Republic of Madagascar

Ex-Post Evaluation of Japanese Grant Aid Project

Project of Construction of a By-Pass of National Route 7

(Projet de construction d'un By-Pass de la Route Nationale N°7)

External Evaluator: Makoto Tanaka, ICONS Inc.

0. Summary

This Project was implemented in Antananarivo, the capital, in order to shorten travel times, to ensure smooth logistics that are not affected by traffic restrictions in the capital region, to ease traffic congestion in the city center, to decrease transport costs and to promote logistics, by the construction of a by-pass that connects National Route 7 and National Route 2 in the suburbs of the capital as part of the Ring Road Plan around the capital. The objective of the Project meets Madagascar's development policy, developmental needs and Japan's ODA policy, therefore its relevance is high. The implementation of the Project has largely achieved its objectives of decreasing time required between National Route 7 and National Route 2 and between the city center and the suburbs, therefore its effectiveness is high. Both the cost and period of the Project were within the plan, therefore efficiency of the Project is high. On the other hand, some problems have been observed in terms of the current status of operation and maintenance, such as thefts of steel parts of road signs and collapse of shoulders; therefore sustainability of the Project effect is fair.

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

1. Project Description

Project Location

Starting Point of the By-pass of the National Road 7

1.1 Background

Antananarivo, the capital of the Republic of Madagascar (hereinafter referred to as "Madagascar"), is located in the center of the national road network, which is the starting

point of national roads that connect the three most important ports, Toamasina in the east (National Route 2), Mahajanga in the north (National Route 4), and Toliara in the south (National Route 7). The capital is at once the accumulating point of most imported and exported goods and the greatest consuming area in the country. These national routes, as well as National Route 6 to Antsiranana in the north, divided from National Route 6, are recognized as one of the most important infrastructures for the social economy of the country, connecting five regional capitals out of six.

Before this Project started, however, trunk roads from the capital only consisted of radial ways without any detour connections between them. Accordingly, many vehicles large and ordinary had to pass the central part of the capital where main national routes were connected. In addition, when it was decided to commence the By-pass project in the year of 2003[1], the Malagasy economy recovered very rapidly from the bad situation in the previous year caused by political disorders[2] resulting in increase of traffic and the enlargement of vehicle sizes. Accordingly, social and economic activities as well as daily lives became badly affected by increased traffic pollutions of air and noise in addition to all-day long traffic jams and frequent traffic accidents. Especially on National Route 7 in the suburbs of the capital, where the roadway is occupied by houses, stores, chariots and mobile shops, the traffic was heavily obstructed by disorderly use of the road as public space,. On the other hand, large vehicles were restricted to limited hours to enter the urban area through National Route 2 to avoid traffic congestion there, since there was no route to the capital from Toamasina Port in the east but National Route 2 on which large vehicles for the urban area were concentrated and parked on the shoulders while waiting for the opening hours for long times obstructing the general traffic there.

Against such a background, the Government of Madagascar requested to the Government of Japan a grant aid project for the construction of road facilities of the By-pass of National Route 7 as a part of the Ring Road Plan, in order to ensure smooth logistics between National Route 7 and National Route 2 and to aim the economic development of Madagascar.

1.2 Project Outline

The Project constitutes “the Ring Road Plan” included in “the Construction of Roads in Antananarivo”. The objective of this Project is to realize smooth logistics and to ease traffic congestion in Antananarivo, the capital, by the construction of a by-pass of about 15 km long that connects National Route 7 and National Route 2, which are main routes of logistics in Madagascar.

[1] The Exchange of Notes for this Project was June 2003.
[2] Source: “ODA Country-by-Country Data Book 2012”, Ministry of Foreign Affairs (MOFA), Japan

Grant Limit / Actual Grant Amount	3,127 million yen / 3,044 million yen
Exchange of Notes Date	June 2003
Implementing Agency	Ministry of Public Works (currently Ministry of Public Works and Meteorology, MTPM)
Project Completion Date	December 2006
Main Contractor(s)	Daiho Corporation
Main Consultant(s)	Construction Project Consultants, Inc. and Chodai Co., Ltd. (JV)
Basic Design	"Basic Design Study on the Project of Construction of a By-Pass of National Route 7" Construction Project Consultants, Inc. and Chodai Co., Ltd. (JV), February 2000 – December 2001
Detailed Design	
Related Projects	<Grant Aid> "The Project of Construction of a Connection Road in the Southern Zone of the Capital" (2007)[3] <French Development Agency> "The Project of Construction of Marais Masay Road" (2000-2006) <European Development Fund> "Construction of Roads in Antananarivo" (2002-2005)

2. Outline of the Evaluation Study

2.1 External Evaluator

Makoto Tanaka, ICONS Inc.

[3] A road that makes a shortcut between a point near 5.5k of this By-pass and a point on National Route 7 near Ikopa River. Only Preliminary Study (2005-2006), Basic Design Study and Implementation Review Study (2007) were implemented there as parts of Grant Aid. The High Authority of the Transition entrusted the construction of another road parallel to this plan in 2010 to a local private company (for tthe road part) and a private company in People's Republic of China (for the bridge part) and completed it in 2011.

2.2 Duration of Evaluation Study

Duration of the Study: November 2012 – November 2013

Duration of the Field Study: January 12 – 26 and March 23 – April 6, 2013

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

3.1 Relevance (Rating: ③[5])

3.1.1 Relevance with the Development Plan of Madagascar

In the road sector, Madagascar regarded development plans by foreign donors as important, especially those by the European Development Fund (EDF) on the agreement with European Union (EU), which was the national development plan de facto. This is because about half of the national budget of Madagascar depended on financial assistance by such foreign donors. At the time of ex-ante evaluation of this Project, the development guideline for the road sector was the EDF 8th Road Plan (1999-2003). Although EU greatly limits its assistance sectors at the time of ex-post evaluation due to the political crisis in 2009[6], the sectors of infrastructure construction and transportation are still one of its assistance objectives, where the construction of roads is included (EDF 10th Plan). Under the High Authority of the Transition that was established in the crisis, the Madagascar Action Plan (MAP), which had been established before the crisis, was brought to a halt, however, development objectives such as the promotion of agriculture and the construction of infrastructures are still regarded as important.

