacts on the natural environment

The Environmental Agreements (EA) to three project roads were issued by Ministry of Waters, Forests and Environmental Protection as follows:

- Improvement of an existing road between Timisoara and Lugoj: September 2001
- Construction of Craiova Bypass : August 1998
- Construction of Timisoara Bypass: revised version in April 2001 (original version in January 1999)

During the project implementation, environmental monitoring was undertaken. When problems including drainage of rain water and the access[10] to private properties occurred, contractors resolved the issues properly by additionally constructing drainage and access approaches, following the instructions by the implementing agency. Regarding disposal of soils and protection of slope erosion, countermeasures including transporting wasted soils to the designated sites and undertaking planting works were also properly implemented. After the project was completed, a brief environmental impact assessment was made, and traffic signs (e.g. lowered speed limit) were installed to sections where traffic noise and vibration were issues.

(2) Land Acquisition and Resettlement

Planned and actual numbers of resettled households and land area acquired are as follows:

Table 5 Number of Resettled Households and Land Area Acquired

	Plan		Actual
Land Area acquired	Timisoara – Lugoj	9.9 ha	0
	Craiova Bypass	30.4 ha	43.2 ha
	Timisoara Bypass	33 ha	41.0 ha
	Total	73.3 ha	84.2 ha
Number of Resettled Households	4 - 5 households		0
Compensation paid	US$ 3.49 million		3.98 million lei for Craiova Bypass ($1.22 million at the current exchange rate)

Note: Current exchange rate as of December 2013: 1 lei = US$0.30266

[10] Condition that no road approaching to the lot is provided.

Increase of land area acquired was made mainly by securing the area needed to relocate some facilities and the sufficient area to construct intersections.

Regarding land acquisition for construction of Craiova Bypass, since residents who claim that he/she is a land owner did not possess the documents such as the title to an estate, which proves his/her ownership, it took a long time to process the compensation procedures. With respect to certification of the ownership, compensation was eventually paid to the people who possess any official documents possibly certifying the ownership instead of the title, following the national laws and regulations. In addition, since service roads were not constructed parallel to the partially access controlled bypass, some properties were divided into two lots by a bypass, hence no access to some lots was provided and Craiova Regional Roads and Bridges Directorate was sued by residents. As a result of the trial, the court ordered the Regional Road and Bridges Directorate to pay compensation to the residents. Payment was made and provision of access was also made as a countermeasure to tackle the issue on the division of properties. The lengthy battle/procedures at the court resulted in extension of the project period.

(3) Other Positive and Negative Impacts

None.

The traffic volume of Timisoara - Lugoj road and Timisoara Bypass is about the volume as projected. The traffic volume of Craiova Bypass has reached about 70% of the highway capacity of 2-lane highway, and it has been used as an alternative route of the existing road. Regarding change of travel time, the time between Timisoara and Lugoj before the project was 63 minutes and was shortened to 47 minutes in 2010, right after the project completion. However, as traffic volume increases with the economic development, traffic congestion was worsened and thus, the travel time was elongated to 60 minutes as of 2013. The travel time of Craiova and Timisoara Bypasses has been elongated as traffic volume has increased. Regarding the question on contribution of the project to improvement of air pollution, about 90-96% of respondents admit or strongly admit its contribution. Regarding contribution to reduce traffic noise, about 83-88% of respondents admit or strongly admit its contribution.

Regarding contribution (impacts) to the regional economic development, about 77-85% of respondents admit that its contribution of three project roads to activation of economic activities is “substantial” or “fairly” and about 67-78% of respondents admit that its contribution to increase of business chances is “substantial” or “fairly”.

The project has largely achieved its objectives and thus the effectiveness and impact is high.

3.4 Efficiency (Rating: ①)

3.4.1 Project Outputs

The original and actual output of the project is shown in Table 6.

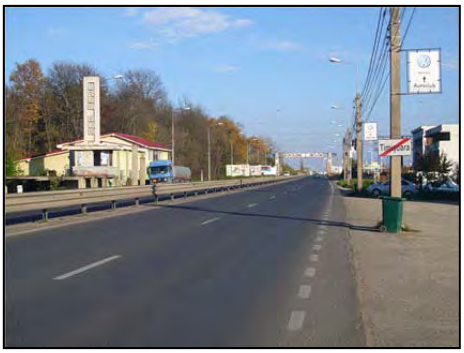
The original project scope at appraisal was planned based on the project scope and bill of quantities defined in the feasibility study, which was completed in 1999. However, detail designs were undertaken under the project, and the project scope was partly revised.

