

PART V

TRANSPORT AND TERRITORIAL DEVELOPMENT PLAN FOR TATOM ECONOMIC AXIS

Chapter 23 Present Situation and Challenges of TaToM Economic Axis

23.1 Transport and Territorial Development Plan for TaToM Economic Axis

23.1.1 Overview of TaToM Economic Axis

The TaToM Economic Axis, which is composed by NR2 and the railway connecting Antananarivo and Toamasina, is the most important transport axis in Madagascar. This transport axis not only plays the role of connecting the national capital city and the largest international port of Madagascar, but also an enormous role in the national spatial structure due to the locations of the two cities and the axis.

As shown in Figure 23.1.1, the capital city Antananarivo is located as the intersection of north-south national roads and east-west national roads. Located in the centre of the country, all cities in Madagascar are within 800 km from Antananarivo. Antananarivo is also connected to major cities of Madagascar, such as Toamasina, Toliara, Mahajanga, Atsiranana and Tolagnaro, and major tourist destinations, such as Nosy Be, Sainte-Marie and Morondava with flights. Other major cities, such as Antsirabe (170 km from Antananarivo), Fianarantsoa (405 km) and Moramanga (115 km) are accessible with national roads from Antananarivo.

NR4 connecting to northern parts of the country

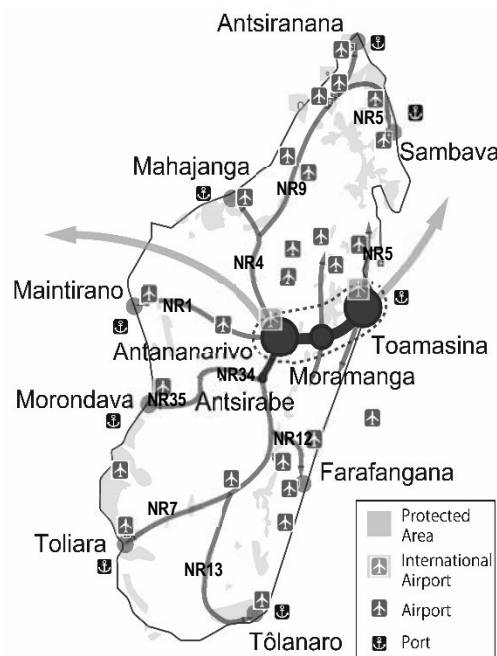
- Mahajanga
- Antsiranana via NR9
- Sambava via NR9 and NR5

NR1 connecting to western cities

- Maintirano

NR 7 connecting to southern parts of the country

- Antsirabe
- Toliara
- Tolanaro via NR13
- Manakara and Farangana via NR12 and/or NR 27
- Morondava via NR34/35



Source: JICA Study Team

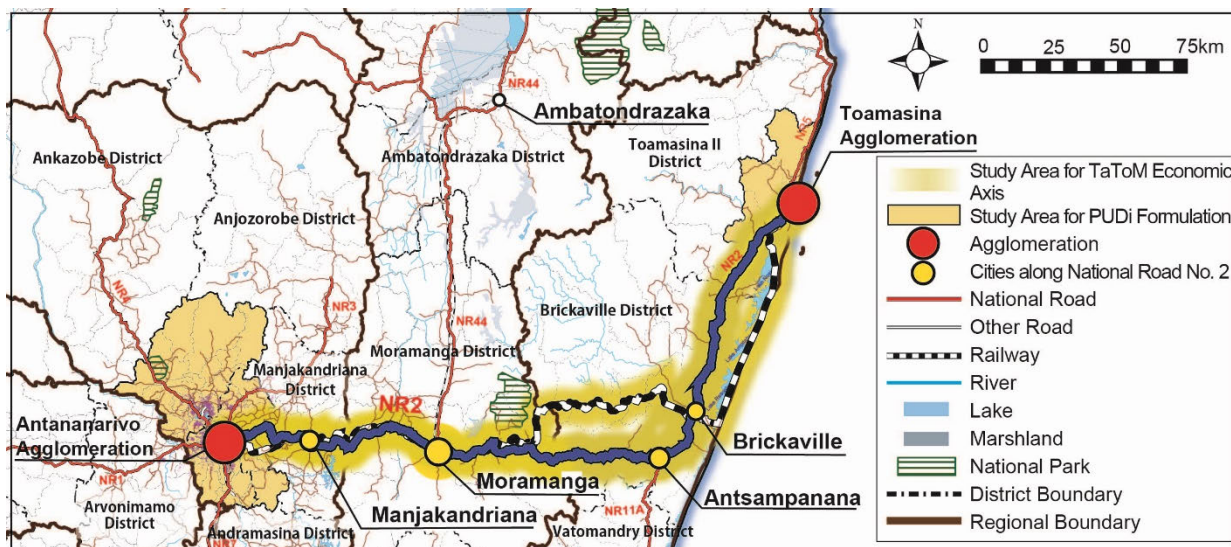
Figure 23.1.1 Strategic Location of Antananarivo, Toamasina and TaToM Economic Axis in Madagascar

Most of imported goods arrive in Toamasina Port which is the largest sea port. They are transported to Antananarivo, and then distributed to the all over the country. In the opposite direction, goods

which are produced in the country are transported to Toamasina Port via Antananarivo, and then exported. Other national roads connecting to rural areas are very weak. Those rural areas rely on the limited national road network.

Figure 23.1.1 also shows the locations of airports in Madagascar. The main international airport is Ivato Airport in Antananarivo Agglomeration, while Toamasina Airport also has international flight to Reunion.

There are five cities (urban commune and its surrounding urbanized areas) in TaToM Economic Axis, which are Antananarivo Agglomeration (including CUA and 37 surrounding communes), Manjakandriana, Moramanga, Brickville and Toamasina Agglomeration (including CUT and four surrounding communes).



Source: JICA Study Team

Figure 23.1.2 Strategic Location of Antananarivo, Toamasina and TaToM Economic Axis in Madagascar

23.1.2 Organization of the Plan

The Transport and Territorial Development Plan for TaToM Economic Axis are composed of the following:

- Present Situation and Challenges of TaToM Economic Axis
- Future Vision and Growth Scenarios for TaToM Economic Axis
- Strategies for Development of Transportation System of TaToM Economic Axis
- Strategies for Development of Moramanga

23.2 Present Situation and Challenges of TaToM Economic Axis

23.2.1 Present Situation on Cities along TaToM Economic Axis

There are around 3.5 million urban population in TaToM Economic Axis, of which 2.9 million in Antananarivo Agglomeration, 0.4 million in Toamasina Agglomeration and 0.1 million in Moramanga urban area. Manjakandriana and Brickville are also urban communes, but the population are quite small with approximately 30 thousand inhabitants.

In TaToM Economic Axis, there are also several other towns and villages along NR2 and around the railway stations, but the population of each settlement are small.

The population in Antananarivo Agglomeration, Toamasina Agglomeration and Moramanga urban area are growing rapidly with annual growth rate of around 4%.

Table 23.2.1 Population of Urban Areas in TaToM Economic Axis

Urban Areas in TaToM Economic Axis	Area (km ²)	Population		Population Growth Rate	Population Density (person/km ²)
		1993	2018	1993-2018	
Antananarivo Agglomeration	768	1,132,046	2,558,245	3.37%	3,331
CUA	85	710,236	1,275,207	2.37%	15,002
Surrounding 37 Communes	683	421,810	1,283,038	4.71%	1,879
Manjakandriana	75	21,020	33,156	1.84%	442
Moramanga Urban Area	983	33,187	99,553	4.49%	101
Moramanga Urban Commune	41	18,852	58,753	4.65%	1,433
Ambohibary Rural Commune	942	14,335	40,800	4.27%	43
Brickaville	135	16,366	30,916	2.58%	229
Toamasina Agglomeration	1,060	165,464	437,004	3.96%	412
CUT	31	137,782	326,286	3.51%	10,525
Surrounding 4 Communes	1,029	34,102	110,718	4.82%	108

Source: JICA Study Team based on data from INSTAT and FTM

The characteristics of the urban areas in TaToM Economic Axis are summarized below.

1) Antananarivo Agglomeration

Antananarivo Agglomeration is the largest urban centre of Madagascar, with the national capital Urban Commune of Antananarivo (CUA) and its 37 surrounding communes.

Antananarivo Agglomeration is located between longitude 47°37'E and 47°61'E, and latitude 18°89'S and 18°95'S. Antananarivo Agglomeration lies at altitudes between 1,280 and 1,480 metre above sea level, and is located in relatively centre of the island. The whole area lies in the Sub-Tropical Highland Zone with mild dry winter and warm rainy summer.

The international gateway, Ivato International Airport located in the northern area within Antananarivo Agglomeration is the hub airport for its national flag-carrier Air Madagascar which flies to nine cities: Guangzhou (China), Anjouan (Comoros), Moroni (Comoros), Marseille (France), Paris (France), Nairobi (Kenya), Port Louis (Mauritius), Dzaoudzi (Mayotte), Saint-Denis (Réunion), Mahé (Seychelles) and Johannesburg (South Africa). Ivato Airport also has 12 international airlines coming to connect with cities such as Addis Ababa and Istanbul.

The population of Antananarivo Agglomeration is increasing rapidly especially in the surrounding 37 communes with annual growth rate exceeding 5%. Such population increase has occurred under insufficient infrastructure development due to repeated political risks. Therefore, the urban functions are concentrated in the city centre of Antananarivo causing daily traffic congestion.

The total urbanised areas within Antananarivo Agglomeration is 147 km², which is 24% of the agglomeration, and the majority is residential area. There is a large extent of industries located in Tanjombato, south of CUA. There are also some factories in Ankorondorano, along the National Roads 1 and 4. Apart from that, a few large scale industrial areas are found in the agglomeration.

2) Toamasina Agglomeration

Toamasina Agglomeration is an urban centre with Urban Commune of Toamasina (CUT) and its four surrounding communes. It is located between longitude 49°16'E and 49°43'E, and latitude 17°59'S and 18°22'S, which is 220 km east of Antananarivo. The whole area lies in the Tropical Rain Zone with mild dry winter and warm rainy summer. It is located on the eastern coast of the island and has the largest port in Madagascar.

The population is concentrated in CUT, but the urbanisation is expanding gradually to the Suburban Commune of Toamasina.

The port is located at the eastern edge of the coast, and originally the city was constructed at the west of the port. The ongoing port expansion project is planned to be completed in 2028. There is also a refinery factory of Ambatovy located in the south of CUT.

3) Moramanga Urban Area

Moramanga is a city located at the junction of NR2 and NR44. It is in the eastern part of the Mangoro basin, at an altitude of 928m. On the east of the city lie the Betsimisaraka cliffs, while most part of the southern area is also mountainous. In the northern areas of Moramanga, there is the mining site for Ambatovy. Further north, there are huge agriculturally productive areas around Alaotra Lake.

Although the population of Urban Commune of Moramanga is increasing rapidly, the dominant urban area of Moramanga is still inside the Urban Commune. Although there is a plan to accommodate an industrial park in the north of the city, at present, major economic activities are centred in the city centre and commercial buildings such as small retail shops and hotels are mainly located only along NR2.

4) Other Settlements in TaToM Economic Axis

Brickaville and Manjakandriana are the other urban communes along NR2. Brickaville is located between Moramanga and Toamasina, 90km east of Moramanga and 85km south of Toamasina, while Manjakandriana is located between Antananarivo and Moramanga, 42km east of Antananarivo.

Besides these two small towns, there are also notable villages such as Antsampanana (80km east from Moramanga) along NR2 and Andasibe (20 km east from Moramanga) along the railway.

23.2.2 Characteristics and Problems on Economic Sectors in TaToM Economic Axis

The Overall TaToM Area covering Analamanga, Atsinanana and Alaotra-Mangoro Regions generates approximately half of national GDP. Most of this GRDP is generated in Antananarivo Agglomeration which contributes to approximately 80% of the GRDP generated in the Overall TaToM Area or otherwise 40% of GDP generated in Madagascar. Antananarivo Agglomeration has been the economic engine of the country. Therefore, although economic sectors in Antananarivo Agglomeration may have not been sufficiently developed to generate enough employment opportunities for the large number of population, compared with other areas of Madagascar, economic activities, job opportunities and workforce are concentrated in Antananarivo.

Toamasina Agglomeration, although much smaller compared to Antananarivo Agglomeration, contributes 3.7% of the GRDP generated in the Overall TaToM Area. The major economic activities in Toamasina Agglomeration besides Ambatovy are industries, such as agro-processing, textile, logistics and tourism.

The cities and villages in TaToM Economic Axis connecting these two agglomerations have locational advantage for economic development compared with other cities and villages in Madagascar. However, economic activities have not yet been facilitated and are limited. In some of the cities and villages, the main source of income for the residents are small business on trade and car repairing for road users of NR2.

In 2019, the government of Mauritius agreed to develop an industrial park for textile industry in Moramanga. However, at present, there is no skilled labour for such industry in Moramanga and it will be a challenge to attract necessary workforce to Moramanga, as well as to develop existing human resources of Moramanga.

There are also national parks in TaToM Economic Axis accessible from NR2, which attract tourist. The most recognized is Mantadia National Park in Andasibe, where a few kinds of lemurs habitat.

Due to this National Park, some hotels and restaurants for both national and international tourists are located around Andasibe.

There is also a plan to construct a new 4-lane motorway between Antananarivo and Toamasina. The planned route of this motorway goes towards west of Toamasina accessing Antananarivo from north east. The motorway could decrease the traffic volume on NR2 but if the number of user on NR2 decreases, the cities and villages along NR2 which have the means of earning a livelihood from a business with the users of NR2 could decrease their business opportunity. Therefore, it is important for the cities and villages along NR2 to develop various types of economic activities.

23.2.3 Characteristics and Problems on Transportation System along TaToM Economic Axis

Although NR2 and railway between Antananarivo and Toamasina composed an essential transport corridor for Madagascar, the traffic volume of NR2 was limited to around 1,700 vehicles per day (2018) and the cargo volume of the railway was around 96,000 tonne per year (2017).

Antananarivo and Toamasina has approximately 1,400m difference of elevation. NR2 has to go through mountainous areas. Therefore, NR2's horizontal and vertical alignments are so bad that it is very costly to improve the horizontal and vertical alignments for the purpose of increasing transport volume and travel speed on NR2.

The railway for cargo runs between Antananarivo and Toamasina, transporting mainly fuel. However, passenger train only runs between Moramanga and Toamasina once or twice a week. The railway infrastructure has been degraded due to heavy rainfall and shortage of maintenance and rehabilitation budgets. It is also necessary to improve the alignment partly to ensure its sufficient functioning.

For the economic development of Madagascar, it is important for Antananarivo Agglomeration and Toamasina Agglomeration to promote economic sectors development. However, the current transportation system of TaToM Economic Axis does not have sufficient safety to support the two economic hubs. Furthermore, the capacity of transportation system will not be sufficient to satisfy the future demand of Antananarivo Agglomeration.

Chapter 24 Future Vision, Growth Scenarios and Socio-Economic Framework for TaToM Economic Axis

24.1 Future Vision for TaToM Economic Axis

The TaToM Economic Axis is composed of two types of elements. The one is the transportation system of the TaToM Economic Axis, consisting of NR2, railway (TCE Line), air transport and planned expressway, between Antananarivo and Toamasina Agglomerations. The other are the economic sectors in the areas along NR4, railway, air transport and the planned expressway.

A vision statement is reflection of hope and dream, to be shared by people, which illuminates a direction of development of the TaToM Economic Axis for the future. The future vision is to cover the two elements of transportation and economic sectors.

A vision statement expressing aspiration for TaToM Economic Axis in 2033 is proposed below.

[Future Vision for TaToM Economic Axis]

Economic Sectors Development for Antananarivo and Toamasina Agglomeration by Strengthening of the Connectivity between Antananarivo and Toamasina

“TaToM Economic Axis will continue to be the most important national transport axis for Madagascar because its connectivity between Antananarivo and Toamasina through NR2 and railway would be the basis for sustainable development of economic sectors of both Antananarivo Agglomeration and Toamasina Agglomeration. Since the two agglomerations are expected to grow their economic sectors, the importance of the transport function of TaToM Economic Axis will become much larger than that at present.

Economic Sectors Development for Other Regions by Strengthening of the Connectivity with Other Regions

The improved transport system between Antananarivo and Toamasina would contribute to the enhancement of the connectivity between Antananarivo and other regions and the connectivity between Toamasina Port and other regions within Madagascar. This could support the development of economic sectors of other regions.

Development of Economic Sectors along the TaToM Economic Axis

Based on an upgraded connectivity through the TaToM Economic Axis, urban and rural economies of Moramanga, Brickaville, Manjakandriana and Antsampanana will flourish not only by expansion of trade and vehicle repairing services for passengers and cargo trucks, but also by investment to economic sectors taking advantage of proximity to Toamasina Port.”

24.2 Alternative Growth Scenarios for TaToM Economic Axis

24.2.1 Three Alternative Growth Scenarios for TaToM Economic Axis

In order to select the most appropriate growth scenarios, three alternatives are proposed, corresponding to the three growth scenarios for the Overall TaToM Area discussed in Section 3.3.

[Growth Scenario A for TaToM Economic Axis]

This scenario aims to develop Antananarivo Agglomeration to the maximum extent possible. As discussed in Chapter 3.3, development efforts for economic sectors will be concentrated in Antananarivo Agglomeration by taking advantage of existing infrastructure and human resources, while Toamasina Agglomeration will play a functional gateway to Antananarivo, by focusing on development of the Port of Toamasina and its logistics function.

In Scenario A, the TaToM Economic Axis plays a vital role in supporting the development of new manufacturing industries in Antananarivo Agglomeration.

[Growth Scenario B for TaToM Economic Axis]

In Growth Scenario B, besides being the national capital, Antananarivo Agglomeration will be developed as the centre of service and trade not only for living people in Antananarivo Agglomeration, but also for businesses and industries for Madagascar. On the other hand, new industrial development efforts will be made in Toamasina Agglomeration, Moramanga and other regions' capitals.

In Scenario B, the main objective of the TaToM Economic Axis is to provide smooth transportation means for passengers travelling between Antananarivo Agglomeration and Toamasina Agglomeration.

[Growth Scenario C for TaToM Economic Axis]

Antananarivo Agglomeration will accommodate a variety of economic sectors aiming at balanced development of the two agglomerations. In addition, new industrial development efforts will be made in Toamasina Agglomeration, Moramanga and other regions' capitals.

The improvement of the transportation function of TaToM Economic Axis is required for promoting industrial development in both Antananarivo Agglomeration and Toamasina Agglomeration.

24.2.2 Selected Growth Scenario for Development of TaToM Economic Axis (Growth Scenario C)

Considering the existing conditions, development trends and potentials, development plans and proposed projects, and the implementability, Growth Scenario C is selected as the most viable scenario for the development of transportation system of TaToM Economic Axis.

Along with the rapid population growth of the entire Madagascar, the influx of migration to Antananarivo Agglomeration has been continued, due to its relatively good conditions of the economy and infrastructure. This trend is expected to continue in the future.

In order to continuously create employment opportunities for the increasing population in the agglomeration and to revitalize the urban economy, Antananarivo Agglomeration needs new export-oriented industries which can lead not only its own urban economy, but also Madagascar's national economy. The export-oriented industry should target the growing regional markets of recently developing "Free Trade Areas" in African and the Indian Ocean countries. Madagascar is a member country of SADC, COMESA and IORA, as well as AfCFTA.

In more than the last two decades, low-cost manufacturing has been dominated by countries endowed with low-wage and hard-working labour force, such as China, South-east Asia and South Asian countries. However, low-cost manufacturing companies are looking for countries suitable for their locations in the next to China because of the increase in their wage levels. Madagascar is a good candidate for such low-cost manufacturing industries.

Both Antananarivo Agglomeration and Toamasina Agglomeration have developmental potentialities as the location of such industries. However, these two agglomerations have the following different characteristics in terms of industrial location:

- Toamasina Agglomeration has a higher advantage than Antananarivo Agglomeration as the industry location from the aspects of the proximity and connectivity to the regional markets, because Antananarivo is 350 km away from the Port of Toamasina and the transportation capacities (volume, speed, cost, safety and resilience of transportation for passengers and cargo) of National Road No. 2 and the existing railway are limited.
- A cheap and abundant labour force is already available and infrastructure is relatively developed in Antananarivo Agglomeration.

By responding to these different characteristics of the two agglomerations, “Growth Scenario C” will make the following two different efforts at developing the transportation system of TaToM Economic Axis for the economic development of two agglomeration:

- Upgrade the cargo transport volume for the development of economic sectors of Antananarivo Agglomeration
- Increase the speed of transport for the development of economic sectors of Toamasina Agglomeration

For the development of each agglomeration, the development of transportation system of TaToM Economic Axis is essential. However, the cost of necessary measures to develop the transportation system of TaToM Economic Axis are not cheap. Therefore, it is important that each measure brings benefit to not only one agglomeration but to both agglomerations for sustainable development of the TaToM Economic Axis.

It would be possible to promote the development of urban and rural economies of Moramanga, Brickaville, Manjakandriana and Antsampanana not only by expansion of trade and vehicle repairing services for passengers and cargo trucks, but also by attracting investment to economic sectors by taking advantage of the enhanced connectivity and proximity to Toamasina Port, if there is a special development policy lie the industrial park in Moramanga Urban Area.

24.3 Future Socio-Economic Framework for TaToM Economic Axis

Since there is no GRDP data at the district level, economic framework at the level of TaToM Economic Axis is not possible to be prepared. The economic framework at the regional level for the three regions which covers the Overall TaToM Area can be found in Chapter 3.

(1) Current Population in TaToM Economic Axis

To understand the situation of current population in TaToM Economic Axis, 11 districts which cover the area of Overall TaToM Area are analysed. The total population of the 11 districts is 4.8 million.