The current road development plan of Madagascar is based on the EDF 10th Plan (2008-2013). The Ring Road Plan is included there, which aims to improve the connection between national routes and to ease traffic congestion in Antananarivo as well. The By-pass is relevant to the current road plan since it is part of this plan[7] (see Table 1 and Figure 1).

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

[5] ③: High, ② Fair, ① Low

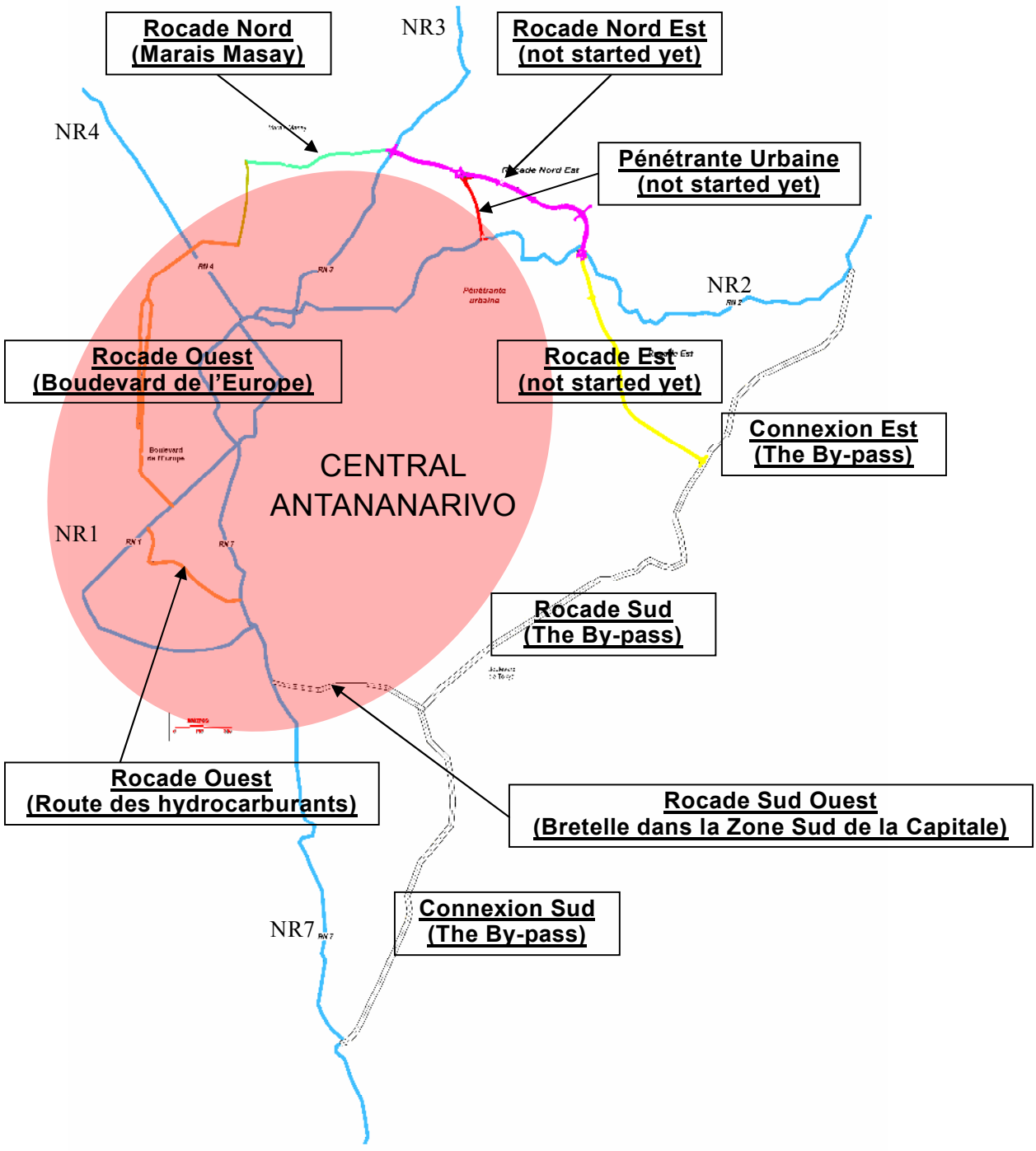
[6] In March 2009, the then President resigned and all the authority of the president was transferred to newly established "High Authority of the Transition" represented by "President of the Transition". International society criticized this as a change of power not following the constitutionally prescribed procedure. Major donors including Japan decided to stop their new assistance projects except humanitarian and emergent ones (source: "ODA Country-by-Country Data Book 2012", MOFA, Japan).

[7] Sections of the Ring Road were assigned to donors after the discussion between them and the Malagasy Government.

Table 1: Construction Plan of the Ring Road

Planned Sections	Names	Contents	Donors	Status (at the time of ex-post evaluation)
Rocade Sud Ouest (Southwest Ring Road)	*Bretelle dans la Zone Sud de la Capitale* (Connection Road in the Southern Zone of the Capital)	Newly constructed	Gov. of Japan (plan only)	Already opened (constructed by High Authority of the Transition)
Connexion Sud (South Connection Road)	By-pass of National Route 7 (this Project)	Newly constructed	Gov. of Japan	Already opened
Rocade Sud (South Ring Road)				
Rocade Est (East Ring Road)				
Rocade Ouest (West Ring Road)	*Route des hydrocarbures* (Fuel Road)	Newly constructed	AFD	Already opened
	Boulevard de l'Europe (Boulevard of Europe)	Newly constructed, improvement of existing roads		
Rocade Nord (North Ring Road)	Marais Masay	Newly constructed	AFD	Already opened
Rocade Nord Est (Northeast Ring Road)	—	Newly constructed	AFD	Not started yet (freezing)
Rocade Est (East Ring Road)	—	Newly constructed	AFD	Not started yet (freezing)
Pénétrante Urbaine (Urban Penetrant)	—	Newly constructed	AFD	Not started yet (freezing)

Source: the Evaluator, making reference to Basic Design Study Report, "Basic Design Study Report for the Project of Construction of a Connection Road in the Southern Zone of the Capital", JICA, 2007, pamphlet prepared by Madagascar Road Authority (ARM) and the results of interview survey to ARM



NR: National Routes, **Bold Underlined**: sections of the Ring Road Plan

Figure 1: The Ring Road Plan

Source: "Basic Design Study Report for the Project of Construction of a Connection Road in the Southern Zone of the Capital", JICA, 2007

Thus, the By-pass is relevant to Malagasy development policy at the time of ex-ante and ex-post evaluation.