Table 6 Comparison of Output (original and actual)

Item	Project Scope at Appraisal	Project Scope at Project Completion
Civil Work	・ Improvement of the existing road between Timisoara and Lugoj (52.2km), among which the 49.6km section is improvement of 2-lane section and 2.6km section is improvement of 4-lane section including rehabilitation of 10 bridges.	Road length is as planned. Regarding bridges, three existing bridges were demolished and reconstructed.
	・ Construction of Craiova Bypass (13.8km), including construction of a bridge and three intersections.	Road length is almost as planned. (14.1km) A short bridge, which overpasses the ash transporting pipes was constructed as an additional work. If intersections both at beginning and ending points are included, the total number of intersections is 5.
	・ Construction of Timisoara Bypass (15km), including construction of three bridges and three intersections.	Road length was shortened to 12.6km due to change of alignment partly. The number of bridges constructed is 5. The number of intersections was increased by one. If intersections both at beginning and ending points are included, the total number of intersections is 6.
Consulting services	・ Detail designs ・ Assistance for tendering (preparation and evaluation) ・ Construction supervision Foreign expert: 95 M/M Local expert: 119M/M	The scope of work is as planned.

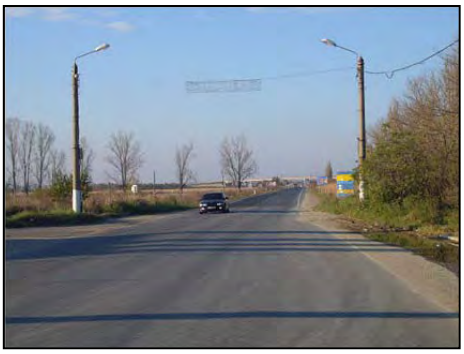
Source: Project appraisal documents, Project completion report, Responses for the Questionnaire

At the implementation stage of detail designs, which were undertaken taking into account the field condition and actual situation, the project scope was partly revised. Revisions made are considered appropriate. Regarding consulting services, since the project period was substantially extended, the input by the consultants (man/months) was also substantially increased.



Beginning point of Timisoara - Lugoj Road
(4-lane section)

Timisoara - Lugoj Road
(2-lane section)



Ending point of Timisoara – Lugoj Road
(2-lane section)

3.4.2 Project Inputs

3.4.2.1 Project Cost

The estimated project cost at appraisal was 14,608 million yen, among which the total Japanese ODA loan was 9,189 million yen. The actual project cost was 18,549 million yen, among which the total Japanese ODA loan was 8,983 million yen and higher than planned (equivalent to 127% of the planned cost).

Table 7 Comparison of Project Cost (Planned and Actual)

Unit: million yen

Item	Planned			Actual		
	ODA loan	Own fund	Total	ODA loan	Own fund	Total
・ Civil Work	8,734	0	8,734	7,938	6,342	14,280
1. Timisoara - Lugoj road	3,355	-	3,353	3,640	2,227	5,867
2. Craiova Bypass	1,858	-	1,858	2,135	1,969	4,104
3. Timisoara Bypass	1,812	-	1,812	2,163	2,146	4,309
4. Price Escalation	1,295	0	1,295	-	-	-
5. Contingency	416	0	416	-	-	-
・ Consulting Services	455	0	455	1,045	28	1,073
・ Land Acquisition	0	550	550	0	224	224
・ Tax	0	4,869	4,869	0	2,972	2,972
Total	9,189	5,419	14,608	8,983	9,566	18,549

Source: Project appraisal documents, Project completion report, Responses to the Questionnaire
Exchange rates: at appraisal: 1 US$ =118 yen, 1 US$ =3,492 old lei,100 yen = 2,959 old lei, in January 2002, 100 yen = 2.469 RON, in December 2013, 100 yen = 3.1868 RON
Cost estimation made: 1997
Note 1: The contract price with contractors was fixed with the exchange rate as of October 28, 2002.

