Lao People's Democratic Republic

Ex-Post Evaluation of Japanese ODA Grant Aid Project

"The Project for the Improvement of the Vientiane No.1 Road"

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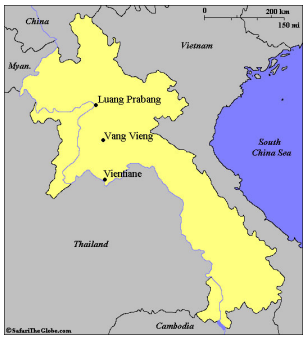
0. Summary

This project was implemented to restore the safe and smooth flow of traffic on Road No.1, an arterial road for Vientiane, by undertaking road improvements and flood prevention. Improving Road No.1 was of utmost importance for the rapidly growing economy of Lao PDR because of the important role it plays as part of Lao PDR's domestic and international road network. This project shortened travel time and decreased flooding, and thereby contributed to the increase in economic activities along the road and in the development of the tourism industry. One section of road targeted for construction included the high probability of encountering buried artifacts. During construction, the project paid maximum attention to the possibility of encountering underground artifacts and important historical cornerstones of Vientiane city (baseman stones) were discovered. Although the project cost was within the plan, the project period slightly exceeded the plan because construction work was suspended due to the unearthed cultural properties. Efficiency of the project; therefore, is fair. The implementing agency promptly repairs surface damage and road conditions are good thanks in part to roadside residents who help in cleaning and cutting grass in ditches alongside the road.

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

1. Project Description



Project Location

Vientiane No.1 Road

1.1 Background

The Capital of Lao PDR, Vientiane, formulated a road improvement plan for seven trunk roads in 1997. Starting in 1998, with funds from the Asian Development Bank, renovation of six of the seven trunk roads started, and a total of 45.1 km of road was completed. However, Vientiane road No.1, the longest of the seven roads at a length of approximately 28.9km (hereafter Road No.1), was left untouched.

Road No.1 runs through two of Lao PDR's international entrances, Wattay International Airport and the Friendship Bridge, which is built over the Mekong River bordering Thailand and connects to the heart of the city (figure 1). At the time of the Basic Design Study (hereafter, B/D) in 2003, 12% of people entering Lao PDR came from Wattay International Airport while 60% came over the Friendship Bridge[1]. In addition, Road No.1 links to national highway No. 13, and allows traffic from Vientiane to northern and southern Laos as well as northern Thailand. However, Road No.1 had been experiencing problems affecting the country's social economic activities and daily lives of people in Vientiane such as flooding due to inadequate sewage systems and road surface deterioration.

This project was implemented to restore function to Road No.1 for the safe and smooth flow of traffic, by implementing road improvements and installing a drainage system.

1.2 Project Outline

The objective of this project is to restore function and capacity to Road No.1 between Sikhay Junction and Thanaleng Warehouse, by improving the deteriorated pavement and poor drainage system and thereby ensure the recovery of the smooth flow of goods and people to affected regions.

Grant Limit / Actual Grant Amount	Phase I & II total:4,645miilion yen /4,162 million yen
Exchange of Notes Date	Phase I :July 2005　Phase II: June 2006
Implementing Agency	Ministry of Public Works and Transport (MPWT)
Project Completion Date	December, 2007
Main Contractors	Phase I: Shimizu Corporation Phase II: Obayashi Corporation
Main Consultant	Katahira & Engineers International
Basic Design	"Basic Design Study Report on Project for Improvement of Vientiane No.1 Road in Lao People's Democratic Republic" JICA, June 2005
Detailed Design	August - December, 2005
Related Projects (if any)	"The study of master plan on comprehensive urban transport in Vientiane in Lao PDR"（2007~ 2008）, "The Lao People's Democratic Republic, the project for urban development master plan study in Vientiane Capital"(2010.1~2011.3), "Project for Improvement of the Road Management Capability"（2011.9~2016.9）

[1] In 2010, although the percentage of the people entering the country from Wattay Airport (10%) and the Friendship Bridge (39%) decreased, the actual number of people doubled, from 72,224 (2003) to 158,713 (2010) in Wattay Airport, and from 357,038 (2003) to 719,347 (2010) at the Friendship Bridge.