3.1.2 Relevance with the Development Needs of Madagascar

Traffic between the starting and terminal points of the By-pass was estimated to be about 4,400 – 6,500 vehicles/day in 2000 before its opening[8], and was predicted to be about 12,000 vehicles/day in 2015 after the opening (source: "Feasibility Study Report on the Ring Road Plan", EU, 1996 and the Basic Design Study Report). Before the opening of the By-pass, it was recognized that the then existing road network did not have enough capacity to handle such traffic demand since it was necessary for the traffic between National Route 7 and National Route 2 to pass through the central part of Antananarivo, where very severe traffic congestion existed and the entrance to which was available only during restricted hours.

According to interview survey with the Ministry of Public Works and Meteorology (MTPM) and other government offices concerned with roads[9], the traffic in Antananarivo keeps increasing, thus the Ring Road is still regarded as important for connecting National Routes 1, 2, 4 and 7 to each other, which are important trunk roads that connect the capital and other important cities, from the viewpoint of ensuring smooth logistics. It also contributes to easing traffic congestion in Antananarivo, by diverting traffic between these routes from the city center.

Thus, the Ring Road Plan and the By-pass Project that constitute it are relevant to development assistance policy at the time of ex-ante and ex-post evaluation.

3.1.3 Relevance with Japan's ODA Policy

"ODA Country-by-Country Data Book 2002", Ministry of Foreign Affairs (MOFA), Japan, says "A political consultation on grant aid and technical cooperation was performed in December 1997, where it was confirmed to implement assistance projects, regarding as important in the fields of basic life, infrastructure for regional development, environment and human development" and regards as important, assistance in the field of infrastructure that contributes to regional development, including road projects such as the one implemented in the Project. This Project follows this direction since it will contribute to regional development, make the traffic easier between the area beside National Route 7 and Toamasina Port, the terminal point of National Route 2, which is an important hub of import and export, and make it easier to provide materials to the former and to export agricultural products from there[10].

[8] Data of OD traffic investigation in 2000 showed that traffic at the whole section between the National Routes 7 and 2 was about 1,500 vehicles/day. OD traffic is the quantity of traffic originated from a certain zone and destined for another zone. OD stands for origin-destination.

[9] There are two government offices concerned in roads other than the Ministry of Public Works and Meteorology (MTPM), the implementing agency of the Project: the Vice-Prime Ministry in Charge of Development and Improvement of the Territory (VPDAT) and the Ministry of Transport (MT). MTPM has jurisdiction over national routes, VPDAT over local ones and MT over road traffic.

[10] Before the construction of the By-pass, it greatly interfered with inter-regional traffic that national routes

Thus, the Project was relevant to Japanese development assistance policy at the time of ex-ante evaluation.

From above, this Project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness[11] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

3.2.1.1 Time required and traffic quantity between the starting and terminal points of the By-pass

Before the opening of the By-pass, vehicles must have passed through the central part of Antananarivo when they go between National Route 7 and National Route 2. There was also time restriction for heavy vehicles to enter the city from National Route 2. Table 2 shows the time required between the starting point (Iavoloha District) and the terminal point (Ambohimangakely District) before and after the opening of the By-pass as quantitative indices reflecting this improvement. The time required between the starting and terminal points of the By-pass has been greatly improved up to one sixth (except peak hours) with its opening.

Table 2: Time required between the starting and terminal points of the By-pass

Indices (unit)	Target (2005)	Actual (2000)	Actual (2010)
Time required between the starting and terminal points of the By-pass (min.)	20	restricted hours: 90 (except peak hours) other hours: 90	15

Source: Basic Design Study Report for target (2005) and actual (2000) values and Data Traffic on By-pass of National Route 7 by MTPM, 2010 for actual (2010) values

3.2.1.2 Traffic inside Antananarivo city and between the city center and outside

It was expected beforehand that after the opening of the By-pass, traffic congestion in the city would be eased since vehicles going between National Route 7 and National Route 2 would go through the By-pass not via the city center. In order to investigate this quantitative effect, questionnaire survey was performed on habitants beside the routes and transport

passed through the central part of Antananarivo; it became at least the next day for a freight truck to arrive at National Route 7 from National Route 2, during which there were some cases that consigners canceled their freight agreement during the trucks were waiting for the opening time of entrance into the city; for example, it took two days for a bus to drive on a regular route between Toamasina (352 km via National Route 2 from Antananarivo) and Antsirabe (163 km via National Route 7 from Antananarivo) (source: the result of interview survey to MT).

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

companies about the situation of traffic congestion in the city center and the traffic between there and outside before and after the opening of the By-pass[12]. As a result of the survey, great improvement was found in the time required and traffic congestion as described below.

First, after the questionnaire survey to 50 habitants beside the routes, the improvement in the time required was confirmed about the access to suburbs after the completion of the Project: the mean velocity in all directions was 6.6 km/h before and 14.3 km/h after the opening of the By-pass respectively (see Table 3). 90% of the habitants answered that it became easier to go between National Route 7 and National Route 2 and to go to the city center from the suburbs.