The most populated district is Antananarivo Renivohitra which is CUA. The fastest growing district is Antananarivo Atsimondrano with annual growth rate of 4.20% followed by Antananarivo Avaradrano and Ambohidratrimo with 4.13% and 3.54% respectively. These three districts all belongs partly to Antananarivo Agglomeration.

Table 24.3.1 Population of TaToM Economic Axis and Agglomerations of Antananarivo and Toamasina by District

Districts	Population		Population Growth Rate
	1993	2018	1993-2018
Toamasina I	137,782	326,286	3.51%
Toamasina II	129,581	261,516	2.85%
Brickaville	122,588	212,572	2.23%
Moramanga	167,723	352,874	3.02%

Ambatondrazaka	184,784	359,614	2.70%
Antananarivo Renivohitra	710,236	1,275,207	2.37%
Antananarivo Avaradrano	163,471	449,425	4.13%
Ambohidratrimo	185,146	441,682	3.54%
Antananarivo Atsimondrano	229,597	642,364	4.20%
Manjakandriana	159,406	220,079	1.30%
Anjozorobe	114,312	225,792	2.76%
Total	2,304,626	4,767,411	2.95%
Overall TaToM Area	3,152,822	6,358,045	2.85%
Madagascar	12,238,914	25,734,342	3.02%

Source: INSTAT

(2) Population Framework for TaToM Economic Axis

The population framework for TaToM Economic Axis for 2033 is set based on the following factors:

- Past trend of population growth in each commune
- Selected growth scenario in Section 24.2

Table 24.3.2 shows the future population framework for TaToM Economic Axis by short, medium and long term.

Table 24.3.2 Future Population Framework for TaToM Economic Axis

Districts	Population				Population Growth Rate		
	2018	2023	2028	2033	2018-23	2023-28	2028-33
Brickaville	212,572	233,553	253,040	271,484	1.90%	1.62%	1.42%
Moramanga	352,874	405,284	470,187	549,464	2.81%	3.02%	3.17%
Ambatondrazaka	359,614	404,333	448,296	492,203	2.37%	2.09%	1.89%
Manjakandriana	220,079	231,026	239,149	245,147	0.98%	0.69%	0.50%
Anjozorobe	225,792	254,624	283,149	311,805	2.43%	2.15%	1.95%
TaToM Economic Axis	1,370,931	1,528,820	1,693,821	1,870,103	2.20%	2.07%	2.00%
Antananarivo Agglomeration	2,558,245	3,022,647	3,547,471	4,151,467	3.39%	3.25%	3.19%
Toamasina Agglomeration	437,004	520,991	626,861	762,839	3.58%	3.77%	4.01%

Source: JICA Study Team

Chapter 25 Development Plan for Transportation System of TaToM Economic Axis

25.1 Present Situation of Transportation System of TaToM Economic Axis

25.1.1 Overall Transportation System of TaToM Economic Axis

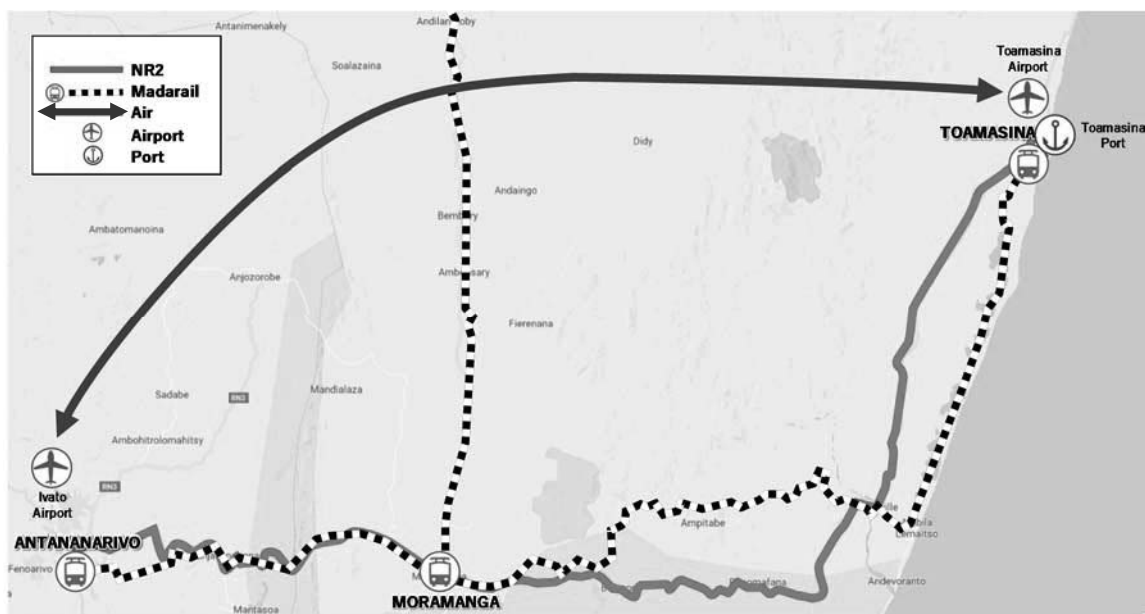
The transportation system of TaToM Axis consists of National Road No. 2 (NR2), railway (Madarail), and air transport.

The road is the most basic component, hence NR2 with length of 353.4 km is functioning as the main passenger and freight transport route of TaToM Economic Axis.

The railway connecting Toamasina Port with the city centre of Antananarivo is being operated by Madarail S.A., which is the concessionaire under the Ministry of Transport, Tourism and Meteorology (MTM: *Ministère des Transports, du Tourisme et de la Météorologie*). The rail actually functions as freight transport mode for fuel, operating two times per day between the oil storage facility near Toamasina Port and the two oil storage facilities in Antananarivo.

For air transportation, Air Madagascar provides a shuttle flight every day between Antananarivo and Toamasina by ATR aircraft. In July 2018, Air Madagascar commenced a new air carrier for domestic flights, Tsaradia, launching new flights.

Besides the above existing transportation system, a motorway project between Antananarivo and Toamasina has been proposed in the sectorial policy of transport formulated by the Ministry of Public Works (MTP: *Ministère des Travaux Publics*)¹ and MTM. The government of Madagascar signed an Memorandum of Understanding (MOU) with a Chinese private company in 2016 regarding the cooperation for the construction of this motorway.



Source: JICA Study Team; © Google Maps

Figure 25.1.1 Present Transportation System on Economic Axis of TaToM

¹ In 2019, MTP was merged with M2PATE and became Ministry of Territorial Planning, Housing and Public Works (MATHTP: *Ministre de l'Aménagement du Territoire, de l'Habitat et des Travaux Publics*).

Table 25.1.1 Overall Transportation Networks of TaToM Economic Axis

Category	Infrastructure/ Operation Service	Length / Travel Hours	Present Role and Function	
			Passenger Transport	Freight Transport
Road (NR2)	Asphalt pavement 2-lane road	354 km / 7-9 hours *Depends on the vehicle type and traffic condition	◎	◎
Railway	TCE line :Tananarive-Côte Est Single track with 1 metre gauge, Operator: Madarail Train operation: Freight: 2 -4 times/day Passenger: 1 times/week	372 km / App.15-20 hours (Antananarivo-Toamasina)	△ (only between Moramanga and Toamasina)	△
Air Transport	Ivato Airport, Toamasina Airport 1 -2 round trip per day	Less than 1 hour	◎	△

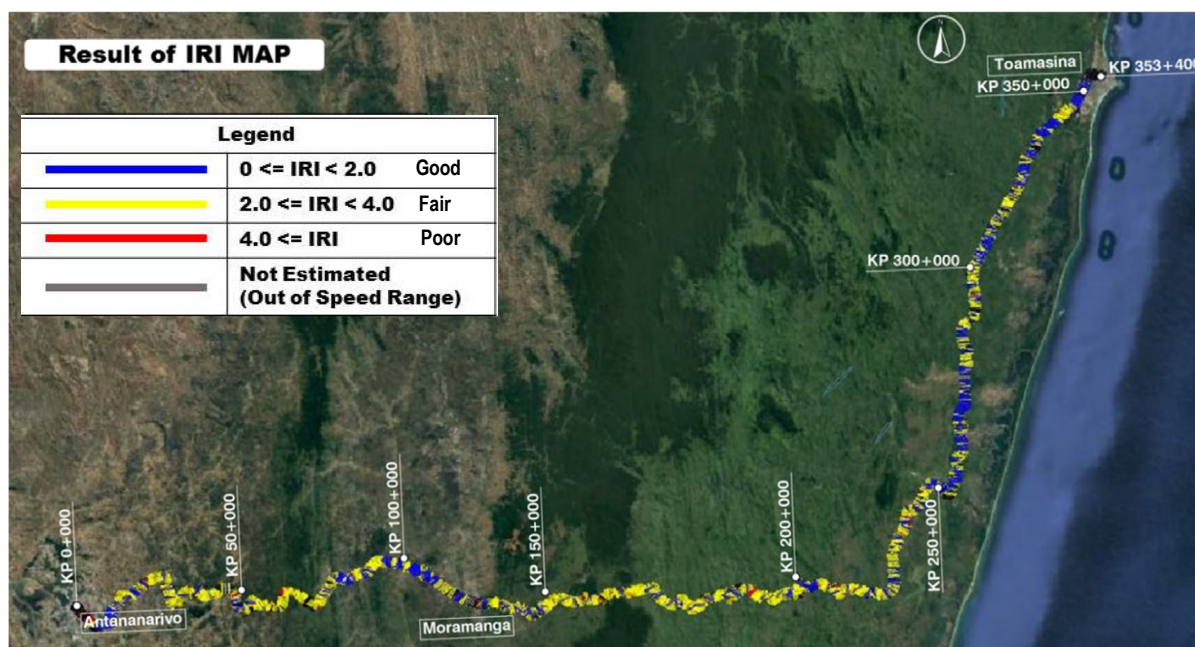
Note: ◎: Functional, △: Partly functional, ×: Non-functional
 Source: JICA Study Team

25.1.2 Present Situation of National Road No. 2

(1) Overview of National Road No. 2

National Road No. 2 (NR2), which connects the national capital Antananarivo and the national gateway Toamasina Port, is one of the most important national roads in Madagascar. This national road accommodates not only large portion of freight transport but also the passenger transport between Antananarivo and Toamasina.

However, the road condition and road structure are not appropriate for fulfilling the function required as part of the important economic axis in Madagascar. International Roughness Index (IRI)² survey result shows that although some sections between Moramanga and Toamasina are in good condition, most sections especially between Antananarivo and Moramanga are in fair condition, which is not sufficient as NR2 is the main axis road of Madagascar (See Figure 25.1.2).



Image©2017 Landsat/Copernicus, Digital Globe, CNES/Airbus, Google
 Source: JICA Study Team

Figure 25.1.2 International Roughness Index of National Road No.2

² IRI is an indicator for measuring pavement roughness. Such indicator can be used to know the comfort of vehicle occupants and how much damage the road can cause to vehicle.

(2) Existing Condition of National Road No. 2

Considering that NR2 plays the key role of economic axis (i.e., functioning as main passenger and freight transport in Madagascar) with a potential for development, the road function, especially for smooth traffic and safety, is necessary.

The major cause of the deterioration of the smooth traffic of vehicles and traffic safety at NR2 is due to the road geometry. Such bad road geometry also creates vulnerability to natural disasters. The present road geometry of NR2 does not satisfy the condition required for the most important national road in the country.

The present situation on road safety, present travel speed, and vulnerability to natural disasters of NR2 are summarised below.

1) Road Safety

Unsafe road condition of NR2 is a major factor hindering the development of the TaToM Economic Axis. While it is functioning as the main passenger and freight transport route in TaToM Economic Axis, its road structure and condition are creating dangerous conditions for both vehicles and pedestrians. This situation not only endangers the passengers and drivers using this road, but it also creates time and economic losses from accidents.

The unsafe conditions come from the following five main causes of bad road geometry:

- Undesirable alignments (vertical and horizontal), especially in mountain areas where structural issues such as sharp curves with curve radius of less than 120 m and slopes with more than 7% climb can cause accidents.
- Narrow carriageway with insufficient carriageway width. Some bridge sections, such as those in Mangoro Bridge and Antsapazana Bridge, have narrow carriageway where only one vehicle can pass at a time.
- Bad pavement conditions. Pavements in bad condition account for 42.5% of all sections; and only 8.5 % of the pavements are in good condition.
- Lack of traffic safety facilities. No traffic safety facilities can be seen throughout NR2.
- Lack of distinction between car traffic and pedestrian traffic.

The above causes create an even more dangerous travel condition at night time. This is why petroleum tankers are prohibited on this road after 9 P.M., and many freight companies do not allow their truck drivers to drive after 10 P.M.

2) Travel Speed

NR2 consists of many slopes, thus trucks and other heavy vehicles can only travel at a slow speed. Moreover, the bad traffic safety condition provides drivers with no option but to drive slowly. Therefore, trucks are on the road for over 11 hours, excluding resting time, when travelling from Toamasina to Antananarivo.

Additionally, as described above, cargo trucks cannot be driven at night, causing the travel time to increase to over 17 hours in case they leave Toamasina in the afternoon.

Passenger cars also take a long time to travel between the two cities. While passenger cars should travel comparatively quicker than larger and heavier vehicles in mountain areas, the narrow alignment of NR2 makes it dangerous to take over slow vehicles. Therefore, in many sections of the road, passenger cars are driven at similar speed with large trucks, making the total travel time from Toamasina to Antananarivo around 8 hours, excluding rest time.

Other causes of unsafe driving and slow traffic speed on NR2 are summarised in Table 25.1.2.

Table 25.1.2 Causes of Unsafe Driving and Slow Traffic Speed on National Road No. 2

No.	Cause	Affected Aspects	
		Road Safety	Traffic Speed
1	Undesirable horizontal / vertical alignment	0	0
2	Undesirable carriageway width	0	0
3	Old bridges	0	0
4	In 3 bridges, it is impossible for vehicles to pass each other.	0	0
5	Section with 1.5 lane width make it difficult for vehicles to pass each other	0	0
6	No shoulder / sidewalk section	0	-
7	Sections crossing at centre of city or village (Heavy vehicle traffic passing through)	0	-
8	Low speed traffic and on-street parking due to breakdown	-	0
9	High ratio of heavy vehicle traffic	-	0
10	Overloaded vehicle	-	0
11	Non-exhaustive traffic safety facilities	0	-
12	No parking space for emergency cases		0
13	Deterioration of pavement and lack of maintenance and repair work	0	0
14	Vulnerability to natural disaster	0	0

Source: JICA Study Team

3) Natural Disasters


Traffic at NR2 is frequently stopped due to landslides. A large part of said national road runs through mountain areas, specifically along mountain sides, where no measures have been taken against landslides. Therefore, when heavy rain and cyclone cause landslides, the road is blocked and becomes impassable. As there are no detours along the road, such landslides stop traffic from moving between Antananarivo and Toamasina. This situation has a severe impact to both the movement of cargoes and passengers along the TaToM Economic Axis.

(3) Necessary Improvement Measures for National Road No. 2

Table 25.1.4 shows the present situation of NR2 by section as well as corresponding measures for improvement, while Figure 25.1.3 to Figure 25.1.6 show the location of these sections.

Expected measures for improvement on NR2 are classified in Table 25.1.3 and possible measures by section are summarised in Table 25.1.5.

Table 25.1.3 Measures for Improvement of Road Infrastructure








Target	Scale	Measure Type	Measures
Road		R-1	Bypass construction (Including of tunnel)
		R-2	Alignment improvement
		R-3	Installation of truck lane for slow traffic
		R-4	Installation of on-street parking lot
		R-5	Installation of sidewalk
		R-6	Widening
		R-7	Intersection improvement
		R-8	Installation of traffic safety facilities
		R-9	Rehabilitation
		R-10	Lane marking
		R-11	Traffic regulation
Bridge	Large	B-1	Replacement (new construction)
	Small	B-2	Partial replacement or improvement
Slope	Large	S-1	Slope stabilization
	Small	S-2	Installation of retaining wall
Other	-	O-1	Roadside rest stop

Source: JICA Study Team



Table 25.1.4 Present Situation and Necessary Measures of National Road No.2 by Section

Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
01	0+00-5+400	R-1 R-4 R-5 R-6 R-7 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside the city ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Deformed at-grade intersection ● Pavement deterioration 		• CUA
02	5+400-9+400	R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Narrow carriageway 		• CUA
03	9+400-10+600	R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Pavement deterioration 		• CUA
04	10+600-13+500	R-2 R-3 R-6 R-8 R-10	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment 		• Ambohitrombihavana
05	15+800-24+800	R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration 		• Ambatomanoina • Ambatolampikely
06	29+00-34+300	R-2 R-3 R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Narrow carriageway 		• Carion








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Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
07	35+400-38+600	R-2 R-3 R-6 R-8 R-10	<ul style="list-style-type: none"> Undesirable horizontal and vertical alignment 		<ul style="list-style-type: none"> Carion
08	40+800-44+200	R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> Buildings along the road On-street parking for commercial activities Pedestrian traffic Narrow carriageway Pavement deterioration 		<ul style="list-style-type: none"> Sambaina Ambohibary
09	46+100-48+000	R-1 R-4 R-5 R-6 R-7 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> Low travelling speed of less than 10km/h due to congestion inside the city Traffic bottleneck Buildings along the road On-street parking for commercial activities Pedestrian traffic Narrow carriageway 		<ul style="list-style-type: none"> Manjakandriana
10	48+000-50+500	R-6 R-9 R-10 R-11	<ul style="list-style-type: none"> Narrow carriageway Pavement deterioration 		<ul style="list-style-type: none"> Manjakandriana
11	51+00-57+100	R-2 R-3 R-6 R-8 R-9 R-10	<ul style="list-style-type: none"> Undesirable horizontal and vertical alignment Pavement deterioration 		<ul style="list-style-type: none"> Manjakandriana Ambatoloana
12	57+300-58+500	R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> Buildings along the road On-street parking for commercial activities Pedestrian traffic Narrow carriageway 		<ul style="list-style-type: none"> Ambatoloana
13	59+700-71+900	R-2 R-3 R-4 R-6 R-8 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> Undesirable horizontal and vertical alignment Buildings along the road Narrow carriageway Pavement deterioration Natural disaster hazard area 		<ul style="list-style-type: none"> Ambatoloana

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Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
14	72+300-78+700	R-4 R-5 R-8 R-10 R-11 O-1	<ul style="list-style-type: none"> ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Good geographical conditions for rest stop 		● Marozavo
15	84+000-85+000	R-5 R-10	<ul style="list-style-type: none"> ● Pedestrian traffic 		● Andriaka
16	90+900-92+700	R-3 R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic 		● Ankarefo
17	93+600-94+600	R-5 R-6 R-8 R-9 R-10 R-11 B-1	<ul style="list-style-type: none"> ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Old bridge (Mangoro Bridge) 		● Mangoro
18	98+700-101+500	R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway 		● Antsirinala
19	101+500-105+000	R-3 R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Continuous up-down section ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway 		● Andranokobaka
20	105+000-106+300	R-6 R-10 R-11 B-1	<ul style="list-style-type: none"> ● Traffic bottleneck ● Narrow carriageway ● Old bridge (Moramanga Bridge) 		● Andranokobaka








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Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
21	106+300-108+000	R-6 R-10 R-11	<ul style="list-style-type: none"> ● Narrow carriageway 		<ul style="list-style-type: none"> ● Andranokobaka
22	108+00-112+000	R-1 R-2 R-4 R-5 R-6 R-7 R-8 R-9 R-10 R-11 O-1	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside the city ● Undesirable horizontal alignment ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Deformed at-grade intersection ● Pavement deterioration ● Good geographical conditions for rest stop 	 	<ul style="list-style-type: none"> ● Moramanga
23	113+300-121+000	R-2 R-3 R-6 R-8 R-9 R-10	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Continuous up-down section 		<ul style="list-style-type: none"> ● Moramanga
24	125+000-132+000	R-2 R-3 R-6 R-8 R-9 R-10 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Continuous up-down section ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Ampasimpotsy
25	135+100-136+000	R-4 R-5 R-8 R-10 R-11 O-1	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic ● Tourist potential ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Andasibe
26	137+100-149+600	R-2 R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Andasibe, ● Ambavaniasy









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Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
27	151+000-157+700	R-2 R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Ambavaniasy ● Beforona
28	158+000-160+000	R-1 R-4 R-5 R-6 R-8 R-9 R-10 R-11 O-11	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside city ● Buildings along the road ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Pavement deterioration ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Beforona
29	160+000-165+100	R-2 R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Beforona, ● Mahatsara, ● Soakambana,
30	165+100-166+500	R-5 R-6 R-9 R-10 O-1	<ul style="list-style-type: none"> ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Soakambana
31	166+500-176+000	R-2 R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Soakambana, ● Marozevo Beforona, ● Beanandrambo
32	176+000-178+400	R-1 R-2 R-3 R-4 R-5 R-6 R-8 R-10 R-11 O-11	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside city ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Ampasimbe
33	178+400-187+000	R-2 R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Tsaravintana

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Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
34	187+500-190+500	R-2 R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Tsaravintana
35	190+500-191+100	R-1 R-4 R-5 R-6 R-8 R-10 R-11 O-11	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside city ● Buildings along the road ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Atongombato
36	191+100-193+300	R-2 R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Buildings along the road ● Pedestrian traffic ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Atongombato ● Sahamamy
37	195+000-199+300	R-2 R-3 R-6 R-8 R-10 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal and vertical alignment ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Ambodivoara
38	199+300-199+900	R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration 		<ul style="list-style-type: none"> ● Marovola
39	199+900-203+000	R-2 R-3 R-4 R-5 R-6 R-8 R-10 R-11 S-1	<ul style="list-style-type: none"> ● Undesirable horizontal alignment ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Marovola ● Bedary
40	204+400-205+500	R-1 R-3 R-4 R-5 R-6 R-8 R-10 R-11 O-11	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside city ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Traffic bottleneck ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Ranomafana