Main reasons for increase of project cost increase are as follows:

1) The project period was substantially extended. The originally planned project period of 56 months was extended to 151 months.
2) During the project implementation, a contractor for 2 contract sections out of 3 contract sections was replaced. Regarding the consultant, which was responsible for construction supervision, the foreign consultant withdrew at the last implementing stage, and another foreign consultant through the Romanian Branch took over the consulting services.
3) Part of the project scope has changed, and the actual bill of quantities increased.

3.4.2.2 Project Period

The originally planned project period was from February 1998 (signing of the Loan Agreement) to September 2002 (completion of civil work) with a total period of 56 months. The actual project period was from February 1998 (signing of the Loan Agreement) to August 2010 (completion of civil work) with a total period of 151 months (equivalent to 270% of the plan).

Table 8 Comparison of Project Period (Planned and Actual)

	Planned (at L/A signing)	Actual
Selection of a consultant	1997.09 – 1998.05	
Detail design	1998.06 – 1998.11	2001-2002.11
Land acquisition	1999.01 – 1999.12	
Bidding for civil work	1998.10 – 2000.03	2007.6 – 2008.2 (rebidding for J1 and J2 contract sections)
Civil work ・ Timisoara - Lugoj road ・ Craiova Bypass ・ Timisoara Bypass	2000.04 – 2002.09	 Original: 2003.01-2006.11; Rebidding: 2008.2-2010.4 2003.08-2007.06 Original: 2003.01-2006.11; Rebidding: 2008.02-2010.8
Consulting services	1998.06 – 2002.10	Original contract: 2000.04 - 2009.05 After rebidding: 2009.08 - 2014.01

Source: Project appraisal documents, Project completion report, Responses to the Questionnaire
Note 1: During the period from June to July 2009, when a supervision consultant was not engaged, Timisoara Regional Roads and Bridges Directorate was in charge of supervision.

Main reasons for delay of the project implementation are as follows:

1) Even though implementation details of activities (selection of a consultant, detail designs, land acquisition, and tendering for civil work) before the civil work commenced (in January 2003) are uncertain, implementation was already behind the planned schedule by about three years at the commencement of civil work. Main reasons are as follows:
   - change of disbursement method

- unexpected time consumption for negotiations with the consultants
- time required for clarification of underground objectives (such as gas pipes) during the detail design stage
- clarification of conformation of clauses stated in the bidding documents with the Romanian rules/regulations
- adjustment of payment procedures to contractors

2) In the sections to be improved along the existing Timisoara - Lugoj road, particularly where the existing pavement was seriously damaged or deteriorated, the length of the project road, where the originally planned minimum repaving (overlay) on the existing road was needed to be changed to the new construction of pavement structures by scarifying the existing pavement surface. This was extended from 4,610m to 26,340 m, resulting in 12 months extension of project period.
3) Even though no major problems were anticipated regarding land acquisition, it took about two years to negotiate with land owners under the Craiova Bypass project.
4) Due to unsatisfactory performance of a joint venture entity consisting of two Greek companies and a Japanese company, who won contracts for improvement and widening of the existing Timisoara - Lugoj road and construction of Timisoara Bypass, the contract with the joint venture was cancelled in November 2006 and rebidding for new contractors was undertaken. The reason for unsatisfactory performance by the joint venture was financial collapse of two Greek companies. Work for two contract sections was recommended by new contractors in February 2008, and completed in April 2010 and August 2010, respectively.
5) Due to unsatisfactory performance of a contractor, who won the contract for construction of Timisoara Bypass after rebidding, particularly during the early stage of recommenced work, the project period was extended.
6) Due to bankruptcy of a Japanese consulting firm who won the contract for consulting services including detail designs and construction supervision in September 2008, the contract with the firm was officially cancelled in May 2009. After that, reselection of a consultant was made. During absence of a consulting firm, Timisoara Regional Roads and Bridges Directorate was in charge of supervision.

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

Economic Internal Rate of Return (EIRR) for the whole three components calculated at appraisal was 28.3%. Regarding EIRR at the post evaluation stage, since the data on costs (economic cost of yearly construction and maintenance costs) and benefits (e.g. vehicle operating cost by type of vehicle, time saving unit cost, average damage cost of fatal/injured/damage accidents) needed for calculation of EIRR were not available, recalculation

was not made.