Table 3: Mean travel velocity before and after the opening of the By-pass[13]

Directions	Number of answers	Mean travel velocity (km/h)	
		Before	After
Direction of NR2	13	7.3	16.4
Direction of NR3	1	2.4	6.4
Direction of NR4	1	6.9	27.6
Direction of NR7	15	7.0	14.6
Other directions	9	11.7	25.9
Mean in all directions	39	6.6	14.3

Source: The evaluator's calculation from the results of questionnaire survey for habitants

Questionnaire survey was also performed on five passenger transport companies that operate bus routes connecting the city center and outside and one cargo transport company about the traffic between the city center and outside. As the results of the survey, answers were obtained as listed in Table 4 and Table 5 about the time required before and after the opening of the By-pass. The time required has been shortened between the city center and each point in the directions of National Route 7 (south) and National Route 2 (east) respectively. According to MTPM, the time required has been shortened by the following two

[12] On each of 50 residences of habitants beside National Route 7, National Route 2 and the By-pass and 7 transport companies (5 passenger and 2 cargo transport companies) questionnaire survey and interview survey were performed door to door. They were requested to answer how much they are satisfied with the By-pass and the times required and the travel costs between certain points before and after the opening of the By-pass and to make comments on it. The habitants were also asked about the improvement of air quality.

[13] Each habitant targeted in questionnaire survey was requested to declare a certain point they often visit and to answer the time required between the declared point and the city center. The evaluator measured the distance on maps and classified the points into directions, and calculated the mean travel velocity as the sum of the distances from the city center divided by the sum of the time required.

effects: because the Project has shortened the waiting queue since heavy vehicles going from National Route 2 to National Route 7 stopped going via the city center to avoid waiting for the entrance from National Route 2 into the city, and because the whole lengths of the two national routes (NR7: Antananarivo – Toliara, NR2: Antananarivo – Toamasina) were improved (pavement on unpaved sections, widening of narrow sections, strengthening on bridges which often fall and slopes which often collapse due to heavy rain, etc.).

Table 4: Time required between the city center and outside before and after the opening of the By-pass (Answers by passenger transport companies)

Companies	Section		Direction	Distance (km)	Time required (h:mm)	
	From	To			Before	After
TRANSTAFITA	City center	Moramanga	East (NR2)	98.2	2:30	2:20
KOMPIMA					3:00	2:00
FIFIABE	City center	Toamasina	East (NR2)	324	10:00	8:00
MADATRANS	City center	Toliara	South (NR7)	923	16:00	14:00
FIFIABE					19:00	15:00

Source: results of the questionnaire survey for passenger transport companies (except distances) and the evaluator (distances)

Table 5: Time required between the city center and outside before and after the opening of the By-pass (answers by cargo transport companies)

Companies	Section		Via	Distance (km)	Time required (h:mm)	
	From	To			Before	After
SALONE	Anosy, City center	East, Ambohimangakely	East (NR2)	13.0	2:00	0:30

Source: results of the questionnaire survey for cargo transport companies

In addition, in questionnaire survey of habitants beside the routes, 94% of the targeted habitants answered that traffic congestion in the city decreased with the opening of the By-pass. The results of questionnaire survey to one cargo transport company are as shown in Table 6, about the traffic between the starting and terminal points before and after the opening of the By-pass. Although it took a very long time beforehand because of the necessity to pass through the city center, the time has been shortened since vehicles drive via the By-pass.

Table 6: Time required between the starting and terminal points before and after the opening of the By-pass (answers by cargo transport companies)

Companies	Section		Via	Distance (km)	Time required (h:mm)	
	From	To			Before	After
COLAS	13k of NR7, South	11k of NR2, East	City center	31	2:30	—
			By-pass	21	—	0:20

Source: results of the questionnaire survey for cargo transport companies

From above, it can be said that the habitants and the transport companies think that traffic congestion in Antananarivo has been eased and the traffic between the city center and outside has improved with the opening of the By-pass. There is only limited effect in terms of reducing transport cost because of the rapid inflation of fuel expenses[14], which was expected at the time of basic design, even though fuel consumption decreased due to the opening of the By-pass.

3.2.2 Qualitative Effects

3.2.2.1 Improvement of transport between ports and industrial and agricultural areas

City Job Institute (IMV)[15] has announced a research result that it has become possible to transport efficiently between ports and industrial and agricultural areas. It has become possible to transport agricultural products within a day from agricultural areas beside National Route 7 to Antananarivo, a consuming area, and to Toamasina Port (the terminal point of National Route 2), an important hub of import and export, and moroever, cases of goods on vehicles being stolen during traffic congestion, etc. have decreased. From this, it is thought that the effectiveness of the By-pass improved the transport between ports and industrial and agricultural areas.

3.2.2.2 Entrance restriction for vehicles into Antananarivo

MTPM and IMV told that the restriction of the entrance into Antananarivo depends on three classes of gross vehicle weight. At the time of ex-post evaluation, the restriction was

[14] The price of fuel increased: the retail prices of regular gasoline and diesel oil were 1,002 and 714 in June 1, 2003 before the Project and 2,710 (increased by 170%) and 2,540 (by 256%) in March 26, 2008 after the Project respectively (unit: MGA/ℓ) (source: statistics by Malagasy Hydrocarbon Office (OMH)). MGA stands for Madagascar Ariary, the currency of Madagascar, the exchange rate of which is 1 MGA = 0.0427 yen as of March 2013 (source: announcement by Central Bank of Madagascar (BCM)).

[15] A research institute established in 1989 by Île-de-France (Autonomous entity) in France for the purpose of technical exchange and reciprocity with Antananarivo Urban Commune (CUA), dealing with general urban problems in Antananarivo, currently under the management of CUA.

strengthened for vehicles classified in the heaviest group (over 16 tons) compared to the time of ex-ante evaluation, because vehicles have absolutely increased and because there are few parking areas for heavy vehicles inside the city: they are not allowed to enter the city from National Route 2 from 6:00 to 20:00 as a general rule. However, the restriction is removed for vehicles going to the truck terminal that is the largest logistical hub in the city, to go to and go out from the terminal, since the access road to the terminal had been improved. For vehicles classified in the light and middle groups (gross vehicle weight of not more than 16 t), the restriction was abolished.

The transport companies commented the following as free answers in the questionnaire survey:

- The drivers are to be paid extra even during waiting not only for overtime but also for night-work since the restriction is over at 21:00. Such personnel expenses had been heavy before the opening of the By-pass. However, it has been reduced because the waiting time has been shortened after the opening of the By-pass.
- It has become easy to plan the arrangement of drivers since it has become possible to estimate the time or driving.

As described above, it is thought that the effectiveness of the By-pass shortened the time required and improved the transport between ports and industrial and agricultural areas.