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Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
41	206+500-210+000	R-2 R-3 R-6 R-8 R-9 R-10	<ul style="list-style-type: none"> ● Undesirable horizontal alignment 		<ul style="list-style-type: none"> • Ranomafana
42	210+200-210+700	R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration 		<ul style="list-style-type: none"> • Tsaramandroso
43	213+100-217+600	R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration 		<ul style="list-style-type: none"> • Manambonitra
44	217+600-220+100	R-1 R-4 R-5 R-6 R-8 R-10 R-11 O-11	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside city ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Traffic bottleneck ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> • Antsampanana
45	221+000-242+800	R-3 R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Continuous up-down section ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway ● Pavement deterioration 		<ul style="list-style-type: none"> • Antsampanana • Maevasoa • Ambodriana • Amatolampy • Maromamy
46	247+200-249+000	R-1 R-4 R-5 R-6 R-8 R-10 R-11 O-1	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside city ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> • Brickaville
47	249+00-249+300	R-6 R-11 B-2	<ul style="list-style-type: none"> ● Combined bridge (road and railway) ● Traffic bottleneck 		<ul style="list-style-type: none"> • Brickaville
48	249+300-250+500	R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway 		<ul style="list-style-type: none"> • Brickaville

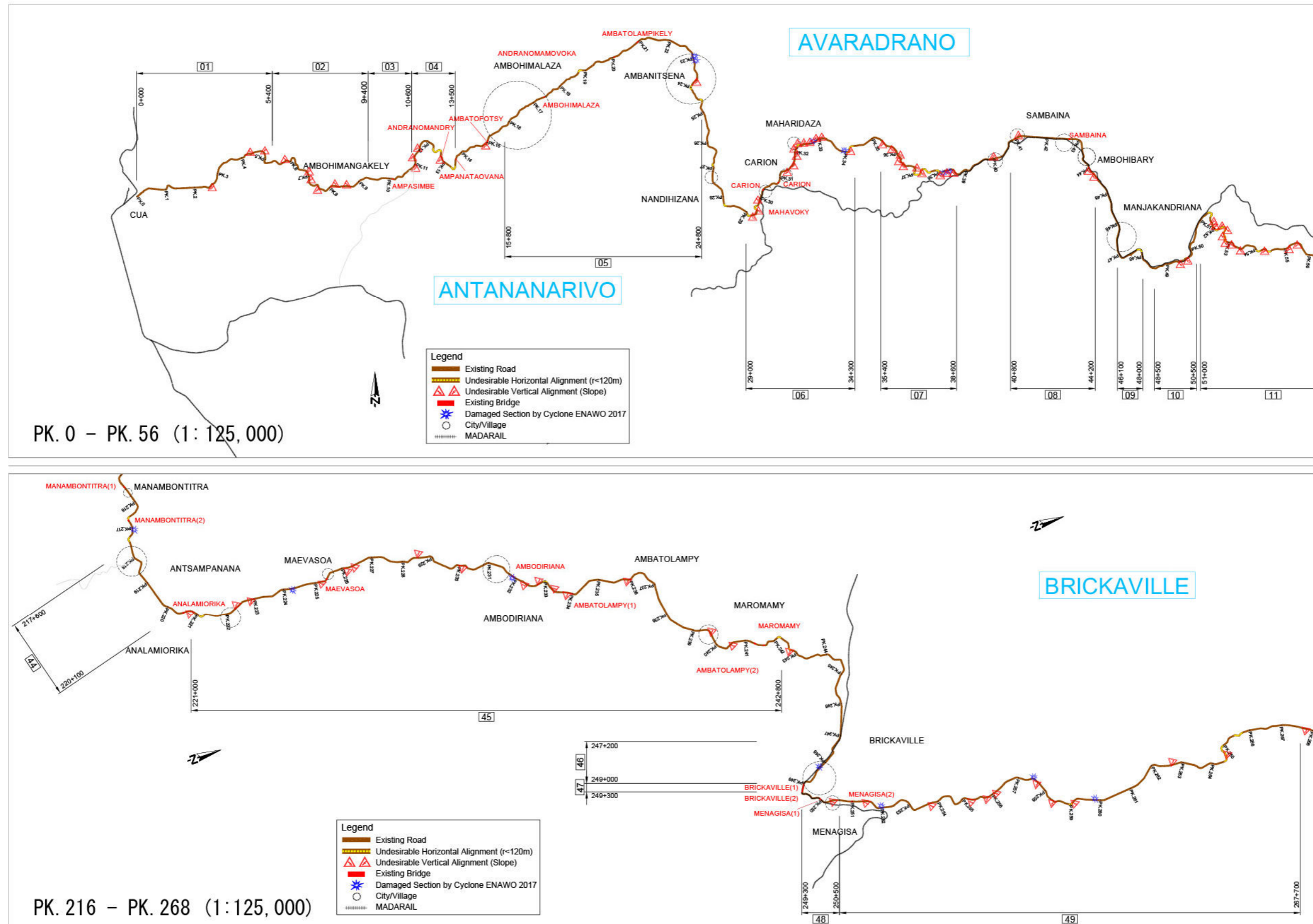
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Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
49	250+500-267+000	R-3 R-10	<ul style="list-style-type: none"> ● Continuous up-down section 		<ul style="list-style-type: none"> ● Brickville to Sahamandrevo
50	274+300-279+100	R-6 R-10 R-11	<ul style="list-style-type: none"> ● Narrow carriageway 		<ul style="list-style-type: none"> ● Analila ● Sahavalaina
51	279+100-280+600	R-4 R-5 R-6 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic ● Narrow carriageway 		<ul style="list-style-type: none"> ● Sahavalaina
52	280+600-288+900	R-6 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Narrow carriageway ● Pavement deterioration 		<ul style="list-style-type: none"> ● Sahavalaina ● Manambonitra ● Vohitsara
53	288+900-296+000	R-3 R-9 R-10	<ul style="list-style-type: none"> ● Continuous up-down section ● Pavement deterioration 		<ul style="list-style-type: none"> ● Vohitsara
54	296+000-296+200	O-1	<ul style="list-style-type: none"> ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Manevasoa
55	296+200-300+300	R-2 R-3 R-6 R-9 R-10 R-11 S-1 S-2	<ul style="list-style-type: none"> ● Undesirable horizontal alignment ● Continuous up-down section ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Manevasoa ● Tsaratampona

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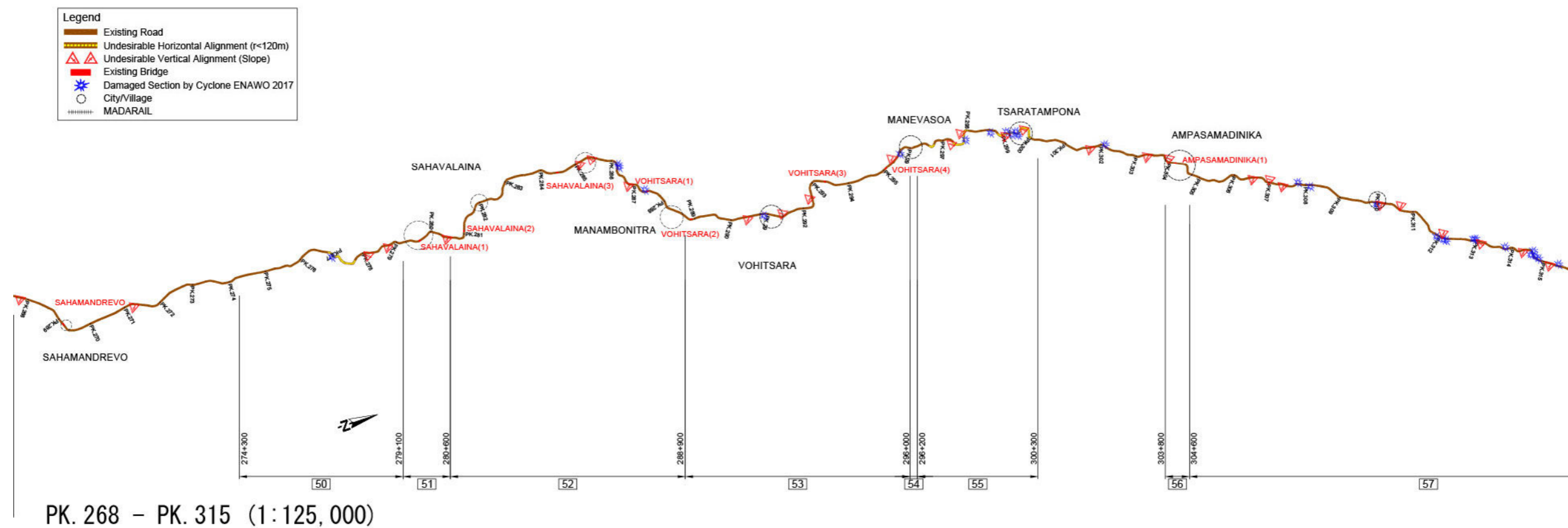
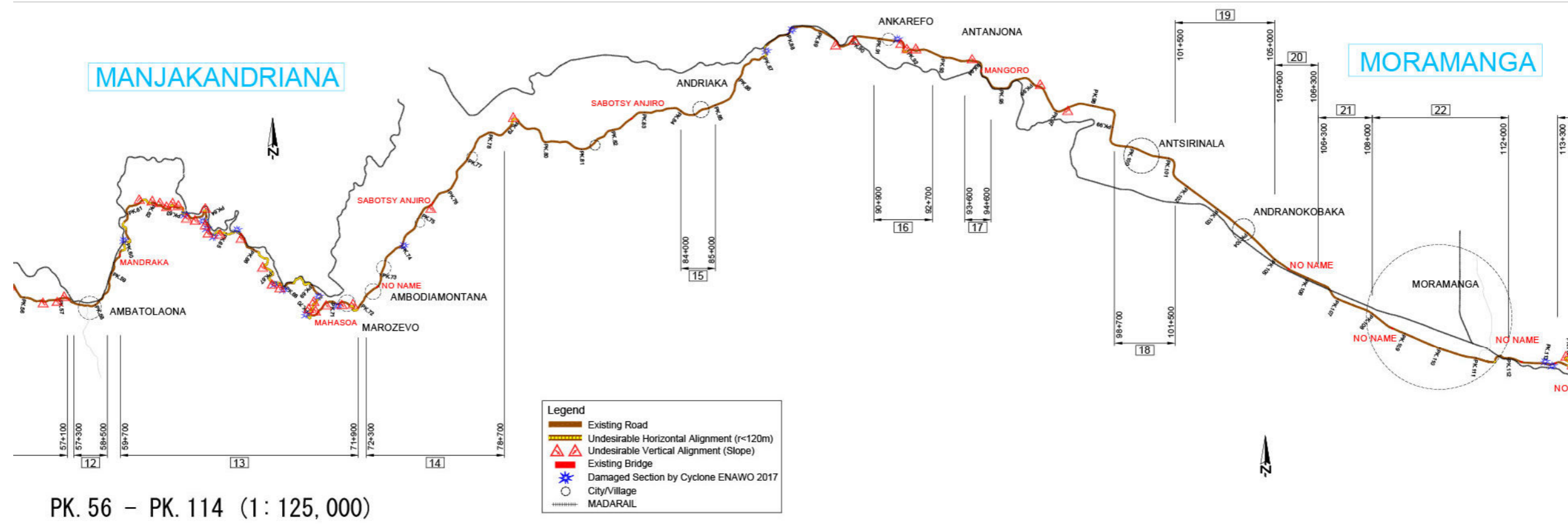
Section No.	Station No.	Types of Measures	Present Situation	Typical Photo	Location
56	303+800-304+600	R-4 R-5 R-8 R-10 R-11 O-1	<ul style="list-style-type: none"> ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Good geographical conditions for rest stop 		<ul style="list-style-type: none"> ● Ampasadinika
57	304+600-318+500	R-3 R-9 R-10 S-1 S-2	<ul style="list-style-type: none"> ● Continuous up-down section ● Pavement deterioration ● Natural disaster hazard area 		<ul style="list-style-type: none"> ● Ampasadinika ● Atanandrano ● Ambodibonara
58	318+500-320+100	R-4 R-5 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic 		<ul style="list-style-type: none"> ● Ambodibonara
59	320+100-326+600	R-3 R-10	<ul style="list-style-type: none"> ● Continuous up-down section 		<ul style="list-style-type: none"> ● Ambodibonara ● Fanandrana
60	326+600-328+000	R-5 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Buildings along the road ● Pedestrian traffic 		<ul style="list-style-type: none"> ● Fanandrana
61	328+000-339+000	R-3 R-4 R-5 R-8 R-10 R-11	<ul style="list-style-type: none"> ● Continuous up-down section ● Buildings along the road ● Pedestrian traffic 		<ul style="list-style-type: none"> ● Fanandrana ● Melville ● Antananambo ● Atanandrano
62	342+400-353+368	R-1 R-4 R-5 R-6 R-8 R-9 R-10 R-11	<ul style="list-style-type: none"> ● Low travelling speed of less than 10km/h due to congestion inside city ● Buildings along the road ● On-street parking for commercial activities ● Pedestrian traffic ● Traffic bottleneck ● Narrow carriageway ● Pavement deterioration 		<ul style="list-style-type: none"> ● Toamashina

Source: JICA Study Team



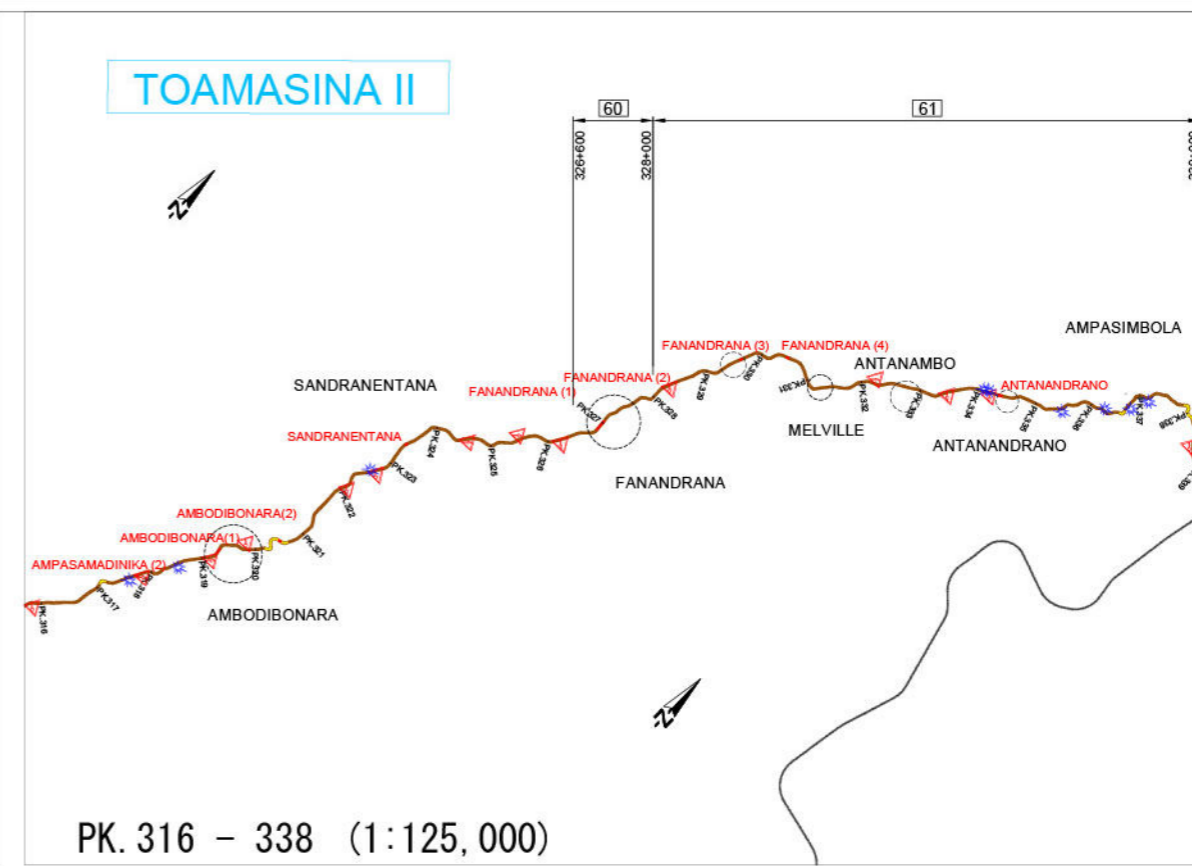
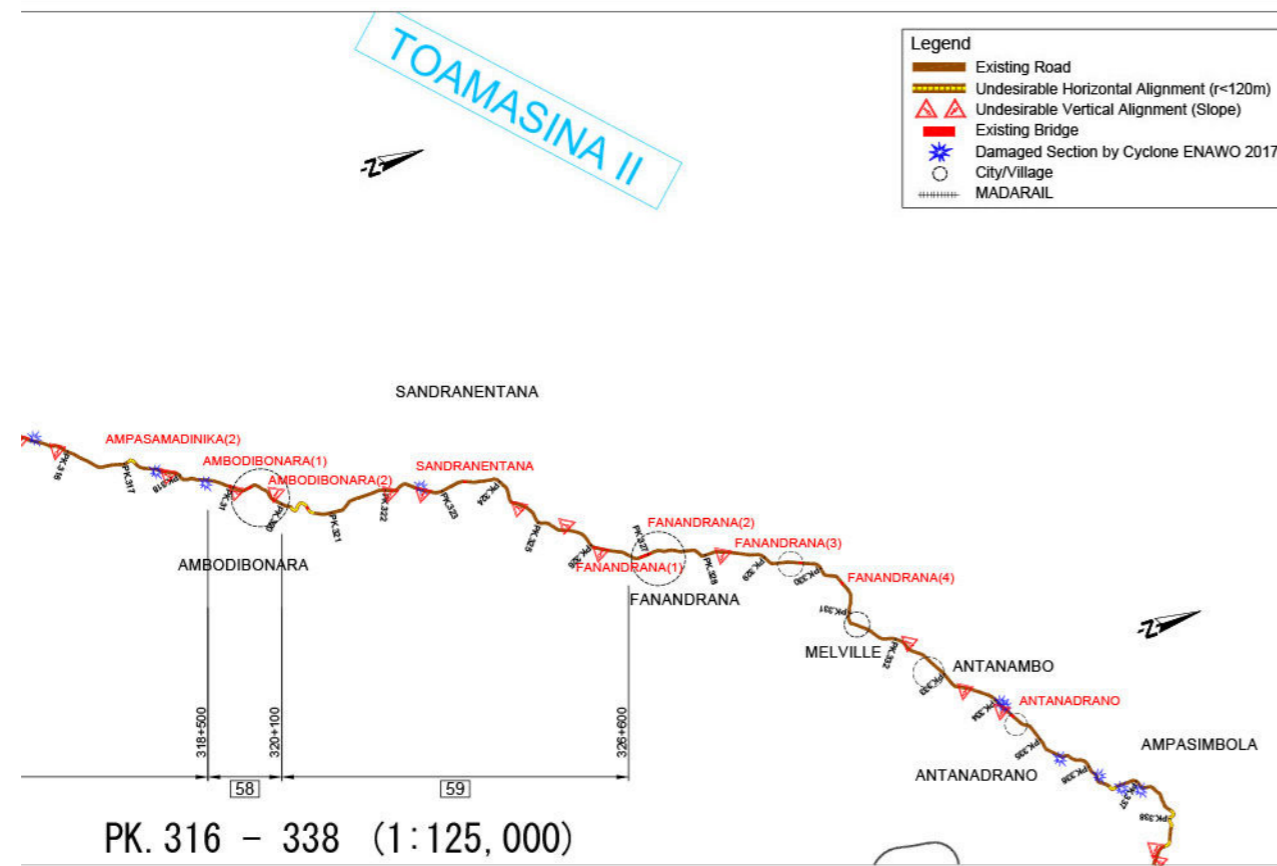
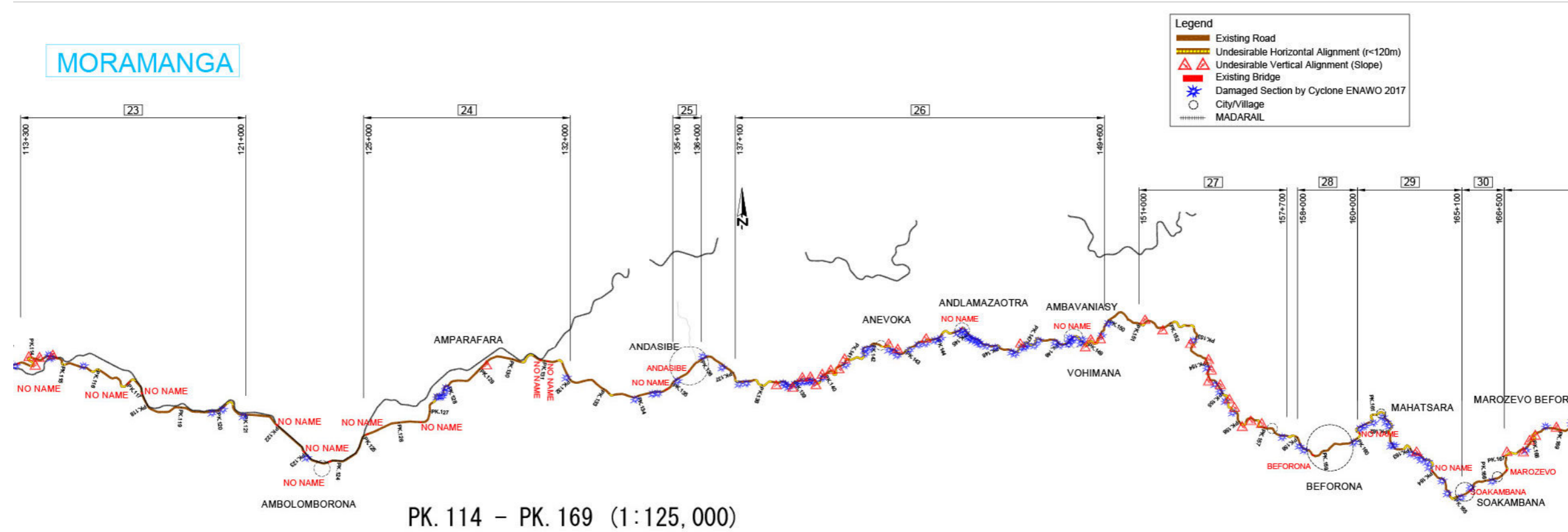
Source: JICA Study Team