Figure 1 Vientiane Road No.1 (based on B/D)

2. Outline of the Evaluation Study

2.1 External Evaluator

Nobuko Fujita, Foundation for Advanced Studies on International Development

2.2 Duration of Evaluation Study

Duration of the Study: November 2011 - September 2012

Duration of the Field Study: February 6th - February 18th, 2012; May 14th - May 18th, 2012

2.3 Constraints during the Evaluation Study (if any)

None.

3. Results of the Evaluation (Overall Rating: A[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plan of Laos

In the "Sixth National Socio Economic Development Plan (2006～2010)", the government of Lao PDR set forth objectives to develop infrastructure to more easily access foreign markets and allow people to move more easily that included constructing 2,300~2,400 km of road, and reaching an asphalt pavement ratio of 65.0~66.7%. Based on this plan, paving and improving roads, including the section of Road No.1 going to the Friendship Bridge, was set under way[4].

As for the current "Seventh Socio Economic Development Plan (2011~2015)", goals include efficient production by strengthening the transportation sector, and making transportation pivotal for

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[3] ③: High, ②:Fair, ①:Low
[4] Lao PDR : Sixth National Socio Economic Development Plan (2006～2010) p129,168

modernization and industrialization by making it more accessible to all areas of the country and neighboring nations.

In the transportation sector, the "Traffic, Transport, Postal Services, and Construction Development Plan (1996-2020)" was implemented, stating that road traffic be enhanced to allow Laos's socio economic standards to be level with its neighboring nations.

3.1.2 Relevance with the Development Needs of Laos

In the city of Vientiane, the development of socioeconomic activity and the rapid increase in the number of registered vehicles made it necessary to build a better road network. Road No.1 is a main road, both commercially and residentially, and a focal point of the city's road network. However, the surface was deteriorating, and an insufficient draining system caused frequent flooding of the road, making it unsafe for passengers and vehicles.

Currently, although large-sized trucks avoid traffic by using the more recently built 450 Memorial Road, traffic on Road No.1 has been increasing exponentially, making it the capital's most important road. Road No. 1, together with Lane Xang Avenue (home to Victory Gate), are also national symbols for visitors and tourists who inevitably use these roads once they are in Vientiane city.

3.1.3 Relevance with Japan's ODA Policy

As for Japan's ODA policy, one of the four important sectors identified in policy dialogue between Lao PDR and the study mission on economic cooperation in 1998 was infrastructure development. Bearing in mind the integrated development of ASEAN countries, Japan had been cooperating in transportation infrastructure projects (mainly trunk roads and bridges), and therefore this project corresponded with Japan's ODA policy. In September 2006, a Country Assistance Plan for Lao PDR was formulated in which infrastructure development as well as the effective use of existing infrastructure was identified as one of six important sectors.

This project has been highly relevant with the country's development plan, development needs, and with Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness[5] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The evaluation of previously set indicators, which were the reduction in travel time and the decrease in flooding on Road No.1, are as follows:

(1) Travel time reduction

1) The time it takes to drive from Sikhay junction to Chinay Moo junction, a distance of 12.3km,

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

during rush hour has somewhat decreased, as shown in the table below.

2) When the travel time from Sikhay to Thanaleng, a distance of 28.9km, is considered, what used to take 1 hour to complete can now be completed in one third of the time.

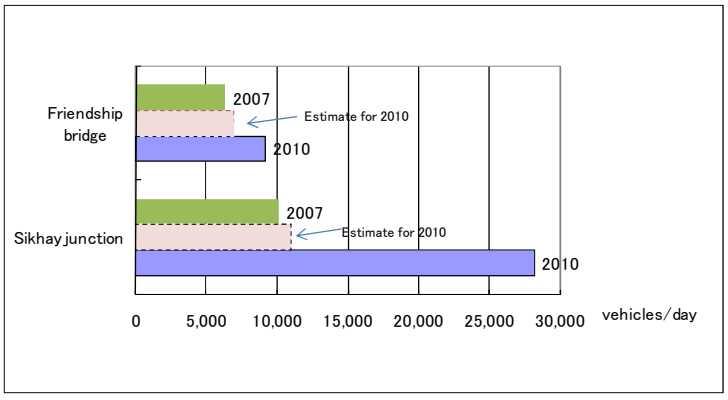
Table 1　Decrease in Driving Time (minutes)