3.3 Impact

3.3.1 Intended Impacts

3.3.1.1 Impact on agriculture

At the time of ex-ante evaluation of the Project, the increase in agricultural incentive was expected as one of the indirect effects, since the increase in sales had been anticipated because the transport of agricultural products would become more efficient and expand the sales area.

According to IMV, the agriculture in the suburbs of Antananarivo has been activated with the opening of the By-pass. Its causes are that the development beside the By-pass has come under surveillance of the authorities to prevent the destruction of farmland and that displays and sales of agricultural products began to be held on weekends and holidays at open-air markets beside it (especially on the north of the railroad crossing near 11k). There is as well a report on the activation of agriculture that the area of farmland increased by 66% from 2000 to 2008 after the opening of the By-pass in Ambohijanaka Commune beside it while it decreased by 12% from 1999 to 2006 in Antananarivo[16].

[16] p. 23 of the research report of the first year by Mr. Pauline Abrieu, a master course student tutored by

3.3.1.2 Impact on transport

As described in 3.1.1, the Ring Road has already opened in the year of 2011 except some part, forming a route from the By-pass via Androndrakely to the western part of the capital. This made it possible to connect National Routes 1, 2, 4 and 7 to each other, to improve the traffic between them and to realize the objective of the By-pass, that is, "to ensure smooth logistics that are not affected by the traffic restrictions" between the four routes, not only National Route 7 and National Route 2 but National Routes 1 and 4.

3.3.2 Other Impacts

3.3.2.1 Impacts on the natural environment

Ac cording to interview survey to the government offices concerned such as MTPM, VPDAT and MT etc., there is no report of Impacts on the natural environment beside the By-pass (including flooding on the central section of the By-pass (ca 5km length) which were examined in basic design study) and there is a negative Impact on the natural environment such as air pollution and noise and vibration etc. that were worried beforehand, except few air pollution cases reported. Answers were obtained also in questionnaire survey to habitants beside the routes (total 50 residents: 20 residents beside National Route 7 inside the urban area, 10 residents beside National Route 2 inside the urban area, 10 residents beside National Route 2 in the suburbs and 10 residents beside the By-pass) as shown in Table 7.

Table 7: Results of questionnaire survey to habitants on the effect by the By-pass on air quality

Question	Improved	Not Changed	Degraded[17]
Change in air quality	28%	68%	4%

Source: results of the questionnaire survey for habitants

And according to Antananarivo Urban Commune (CUA), there were many cases of unsanitary situation caused by drivers' defecation and urination beside the road before the opening of the By-pass, as well as exhaust gas, noise and vibration by vehicles waiting for the opening hours, but such cases are currently very few because the waiting time has been greatly shortened.

IMV.

[17] Of the 50 residents there were two who answered that the air quality was degraded. One of the two was in Andoharanofotsy about 3 km north of the start point of the By-pass, while the other was in Ambohimanambola about 4 km southeast of the Bridge No. 2 of the By-pass. The reason the air quality degraded is not clear for the former, for the latter, however, it would be the increase in the population and the insider traffic since the zone is located in the suburbs.

3.3.2.2 Land Acquisition and Resettlement

According to MTPM, Land Acquisition and Resettlement at the expense of the Malagasy side was implemented as described in the Basic Design Study Report without any problem[18]. However, no more information has been obtained since there were no detailed references of Land Acquisition and Resettlement at the ministries and organizations concerned including MTPM; they might be scattered and lost because of the political crisis, etc.

3.3.2.3 Unintended Positive/Negative Impact

There can be listed the following unintended Positive/Negative Impacts.

(1) Positive impacts

①Cargo transport companies using the routes answered that the thefts of transported goods during waiting have been decreased since the time has been greatly shortened before the opening time to enter the city.

②According to CUA, the access to Antsirabe became easier because traffic congestion in the city was eased; many citizens go for recreation to Antsirabe on Sundays since there are few amusement facilities in the city.

③According to MT, the areas beside the By-pass become amusement parks of carnivals, street stalls and cleaning volunteers on weekends and holidays (especially in Amoronakony area in Ambohimangakely Commune).

④It has become possible to commute to the city center from the areas beside the By-pass with its opening, which were only lonely villages beforehand, and many houses have been built there. The fact provides some support for it that land price has increased here[19].

(2) Negative impacts

①In Madagascar, it is common that crossing points between trunk roads are planned as roundabouts while those between a trunk road and an existing non-trunk road as plane crossings where users of that non-trunk road should once stop there. This general rule is also applied to the Ring Road Plan (the By-pass is part of it). However, traffic accidents occur at two of the plane crossings in Ambohijanaka Commune, which are of the

[18] In the Basic Design, total 11,323 million FMG expense of the Malagasy side was appropriated; 11,020 million FMG for land acquisition (5,310 million FMG for land, 3,190 million FMG for residences, and 2,520 million FMG for resettlement), 300 million FMG for the movement of electric wires, water pipes and telephone lines (100 million FMG for each), 3.10 million FMG for the equipment of traffic signs etc. FMG stands for Madagascar Franc, the former currency of Madagascar, the exchange rate of which was fixed as 1 MGA = 5 FMG. This means the total expense of 203 million yen on the Malagasy side, calculation depends on the rate of 1.00 FMG = 0.0179 yen (as of May 2001 – October 2001) (source: .Basic Design Study Report).

[19] 10,000 – 15,000 MGA/m^2 before the opening of the By-pass and about 250,000 MGA/m^2 afterward (source: result of interview survey to MT).

By-pass and existing non-trunk roads, probably caused by carelessness of users of the latter[20]. MTPM commented in interview survey that they cannot find any effective measures of hardware[21].

②The Evaluator actually ran over the By-pass and found many brake tracks as shown in Photo 1. According to MTPM and CUA, these are caused by reckless driving and grazed animals rushing out to it.

③According to CUA, crimes such as purse-snatching take place and many human accidents occur in the areas beside the By-pass because of narrow views caused by poor lighting while the number of population and people passing through increased with the opening of the By-pass.