Figure 25.1.3 Road Section to be Improved on NR2 (PK 0 - PK 56 & PK 216 – 268)



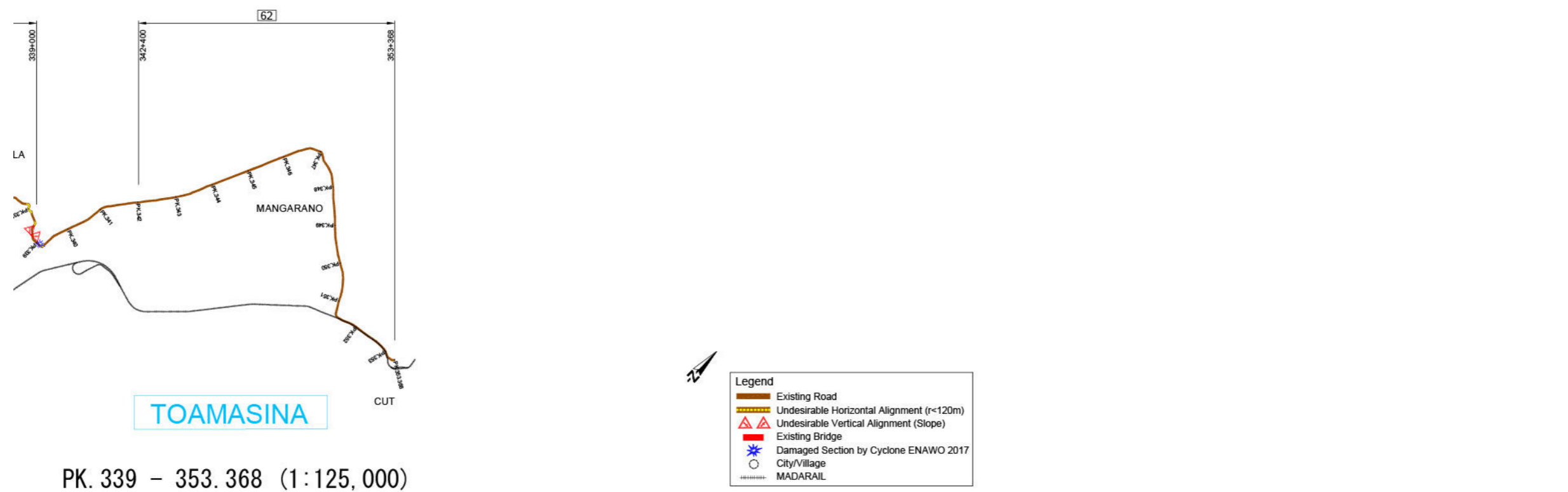
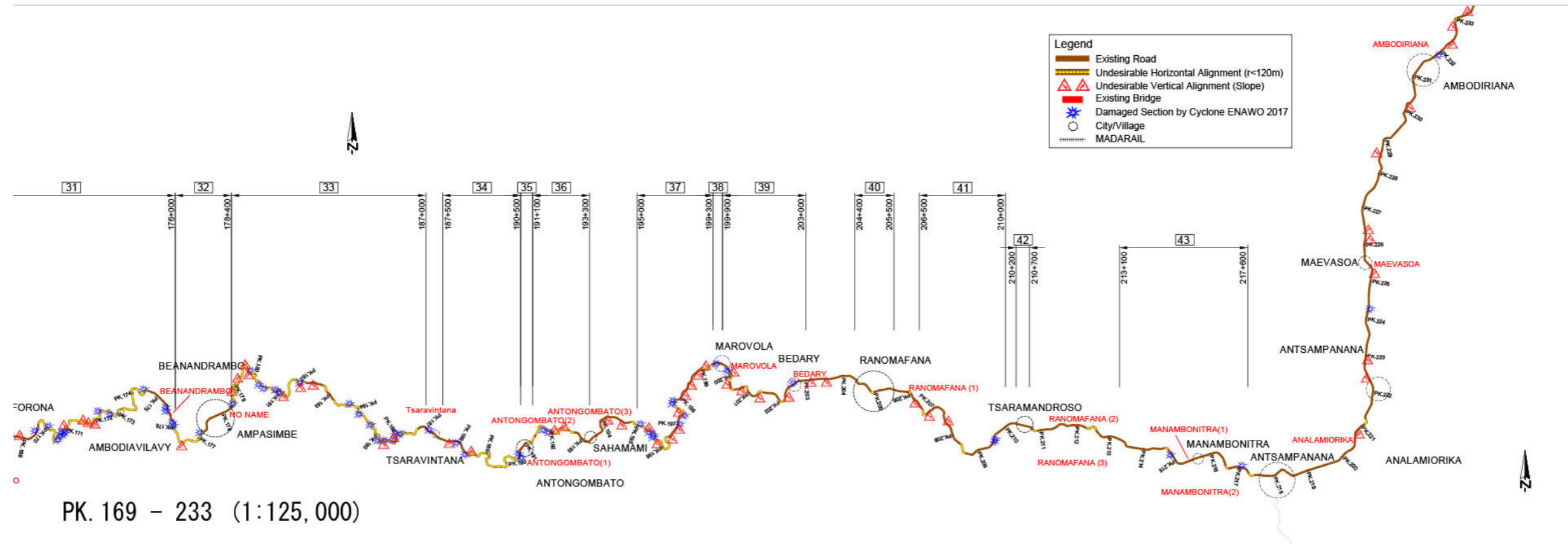
Source: JICA Study Team

Figure 25.1.4 Road Section to be Improved on NR2 (PK 56 - PK 114 & PK 268 - PK 315)



Source: JICA Study Team

Figure 25.1.5 Road Section to be Improved on NR2 (PK 114 – PK 169 & PK 316 – PK 338)



Source: JICA Study Team

Figure 25.1.6 Road Section to be Improved on NR2 (PK 169 - PK 233 & PK 339 - PK 353.368)

Table 25.1.5 Possible Measures by Section to Improve National Road No.2

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	B1	B2	S1	S2	O1	
	Bypass Construction	Bypass Construction (Tunnel)	Alignment Improvement	Installation of Climbing Lane	Installation of On-Street Parking Lot	Installation of Sidewalk	Road Widening	Intersection Improvement	Installation of Traffic Safety	Rehabilitation	Lane Marking	Traffic Regulation	Bridge Replacement	Partial Repalcement or Improvement	Slope Stabilization	Installation of Retaining Wall	Roadsie Rest Area
Section1	1				1	1	1	1	1	1	1						
Section2					1	1	1		1		1	1					
Section3					1	1	1		1	1	1	1					
Section4			1	1			1		1		1						
Section5					1	1	1		1	1	1	1					
Section6			1	1	1	1	1		1		1	1					
Section7		1	1	1			1		1		1						
Section8					1	1	1		1	1	1	1					
Section9	1				1	1	1	1	1	1	1	1					
Section10							1		1	1	1	1					
Section11		1	1	1			1		1	1	1						
Section12					1	1	1		1		1	1					
Section13			1	1	1		1		1		1	1			1	1	
Section14					1	1			1		1	1					1
Section15						1					1						
Section16				1	1	1	1		1		1	1					
Section17						1	1		1	1	1	1	1				
Section18					1	1	1		1		1	1		1			
Section19				1	1	1	1		1		1	1					
Section20							1				1	1	1				
Section21							1				1	1					
Section22	1		1		1	1	1	1	1	1	1	1					1
Section23			1	1			1		1	1	1						
Section24			1	1			1		1	1	1				1	1	
Section25					1	1			1		1	1					1
Section26		1	1	1	1	1	1		1	1	1	1			1	1	
Section27			1	1	1	1	1		1	1	1	1			1	1	
Section28	1				1	1	1		1	1	1	1					1
Section29		1	1	1	1	1	1		1	1	1	1			1	1	
Section30						1	1			1	1						1
Section31		1	1	1	1	1	1		1	1	1	1			1	1	
Section32	1	1	1	1	1	1	1		1		1	1					1
Section33		1	1	1	1	1	1		1	1	1	1			1	1	
Section34			1	1	1	1	1		1	1	1	1			1	1	
Section35	1				1	1	1		1		1	1					1
Section36			1	1	1	1	1		1	1	1	1			1	1	
Section37			1	1			1		1		1						
Section38					1	1	1		1	1	1	1					
Section39			1	1	1	1	1		1		1	1			1		
Section40	1				1	1	1		1		1	1					1
Section41			1	1			1		1	1	1						
Section42					1	1	1		1	1	1	1					
Section43					1	1	1		1	1	1	1					
Section44	1				1	1	1		1		1	1					1
Section45				1	1	1	1		1	1	1	1					
Section46	1				1	1	1		1		1	1					1
Section47							1				1		1				
Section48					1	1	1		1		1	1					
Section49				1							1						
Section50							1				1	1					
Section51					1	1	1		1		1	1					
Section52							1		1		1	1					
Section53				1					1	1							
Section54											1						1
Section55			1	1			1		1	1	1	1			1	1	
Section56					1	1			1		1	1					1
Section57				1					1	1	1				1	1	
Section58					1	1			1		1	1					
Section59				1							1						
Section60						1			1		1	1					
Section61				1	1	1			1		1	1					
Section62	1				1	1	1		1	1	1	1					

Source: JICA Study Team

25.1.3 Present Situation of Railway in TaToM Economic Axis

(1) Overview of Railway in TaToM Economic Axis

The railway between Antananarivo and Toamasina, called Antananarivo-East Coast (TCE: *Tananarive-Côte Est*) Line, functions as an important transportation means of logistics on the TaToM Economic Axis. The total length is 372km with 147 bridges and 28 tunnels (See Table 25.1.6).

Table 25.1.6 Major Infrastructure of TCE Network of Madarail

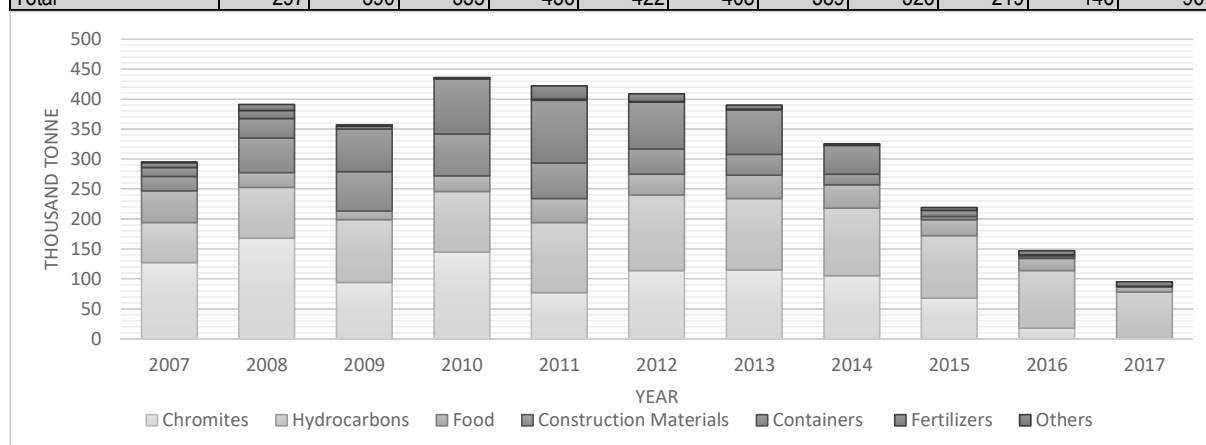
Line	Total Length	No. of Bridges	No. of Tunnels	No. of Curves
Antananarivo and East Coast (TCE)	372 km	147	28	1,370

Source: Madarail

The railway contributes to the economic activities of Madagascar by transporting half of fuel supply used in the area; fuel is an essential cargo for urban activities. Madarail had slowly renewed the aged infrastructure and rolling stocks using aid funds from the World Bank. Unfortunately, the funding aid stopped due to political unrest. As a consequence, the railway company faced a significant delay of the rehabilitation programme, and the transportation capacity dropped sharply. Moreover, the political unrest caused economic stagnation. The transportation volume since 2010 have decreased. The cargo volume handled in 2015 is half the volume compared to its peak point in 2010. As a result, the response to maritime container cargo transport which accounts for most of the cargo on the TaToM Economic Axis has not progressed, and the volume of cargo handled has not increased. The transportation volume since 2010 have decreased, and the cargo volume handled in 2017 is around 20% of the volume compared to its peak point in 2010 (See Figure 25.1.7).

Unit: Thousand Tonnes

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Chromites	127	168	94	145	77	114	115	105	68	18	0
Hydrocarbons	67	85	105	101	117	126	119	113	104	96	78
Food	53	24	14	26	40	35	39	39	27	20	9
Construction Materials	24	58	66	70	59	42	35	18	5	3	0
Containers	15	33	71	91	105	78	74	48	10	3	1
Fertilizers	8	13	5	2	2	1	1	0	0	0	0
Others	1	10	2	1	22	13	7	2	5	7	7
Total	297	390	355	436	422	408	389	326	219	146	96

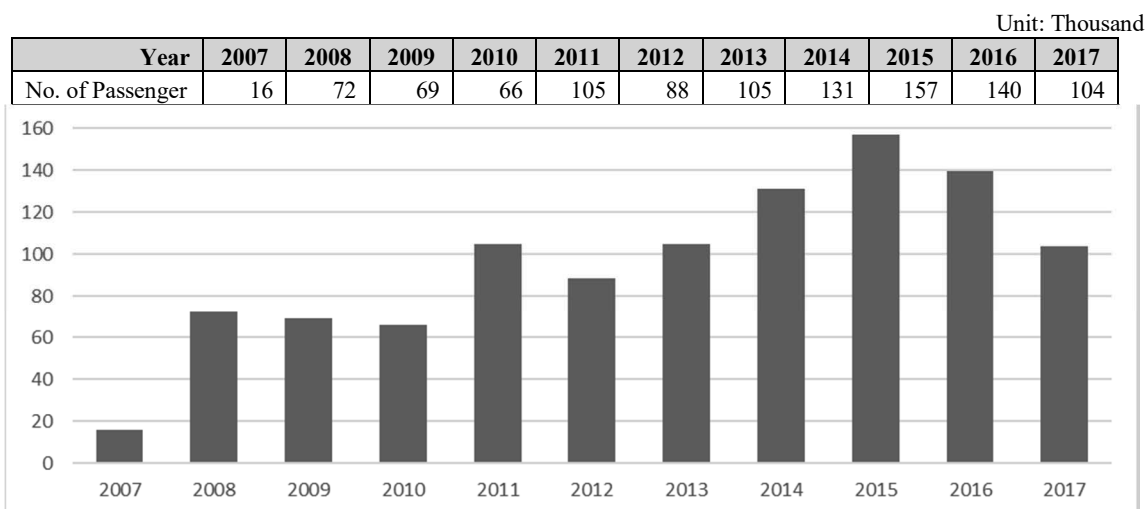


Source Madarail

Figure 25.1.7 Change of Freight Transport Volume by Madarail

On the other hand, the number of passengers using Madarail increased continuously from 2012 until 2015. There were approximately 157 thousand passengers in 2015. However, this number decreased in 2016 and 2017, and the number of passengers in 2017 was 104 thousand (See Figure

25.1.8). The villages along the TCE Line, which are far from NR2, mainly rely on the railway as means of transport.



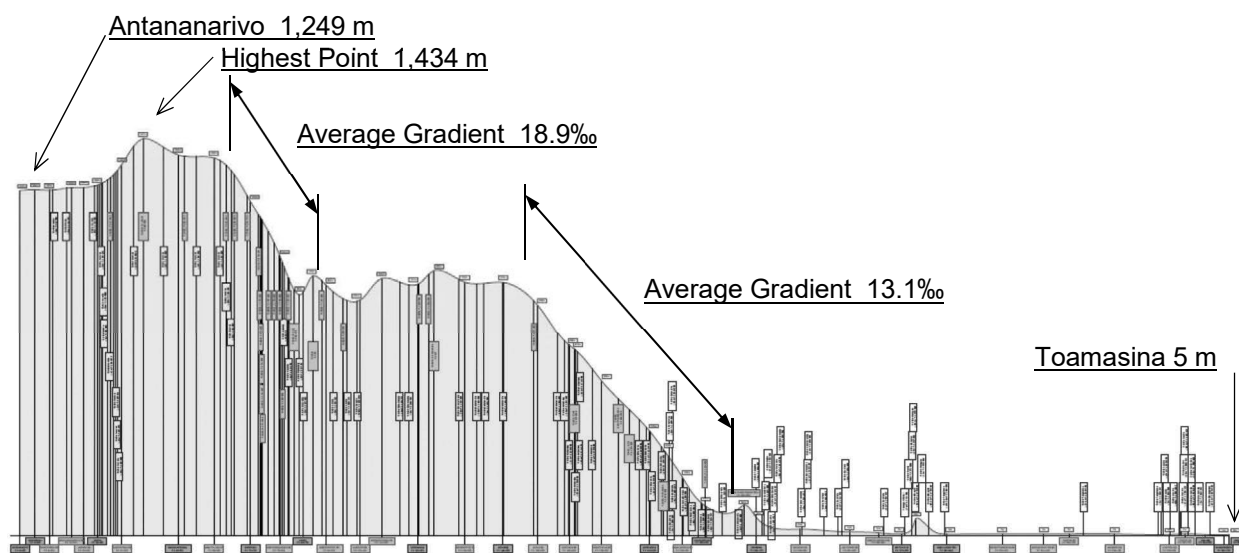
Source: Madarail

Figure 25.1.8 Change of Passenger Transported by Madarail

(2) Existing Condition of TCE Line

1) Infrastructure

TCE Line has sections with plane curve radius of less than 100 m or a gradient of more than 10‰. The average gradient between Manjakandriana (PK 48) and Anjiro (PK 86) is the steepest at 18.9‰. The average gradient between Andasibe (PK 148) and Lohariandava (PK 209) is also steeper than 10‰, that is, 13.1‰ (See Figure 25.1.9). Therefore, partial improvement of alignment is considered necessary to ensure sufficient functioning of the TCE Line as an appropriate railway.



Source: Madarail

Figure 25.1.9 Vertical Alignment of TCE Line

Ballasted tracks are used throughout the TCE Line. Various types of rails and sleepers are used in a mixture. The rails used are those less than 29 kg/m, 30 kg/m, 31 kg/m – 39 kg/m, and 40kg/m. The two major types of rails, 30 kg/m and 31 kg/m – 39 kg/m, are the ones used for the TCE Line, specifically for approximately 80% of the total line. Although no major deformation or damage existed on the rails as of 2015, there were extensive wear and tear reported in many sections.

There are two types of sleepers used, one made of reinforced concrete (RC) and the other made of iron. RC sleepers are produced by Madarail using its own manufacturing machines thus they are replaced whenever required.

2) Rolling Stock

The locomotives, purchased second-hand with financing from the World Bank and others in the first half of the 2000s, are continuously used while being maintained. They have a low horsepower output, often break down and can only pull up to seven freight cars when they are fully loaded with fuel freight. As of 2015, there were 17 locomotives but only nine were operational. Out of the 17 locomotives, 11 were over 40 years old. Poor condition and performance of the locomotives caused the low level of service.

Table 25.1.7 Existing Rolling Stock of Madarail

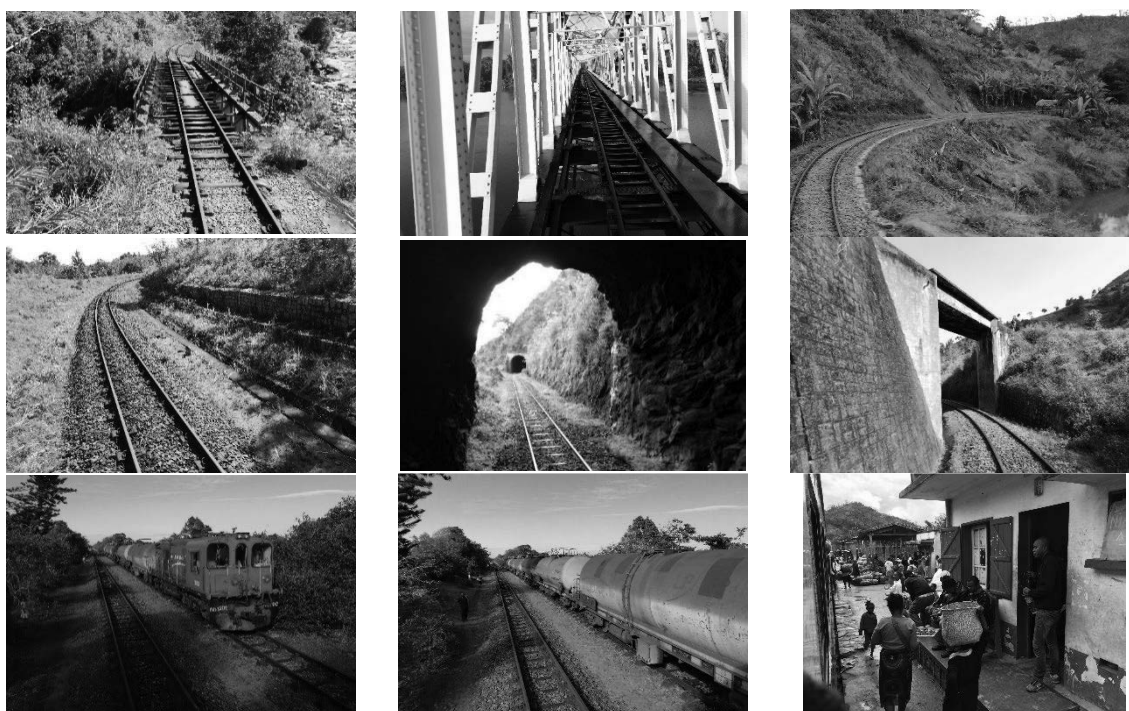
Type of Rolling Stock	No. of Rolling Stocks	No. of Operational Rolling Stocks	Operation Rate
Locomotives	17	9	53%
Wagons (Freight Cars)	264	181	69%
Coaches (Passenger/Baggage Cars)	9	7	78%
Total	290	197	68%

Source: Madarail

3) Service

The average running speed of TCE Line is approximately 25 km/h. The maximum running speed determined for each section, depending on the alignment condition and rail status, is 50 km/h in flat areas; while it is 20 km/h in mountain areas.