Section	Time of Day	Baseline (2004)	Target (2007)	Actual (2011)
Sikhay to Chinay Moo (12.3km)	morning and evening rush hour	about 30	21	about 28
	non-rush hour	—	—	15～21
Sikhay to Thanaleng (28.9km)	non-rush hour	60	—	39～43

(Source：B/D for baseline and target of "Sikhay to Chinay Moo", DPWT for baseline of Sikhay to Thanaleng, actual time were measured during the field study)

The section from Sikhay to Chinay Moo during rush hour did not reach its target times most likely because the road's renovation increased traffic more than expected and there has also been a considerable increase in the number of illegally parked cars. The amount of traffic in 2010 was 1.4~2.8 times more than 2007. This represents an annual increase of 12~41 % (see figure 2), as compared to an estimated annual increase of only 2.9% in the B/D[6]. Furthermore, the number of vehicles in the city has also increased significantly. Due to the lack of parking spaces, illegal street parking has increased accordingly, worsening the congestion on Road No.1. In addition, compared to 2004, the total number of registered vehicles in Vientiane in 2010 increased 2.5 times (1.7 times over the period 2007~2010).

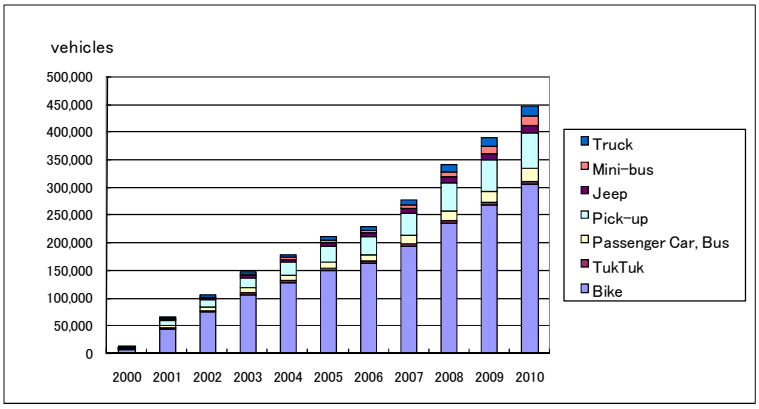
While driving on the Road No.1 during field studies, there was nothing wrong with the road and there was no traffic caused by vehicles needing to avoid holes. As rough sections of the road no longer slow down traffic, the objective to shorten the time of travel has been achieved.



(Source：The Project for Urban Development Master Plan Study in Vientiane Capital Final Report:App.1-76)

Figure 2　Increase of Traffic on Road No.1Compared to the Estimate

[6] It was estimated that between 2003 and 2017, there would be a 48.2% increase (B/D).



（Source：Ministry of Public Works and Transport）

Figure 3　Number of Vehicle Registration（Vientiane city）

(2) Flooding

Flooding used to occur primarily in low areas, but due to the installation of efficient draining systems, flooding has decreased significantly[7]. According to the Ministry of Public Works and Transport (hereafter MPWT), flooding occurred every time it rained hard; in 2004 it flooded 73 times. However, in the past 4 years, Road No.1 has experienced only one flood per year if any, and the length of time traffic is stopped due to flooding has decreased from 3 hours to 1~2 hours (table 2).

In 2008 and 2010, the Mekong River flooded causing parts of the city to be submerged. By piling up sandbags; however, Road No.1 managed to remain above water. In 2011, Laos experienced unusual rainfall. Although the Mekong River did not flood, Road No.1 was briefly submerged under water as deep as 20cm in some places, but the water withdrew within a few hours.[8]

In the road side residents' survey[9] of all residents on Road No.1 that were affected by flooding, over 93% responded that they had seen improvement.[10] Over 87% of respondents stated that it takes less time for the road to clear. Prior to the project, the respondents pointed out that without a proper draining system there were parts of the road that took 6 to 7 days to drain.

[7] Flooding here is defined by rainfall that covers the road and inhibits driving.

[8] To prevent the Mekong from flooding, a bank road was also constructed along the river by Korea (the Economic Development Cooperation Fund, "the Mekong river Integrated Management Project," 2009-2013, 30.855 million US$).