Near 9k600, inside Alasora Commune

Near 10k000, inside Alasora Commune

Near 10k600, Amolonakony area inside Ambohimangakely Commune

Photo 1: Brake tracks on the By-pass

From above, this Project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Efficiency (Rating: ③)

[20] According to interview survey to the mayor of the commune, there were 10 accidents after the opening of the By-pass till now (5 years), in which 80% of the victims pedestrians (half adults and half children): the rest are one motorcycle and one bicycle cases. All the accidents except the motorcycle case occurred in daytime.

[21] For example, President's Office opposes making speed-reducing bumps on the By-pass (Presidential Palace is near the starting point and the By-pass is an access road to it). The habitants who carry goods over their head would not use footbridges since they can see very far ahead from the crossings. The cars rapidly driving on the By-pass would not slow down or stop even if there are signs "Pedestrians' Crossing" on the road surface. Steel-made road signs installed beside the By-pass are often stolen and lost.

3.4.1 Project Outputs

3.4.1.1 Japanese Side

The construction of facilities in the Project was implemented almost following the basic design except adding the movement of railroads[22] as shown in Table 8.

Table 8: Output of this Project (Construction of facilities)

Items	Plan (at the time of Basic Design Study)	Actual
Construction of a road	Total length about 15 km One lane per direction: (lane width 3.5 m, shoulder 2.0 m) Asphalt pavement	Total length 15.205 km One lane per direction: (lane width 3.5 m, shoulder 2.0 m) Asphalt-concrete pavement
Construction of bridges	Bridge No. 1 (length 96 m, one lane per direction) Bridge No. 2 (length 150 m, one lane per direction)	Bridge No. 1 (length 95.50 m, one lane per direction) Bridge No. 2 (length 150.25 m, one lane per direction)
Movement of railroads	—	1,245.0 m

Source: Basic Design Study Report, Completion Report and Defect Inspection Report

3.4.1.2 Malagasy Side

According to the Completion Report and the Defect Inspection Report, the items at the expense of the Malagasy side described in the Basic Design Study Report (listed below) were implemented as planned without any problem.

(1) Securing the land for Resettlement

(2) Land Acquisition for residents

(3) Handling electric wires, telephone lines and water pipes and moving wells, etc.

(4) Land Acquisition for farmland

There is no report on the influence about Land Acquisition.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The actual Project cost was 3,044 million yen, which was lower than the planned cost of 3,127 million yen (97% of the planned cost).

[22] The movement of railroads is for the purpose of coping with the improvement of the angles between the railroads and the By-pass and with the height of road embankment. If the railroads and the road cross each other acutely, there are dangers of missing steering control and jumping out of the road for vehicles passing through the crossing.

3.4.2.2 Project Period

This Project started in June 2003 and ended in December 2006, thus the Project period was 42 months, which was shorter than the planned Project period of 46 months (91% of the planned Project period)[23].

From above, both Project cost and Project period were within the plan, therefore efficiency of the Project is high.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

As the results of interview survey to related ministries, the maintenance activities are under the superintendence of Department of Road Maintenance (DER), MTPM. DER is a department of MTPM established in 2006, which generally deals with planning of maintenance of national routes, where seven exclusive persons are in charge. Actual maintenance activities are divided into routine (cleaning road surface, clearing drain outlets, removing grasses etc.), convention (confirming faults caused by the construction works), annual (repairing and replacing regularly parts such as buffers and curbs etc.), urgent (coping with bridge collapse, tree toppling and rock fall caused by natural disasters and traffic accidents etc.) and special (others) ones, each of which is implemented by the entities listed below respectively (see also Table 9).

- Routine: Bureau of Inter-Regional Public Works and Meteorology (DIRTPM), MTPM
  A department of MTPM established in 2007, which implements the maintenance plans for the By-pass established by MTPM-DER. There are seven exclusive persons in charge.
- Convention, annual and special: Road Maintenance Fund (FER)
  A public organization under MTPM established in 1998, which accepts funds subventions from donors. It performs conventional, annual and special maintenance activities by itself and pays the costs of routine maintenance activities by

[23] Pavement surface was cracked at a section of about 100 m long around 10k700 in January 2007 due to slide of the embankment. A survey clarified that the month had three times as much rain as in the average year and the slide was because of rainwater flown on private access roads and drains that habitants who live there had connected to the By-pass without permission. Since this is for an exceptional reason to which the contractor is not responsible, the consultant and MTPM, the counterpart organization in charge of supervision discussed and decided to implement restoration works paid by the Malagasy side with no defect period. The Malagasy side agreed to regard the whole completion of the plan as the completion of those works. After a survey for the confirmation of the causes had completed, restoration works were implemented in the section from 10k600 to 10k750 just after the rainy season was over, since it was judged that the works were impossible during the season. Although the Project itself was completed in December 2006, the opening of the By-pass was postponed to March 2008 after the completion inspection was performed in that month.

MTPM-DIRTPM and urgent ones by Office of Urgent Works (OTU). It has a voice in the establishment of plans by MTPM but cannot make decisions on them.

- Urgent: Office of Urgent Works (OTU)
  A public organization under MTPM established in 2006, which is dispatched to cope with urgent maintenance activities in emergencies such as cyclone attacks.

Table 9: Entities implementing the maintenance of national roads

Kinds	Entities	Forms of implementation	Cost payer
Routine	MTPM -DIRTPM	Entrusted to private companies	FER
Convention, annual and special	FER	Entrusted to private companies	FER
Urgent	OTU	Directly implemented	FER (paid after discussion with OTU)

Source: results of interview survey to MTPM, FER and OTU

Different departments of and public organizations under MTPM are in charge of each of the maintenance activities, routine, annual and urgent, in close cooperation with each other without any bad effect.

3.5.2 Technical Aspects of Operation and Maintenance

Every one of MTPM-DER, DIRTPM, FER and OTU holds enough personnel and technology for maintenance activities.

The maintenance activities for the By-pass are entrusted from MTPM-DIRTPM to private companies that are selected in bids every year considering prices and technical skills as shown in Table 10 without any technical and financial problem. It will continue that FER entrusts the maintenance activities to technically skilled private companies. There have been periods in which no maintenance activities were entrusted from MTPM-DIRTPM and FER to private companies. However, on weekends and holidays during those periods, cleaning volunteers came there from the city center and cleared drain outlets and removed grass, etc. (almost equivalent to routine maintenance activities) voluntarily, without any problem on maintenance.