Although the speed of rail transport is much slower than truck transport, the transport price of Madarail is lower than truck transport price. The cost of rail transport between Antananarivo and Toamasina is US\$ 17.5/tonne, while that of truck is US\$ 25.8/tonne; hence the price difference is US\$ 8.3/tonne. Therefore, it is necessary to maintain and invest in rail infrastructure.



Source: JICA Study Team

Figure 25.1.10 Current Status of Railway Infrastructure on TCE Line

(3) Madarail’s Investment Plan for Railway of TaToM Economic Axis

Madarail is planning to invest approximately 105 million USD in the coming 15 years. It intends to pursue the repair of infrastructure and the purchase of new rolling stock, such as locomotives, to promote the enhancement of transportation capacity.

The components of Madarail’s development plan are as follows:

- Rehabilitation of rail and infrastructure including the bridges,
- Installation of security system and traffic management system,
- Purchase of improved rolling stocks.

This investment will realize an improvement on the reliability of operation, safety, and upgrading the existing service level of travel speed from 20 km/h to 35 km/h.

Table 25.1.8 Madarail’s Investment Plan for Railway between Antananarivo and Toamasina

Component	Cost
A. Investment on the rail - Concrete sleeper (120,000) - Table rail and fixation sets (85,000) - Rails and accessories (7,780 Tons) - Turnout sleepers (20) - Ballast (50,000m ³) - Manual and mechanised tools - Implementation work	40 million USD
B. Investment on the bridges	6 million USD
C. Investment on the rolling stocks - Great revision and rehabilitation of the series AD18 - Buy 15 locomotives (type: CoCo90 Tons) - Buy 3 shunting locomotives of type B - Rehabilitation and modernisation of the wagons - Buy 3 permanent way motor vehicles - Rehabilitation of the tamping machine (BND) and of the handling machine - Rehabilitation of the workshops	55 million USD
D. Investment on the traffic/informatics management - Driving simulator - Computerised management of the railway traffic - Computer networks	4 million USD
TOTAL	105 million USD

Source: Madarail 2017

(4) Necessary Improvement Measures for TCE Line

Rail transport between Toamasina and Antananarivo is essential to share the mode of transporting cargo volume which is expected to increase. The existing railway between Antananarivo and Toamasina should be upgraded based on the capacity and service level of logistics by rehabilitation of the existing railway and purchase of new locomotives.

To improve the TCE line, some of the main measures are to rehabilitate the rail’s aging infrastructure, improve the transportation service reliability and time reliability, and establish a firm position as a means of transportation in the TaToM Economic Axis.

Secondly, it is also necessary to purchase locomotive and rolling stock to improve transportation capacity. It is especially important to reinforce the rolling stock to be able to cope with the transportation requirements of fuel cargo and increasing container cargoes essential for urban activities.

Finally, it is important to increase the loading and storage functions of container cargo and to improve the capacity of transshipment function of truck transport and improve its efficiency.

25.1.4 Present Situation on Air Transport

(1) Overview of Air Transport in TaToM Economic Axis

Ivato Airport and Toamasina Airport are international airports functioning as gateway of sky in Madagascar. It is important to develop and expand airport infrastructure that supports future economic activities and responds to tourism demand.

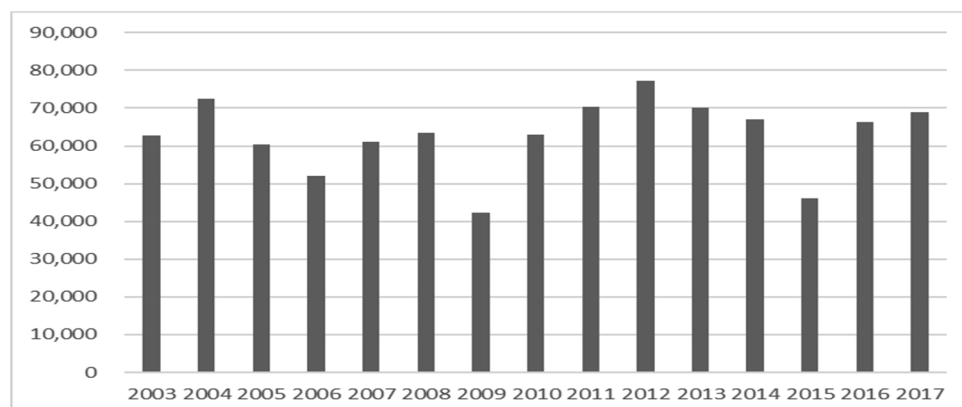
Table 25.1.9 shows the description of both airports. Ivato Airport has a runway of 3,000 m and Toamasina Airport has only 2,200 m runway. A new airport terminal is being constructed at Ivato Airport.

In 2018, Ivato Airport had 907 thousand passengers, while Toamasina Airport had 69 thousand passengers. The traffic volume of both airports comprised 66% of the national total.

Table 25.1.9 Description of Airports in TaToM Axis

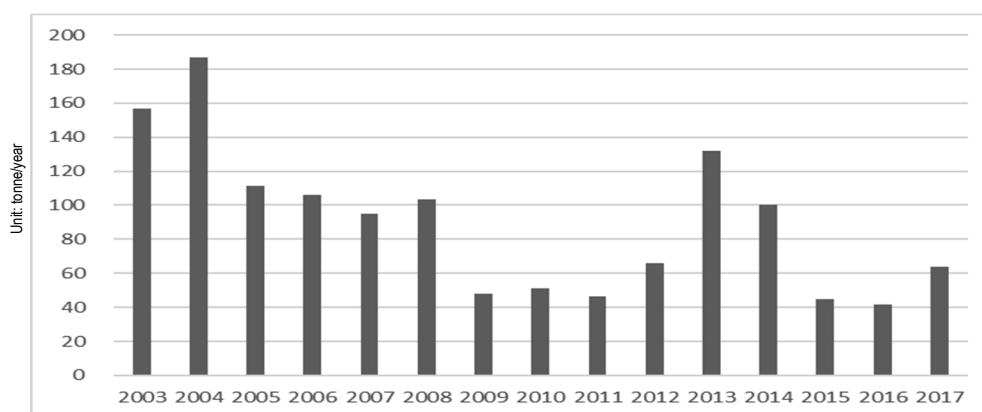
Airport	Ivato International Airport	Toamasina Airport
Location	16km from the city centre of Antananarivo	7km from the city centre of Toamasina
Category	Principal airport International airport	Principal airport International airport
Operator	Ravinala Airports	ADEMA S.A
Runways	3100 x 45 meters	2200 x 40 meters
Number and percentage of passengers (Share to the national total)	907 thousand (61%)	69 thousand (5%)

Source: JICA Study Team based on information from MTM and ADEMA



Source: ACM

Figure 25.1.11 Number of Air Transport Passengers between Antananarivo and Toamasina



Source: ACM

Figure 25.1.12 Volume of Air Freight Transportation between Antananarivo and Toamasina

It is important to develop and expand airport infrastructure that will support future economic activities and will respond to tourism demand. Air transport is also a means of transportation that provides high-speed services between the two main cities, and therefore it is important to make the airports convenient.

(2) Existing Conditions of Ivato Airport and Toamasina Airport

1) Ivato International Airport

The concession company, Ravinala Airports, has been overseeing the operation of Madagascar's Ivato International Airport since 23 December 2016 as part of a concession contract signed for a period of 28 years with the Government of the Republic of Madagascar.

Ivato Airport does not only need to expand the international terminal and reinforcement of the runway but also to address the increasing number of passengers who are mainly business persons and tourists, and also accommodate large-sized aircraft. At the same time, the existing terminal needs to be modernised. (The expansion project is on-going as of 2019.)

The airport access road, Tsarasaotra Road, was constructed for faster access to the city centre. This is now in operation.

However, the implementation of public transportation system (such as airport access bus or railway) should be discussed as a long-term plan

2) Toamasina Airport

Due to the deterioration of runway, Toamasina Airport cannot accommodate Boeing 737 class aircraft with seat capacity of around 160 passengers, which is a major aircraft type in this region. Currently, only ATR aircraft, which has a seat capacity of around 70 passengers, can land to this airport which makes it difficult to promote the international and regional line to improve efficiency of air transportation. Additionally, the terminal and its equipment are outdated to ensure the convenience of international and regional business persons and tourists.

The most immediate challenge for Toamasina Airport is the rehabilitation of the runway, and the modernisation of the terminal and its equipment. To deal with the increasing passenger demand, the access road and the public transportation system which connect to the city centre or major city function should be developed according to this reinforcement project.

Regarding domestic air transportation, the lack of aircraft by Air Madagascar (Tsaradia) and Madagasikara Airways may limit the domestic traffic volume despite the increased demand. In order to introduce new aircraft and equipment, it is necessary to improve profitability. Another means could be to call for foreign investments, or to form alliances with other airline companies.

(3) Existing Plan and Projects for Airport Development in TaToM Economic Axis

1) Project for the Upgrading of Ivato International Airport

Ravinala Airports (concession company) formed by Groupe ADP (35% shareholder via its subsidiary ADP Management), the Bouygues Group (20%) through Bouygues Bâtiment International, and Colas Madagascar (a subsidiary of the Colas Group), and Meridiam (45%), had formulated a development master plan for year 2035 to respond to the increasing traffic volume based on the initial development master plan formulated by ADEMA. The company announced the finalised funding arrangements and commencement of first-phase work of airport development plan on 5th of July 2017.

The financing of the fixed investment programme was finalised on 25 June 2017, with a consortium of five international development banks: the International Finance Corporation of the World Bank Group, Proparco, the Development Bank of Southern Africa, the Emerging Africa Infrastructure Fund Limited, and the OPEC Fund for International Development with the capital contributed by the shareholders of Ravinala Airports.

The expected average annual passenger numbers should increase by at least 5% over the coming years.

The construction work of Phase 1 consists the following:

- A new 17,500 m² international terminal with an initial capacity of 1.5 million passengers
- Renovation of the existing terminal to handle domestic traffic
- Strengthening and full resurfacing of the runway
- Technical and environmental compliance of facilities

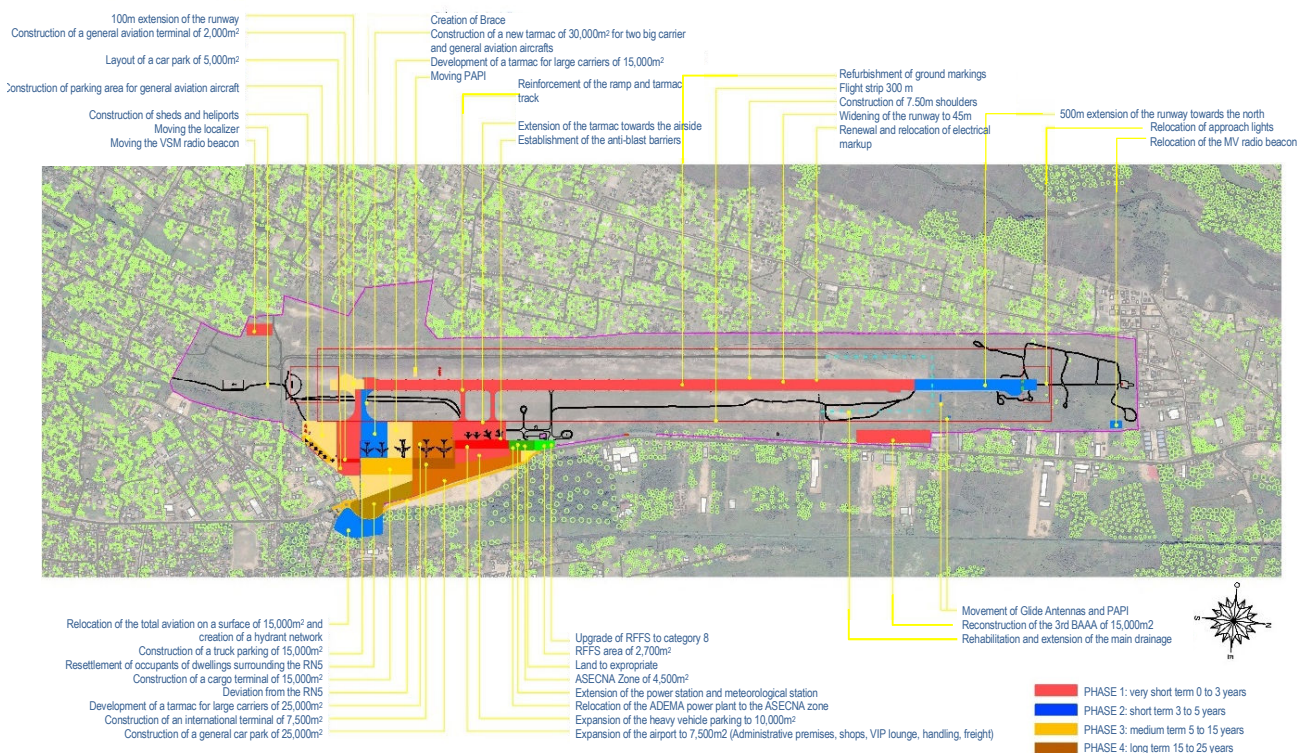
2) Development Plan for Toamasina Airport

Aéroports de Madagascar (ADEMA) has formulated a development plan for Toamasina Airport, “Schema d'aménagement des infrastructures aéronautiques et logistiques de l'aéroport Toamasina”, mainly in order to rehabilitate and reinforce the runway functions of Toamasina Airport for accommodating Boeing 737 class aircraft.

The rehabilitation, capacity building, and upgrading are part of the short-term and medium-term priorities for the following purposes:

- To contribute to the opening up of the internal areas
- To ensure the development of airport infrastructure in PIC zones and areas with high economic potential

The development plan for Toamasina Airport has four phases. Phase 1 work consists of rehabilitation of runway and extension of aircraft parking apron for small-sized private jets as an urgent project stage. Phase 2 work consists of the runway expansion project of 500 m and aircraft parking apron of 30,000m².



Source: ADEMA, 2017

Figure 25.1.13 Phased Development Plan for Toamasina Airport

25.2 Future Traffic Demand in TaToM Economic Axis

The selected growth scenario for overall TaToM development aims not only to stimulate existing economic sectors but also new types of light industries. The development of economic sectors should be emphasised for both agglomerations.

The total population of related three regions of TaToM in 2033 is estimated at 10.5 million in comparison to 6.8 million in 2018. On the other hand, their GDP (which shows economic scale) is estimated at 37,800 billion Ar. in 2033 in comparison to 16,000 billion Ar. in 2018.

Based on the above basic conditions, the development and improvement of the transportation system in TaToM Economic Axis need the following four requirements: safety, resilience, volume and speed. Safety is the provision of measures to ensure road safety. On the other hand, resilience is to strengthen ability to recover from natural disaster. Volume is to upgrade the traffic capacity corresponding to the increase of freight transport due to the Toamasina Port expansion development and population change. While speed is to improve the transportation speed so as to lessen travel time.

25.2.1 Current Traffic Volume

Table 25.2.1 shows the current passenger and freight demands for all the traffic modes (including road, railway, and airline) in the TaToM Economic Axis.

Table 25.2.1 Current Passenger and Freight Demands in the TaToM Economic Axis

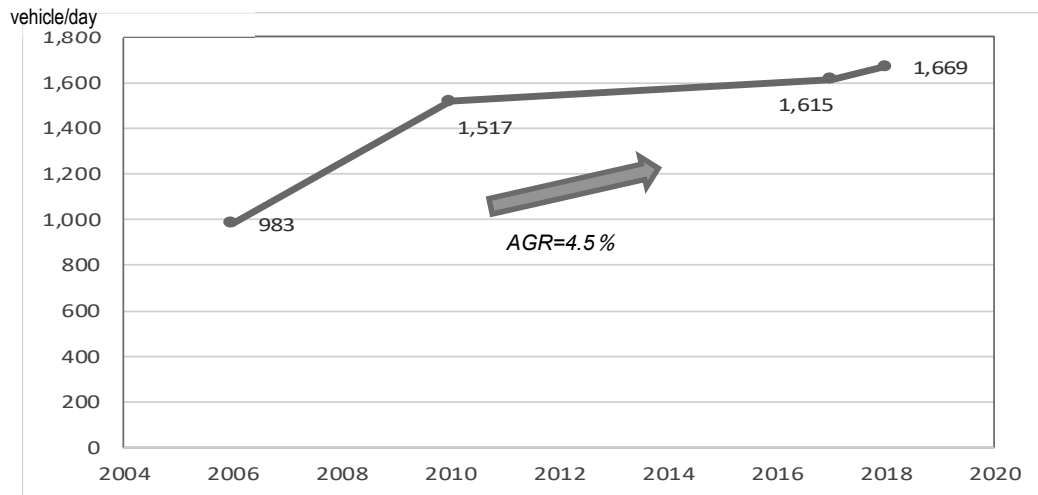
Passenger Demand('000)											
Mode	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Road(NR2)	2,012	2,243	2,500	2,786	2,867	2,950	3,035	3,123	3,214	3,307	3,403
Railway	16	72	69	66	105	88	105	131	157	140	104
Air	48	49	38	45	51	57	57	50	29	49	50
Total	2,076	2,364	2,607	2,898	2,871	2,941	3,197	3,304	3,400	3,495	3,557

Freight Demand (tonne)											
Mode	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Road(NR2)	3,024,548	3,187,991	3,360,267	3,541,852	3,457,293	3,374,753	3,467,561	3,745,437	4,056,405	4,167,960	4,282,582
Railway	169,060	222,912	261,353	290,695	345,299	294,216	274,412	221,205	151,407	128,484	95,818
Chromites											
Hydrocarbures	67,244	85,037	104,739	100,864	117,174	125,850	118,844	113,265	104,104	95,552	78,289
Produits alimentaires	52,749	23,825	13,644	25,888	39,550	34,981	39,337	38,963	26,518	20,116	9,199
Matériaux de construction	24,200	58,150	65,714	70,080	58,995	41,928	35,279	18,480	5,365	3,011	0
Conteneurs	15,348	33,029	71,009	91,203	105,320	78,235	73,961	48,410	10,284	2,679	1,055
Engrais	8,140	13,133	4,594	1,535	1,951	630	311	210	0	0	0
Divers	1,379	9,738	1,653	1,126	22,309	12,592	6,680	1,876	5,137	7,126	7,275
Air	83	92	42	44	42	65	131	100	43	42	63
Total	3,193,690	3,410,995	3,621,662	3,832,591	3,802,633	3,669,034	3,742,105	3,966,741	4,207,855	4,296,485	4,378,463

Source: JICA Study Team based on the traffic survey and other existing data from Madarail, ACM and ARM

To understand the changes in traffic, the section between Mangora and Moramanda on NR2 as a typical section was studied. The transition of daily average traffic volumes between Mangaro and Moramanga was analysed based on the traffic census results in Madagascar (2006 and 2010), traffic survey results of the TaToM Project by JICA (2017), and traffic survey results in this study. The annual average growth rate from 2006 to 2018 was approximately 4.5%, and the most recent growth rate for one year from 2017 to 2018 was approximately 3.4%.

The number of trucks on NR2 increased 1.3 times more than passenger cars, and the approximate annual average growth rates by vehicle types from 2006 to 2018 were 4.1% for passenger cars and 5.4% for trucks. This trend can be seen also in other developing countries, where the growth in truck traffic volume tends to exceed passenger volume in arterial roads.

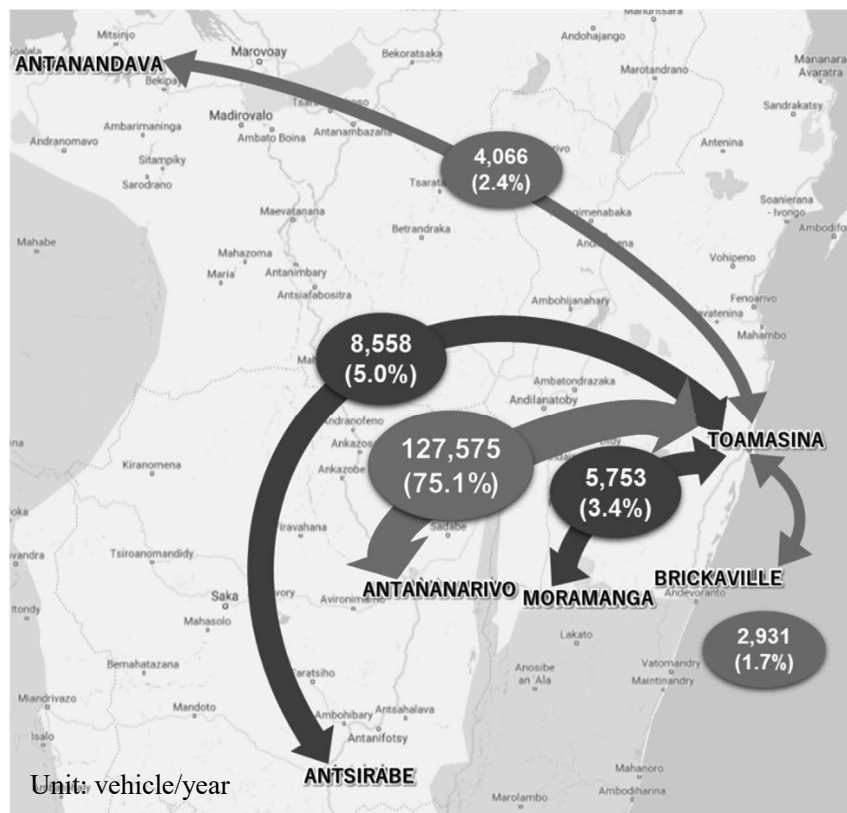


Note 1: Since different surveys were conducted at different points, the figures show average values between Mangoro and Moramanga.