Although the actual project scope (output) was partially revised from the originally planned scope, changes made are considered appropriate. The project cost was higher than planned, and the project period was significantly longer than planned. Therefore, efficiency of the project is considered low.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

In February 2004, National Road Administration (NRA) was reformed to Romanian National Company of Motorways and National Roads (RNCMNR), and construction of motorways and operation/maintenance was added to the business operations by NRA. The total length of roads under management at the post evaluation stage is about 17,000 km including 548 km of motorways. There are 7 Regional Roads and Bridges Directorates (RRBD) under RNCMNR Headquarter. Timisoara RRBD is responsible for operation and maintenance of Timisoara - Lugoj road and Timisoara Bypass under the project, and Craiova RRBD for Craiova Bypass. Timisoara RRBD consists of 5 departments including the department in charge of operation and maintenance. The total number of staffs is about 210 and the number of staffs assigned to the operation and maintenance department is about 65. Under the RRBD, there are 5 branch offices within the assigned region with a total staff number of 540. Craiova RRBD has similar organizational setup and consists of 5 departments including the department in charge of operation and maintenance. The total number of staffs is about 210 and the number of staffs assigned to the operation and maintenance department is about 50. Under the RRBD, there are 5 branch offices within the assigned region with a total staff number of 530. Both Timisoara and Craiova RRBDs entrust the routine and periodic maintenance work to private contractors, who are specialized in maintenance work, and were selected through the competitive bidding with a few years contract period.

Ending Point of Craiova Bypass

Craiova Bypass

3.5.2 Technical Aspects of Operation and Maintenance

Numbers of staffs in charge of operation and maintenance of road sections constructed/improved under the project are 22 and 19 in Timisoara and Craiova RRBDs respectively and both RRBD management considers that these are considered appropriate. Majority of these staffs are administrative officials and engaged in administrative services and contract management. Since most of them are administrative staffs, they do not take any specific external training. However, guidelines/manuals on maintenance work are developed/ prepared under the EU-financed road improvement projects. Main documents prepared are: standards for rehabilitation of public roads, methodology for conducting acceptance of maintenance work and rehabilitation of roads and bridges, and technical instructions for maintaining bridge condition. As mentioned above, both Timisoara and Craiova RRBDs entrust routine and periodic maintenance work to private contractors. In the bidding for selection of a contractor, selection is made by examining company's technical capacity (company's experience of similar work, employees' educational and professional qualification and experience, and equipment owned), and financial capacity (annual turnover, assets and liabilities, profit and loss) together with checking the bid price. Contactors have undertaken maintenance work according to the terms of reference and RNCMNR 's guidelines and manuals.

3.5.3 Financial Aspects of Operation and Maintenance

The amount spent for maintenance by Timisoara and Craiova RRBDs for the past 3 years is shown in Table 9.

Table 9 Amount spent for maintenance by RRBDs for the past 3 years

Unit: million RON

RRBD	2010	2011	2012
Timisoara	61.1	132.0	473.5
Craiova	68.7	74.2	100.7

The amount spent for maintenance by both RRBDs for the past 3 years has been increasing year by year. Expenditures by Timisoara RRBD increased by about 3.6- hold from 2011 to 2012. The reason for increase is that Motorway Route No.1 heading the west via Arad from Timisoara was open to traffic in 2012 and the monitoring equipment was installed.

The amount spent for maintenance of three road sections under the project for the past 3 years is shown in Table 10.

Table 10 Amount spent for maintenance of Project Roads for the past 3 years

Unit: RON

Road	2010	2011	2012
Timisoara - Lugoj	146,168	175,781	209,082
Craiova Bypass	211,970	394,198	359,250
Timisoara Bypass	671,079	674,905	771,192

The amount spent for maintenance of three road sections under the project for the past 3 years tends to generally increase except no increase in some years.

3.5.4 Current Status of Operation and Maintenance

The maintenance work has been undertaken by private contractors under the supervision of both Timisoara and Craiova RRBDs. As daily maintenance work, the surveillance and inspection work on the following items has been conducted.