[9] The road side residents' survey was conducted between Sikhay Junction to Thanaleng Warehouse in 31 different locations with 36 residents that have lived or worked on or near Road No.1 for over 10 years using face to face interview with a questionnaire (30 valid samples). The breakdown of interviewees was: 20 commercial set ups, 5 non-commercial facilities (schools, hospitals), 20 residences（including those with store attached), 2 temples. Questions included satisfaction toward the project, changes before and after the project (business, convenience, sanitation, scenery, flooding situation, and safety issue), opinions regarding cultural preservation, maintenance of the road, and visibility of the project, etc.

[10] Even in areas where respondents answered that flooding "increased," only one incident during a storm in 2011 was mentioned.

Therefore, the project has achieved its goal of decreasing flood occurrence and draining time.

Table 2　Frequency of Flooding and Clearing Time

Indicators（unit）	Baseline（2004）	Target（2007）	Actual			
			2008	2009	2010	2011
Flooding frequency (per year)	73	decrease	1	0	0	1
Average time taken for road to clear from flooding (hours)	3	decrease	1	0	0	2

（Source： B/D for baseline and target. MPWT for actual）

3.2.2 Qualitative Effects

(1) Increase in Access

With the improvements to the pavement, sidewalks, and drainage systems, Road No.1 has become more convenient. In the roadside residents' survey, 97% responded that traveling on foot and by vehicle has become faster, and more convenient. Additionally, the improvements to the sidewalks and drainage systems have made walking and shopping more pleasant for tourists in the central area which has many temples.[11]

(2) Increase in Safety

In regards to safety issues, there were both positive effects and negative effects. Positive effects include surface improvements, installation of sidewalks, bus stops, parking lots, pedestrian crossings, traffic lights, and road signs whereas negative effects include the increase in speeding enabled by smoother pavement.

There is no data for traffic accidents that occur only on Road No.1[12], but according to the road side residents' survey, 50% said that the number of accidents has decreased since the project, while 43% said that the number of accidents has increased. 55% also said that they feel the road is safer thanks to the median, disappearance of potholes, and pavement improvement, while 38%said that the road has become more dangerous due to the increase in traffic as well as the increase in speeding[13]. Reasons for the increase in speeding can be attributed to the project's road improvements, but the reasons for the increase in traffic has to do with driving manners which are outside of the project[14].

[11] According to the Tourism Department, road side stores and guest house hearing

[12] As for the total number of accidents in Vientiane city in 2011, accidents have decreased by 15%, injuries decreased by 21%, and deaths increased by 18% compared to 2007(MPWT hearing).

[13] In the roadside residents' survey, a few people pointed out accidents caused by making a sudden big turn at the cuts in the median which was made for residents' conveniences, and by bikes' hitting concrete blocks (curbstones) which were placed to divide pedestrians and vehicles safely. However, most of the accidents are caused by multiple factors such as drinking, violation of traffic rules, speeding, unlicensed driving, etc., and the number of accidents that are clearly caused by the road's design is unknown. As for bikes' bumping into curbstones, most of them are minor accidents and reporting to the police is not required (Vientiane city traffic police, Sisatunuk district traffic police hearing).

[14] In Vientiane city, 70% of motor vehicle accidents include under aged drivers, unlicensed drivers, and drivers under the influence (Lao PDR Statistical Yearbook 2010).

3.3 Impact

3.3.1 Intended Impacts

(1) Socioeconomic Impact

Since the renovation of Road No.1, new houses, shops, and factories have been built, boosting the economy of small businesses along the road. According to the road side residents' survey, 77% of shops and bus tour companies reported an increase in sales.[15] In addition to commercial facilities, temples and hospitals have also become more accessible to the people.[16]

Between 2007 and 2010, the annual GDP growth was 7~8%, and GDP per capita increased from $714 US to $1, 088 US.

Column 1 : Sisatunuk District Hospital

(A nurse explains,)

"Previously, Road No.1 in front of the hospital used to flood for over 3 hours, making it very difficult for me to commute by motorcycle and the patients to come to the hospital. However, the new drainage system clears the road quickly and it has been very helpful. I also feel that the road has gotten safer now that people don't have to drive on submerged pavement."