Note 2: Two-wheeled vehicles were excluded.

Source: Survey team based on various data

Figure 25.2.1 Changes of Annual Average Daily Traffic Volumes on National Road No. 2



Note: Truck traffic volume does not equal to all traffic volume.

Source: ARM data on ANTSARAKOFAFA

Figure 25.2.2 Traffic Flow of Truck Traffic Passing National Road No. 2

The top 10 items under HS code transported by truck show similar trends in both traffic volume and loading capacity, which is around 25 to 30 tonnes per vehicle. The top 10 items occupy more than half of the total in terms of traffic volume, of which the largest proportion is for oil products such as gasoline, followed by cereals and cement.

Table 25.2.2 Truck Traffic Volume by Type of Transportation Goods (2017)

Rank	HS Code	Type of Good	Number of Vehicle	Traffic-based Share	Loaded-based Share
1	27	Oil Products, Gasoline and other fuels	20,026	15%	12%
2	10	Cereals	12,987	10%	8%
3	25	Lime and cement	10,976	8%	6%
4	96	Miscellaneous goods	6,674	5%	4%
5	22	Beverage, alcohol and vinegar	5,722	4%	3%
6	70	Glass and its products	4,824	4%	3%
7	78	Lead and its products	3,694	3%	2%
8	52	Lead and its products	3,508	3%	2%
9	7	Edible vegetables, roots and tubers	3,401	3%	2%
10	17	Sugar and sugar candy	3,383	3%	2%
		Others	59085	44%	35%
		Subtotal	110,184	100%	79%
		Empty truck	35,516	-	21%
		Total	169,796	-	100%

Source: ARM data on ANTSARAKOFAFA

25.2.2 Future Traffic Demand in TaToM Economic Axis

(1) Future Traffic Demand of Toamasina Port

The current port expansion project can be expected to become an initiator of economic development for Madagascar and Toamasina. This is a good chance to further develop Madagascar and Toamasina as a port city.

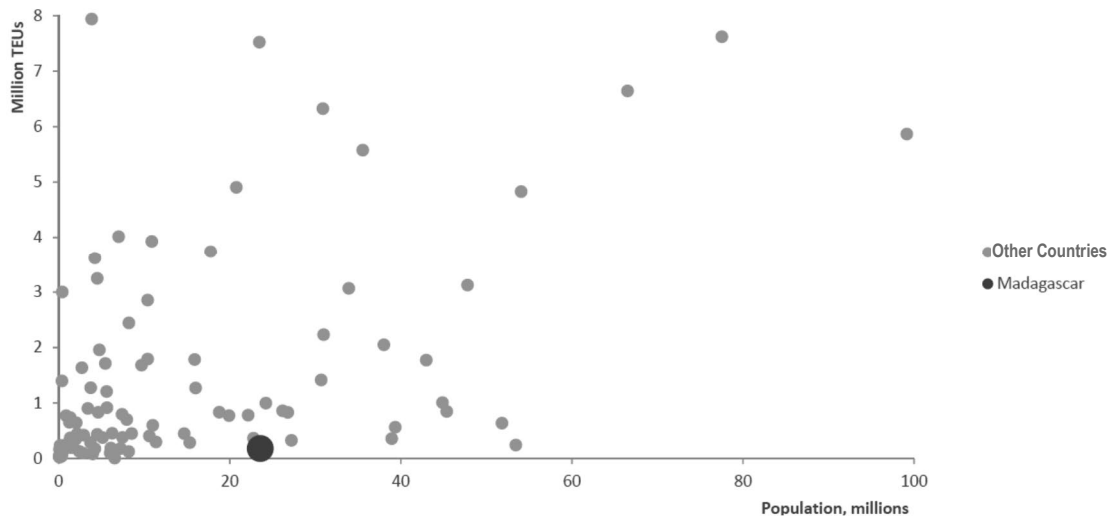
Toamasina Port handles all types of cargoes such as maritime container, bulk cargo, general cargo, oil products and mining products. Table 25.2.3 shows the volume of handled cargoes at Toamasina Port in 2010 to 2017. The total traffic continuously increased from 2010 to 2017 when the volume of cargoes was more than 6.7 million tonnes

Table 25.2.3 Cargo-Handling Volume by Cargo Type at Toamasina Port

Year	Containers (1,000TEU)	Container Content Weight (1,000 tonne)	Bulk & General Cargo (1,000 tonne)	Fuel (1,000 tonne)	Total (1,000 tonne)
2010	141	1,328	418	682	2,427
2011	146	1,525	558	759	2,842
2012	182	1,683	1,521	806	4,010
2013	196	1,861	1,820	800	4,482
2014	207	1,992	2,783	776	5,551
2015	191	2,032	3,251	937	6,220
2016	209	2,248	2,958	992	6,198
2017	243	2,535	3,180	1,019	6,734
Annual Growth Rate (2010-2017)	8%	10%	34%	6%	16%

Source: SPAT

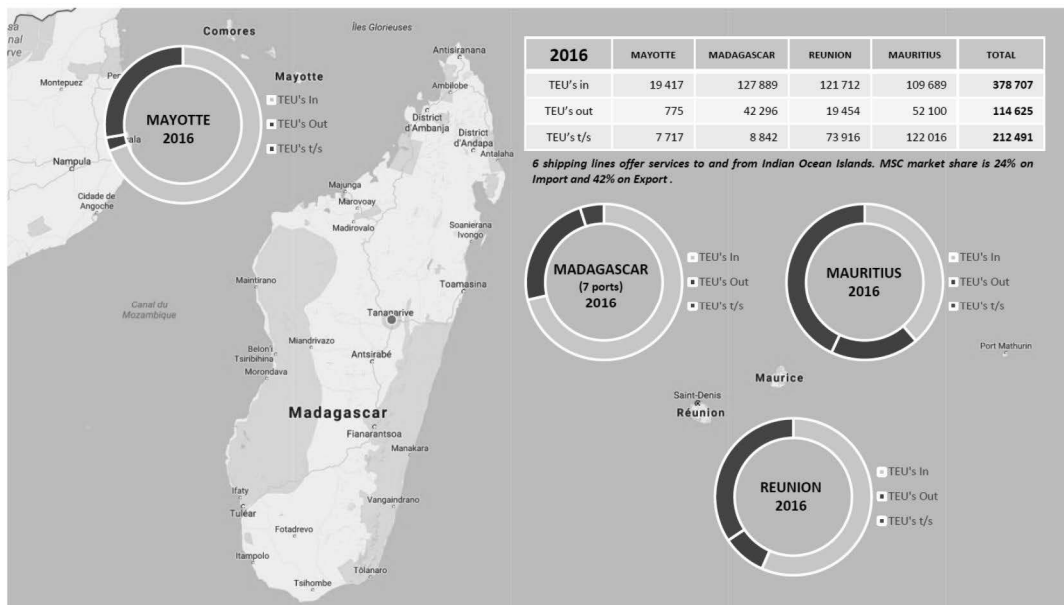
According to Madagascar International Container Terminal Services Limited (MICTSL), the port productivity performance of Toamasina Port is ranked as fourth or fifth among the ports of Sub-Saharan Africa. Figure 25.2.3 shows the correlation between country population and container throughput in 2014. Based on this data, container handling volumes in Madagascar there could be more traffic volume considering the population size and the average economic strength corresponding to the population size.



Source: JICA study team based on World Bank data

Figure 25.2.3 Container Volume and Population in 2014

Figure 26.5.5 shows the comparison of cargo handling volume by port in the sub-region. Among the four ports, the handling volume of transshipment is the lowest in Toamasina Port comparing with others.

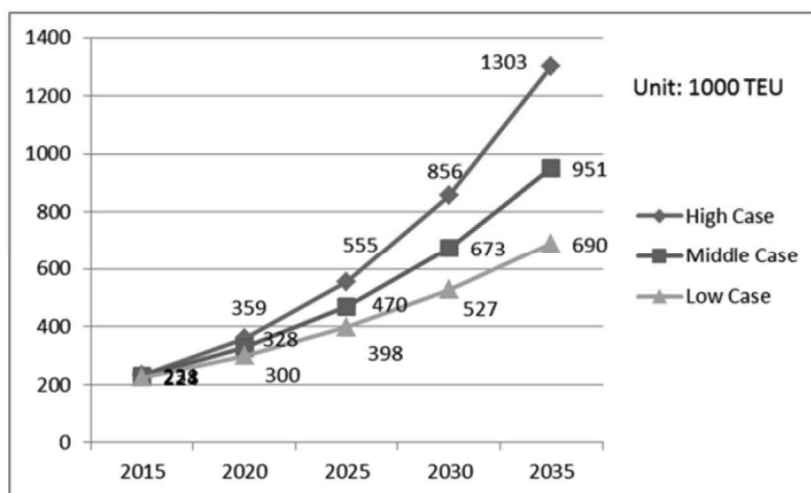


Source: Major shipping company

Figure 25.2.4 Comparison of Cargo Handling Volume by Ports in Sub-region in 2016

Figure 25.2.5 shows the future traffic demand of the maritime container projected by SPAT in 2015. According to the result of the middle case among the three cases prepared, the total traffic volume will be 951,000 TEU /year including approximately 20% of transshipment in the total volume. Remaining 80% of total handling container is projected to be import and export cargo for Madagascar. Therefore, it is assumed that the traffic volume of land transport in hinterland will increase as well.

Estimated value in 2015 is already lower than forecast. Therefore, it is necessary to make a downward revision of the future demand forecast of the port.



Source: SPAT, 2015

Figure 25.2.5 Future Container Volume Demand of Toamasina Port

(2) Future Demand Forecast for Freight and Passenger

1) Prerequisite Conditions

The future traffic demands are calculated with 2018 as the reference year, and 2033 as the target year set by TaToM Project.

To calculate the future traffic volumes of both passenger demand and freight demand, it is necessary to assume competitive roads and other traffic modes in the target year. The assumptions shown in Table 25.2.4 were used based on the discussions of basic policy of transportation infrastructure development plan and the growth scenario of TaToM Economic Axis.

The socio-economic framework to be used as explanatory variables of future traffic demands are the population and GRDP values in the three regions along the Economic Axis of TaToM (TaToM Area) and quoted from the frame values that are specified for the TaToM Project. The target three regions are Analamanga Region, Atsinanana Region, and Alaotra-Mangoro Region.

Table 25.2.4 Assumptions of Future Transportation System on TaToM Economic Axis (2033)

Transport Mode	Assumption of maintenance statuses and operations	Transportation Function	
		Passenger	Freight
Road: National Road No. 2	Construction of by-passes in urban sections, elimination of narrow or poorly aligned sections, and adoption of safety measures for road transport will be promoted. Other competitive general roads will not be improved.	⊙	⊙
Road: Motorway	High-standard road will not be in full service by 2033. Part of it will be in service.	×	×
Railway	The investment plan will be implemented to improve the average traveling speed from the current 25 km/hour to around 35 km/hour. Locomotives and freight cars will be enhanced and container transportation will be possible. Because of government policy, railway transportation will continue to operate to carry fuel freight and minerals, etc. Passenger transportation will be provided for a limited number of service days and will not function as a major means of passenger transportation (partially implemented).	△	⊙
Airline	The improvement of airstrips at the Toamasina Airport will be completed, resulting in the upsizing of equipment, increase of service frequency, and doubling or tripling of the current transportation capacity. No charter flight for freight transportation will be in service.	⊙	△

⊙: Functional, △: Partially functional, ×: Not functional

Source: JICA Study Team

Table 25.2.5 Socio-economic Framework for TaToM Area

	Population (1,000 persons)	GRDP (Billion Ariary)
2007	4,800	7,300
2012	5,600	8,600
2018	6,800	11,300
2023	7,900	16,000
2028	9,100	24,000
2033	10,500	37,800

Source: JICA Study Team

2) Future Traffic Demand Forecast

The future demands for passengers and freight were estimated using a demand model with explanatory variables as the population and GRDP values. The passenger and freight volumes were calculated using person and tonne bases, respectively, to obtain the total demand in the TaToM Economic Axis. Then the demand was allocated to the traffic modes to obtain the traffic demands by mode. The demand models were examined using transitional data from 2007 to 2017.

The correlative relations between explanatory variables were checked when the models were examined. As a result of estimation using the demand models, Passenger Volume Model 2 and Freight Volume Model 2 were adopted. Table 25.2.7 shows the results of future demand estimation.

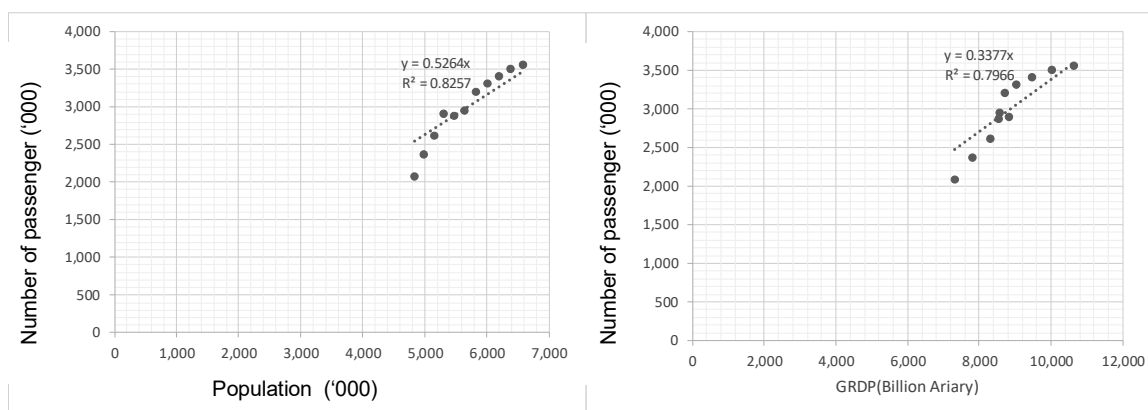
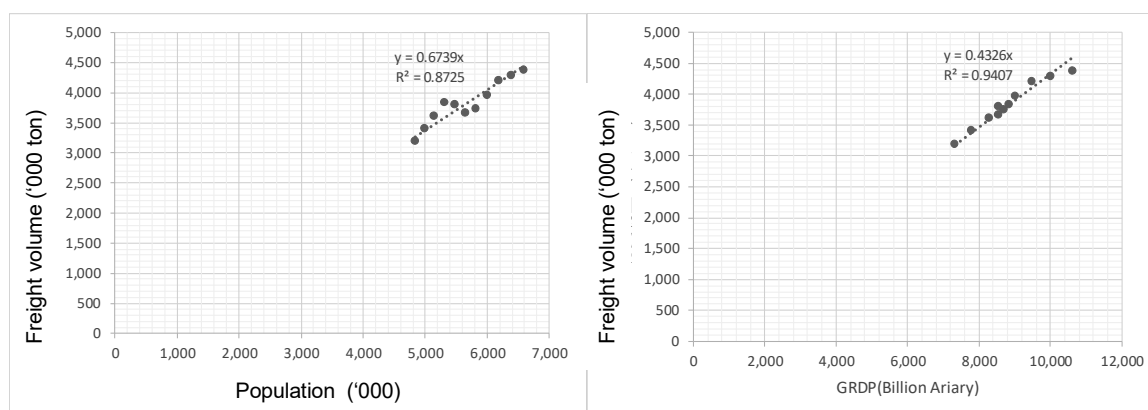


Figure 25.2.6 Relationships of Number of Passengers to Populations and GRDP



Source: JICA Study Team

Figure 25.2.7 Relationships of Freight Volumes to Populations and GRDP

Table 25.2.6 Estimation Results of Future Traffic Demand Using Demand Models

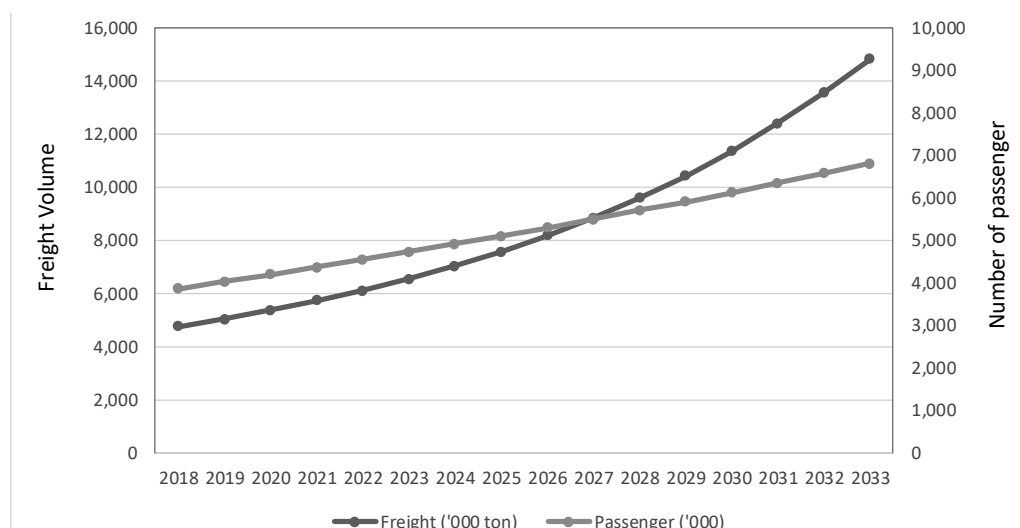
	Population ('000)		GRDP (Billion Ariary)		Const.		Multiple correlation coefficient
	coefficient	<i>t value</i>	coefficient	<i>t value</i>	coefficient	<i>t value</i>	<i>R</i> ²
Passenger model 1	0.68	2.96	0.08	0.55	-1,558.03	-3.73	0.92
Passenger model 2	0.80	11.32	-	-	-1,550.63	-3.86	0.93
Freight model 1	0.09	0.66	0.33	3.88	420.08	1.67	0.95
Freight model 2	-	-	0.38	14.52	467.70	2.01	0.95

Source: JICA Study Team

Table 25.2.7 Future Passenger and Freight Volumes on TaToM Economic Axis

	2017	2033	2033/2017	Annual average growth rate
Number of passengers ('000 persons)	3,702	6,812	1.8	3.9%
Freight volume ('000 tons)	4,509	14,829	3.3	7.7%

Source: JICA Study Team



Source: JICA Study Team

Figure 25.2.8 Future Passenger and Freight Volumes in TaToM Economic Axis

3) Mode Shares

The total demand is allocated to the traffic modes. The mode shares are based on the following assumptions:

Passenger Demand

- The airline demand is 2.5 times as large as the current transportation demand. The passenger capacity is assumed to be enhanced two or three times larger than the present by 2033.
- Based on the current mode shares of passenger cars (12%) and buses (88%), the assumptions are 20% increase for passenger cars and 80% for buses because passenger car ratio is expected to increase in the future.

Freight Demand

- The air freight volume will be 2.5 times larger than the present, in the same way as the volume of passengers.
- The railway transportation volume will be approximately four times larger than the past transportation record on the assumption that part of the investment plan of Madarail makes progress to improve the transportation capacity. This increase will be equivalent to a share of approximately 9% of railway transportation (whereas trucks account for 91%).
- Although Madarail assumes that more than half of the container freight is allocated to the railway, the assumption used in this section is based on a modest scenario.

4) Future Traffic Volume on National Road No. 2

The daily average traffic volume between Mangora and Moramanda on NR2 in 2033 was estimated based on the future total traffic demand in consideration of mode shares. As a result, the daily traffic volume in 2033 is estimated at 6,240 vehicles/day. As for two-wheeled vehicles and others, the average daily traffic volume in 2033 will be at around 300 vehicles.

Table 25.2.8 Future Traffic Volumes between Mongora and Moramanda in 2033

Vehicle Type	Daily Traffic Volume 2033	Share
Passenger car	1,830	29%
Bus (Taxi-Brousse, etc.)	730	12%
Large Truck	3,680	59%
Total	6,240	100%

Source: JICA Study Team

25.3 Overall Issues of Transportation System of TaToM Economic Axis

The overall issues on the development of TaToM Economic Axis are identified considering the current condition of the economic sectors of Antananarivo Agglomeration, Toamasina Agglomeration, and TaToM Economic Axis. These are as follows:

- Insufficient safety is observable in the transport system between Antananarivo and Toamasina.
- Insufficient resilience is evident in the transport system between Antananarivo and Toamasina.
- Insufficient transport capacity is observable in the transport system between Antananarivo and Toamasina.
- Insufficient transport speed impedes travel between Antananarivo and Toamasina

As a result, the development of economic sectors in the TaToM Economic Axis will face the following challenges:

- Further development of economic sectors in Antananarivo Agglomeration could not be possible.
- Promotion of economic sectors in Toamasina Agglomeration would be difficult.
- Promotion of economic sectors in the economic axis between Antananarivo and Toamasina would be a challenge.