Table 10: Results of the entrustment for the maintenance of the By-pass

Years	Kinds of works	Implementing entities	Cost payer	Period	Entrusted companies
2007 - 2008	Routine	MTPM-DIRTPM	FER	N/A	N/A
2008 - 2009	Routine	MTPM-DIRTPM	FER	3 months from May 26, 2009	VONJY
	Convention, annual, special	FER	FER	3 months from May 26, 2009	EGECI
2009 - 2010	Routine	MTPM-DIRTPM	FER	8 months from August 30, 2010	TAMBATRA
	Convention	FER	FER	8 months from August 30, 2010	TAMBATRA
2010 - 2011	Convention, annual, special	FER	FER	4 months from November 7, 2011	BRAIN
2011 - 2012	Convention, annual, special	FER	FER	3 months from November 29, 2012	AVIG

Source: references prepared by FER

OTU prepares in ordinary times technology and financial procedure and performs required works by itself for emergency measures when the road beds are washed away, the bridges fall, the soil masses collapse and the trees are blown over in emergency cases such as attacks of cyclones and heavy rainfalls. After the temporal restoration, the works leave from the jurisdiction of OTU and are entrusted to private companies via MTPM and FER. Many previous results by OTU are confirmed about urgent maintenance activities on national routes, accordingly there is no problem in the maintenance technology of OTU.

From above, there are no technical problems for public organizations in charge of the maintenance of the By-pass such as MTPM-DER, DIRTPM, FER and OTU and private companies to which MTPM and FER entrust the works.

3.5.3 Financial Aspects of Operation and Maintenance

Since the By-pass was registered as a national route (No. 60) and designated as strategically important at the time of its opening, it is expected that the budget for its operation and maintenance is given priority in allocation[24].

[24] Generally, it is easier to allocate maintenance budget to national routes than to regional and communal routes. It is also possible to allocate budget to national routes that are important under the national policy

According to MTPM, the expenses of the operation and maintenance are paid from the budget of the government, main source of which is fuel tax (7% of the retail price of automobile fuels) collected from automobile users. FER once accepts the funds from the national budget and the subventions (donation from donors as maintenance expenses); it pays the maintenance expenses each time maintenance activities are implemented. Table 11 shows the situation of funds accepted by FER. Before the political crisis in 2009, a great part of the maintenance expenses was subventions. However, the share of subventions greatly decreased since donors except the French Development Agency (AFD) froze most of their assistance with the political crisis, resulting in most part of the maintenance expenses being shared by fuel tax. Moreover, the disbursements greatly exceeded the revenues in campaign 2011-12 since the allocated budget to FER greatly decreased as described before, however, the balance of the fund has never been 0 because of remainder from the previous year (source: results of interview survey to FER).

Table 11: Funds accepted by Road Maintenance Fund (FER)

Unit: Million MGA

	2009	2010	2011	2012
Subsidy for Road Maintenance (RER)	75,735	68,023	34,986	-214
Affected Resources (RA)	7,769	0	7,099	0
Petrol Product Tax (TPP)	2	0	0	0
Subventions (SUB)	6,290	0	8,915	2,760
Contributions from Decentralized Territorial Collectivities (ACTD)	1,527	990	0	0
Other resources (AR)	6,901	6,600	8,000	8,200
Total	98,224	75,613	59,000	10,746

Source: announcement by FER

On the other hand, the finance of operation and maintenance will greatly pick up since the World Bank (WB), Delegation of the European Union to Madagascar (DUEM) and African Development Bank (BAD) express that they will resume their assistance including financial

prior to other national routes. Although the By-pass did not satisfy the conditions required for the registration of national routes at the time of opening, it was registered as a national route under a political decision (source: the result of interview survey to the Minister of MTPM). At the time of ex-post evaluation, revisions of laws including the change of the criteria of national route registration (MTPM: the bill of "Act on the Second Revision of the Road Chart") is proposed to and discussed in the Parliament. The By-pass will satisfy the new criteria after the bill is passed. The national routes are classified into three ranks prescribed by a decree (MTPM: Decree on the Revision of the Classification of the National Routes) and the By-pass is classified in the highest rank of Primary National Routes as well as the National Routes 2, 4, 6 and 7.

assistance on condition that international society recognizes the new government that will set up after the presidential election.

Next, here is described the status of disbursements for the maintenance of national routes. As described before, all the funds for the maintenance of national routes are once accepted by FER and paid from it. Table 12 shows the total amount and the amount per 1 km of estimates and allocated budgets for the maintenance of all national routes calculated by FER[25]. The amount per 1 km is for the convenience of comparison since the total length of national routes increases year by year.

Since 2008, the actual amounts allocated from the national budget are no more than 59 – 77% of the estimates. Since campaign 2009-10, the budgets for the maintenance of national routes are not enough. The actual amount per 1 km for the By-pass is less than the estimate and actual amount per 1 km for all national routes. Especially, that greatly decreased in campaign 2011-12. This is because there was no need for large-scale repair works since the By-pass is a new paved road passing in a plain. It was confirmed that each public organization makes efforts to allocate the budget to the By-pass giving priority from what little budget, ranking its projects.

The actual amount per 1 km for the By-pass is less than the estimate and actual amount per 1 km for all national routes. Especially, that greatly decreased in campaign 2011-12. This is because there was no need for large-scale repair works: there is not any financial problem.

Table 12: Estimates and allocated budgets for the maintenance of all national routes and the By-pass by Road Maintenance Fund (FER)

Campaign	Total amount (million MGA)				Amount per 1 km (thousand MGA/km)			
	2008-09	2009-10	2010-11	2011-12	2008-09	2009-10	2010-11	2011-12
Estimate (all NR)	60,170	60,438	62,496	62,906	5,488	5,246	5,415	5,358
Allocated (all NR)	44,189	46,652	36,734	47,195	4,030	4,049	3,183	4,020
Allocated (By-pass)	38	19	30	13	2,542	1,234	2,000	896

Source: references prepared by FER

[25] In the fiscal system of FER, the revenues are appropriated as the sum from January 1 to December 31 every year, while the disbursements are appropriated as the sum from the end of the rainy season to that of the next year, the term of which is called “campaign”. Because of this fiscal system, it was impossible to compare the balance of revenues and disbursements year by year. Madagascar adopts this system since there occurs many natural disasters in the rainy season (November – April).