Sisatunuk District Hospital

(2) Boost in Tourism Industry

This project has improved access from Wattay Airport and Thailand via the Friendship Bridge to the heart of Vientiane, thereby making a positive impact on the tourism industry.[17] Tourist buses that come from Thailand via the Friendship Bridge used to take a detour due to the deteriorated surface conditions of Road No.1. Now they can get to the city faster thanks to the improvement of Road No.1. Moreover, the enhancement of the sidewalk has made it easier for tourists to shop along the Road. The addition of street lights has made it possible to hold events such as the Laos New Year's parade.[18] With the help of the Government of Laos which has been promoting the tourism industry as one of main industries of the country: Vientiane city has seen a 36.5% rise in the number of tourists from 2006 to 2010, new restaurants and guest houses have increased alongside the road, and businesses related to tourism, such as bus companies, are flourishing[19] .

[15] "Decreased" 11%, "No change" 8%, and "Do not know" 4%. The respondent who said their business decreased suggested parking problem as its cause. Due to parked cars in front of the stores, other cars cannot stop by at their stores. This problem is observed in one way street where only one side of the street is designated for parking.

[16] Road side residents survey

[17] In 2010, entry from the Friendship Bridge has increased by 24% and 49% from Wattay Airport compared to 2006 (Statistical Report on Tourism in Laos 2010).

[18] Tourism Department hearing

[19] Road side residents survey

(3) Improvement of Roadside Cleanliness

According to the road-side residents' survey, over 74% replied that the roadside has gotten cleaner.[20] During the dry season, there is less dust; during the rainy season there is less flooding and fewer puddles remain.

3.3.2 Other Impacts

(1) Impacts on the natural environment

There was no negative impact on the environment. All 485 roadside trees remain where they were, and sidewalks were made with bricks for aesthetic considerations in the central area sections in which many temples and important architecture are located. According to the roadside residents' survey, 90% responded that "the landscape has become more beautiful" due to new street lights, medians, greenery on road shoulders, etc.[21]

(2) Land Acquisition and Resettlement

In places where houses needed setbacks to improve the road, sidewalks were adjusted accordingly to avoid resettlements. To explain changes to roadside residents, a Japanese consultant and officials of Environment Section of MPWT went around to each house, approximately 2000 of them. Also, notice of the construction in English and Lao was included in a newspaper flyer. Right before actual work in each area started, meeting to explain to local residents were held lot by lot. There were almost no complaints by the residents, and some residents even brought the workers water and ice. Disturbances to the residents such as construction dust and inconveniences were held to a minimum, and there were no significant problems that were reported.[22]

(3) Other Indirect Impact

The fact that some ancient artifacts were found in the past within the planned project site was revealed during the B/D and the B/D was suspended until a preliminary survey on cultural property was conducted.[23] This survey found the high probability of buried cultural property, therefore utmost attention was paid in digging before building underground structures such as the drainage pipes in the 6 km[24] section of road within the ancient castle wall[25]. As a result, over 140,000 new artifacts, such as

[20] "No change" :19%, "Do not know": 6%, and "Worsened": 0%

[21] "10% replied "unchanged."

[22] Roadside residents' survey

[23] The preliminary study of this project started in January 2003, and B/D started in May. However, probability of buried cultural property revealed to be high by July, survey on cultural property was requested to Lao PDR government, B/D was suspended in consequence. Later, Lao PDR government requested Japan a pilot survey on cultural property, and Support Study for the Buried Cultural Properties was conducted in February 2004. By this study, further support on survey on cultural property was decided. B/D resumed in July, along with test trench conducted by the second Support Study for the Buried Cultural Properties. As a result, it was decided to treat buried property in 1.0m layer between 1.0~2.0 m from surface first, then only after that, digging and construction of underground structure was going to be implemented.

[24] The area to be treated with consideration to cultural properties was decided based on a Decree of the President of the Lao People's Democratic Republic on the Preservation of Cultural, Historical and Natural

ceramic ware and tile, were discovered. The artifacts were divided and categorized, then sent to the National Museum storage in 3000 boxes. Some artifacts are displayed at the Museum. Among the artifacts found were sema stones from Lane Xang dynasty, Vientiane's cornerstone (Column 2).

According to the road side residents' survey, people appreciated consideration given to the cultural properties during the construction, as well as the excavation of artifacts. The project helped raise awareness for cultural properties. Also, 67% of the respondents acknowledged that the project was a Japan grant aid project, and that roads constructed with Japanese aid are known for their sturdiness.