25.4 Overall Objectives for Development of Transportation System of TaToM Economic Axis

Considering the current status and characteristics of the transportation system of TaToM Economic Axis and economic sectors of Antananarivo and Toamasina Agglomerations, and TaToM

Economic Axis, the overall objectives for the development of transportation system of the TaToM Economic Axis are identified as follows:




- To strategically (or selectively) strengthen the transport function (road, railway, and air transport) of the TaToM Economic Axis for purposes of supporting the development of socio-economic aspect of the whole of TaToM area (consisting of Antananarivo Agglomeration, Toamasina Agglomeration, and TaToM Economic Axis)
- To seek the drivers of national economic development of Madagascar, as well as the drivers of the development of economic sectors of the two agglomerations so as to achieve the selected scenario for the whole of TaToM, which is to emphasize the development of new economic sectors targeting regional markets in addition to existing economic sectors in both agglomerations.

25.5 Strategies for Development of Transportation System of TaToM Economic Axis

25.5.1 Alternative Development Scenarios for Transportation System of TaToM Economic Axis

Based on the three growth scenarios of the overall TaToM area in Chapter 3, three alternative development scenarios for transportation system of TaToM Economic Axis are discussed in this section (See Table 25.5.1).

Table 25.5.1 Relationship between Growth Scenarios for the Overall TaToM and Alternative Development Scenarios for Transportation System of TaToM Economic Axis

<p>[Growth Scenario A for the Overall TaToM] In addition to Existing Economic Sectors, Development of New Economic Sectors targeting Regional Markets is more emphasized in Antananarivo Agglomeration.</p> <p style="text-align: center;"></p> <p>Alternative Development Scenario A for Transportation System of TaToM Economic Axis</p>	<p>[Growth Scenario B for the Overall TaToM] Development of New Economic Sectors targeting Regional Markets is emphasized in Toamasina Agglomeration. At the same time, Development of Existing Economic Sectors (Service Industries and Textile Industries, etc) is sought in Antananarivo Agglomeration.</p> <p style="text-align: center;"></p> <p>Alternative Development Scenario B for Transportation System of TaToM Economic Axis</p>	<p style="text-align: center;">Selected Scenario</p> <p>[Growth Scenario C for the Overall TaToM] In addition to Existing Economic Sectors, Development of New Economic Sectors targeting Regional Markets is emphasized in Both Agglomerations.</p> <p style="text-align: center;"></p> <p>Alternative Development Scenario C for Transportation System of TaToM Economic Axis</p>
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Source: JICA Study Team

The key points of the three alternative development scenarios for transportation system of TaToM Economic Axis are described below.

(1) Alternative Development Scenario A for Transportation System of TaToM Economic Axis

In Scenario A, the TaToM Economic Axis plays a vital role in supporting the development of new manufacturing industries in Antananarivo Agglomeration. Therefore, the TaToM Economic Axis should provide a safe and resilient transportation route between the port and Antananarivo Agglomeration, as well as increasing its cargo volume by widening the NR2 to four lanes. While the widening of the priority sections from Brickaville to Toamasina should start in Phase 2, and the widening of the rest of the sections of NR2 should continue throughout Phases 3 and 4. To support the cargo transport, railway infrastructure will be rehabilitated step by step, starting from Phase 1.

1) Phase 1 (2019-2023)

A safe and resilient connectivity between Antananarivo and Toamasina is ensured through installation of safety devices and implementation of work for resilience on NR2.

2) Phase 2 (2024-2028)

The upgrading of cargo transport volume of the TaToM Economic Axis by widening of NR2 to four lanes is selectively started on the sections between Brickaville and Toamasina, and also the rehabilitation of railway infrastructure.

3) Phase 3 (2029-2033)

The upgrading of cargo transport volume is done by selective road widening to four lanes for NR2 since the widening work of the NR2 is extremely expensive.

(2) Alternative Development Scenario B for Transportation System of TaToM Economic Axis

In Scenario B, the main objective of the TaToM Economic Axis is to provide smooth transportation means for passengers travelling between Antananarivo Agglomeration and Toamasina Agglomeration. Therefore, construction of climbing lanes will be prioritized, starting from the priority sections between Antananarivo and Moramanga. The development of motorway between Antananarivo and Toamasina will come after Phase 3 once there is enough traffic demand between the two agglomerations.

1) Phase 1 (2019-2023)

A safe and resilient connectivity between Antananarivo and Toamasina is ensured through installation of safety devices and implementation of work for resilience on NR2.

2) Phase 2 (2024-2028)

Passenger cars' higher speed is ensured through the construction of climbing lanes on the prioritized sections of NR2 between Antananarivo and Moramanga. This construction work will start in the middle of Phase 1, and continue throughout Phase 2.

3) Phase 3 (2029-2033)

Further upgrading of passenger cars' speed is attained through the construction of climbing lanes on necessary selected sections between Moramanga and Brickaville.

(3) Selected Scenario: Alternative Development Scenario C Transportation System of TaToM Economic Axis

In Scenario C, the improvement of the transportation function of TaToM Economic Axis is required for promoting industrial development in both Antananarivo Agglomeration and Toamasina Agglomeration. Therefore, the upgrading of both passenger cars' speed and cargo volume is required. However, due to limited financial resources, the installation of climbing lanes on the priority sections between Antananarivo and Brickaville, and the rehabilitation of railway infrastructure should be prioritized. The development of motorway between Antananarivo and Toamasina will come in Phase 3.

1) Phase 1 (2019-2023)

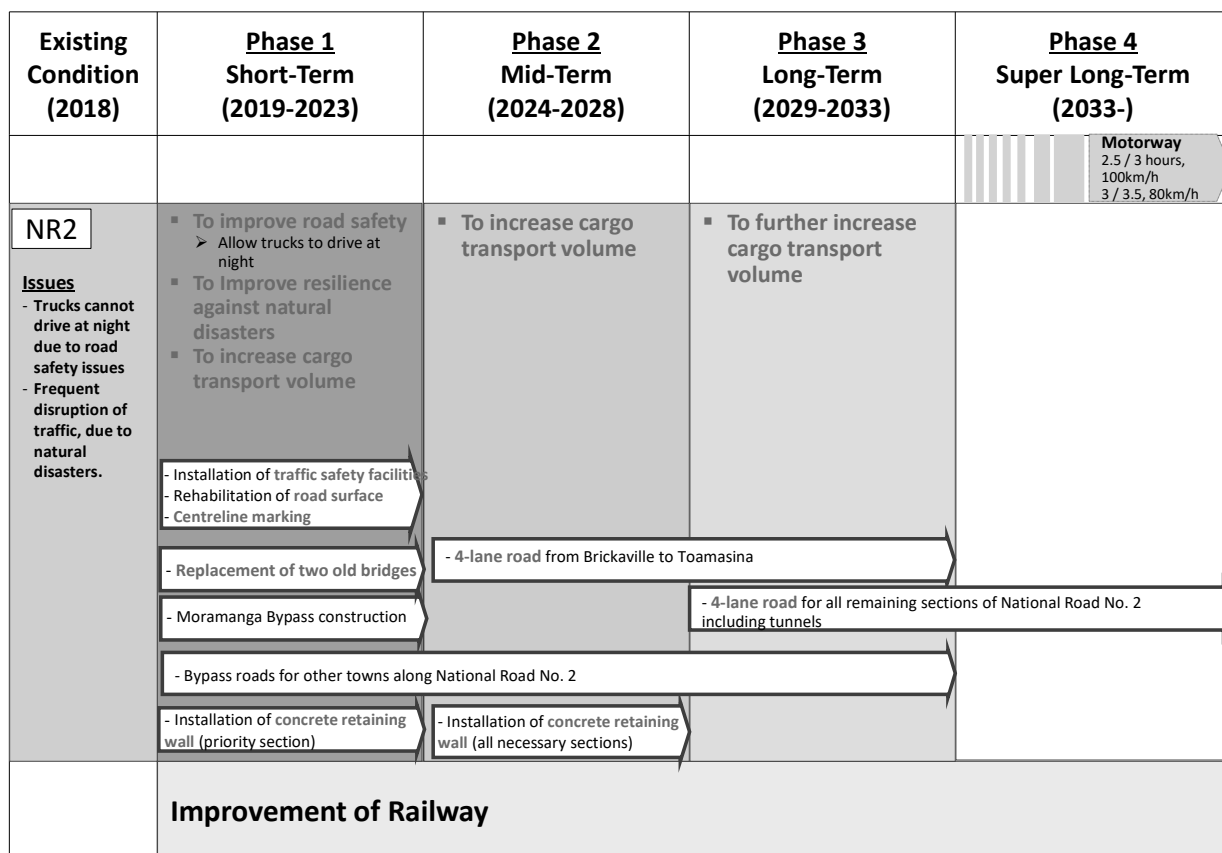
A safe and resilient connectivity between Antananarivo and Toamasina is ensured through installation of safety devices and implementation of work for resilience on NR2.

2) Phase 2 (2024-2028)

Passenger cars' higher speed is ensured through the construction of climbing lanes on the prioritized sections of NR2 between Antananarivo and Moramanga. This construction work will start in the middle of Phase 1, and continue throughout Phase 2.

3) Phase 3 (2029-2033)

Cargo transport volume is upgraded by partial operation of motorway, and also by continuing the rehabilitation of railway infrastructure.



Source: JICA Study Team

Figure 25.5.1 Alternative Development Scenario A for Transportation System of TaToM Economic Axis

Existing Condition (2018)	Phase 1 Short-Term (2019-2023)	Phase 2 Mid-Term (2024-2028)	Phase 3 Long-Term (2029-2033)	Phase 4 Super Long-Term (2033-)
			Motorway 2.5 / 3 hours, 100km/h 3 / 3.5, 80km/h	
NR2 Issues - Trucks cannot drive at night due to road safety issues - Frequent disruption of traffic, due to natural disasters	<ul style="list-style-type: none"> To improve road safety <ul style="list-style-type: none"> Allow trucks to drive at night To Improve resilience against natural disasters To increase passenger travel speed - Installation of traffic safety facilities - Rehabilitation of road surface - Centreline marking - Replacement of two old bridges - Moramanga Bypass construction - Installation of concrete retaining wall (priority section) - Installation of climbing lane for heavy vehicles (Priority Sections)	<ul style="list-style-type: none"> To increase passenger travel speed - Bypass roads for other towns along NR2 - Installation of concrete retaining wall (all necessary sections) - Installation of climbing lane for heavy vehicles (All necessary sections)	<ul style="list-style-type: none"> To further increase passenger travel speed - Construction of tunnels as bypass roads	
	Improvement of Air Transport			

Source: JICA Study Team

Figure 25.5.2 Alternative Development Scenario B for Transportation System of TaToM Economic Axis

Existing Condition (2018)	Phase 1 Short-Term (2019-2023)	Phase 2 Mid-Term (2024-2028)	Phase 3 Long-Term (2029-2033)	Phase 4 Super Long-Term (2033-)
			Motorway 2.5 / 3 hours, 100km/h 3 / 3.5, 80km/h	
NR2 Issues - Trucks cannot drive at night due to road safety issues - Frequent disruption of traffic, due to natural disasters	<ul style="list-style-type: none"> To improve road safety <ul style="list-style-type: none"> Allow trucks to drive at night To Improve resilience against natural disasters To increase passenger travel speed To increase cargo transport volume - Installation of traffic safety facilities - Rehabilitation of road surface - Centreline marking - Replacement of two old bridges - Moramanga Bypass construction - Installation of concrete retaining wall (priority section) - Installation of climbing lane for heavy vehicles (Priority Sections)	<ul style="list-style-type: none"> To increase passenger travel speed - Bypass roads for other towns along NR2 - Installation of concrete retaining wall (all necessary sections) - Installation of climbing lane for heavy vehicles	<ul style="list-style-type: none"> To increase cargo transport volume - Installation of climbing lane for heavy vehicles (All necessary sections)	
	Improvement of Air Transport			
	Improvement of Railway			

	Net	Gross		Net	Gross		Net	Gross		Net	Gross		Net	Gross
Trucks	11	18.5	Trucks	11	11.5	Trucks	10	10.5	Trucks	9.5	10	Trucks	8.5	9
Oil Tank	15	22.5	Oil Tank	15	15.5	Oil Tank	14	14.5	Oil Tank	13.5	14	Oil Tank	12.5	13
Passenger	8	8.5	Passenger	8	8.5	Passenger	7	7.5	Passenger	6	6.5	Passenger	3	3.5
Taxi Brousse	8	8.5	Taxi Brousse	8	8.5	Taxi Brousse	7	7.5	Taxi Brousse	6	6.5	Taxi Brousse	3	3.5

Source: JICA Study Team

Figure 25.5.3 Selected Scenario: Alternative Development Scenario C for Transportation System of TaToM Economic Axis

The key goals for each development phase in the three alternative development scenarios are summarised in Table 25.5.2.

Table 25.5.2 Comparison of Three Alternative Development Scenarios and Key Goals for Transportation System of TaToM Economic Axis in Each Development Phase

	Key Goals for Each Development Phase			
	Phase 1	Phase 2	Phase 2	Phase 3
Year	2019 - 2021	2022 - 2023	2024-2028	2029 - 2033
TaToM Economic Axis Alternative Development Scenario A	<ul style="list-style-type: none"> To Ensure Road Safety To Increase Resilience against Natural Hazards 	<ul style="list-style-type: none"> To Upgrade Cargo Transport Volume 	<ul style="list-style-type: none"> To Upgrade Cargo Transport Volume 	<ul style="list-style-type: none"> To Upgrade Cargo Transport Volume
TaToM Economic Axis Alternative Development Scenario B	<ul style="list-style-type: none"> To Ensure Road Safety To Increase Resilience against Natural Hazards 	<ul style="list-style-type: none"> To Get Higher Travel Speed of Passenger Cars 	<ul style="list-style-type: none"> To Get Higher Travel Speed of Passenger Cars 	<ul style="list-style-type: none"> To Attain Higher Travel Speed of Passenger Cars
TaToM Economic Axis Alternative Development Scenario C	<ul style="list-style-type: none"> To Ensure Road Safety To Increase Resilience against Natural Hazards 	<ul style="list-style-type: none"> To Get Higher Travel Speed of Passenger Cars 	<ul style="list-style-type: none"> To Get Higher Travel Speed of Passenger Cars 	<ul style="list-style-type: none"> To Upgrade Cargo Transport Volume

Source: JICA Study Team

These scenarios were also compared based on the evaluation of five criteria: 1) Efficiency (cost benefit), 2) Feasibility (technical challenges and schedule), 3) Impact (social and natural environment), 4) Sustainability and 5) Redundancy (resilience from natural disaster or catastrophic accident). Summary of the evaluation is shown in Table 25.5.3.

Table 25.5.3 Comparison of Three Alternative Scenarios for Development of Transportation System of TaToM Economic Axis

	Scenario A	Scenario B	Selected Scenario: Scenario C
Transport Mode	NR2 will be widened from 2 lanes to 4 lanes. This 4-lane road will accommodate the growing traffic demand in TaToM Economic Axis. In addition to improvement of road infrastructure, the improvement of railway infrastructure and purchase of locomotives and freight cars will increase the capacity of traffic volume.	Climbing lanes and bypasses (including tunnels) will be implemented in NR2 to increase the speed of passenger cars. In addition to improvement of road infrastructure, improvement of air transport will increase passenger travel speed. Motorway between Antananarivo and Toamasina will be developed also once funding is available.	Climbing lanes and bypasses between Antananarivo and Moramanga will be implemented to increase the speed of passenger cars, while improvement of railway infrastructure and purchase of locomotives and freight cars will accommodate the growing traffic demand in TaToM Economic Axis. The improvement of air transport will also increase passenger travel speed. Motorway between Antananarivo and Toamasina will be developed also to increase cargo transport volume as well as travel speed.
Efficiency: Cost benefit	The road and railway infrastructure will be improved to meet traffic demand. However, upgrading NR2 to a 4-lane road can be expensive because several tunnels are necessary. Efficiency is medium from the viewpoint of cost-benefit within the target year	The construction of tunnels for NR2 and motorway is expensive. Traffic demand will not be enough to cover the cost of motorway construction since this scenario serves to promote manufacturing mainly in Toamasina Agglomeration. Therefore, efficiency is low from the viewpoint of cost-benefit.	The road and railway infrastructure will be improved to meet traffic demand. The construction cost of motorway is expensive. However, this scenario serves to promote manufacturing in both Antananarivo Agglomeration and Toamasina Agglomeration. Therefore, efficiency from the viewpoint of cost-benefit within the target year is medium.
Feasibility:	It is technically possible but it will	Implementation of some tunnel	The improvement measures for NR2,

Technical challenges and schedule	take time to make all sections of NR2 four lanes. Implementation of some tunnel sections will be technically challenging.	sections will be a technical challenge. Since traffic demand will not be enough, it is also technically difficult to start the construction of the motorway.	and are feasible within the target year. The synergetic effect of economic sector promotion and infrastructure improvement shall generate sufficient traffic demand for the construction of the motorway.
Impact: Social & natural environment impact	There will be impact on natural environment since several tunnels will be constructed. The improvement of railway will support rural development of villages along the railway.	There will be impact on natural environment since several tunnels will be constructed. If motorway is to be constructed, the impact to social and natural environment is extremely large due to the new large-scale road development. For some villages located along the motorway route, rural development can be expected.	It is a partial improvement along NR2 and the impact to natural environment is limited. However, impact to social and natural environment is extremely large due to the new large-scale road development. The improvement of railway will support rural development of villages along the railway site.
Sustainability	The TaToM Economic Axis will be sustainable after the implementation phase.	Without enough traffic demand in TaToM Economic Axis, it will be a challenge for the government of Madagascar to maintain both NR2 and motorway after the implementation phase.	There will be enough traffic demand in TaToM Economic Axis by 2038. Therefore, the government of Madagascar should be able to maintain both NR2 and motorway after the implementation phase.
Redundancy	Redundancy efficiency is high as TaToM Economic Axis is complemented by NR2 and railway.	Redundancy efficiency is high as TaToM Economic Axis is complemented by motorway and road.	Among the three, redundancy efficiency is the highest in this scenario as TaToM Economic Axis is complemented by NR2, motorway and railway.

Source: JICA Study Team

25.5.2 Overall Strategies for Development of TaToM Economic Axis

The overall strategies for the development of transportation system of TaToM Economic Axis can be interpreted from the expectations from the economic sectors. To achieve the overall objectives of TaToM Economic Axis and develop TaToM Economic Axis as the selected scenario, following development are expected in the transportation system of TaToM Economic Axis:

1) Expectations from Economic Sectors of Antananarivo Agglomeration

- It is necessary to strengthen the transport capacity for basic materials (e.g., fuel, industrial raw materials, and intermediate goods) and consumer goods from Toamasina Port to Antananarivo Agglomeration to hasten the activities of economic sectors and everyday life of residents in Antananarivo Agglomeration.
- It is imperative to improve cargo transport between Toamasina Port and Antananarivo Agglomeration considering, firstly, safety and resilience; secondly, transport capacity; and thirdly, transport speed in the TaToM Economic Axis.

2) Expectations from Economic Sectors of Toamasina Agglomeration

- It is necessary to prepare the investment environment that facilitates decisions of investments to economic sectors of Toamasina Agglomeration, and to create the business environment for better business/industrial management of its economic sectors, by improving the speed of passenger transport between Toamasina and Antananarivo Agglomerations.
- In order to develop economic sectors in Toamasina Agglomeration, it is imperative to improve passenger transport between Toamasina and Antananarivo Agglomerations considering, firstly, safety and resilience; secondly, travel speed; and thirdly, transport capacity in the TaToM Economic Axis.

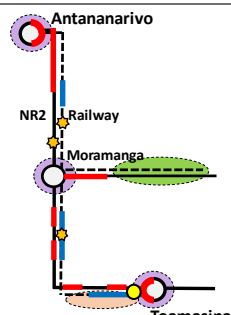
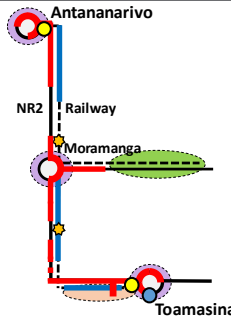
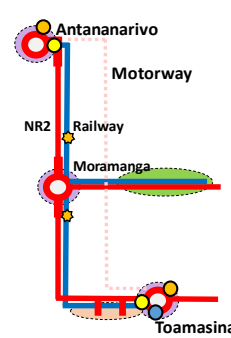

3) Expectations from Economic Sectors of TaToM Economic Axis, Especially Moramanga






- It is necessary to strengthen the transport capacity for basic materials (e.g., fuel, industrial raw materials, and intermediate goods) from Toamasina Port to Moramanga.
- It is imperative to create a conducive environment to attract investments to economic sectors in Moramanga by improving passenger transport between Moramanga and Antananarivo Agglomeration.

25.5.3 Strategies for Phased Development of Transportation System of TaToM Economic Axis

Strategies for National Road No.2 (NR2) development considering the selected scenario are described by phases in Table 25.5.4.