As above, the budget for its maintenance is secured constantly, since each public organization makes efforts to allocate the budget to the By-pass giving priority from what little budget, ranking its projects. After donors resume their assistance, the finance of operation and maintenance will pick up since WB, BAD and EU recognize the importance of the By-pass.

3.5.4 Current Status of Operation and Maintenance

The Evaluator actually drove the whole By-pass and found some minor defects that do not affect the functions, such as collapse of shoulders mainly caused by parking of heavy vehicles, settlement of pavement surface, bumps at bridge connections and thefts of road signs and railings (see also 3.5.3 for thefts). Although there is no major defect that affects the function of the road, it is expected that driven vehicles would be affected if they are left unattended. MTPM-DER recognizes it and expressed that it wants to start repair works just after donors resume their assistance, although it cannot currently do it because of short funds.

Steel parts of road illumination facilities, road signs and railings[26] are often stolen. Once, steel columns were stolen that had been protected with concrete covers as measures against thefts, after the covers were broken with machines like a rock drill. Drastic measures against them are difficult since there are limitations in measures against thefts of steel parts of road signs and railings such as strengthened control and fluent repair works.

In the section of the By-pass where the embankment slid and the pavement surface was cracked just after the completion (see Note 23 in p. 17), there has been no defect of such kind. VPDAT has prohibited and started to control unauthorized connection of private access roads and drains, which had caused this defect.

From above, some problems have been observed in terms of the current status of operation and maintenance, therefore sustainability of the Project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This Project was implemented in Antananarivo, the capital, in order to shorten the travel time required, to ensure smooth logistics that are not affected by traffic restriction in the capital region, to ease traffic congestion in the city center, to decrease transport costs and to promote logistics, by the construction of a by-pass that connects National Route 7 and National Route 2 in the suburbs of the capital as part of the Ring Road Plan around the capital. The objective of the Project meets Madagascar's development policy, developmental needs

[26] The railings of the Bridge No. 1 contain iron parts because of the necessity of water passage in case of flooding. This did not allow to adopt reinforced concrete walls as used in the Bridge No. 2.

and Japan's ODA policy, therefore its relevance is high. The implementation of the Project has largely achieved its objectives of the decrease in time required between National Route 7 and National Route 2 and between the city center and the suburbs, therefore its effectiveness is high. Both the cost and period of the Project were within the plan, therefore efficiency of the Project is high. On the other hand, some problems have been observed in terms of the current status of operation and maintenance, such as thefts of steel parts of road signs and collapse of shoulders, therefore sustainability of the Project effect is fair.

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) Preventive maintenance

The Malagasy side recognizes the importance of the By-pass and makes efforts to secure personnel, technology and institutions and to allocate the budget for its operation and maintenance giving priority. In spite of these efforts, there are some minor defects that do not affect the functions, such as bumps at bridge connections, cracks and settlement of pavement surface, damage on shoulders and clogging up of drain outlets. Although no severe problem currently occurs, these defects will expand and finally cause a status that requires major repair works if they are left unattended. Since the budget for the operation and maintenance is allocated to the By-pass although the amount is small, it will prevent the increase in the cost for operation and maintenance to use the budget to preventive maintenance giving priority.

(2) Traffic safety education

In Madagascar, it is common to make crossing points between trunk road roundabouts and ones between trunk and non-trunk roads plane crossing. There is a fear that many drivers are not aware of the duty that one or both drivers are to notice other traffic when they pass plane crossings. New measures for traffic safety are also required since there were few roads like the By-pass that meet high standards and have no traffic congestion. It is necessary for road users to be awakened that drivers should notice other traffic when they drive rapidly and pass crossings and pedestrians should notice vehicles when they walk on and go across trunk roads, by some means such as instruction at school education and lectures on acquisition of driving permits.

(3) Measures against parking of heavy vehicles

It might be possible that most collapse of shoulders is avoided if heavy vehicles are not parked there. It is recommended to control parking of heavy vehicles there and to avoid such parking by preparing parking areas for heavy vehicles and to guide them to those areas.

(4) Measures against the theft of steel parts

Parts of road signs are sometimes stolen for the purpose of selling iron fillings on the black

market if they are made with steel and are erected on the ground. Possible measures against it are setting of speed limits and painting of direction instructions on the surface. MTPM discussed this idea beforehand, however, it was not adopted because it is hard to see in the night since there is no road illumination[27].

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

The main purpose of the By-pass is to ease traffic congestion and further to ensure smooth logistics. However, there are many cases where new problems such as traffic accidents occur with the construction of new trunk roads. It cannot be avoided if new roads are constructed. This Project has improved traffic congestion in the central part of Antananarivo and traffic between the city center and suburbs with the opening of the By-pass, but also caused a new problem of traffic accidents in the areas beside the By-pass, which were only lonely villages beforehand. According to MTPM and CUA, the main causes of the traffic accidents are reckless driving, careless passing of crossings and grazed animals rushing out to it. Most such traffic accidents would involve drivers who are not familiar with trunk roads like the By-pass that have no traffic congestion and habitants who have not encountered vehicles driving rapidly. It will be possible to minimize negative impacts such as traffic accidents in the cases like this Project of construction of new plane roads in surrounding areas of large cities which are not urbanized, to examine the plans of crossings in consideration of the possible increase of traffic in local roads to be connected to the new roads, including the adoption of roundabouts, as well as supplementary soft components of traffic safety education for drivers and habitants (including making them aware of the duty that one or both drivers are to notice other traffics when they pass plane crossings).

End

[27] It might be another idea to adopt road signs on the surface with paint containing fluorescent colors for limited use that reflects vehicle lamplight. This kind of paint has been experienced in Antananarivo Ivato International Airport. It may be able to domestically purchase such paint, but it is potentially difficult because of its high price.