This project has largely achieved its objectives, therefore its effectiveness is high.

Column 2:Excavation of sema stone, Vientiane city's cornerstone

In January 2007, sema stones were unearthed at a project construction site of the near Simuang temple, about 6.5km from Sikhay junction. Composed of 193 leaf and egg-shaped stones (all together 177cm in length, 99cm in width, and 55cm in height) and once covered by gold leaf and/or painted with red pigment, these stones are said to have been made for religious purposes and used in rituals. They were most likely offered by different regions in the Lane Xang Kingdom when King Setthathilath relocated the capital from Luangprabang to Vientiane (1560), and they are considered valuable for archaeological and religious reasons. The top of the stones were destroyed by road and ditch construction in the first half of 20th century.

The Ministry of Cultural Information (then) decided to build the Vientiane City Pillar Shrine at the excavation site on the grounds that since the stones could remind people of Vientiane's history of repetitious invasions, the shrine would facilitate history education and raise people's awareness of ancient culture. In order to build the shrine, roughly 200 meters of Road No.1 was moved 5 meters to the north (the Lao government covered all expenses related to the construction of the shrine and moving the road). The Shrine is under construction and expected to be completed in the fall of 2012. Until then, the unearthed stones will be displayed at the National Museum.

According to the Ministry of Education, Cultural Information and Tourism, in cases of major construction works inside the castle wall of Lane Xang dynasty, surveying buried cultural properties is mandated by Presidential decree (surveys are, however, rarely implemented). Since the Lao government has not procured budget for archeological surveys, construction projects are the only opportunity for excavation. This project is highly regarded by Lao people for simultaneously achieving the construction of a modern infrastructure and the preservation of ancient cultural properties. This project led the way for the implementation of archaeological survey in large scale project by Lao government and World Bank in the same area. After the

Heritage by Ministry of Education and Culture.

[25] Construction was done in a way that first 1m surface dirt was dogged and taken away by machines, then workers scooped dirt by hands by 25cm deep, wash and dry artifacts found, store in boxes with explanation, numbers and remarks, send it to the storage, then installed drainage pipes. Two experts on cultural properties were involved in this process all thorough this period.

shrine is officially opened, the Department of Tourism Development is planning to launch a campaign to stimulate the tourism industry.

According to the roadside residents' survey, 83% of respondents were aware of the excavation, and 33% had gone to see the stones at the construction site or the Simuang temple where the stones had been stored temporarily. Over half of the respondents stated that "it was good to unearth sacred artifacts" and "the artifacts are worth preserving," while only 2 out of 36 people were dissatisfied with moving the road due to the construction of the new shrine.

One of the sema stones. Inscription of zodiac position is calculated to be 1540.

Stones on display in the National Museum

The new shrine being built on Road No. 1

Photo (left): Preliminary Report on the Buried Cultural Properties Salvage Works for the Project for Improvement of Vientiane Road No.1

3.4 Efficiency (Rating: ②)

3.4.1 Project Output

Project output was produced as planned (see Table 3). Changes from the plan were minor such as the locations of street lights. As for the excavation and preservation of buried cultural properties, works such as sorting, transporting, and storing of unearthed properties were done simultaneously with the construction work over a 6.5km section. Lao side obligations were fulfilled without delay except for the installation of traffic lights which was implemented with funds provided under cooperation from France.

Table 3　Project Output

Japan side	
Road section：Sikhay junction～Thanaleng warehouse Road length：28.92km	
Pavement	All asphalt concrete
Drainage system	15.5km
Relocation of water pipes	6.5km
Road facilities	sidewalk：Mount up type for 10.4km（Sikhay junction～Thatkhao junction）, Flat type for 11.3km（Thatkhao junction～BeerLao）, Road shoulder type for 7.2km（BeerLao~Thanaleng warehouse） Lighting：15.5km Traffic lights：base only Median：9.3km
Unearthing buried cultural properties	6.5km
Lao side	
Preparation for construction	Providing the land necessary for temporary offices, construction works, storage yards and others.
	Conducting building survey alongside the Project site.
	Installing switchboards for street lighting and traffic lights.
Relocation of hindrances	Relocating all structures like electric poles, advertising boards, drainage pipes from factories, underground cables and manholes, etc., that lie in the way.