- damage and flatness of pavement surface
- assurance of good condition of drainage and gutters
- oscillation of level and cleanness at shoulders
- damage on guardrails and poles
- assurance of good condition of traffic signs and markings and
- others

Simple repairs are undertaken weekly including following items in case abnormalities were found,

- assurance of water drain and cleaning of discharge holes
- replacement of guardrails damaged by traffic accidents
- repair of traffic signs and cleaning of damaged markings

Moreover, repainting of markings and repair of traffic signals and guardrails are included in the periodic maintenance, which is undertaken almost every 2 months. During the winter time, snow removal is conducted every day as needed.

Neither major damage nor defect on road sections constructed/improved under the project was observed by ocular inspections during the field visit.

The current operation and maintenance system is well organized and the number of staff assigned is considered appropriate. There are no particular issues on manuals prepared and thus, there are no technical issues in order to sustain the effectiveness of the project. The maintenance budget has been properly allocated and thus, there is no issue in financial aspects. Neither major damage nor defect on road sections constructed/improved under the project was observed by ocular inspections during the field visit.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the project was to alleviate traffic congestion by constructing bypasses around heavy-trafficked Timisoara and Craiova areas, and widening/improving the existing road

between Timisoara and Lugoj along National Road No.6, thereby contributing to activation of the regional economic activities. The project has been highly relevant with the development plans and needs of Romania, as well as Japan’s ODA policies. Thus, its relevance is high. Regarding alleviation of traffic congestion, which is the project objective, the current traffic volume of the Timisoara - Lugoj road is about the volume as estimated, and the traffic volume of Craiova Bypass has reached about 70% of the highway capacity for the 2-lane highway in 6 years after open to traffic (2013). The beneficiary survey reveals that 77-85% of beneficiary recognize the project contributes substantially or fairly to activation of the regional economic activities. This project has largely achieved its objectives. Therefore, its effectiveness and impact is high. Although the actual project scope (output) was partially revised from the originally planned scope, revisions made are considered appropriate. The project cost was higher than planned, and the project period was significantly longer than planned. Therefore, efficiency of the project is considered low. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

(1) Plans to ensure the access to residents in case of land acquisition, which causes the division of communities.

Regarding land acquisition for construction of Craiova Bypass, it took a long time to process the compensation procedures. Particularly, because some properties owned by residents were divided into two lots by a bypass resulting in no provision of access to some lots, the implementing agency was sued by residents. Thus, it needed a longer time to settle the compensation issues. This fact hints that the examination and studies on issues regarding land acquisition including division of properties was insufficient at the detail design stage. JICA needs to request the implementing agency to submit a Resettlement Action Plan, which discusses in detail and incorporates the current condition accurately from the appraisal stage.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Output 1) Civil Work	・Improvement of the existing road between Timisoara and Lugoj (52.2km), among which the 49.6km section is improvement of 2-lane section and 2.6km section is improvement of 4-lane section including rehabilitation of 10 bridges.	Road length is as planned. Regarding bridges, three existing bridges were demolished and reconstructed.
	・Construction of Craiova Bypass (13.8km), including construction of a bridge and three intersections.	Road length is almost as planned. (14.1km) A short bridge, which overpasses the ash transporting pipes was constructed as an additional work. If intersections both at beginning and ending points are included, the total number of intersections is 5.
	・Construction of Timisoara Bypass (15km), including construction of three bridges and three intersections.	Road length was shortened to 12.6km due to change of alignment partly. The number of bridges constructed is 5. The number of intersections was increased by one. If intersections both at beginning and ending points are included, the total number of intersections is 6.
2) Consulting Services	・Detail designs ・Assistance for tendering (preparation and evaluation) ・Construction supervision Foreign expert: 95 M/M Local expert: 119M/M	
2. Project Period	February 1998 - September 2002 (56 months)	February 1998 - August 2010 (151 months)
3. Project Cost Amount paid in Foreign currency	6,636 million yen	Unknown
Amount paid in Local currency	7,972 million yen	Unknown
Total	14,608 million yen	18,549.69 million yen
Japanese ODA loan portion	9,189 million yen	8,983.06 million yen
Exchange rate	100 Yen = 2,959 old Lei (as of September 1996)	100 Yen = 3.1868 RON (as of December 2013)