Sewage pipes	Providing sewage pipes form residences to the public sewage inlet boxes.
Road facilities	Installing traffic lights at intersections improved by the project

Sikhay junction, starting point of Road No.1. Design of lighting is popular among residents.

Morning rush-hour

Buffalo skin shops opened after the project by bus bays

3.4.2 Project Input

The project cost remained under budget.

Table 4 Project Cost

	Planned	Actual
Japan side	4,645 million yen	4,162 million yen（89.6%）
Laos side	84 million yen	N.A.

3.4.2.2 Project Period

The project was estimated to take almost 28 months, but took 29 months and 5 days, and exceeded the schedule slightly (104% of the plan). The reason for the delay was that the construction works were suspended at the sema stone excavation site. The delay was minimized by working on other sections in the meantime.

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

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

Operation and maintenance (from daily cleaning to undertaking necessary major repairs) are carried out by the Department of Public Works and Transport (DPWT), the Vientiane branch of the MPWT, and the Vientiane Urban Development and Administration Authority (VUDAA). The VUDAA is in charge of the section from Sikhay Junction to Nong Khai Junction, while the DPWT covers the section from Nong Khai Junction to Thanaleng warehouse. When necessary, both entities work jointly using DPWT budget for example, when large-scale repairs take place before international conference.

The DPWT consists of 97 employees, 27 of which are in the Department of Roads (2011). VUDDA consists of 70 employees, 27 of which are in the Department of Urban Management and 18 of which are in

the Unit of Traffic Management and Security. When repair projects are taken up by private companies; the company with the best technology and newest equipment are chosen by competitive bidding. Street and traffic light bulbs are changed by Electricité du Laos (EDL).[26] Manpower at implementing agencies seems to be sufficient, and no particular problem is observed in the structural aspects of operation and maintenance.

3.5.2 Technical Aspects of Operation and Maintenance

Maintenance of pavement has been carried out with no difficulties. A section near a beverage factory has been repaired may times since its road surface is fragile due to unstable soil with ground water. [27] During the first field study which happened to be right after a major repair, there was no problem. However, in the second field study conducted 3 months later, 6 or 7 holes were observed in the pavement. In response, the DPWT is planning to raise the road 1 meter over a distance of 300 meters, to prevent puddles after heavy rain which can cause surface damage, and has set aside a budget of 300 million kip for it. It is expected that this major repair will finally improve the condition. [28]

The maintenance manual being used was made by officials in Laos. There have been no technical difficulties reported.

Section that was repaired several times

3.5.3 Financial Aspects of Operation and Maintenance

The budget for operation and maintenance is financed by the Ministry of Finance and the Road Maintenance Fund (RMF) through MPWT. Maintenance of all 7,200km of national roads is financed by RMF, including regular maintenance, emergency repairs, weeding, and labour costs.

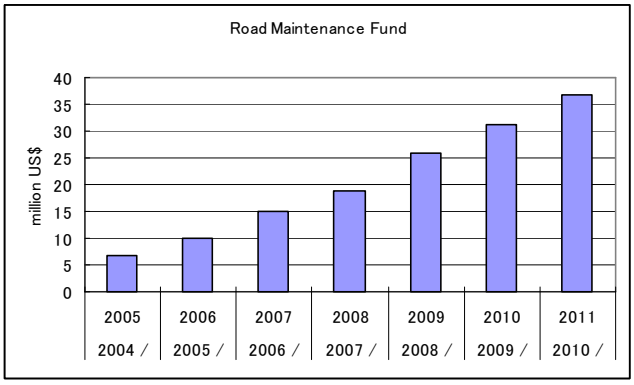
The RMF comes from gasoline, diesel, and engine oil import taxes (currently 420 kip per litre) as well as overload fines. The RMF has been increasing every year; compared to 2006/07, the 2010/2011 RMF revenue was 300 billion kip ($36.78 million US), almost 2.7 times more (table 4). This amount is distributed over 17 prefectures, with the capital city of Vientiane having priority.[29] In 2009, the budget for Road No.1, including daily, periodical, and emergency maintenance, was 410 million kip ($54,000 US), equal to the planned amount: 410 million ($54,065 US). With energy prices hovering at a rather high level, it is expected that revenue will remain stable for some time in the future.

The MPWT and VUDAA both estimate costs necessary for repair, request an appropriate budget as

[26] DPWT, VUDAA hearing
[27] DPWT, MPWT, VUDAA, Expert of "Project for Improvement of the Road Management Capability" hearings.
[28] 100 kip=1 Japanese yen
[29] MPWT hearing

part of an annual plan, and put repair works out for tender (lot by lot) once the budget is disbursed.

To pay for cleaning and maintenance of street and traffic lights, 2000 kip per household per month is paid out of the electricity fee from EDL to VUDAA. For 2011, this amounted to a total of 161 million kip per month. A further 50 million kip per month is taken from water bills in the same manner. From February 2012, EDL took charge of replacing street and traffic lights and used 1000 kip per household per month out of available funds as mentioned above.[30]



（Source: MPWT）

Figure 4　Revenue of Road Maintenance Fund

3.5.4 Current Status of Operation and Maintenance

The current status of operation and maintenance seems to be satisfactory, with no major traffic problems. Potholes in the pavement have been fixed swiftly, cleaning is done regularly, and greenery is kept in good condition. Depending on rainfall, there are certain sections of the road where the drainage system does not work as planned. This can be attributed to clogging by garbage and mud. Residents clean the road and cut grass in ditches every Saturday (according to the road side residents' survey, 97% of residents participate in the cleaning). On the other hand, it was pointed out by the residents that the drains get clogged easily with dirt and sand from construction sites.

Although there is little effect on the function of the road, replacing burnt streetlights bulbs and repairing streetlight poles damaged by　traffic accidents seem to be taking too much time. During the second field study, approximately 10.8%[31] of streetlights from Sikhay Junction to Chinay Moo Junction were not lit. According to VUDAA, EDL is supposed to have the bulbs changed by the fall of 2012 in time for the Asia- Europe Meeting.

Although outside the scope of this project, illegally parked cars (sometimes on multiple lanes) slow down traffic and therefore efforts to increase parking space will be necessary to maintain efficient

[30] Installation of street lights by this project was Sikhay Junction to Chinay Moo Junction. Street lights between Chinay Moo Junction and Thanaleng Warehouse were installed by cooperation from Thailand.
[31] May 15th, 2012, 88 out of 721 streetlights were not lit between Sikhay Junction and Chinay Moo Junction.

traffic flow.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented to restore the safe and smooth flow of traffic on Road No.1, an arterial road for Vientiane, by undertaking road improvements and flood prevention. Improving Road No.1 was of utmost importance for the rapidly growing economy of Lao PDR because of the important role it plays as part of Lao PDR's domestic and international road network. This project shortened travel time and decreased flooding, and thereby contributed to the increase in economic activities along the road and in the development of the tourism industry. One section of road targeted for construction included the high probability of encountering buried artifacts. During construction, the project paid maximum attention to the possibility of encountering underground artifacts and important historical cornerstones of Vientiane city (sema stones) were discovered. Although the project cost was within the plan, the project period slightly exceeded the plan because construction work was suspended due to the unearthed cultural properties. Efficiency of the project; therefore, is fair. The implementing agency promptly repairs surface damage and road conditions are good thanks in part to roadside residents who help in cleaning and cutting grass in ditches alongside the road.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) In order to maintain the efficiency of drainage systems, it is important to remove dirt from the ditches and sewage every year before the rainy season.

(2) To keep drains from getting clogged during the construction of buildings and houses or the installation of telecommunication cables, etc., it is essential for construction companies to understand the importance of avoiding excess dirt reaching the drainage system.

(3) To improve the functional efficacy of the road, illegal street parking needs to be dealt with even though it was not within the scope of this project. Parked cars clog up the road which severely reduces the functional efficacy of the road. Control of illegal parking should be strengthened and ways to supply additional parking spaces should be considered.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

Since the probability of buried cultural properties had become clear during the B/D study, this project was implemented simultaneously with an archaeological study. Although it slowed down the construction of the road, it resulted in raising people's awareness toward cultural properties, and unearthing important artifact such as the ancient Vientiane city cornerstones. This, along with the quality of the completed road, increased the reliability of Japanese cooperation. When undertaking construction projects in areas with historical value such as Vientiane city, sufficient consideration must be given to cultural properties when full-scale archaeological surveys are unaffordable.