Table 25.5.4 Strategies for Phased Development of TaToM Economic Axis

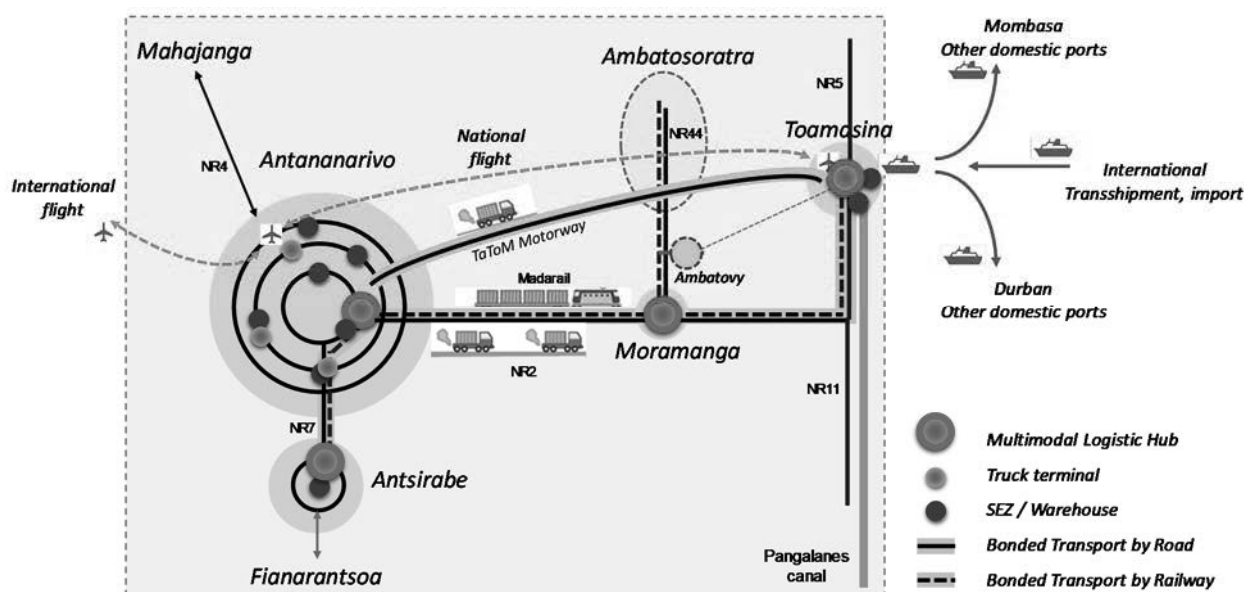
Phase	Development Strategies	
Phase 1: 2019~2023	By taking measures to substantially improve transport safety of trucks traveling on NR2 including maintenance of road and bridges, the night hours in which they can be driven safely between Toamasina and Antananarivo will be extended, and their gross transport time (including the night resting time) will be reduced. Although these transport safety measures cannot reduce the net travel time required for passenger cars and taxis-brousses, they can be driven more safely.	
Phase 2: 2024~2028	NR2 will be improved by taking measures to increase its resilience to natural disasters so that the reliability of road transport will also increase. Climbing lanes will be constructed on steep slopes of NR2. Since it is difficult to improve vertical and horizontal alignments of the road, the net travel speed of large trucks will not be reduced. However, by adding climbing lanes to steep road sections, cars and taxi-brousses can overtake large trucks. As a result, the speed of passenger transport can be improved.	
Phase 3: 2029~2033	NR2 will be upgraded so that passenger cars and taxi-brousses can travel between Toamasina and Antananarivo Agglomerations in 6.5 hours in any weather condition. NR2 will be upgraded so that trucks can travel between Toamasina and Antananarivo in 10 hours in any weather condition. If construction of motorway between Toamasina and NR44 is completed, it will allow passenger cars and taxi-brousses to travel between Toamasina and Antananarivo Agglomerations in 5.5 hours and trucks in 8.5 hours.	
Phase 4: 2034~2038	Depending on the situation of fundraising and degree of economic sector development in Toamasina and Antananarivo Agglomerations, a motorway between Toamasina and Antananarivo will be fully developed to allow passenger cars, taxi-brousses, large buses, and trucks to travel between the Agglomerations in 3 to 3.5 hours.	

- | | | |
|---|---|--|
|  Road Improvement/widening |  Airport expansion |  Agricultural area |
|  Improvement of railway |  Port expansion |  Industrial area |
|  Bridge Improvement |  Multimodal terminal |  Tourism area |

Source: JICA Study Team

25.6 Possible Measures for Development of Multi-Modal Logistics System for Transportation of TaToM Economic Axis

Through the adoption of strategies for the selected scenario, multimodal logistics system shall be developed in TaToM Economic Axis. Multimodal logistics hubs should be implemented in Toamasina, Moramanga and Antananarivo that will connect railway and road transport in TaToM Axis as well as local city logistics providing the bonded transport to and from Toamasina Port, which can avoid the complex procedure at the port and the cargo can go directly to the multimodal logistics hub near the final destination. The concept of multimodal logistics system in TaToM Axis is proposed in Figure 25.6.1.



Source: JICA Study Team

Figure 25.6.1 Concept of Multi-Modal Logistics System for TaToM Economic Axis

The possible measures for development of multi-modal logistics system by transport mode and phase are described in Table 25.6.1.

In phase 1, possible measures are limited since the implementation period is short for the target year of period 1. Basic measures will be implemented to establish reliable and basic transport system. Specifically, basic measures will be implemented to eliminate bottleneck points in road projects and emergency rehabilitation for railway.

In phase 2, the upgrading of multi-modal transportation system will start as well as the implementation of reinforcement of resilience against natural disaster.

In phase 3, the measures to improve travel speed and to increase road capacity for the full-scale operation of multi-modal transport will start.

Table 25.6.1 Possible Measures for Development of Multimodal Logistics System for TaToM Economic Axis

	Road	Railway	Air Transport	Maritime
Phase 1: 2019~2023	Replacement of bottleneck narrow bridges Road widening for narrow road section Installation of traffic safety facilities Truck terminal, parking lot / rest stop Sufficient maintenance of road and bridges to keep them in good condition	Rehabilitation of infrastructure on section requiring emergency actions Purchase of rolling stock and freight car Capacity development for appropriate O&M	New terminal at Ivato Renovation of the existing terminal Rehabilitation of runway at Toamasina Airport	Construction of new container terminal at Toamasina Port Renovation of port area for domestic maritime transport
Phase 2: 2024~2028	Bypass construction Alignment improvement Installation of climbing lane Road widening for narrow road section Slope stabilisation Intersection improvement Installation of sidewalk	Rehabilitation of all infrastructure (Replacement of rail, concrete sleeper, turnout sleepers, ballast, bridges and tunnel) Slope stabilisation Purchase of rolling stock Traffic /information management system	Strengthening and full resurfacing of the runway at Ivato Airport Runway expansion, aircraft parking and apron at Toamasina Airport	
Phase 3: 2029~2033	Construction of Motorway, Same measures with Phase 2.	Construction of multimodal terminals at Antananarivo, Moramanga and Toamasina	Logistics terminal Expansion of parking and reinforcement of airport access	Full operation of new container terminal Terminal for cruise ship
Phase 4: 2034~2038	Same measures with Phase 3.	Rehabilitation of all infrastructure to amelioration of operation speed.	transportation system, etc.	Port for domestic maritime

Note: Road development measures such as rehabilitation, lane marking, and imposition of traffic regulations are applied in all phases, depending on the situation.

Source: JICA Study Team

25.7 Priority Projects for Development of Transportation System of TaToM Economic Axis

The priority projects for the development of transportation system of TaToM Economic Axis have been selected and listed below by phases. Implementation schedule as well as estimation cost for implementation and finance scheme for these priority projects are proposed in Table 25.7.1.

Phase 1

- [E-R-01] Project on Replacement of Two Bridges along National Road No. 2 (Ongoing)
- [E-R-02] Project for Improvement of Traffic Safety on National Road No. 2
- [E-R-03] Project for Development and Operation of Service Areas/Parking Areas on National Road No.2
- [E-R-04] Project for Construction of Climbing Lane in Steep Slope Sections between Antananarivo and Moramanga of National Road No. 2 – Phase 1
- [E-R-06] Project for Construction of Moramanga Bypass Road
- [E-F-01] Project for Rehabilitation of Antananarivo - Toamasina Railway - Phase 1
- [E-F-02] / [A-F-01] Project for Development of Multi-Modal Cargo Transport Terminal in Amoronakona for Antananarivo Agglomeration
- [E-A-01] Project for Rehabilitation of Runway for Toamasina Airport

Phase 2

- [E-R-04] Project for Construction of Climbing Lane in Steep Slope Sections between Antananarivo and Moramanga of National Road No.2 – Phase 2
- [E-R-05] Project for Construction of Climbing Lane in Steep Slope Sections between Moramanga and Brickaville of National Road No.2
- [E-R-8] Projects for Construction of Short Bypass Roads on National Road No.2
- [E-R-9] Project for Development and Operation of Roadside Stations on National Road No.2
- [E-F-01] Project for Rehabilitation of Antananarivo - Toamasina Railway - Phase 2

Phase 3

- [E-R-07] Project for Construction of Brickaville Bypass Road
- [E-F-01] Project for Rehabilitation of Antananarivo - Toamasina Railway - Phase 3
- [E-R-10] Project for Construction of a Motorway between Antananarivo and Toamasina (TaToM Motorway)

Table 25.7.1 Implementation Schedule for Priority Projects of Transportation System of TaToM Economic Axis

Project No.	Project Name	Project Cost (millions USD)	Project Schedule														Finane Scheme			
			Phase1					Phase2					Phase3			Phase4				
			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032		2033	Beyond 2034	
E-R-01	Project on Replacement of Two Bridges along National Road No.2	30																		GoM/ODA Grant
E-R-02	Project for Improvement of Traffic Safety on National Road No. 2	15																		GoM/ODA Grant
E-R-06	Project for Construction of Moramanga Bypass Road	20																		GoM/ODA Grant
E-R-03	Project for Development and Operation of Service Areas / Parking Areas on National Road No.2	10																		GoM/PPP
E-R-04	Project for Construction of Climbing Lane in Steep Slope Sections between Moramanga and Brickaville of National Road No.2	200																		GoM/ODA Grant
E-R-05	Project for Construction of Climbing Lane in Steep Slope Sections between Antananarivo and Moramanga of National Road No.2	75																		GoM/ODA Grant
E-F-01	Project for Rehabilitation of Antananarivo - Toamasina Railway	105																		PPP/Private (Madarail)
E-F-02/ A-F-01	Project for Development of Multi-Modal Cargo Transport Terminal in Amoronakona for Antananarivo Agglomeration	20																		PPP/Private
E-A-01	Project for Runway Rehabilitation at Toamasina Airport	30																		GoM/PPP (ADEMA)
E-R-08	Projects for Construction of Short Bypass Roads on National Road No.2	10																		GoM/ODA Grant
E-R-09	Project for Development and Operation of Roadside Stations on National Road No.2	5																		GoM/PPP
E-R-07	Project for Construction of Brickaville Bypass Road	15																		GoM/ODA Grant
E-R-10	Project for Construction of a Motorway between Antananarivo and Toamasina (TaToM Motorway) - Phase 1	2,000																		PPP/Private

Planning and Design
Construction and Implementation

Source: JICA Study Team

Among the priority projects, the following projects have been selected as high priority projects:

- [E-R-01] Project on Replacement of Two Bridges along National Road No. 2 (Ongoing)
- [E-R-02] Project for Improvement of Traffic Safety on National Road No. 2
- [E-R-04] Project for Construction of Climbing Lane in Steep Slope Sections between Antananarivo and Moramanga of National Road No.2
- [E-R-05] Project for Construction of Climbing Lane in Steep Slope Sections between Moramanga and Brickaville of National Road No. 2
- [E-R-06] Project for Construction of Moramanga Bypass Road
- [E-F-01] Project for Rehabilitation of Antananarivo - Toamasina Railway

25.8 Profiles of Priority Projects for Transportation System of TaToM Economic Axis

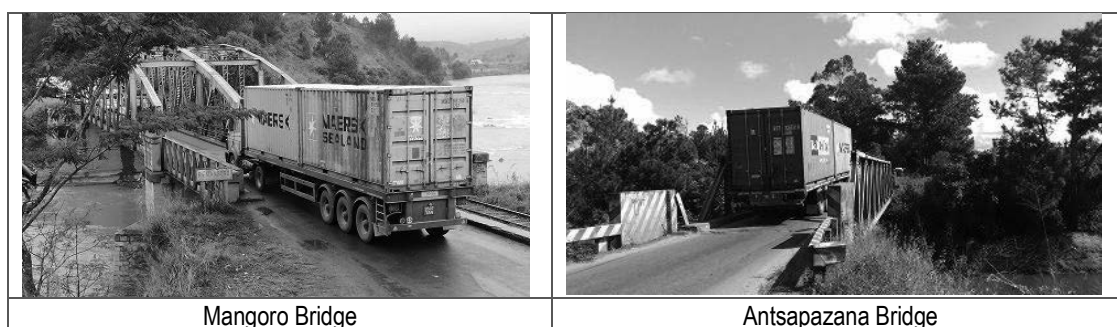
(1) Project on Replacement of Two Bridges along National Road No.2 [E-R-01]

1) Rationale

NR2 is one of the most important road structures supporting the economy of Madagascar, connecting Toamasina Port and Antananarivo which are the main port and the capital city of

Madagascar. It is crucial that vehicles run smoothly and safely on this road to support national economic development.

However, at present there are two bridges on NR2 that are serious structural traffic bottlenecks, specifically the one-lane bridges where vehicles cannot simultaneously pass each other. Based on a survey conducted in Preparatory Study for Replacement of Two Bridges on TaToM Economic Axis in 2018, around 20% of vehicles are affected by these one-lane bridges. The maximum waiting time to cross one bridge is 2 minutes and 30 seconds. Because of this situation, economic losses are taking place. This one-lane bridge situation should be improved not only for road traffic safety but also in terms of their importance to economic development.



Source: JICA Study Team

Figure 25.8.1 Current Condition of the Two Bridges along National Road No.2

2) Objective

The objective of the project is to achieve smooth road traffic between Antananarivo and Toamasina by expanding transport capacity and reducing traffic accidents on NR2

3) Project Description

The project is to construct two new concrete bridges of 2-lane carriageway that will replace the old one-lane bridges. Locations of these bridges are shown in Figure 25.8.2.



Source: JICA Study Team

Figure 25.8.2 Project Location for the Replacement of Two Bridges along National Road No.2

4) Expected Benefits

The following benefits are expected:

- Reduction of travel time by reducing the time duration of waiting for the queue for passing
- Reduction of the number of traffic accidents

5) Executing Agency and Related Institutes

MAHTP and ARM

6) Estimated Project Cost

30 million USD (Total construction cost of the two bridges)

7) Implementation Schedule

A feasibility study supported by JICA is ongoing. JICA grant aid for the construction of the two bridges is expected.

2nd year: Detail Design and Tender

3rd-4th year: Construction

8) Necessary Actions for Implementation / Critical Factor

The study by JICA is ongoing; Finance and project implementation shall be continued under the support of JICA.

9) Related Plans and Projects

None.

10) Social and Environmental Impacts

Normal mitigation measures should be designed.

(2) Project for Improvement of Traffic Safety on National Road No. 2 [E-R-02]

1) Rationale

NR2 is one of the most important road structures supporting the economy of Madagascar, connecting Toamasina Port and Antananarivo which are the main port and the capital city of Madagascar. It is crucial that vehicles can run smoothly and safely on this road to support national economic development.

Most sections of NR2 run through mountain areas and the alignment is both vertically and horizontally undesirable. Sharp curves with curve radius of less than 120 m exist in some sections. However, at present traffic safety facilities and devices are absent and traffic accidents occur frequently. Due to this dangerous travel condition, petroleum tanker trucks are prohibited to drive after 9 P.M. on this road, and many freight companies disallow their drivers to drive after 10 P.M. Furthermore, vehicles involved in traffic accidents often block the road which interfere with economic activities in TaToM Economic Axis. In addition to the undesirable alignment, 42.5% of NR2 has pavement in bad condition.

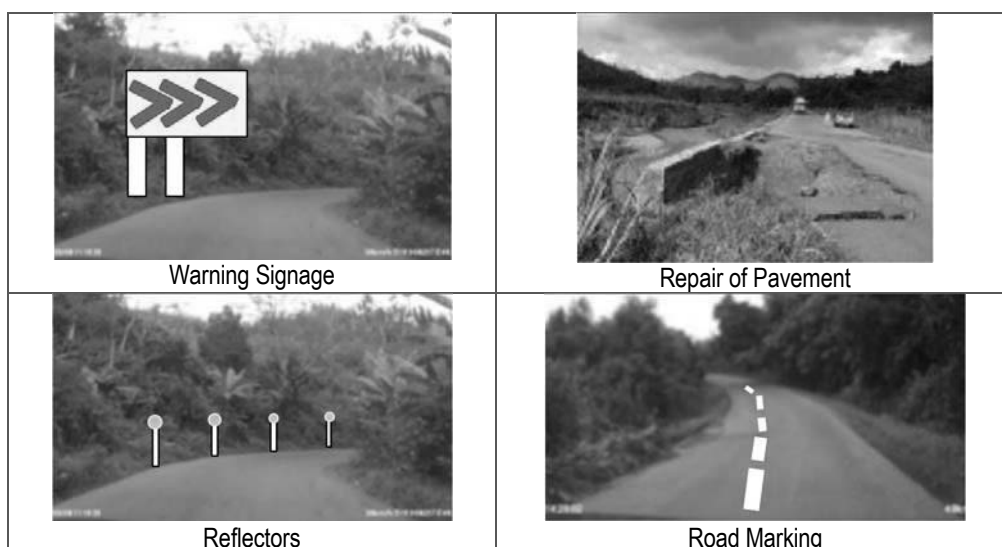
Improvement of traffic safety on NR2 is necessary to ensure stable economic activities in the whole TaToM area.

2) Objectives

The objective of the project is to reduce traffic accidents by installing traffic safety facilities and devices at sections where traffic accidents frequently occur.

3) Project Description

Safety facilities and devices (such as protection fences, alert indications, road lighting, and reflectors) are installed in selected priority sections and points.



Source: JICA Study Team

Figure 25.8.3 Examples of Measures Necessary for Improving Road Safety

4) Expected Benefits

Reduction of economic losses are expected, including reduction of wasted time, damage to cargo and vehicles, and disturbance of travellers.

5) Executing Agency and Related Institutes

MAHTP, ARM and National Police

6) Estimated Project Cost

20 million USD (only for the priority road sections and points)

7) Implementation Schedule

1st year: Selection of priority section, planning and cost estimation

2nd-3rd year: Tender and implementation

8) Necessary Actions for Implementation / Critical Factor

Opinion hearing for truck driver associations and bus driver association

9) Related Plans and Projects

None

10) Social and Environmental Impacts

None

(3) Project for Development and Operation of Rest Areas / Parking Areas on National Road No.2 [E-R-03]

1) Rationale

The total length of NR2 is 350 km, but there are no rest areas which provide facilities for road users before continuing with their journey. Therefore, in many of the cities and villages along NR2, there are several trucks parked by the roadside, blocking its carriageway. This causes congestion in certain cities and villages along NR2 which affect the economic activities of those areas. In addition, since petroleum tanker trucks are prohibited to drive after 9 P.M., and many freight companies disallow their drivers to drive after 10 P.M. on this road, many trucks can be seen parked along NR2, blocking one of the lanes thus reducing the safety of the road. It is important to

maintain the safety of NR2 to sustain economic activities in TaToM Economic Axis for the economy of Madagascar.

It has been pointed out also that vehicle drivers need to get a break every two hours. By providing rest facilities for drivers on NR2, the safety on this road, as a whole, will be enhanced. Furthermore, the rest facilities will provide safe place for road users during occurrence of natural disaster.



Source: Aichi Road Concession Co.,Ltd. HP

Figure 25.8.4 Example of Parking Area in Japan

2) Objective

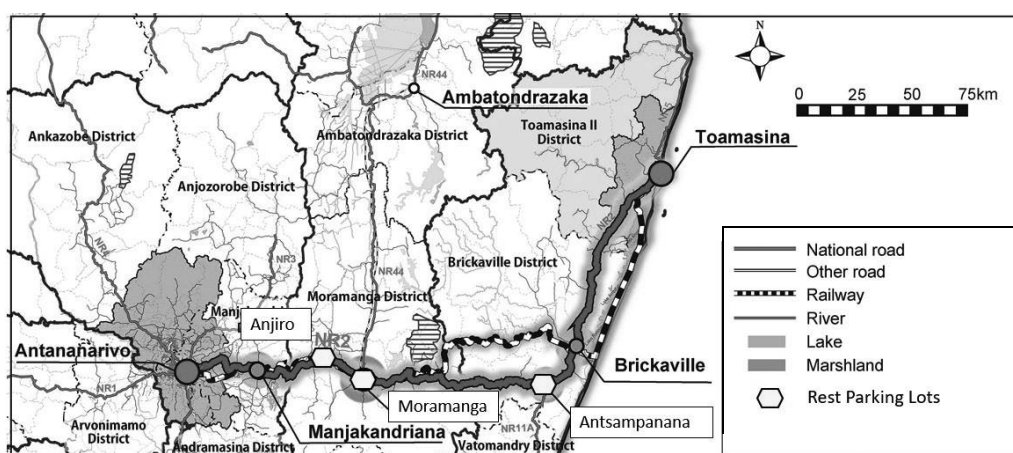
The objective of development of the rest areas is to provide space where the road users including truck drivers, can take a rest for enhancing the safety of NR2.

3) Project Description

Anjiro, Moramanga and Antsampanana are proposed sites for the development of rest area or parking area. They should provide rest facilities, including free 24-hour parking and toilets. Other facilities, such as fuel station and necessary infrastructure for mobile accessibility, should be provided also. Depending on the needs of the users, implementation of other facilities such as shop, canteen and shower room should also be considered.

To accommodate necessary space for future traffic demand, parking space for around 100 vehicles should be provided in each area.

Specific contents of each rest area should be studied in a feasibility study.



Source: JICA Study Team

Figure 25.8.5 Proposed Location for Rest Areas / Parking Areas on National Road No.2

4) Expected Benefits

The following benefits are expected:

- Reduction of risk of traffic accidents
- Decrease in the number of vehicles parked on the street (street parking), hindering traffic along NR2

- Improvement of the well-being and comfort of drivers and travellers

5) Executing Agency and Related Institutes

MAHTP and ARM

6) Estimated Project Cost

2.0 – 5.0 million USD for one parking area

7) Implementation Schedule

1st year: Selection of site, planning and cost estimation.

2nd-3th year: Tender, land acquisition and implementation.

8) Necessary Actions for Implementation / Critical Factor

- Cooperation of residents on land acquisition.
- Public participation in operation and management.

9) Related Plans and Projects

- Project for Construction of Moramanga Bypass Road
- PUDi for Moramanga

10) Social and Environmental Impacts

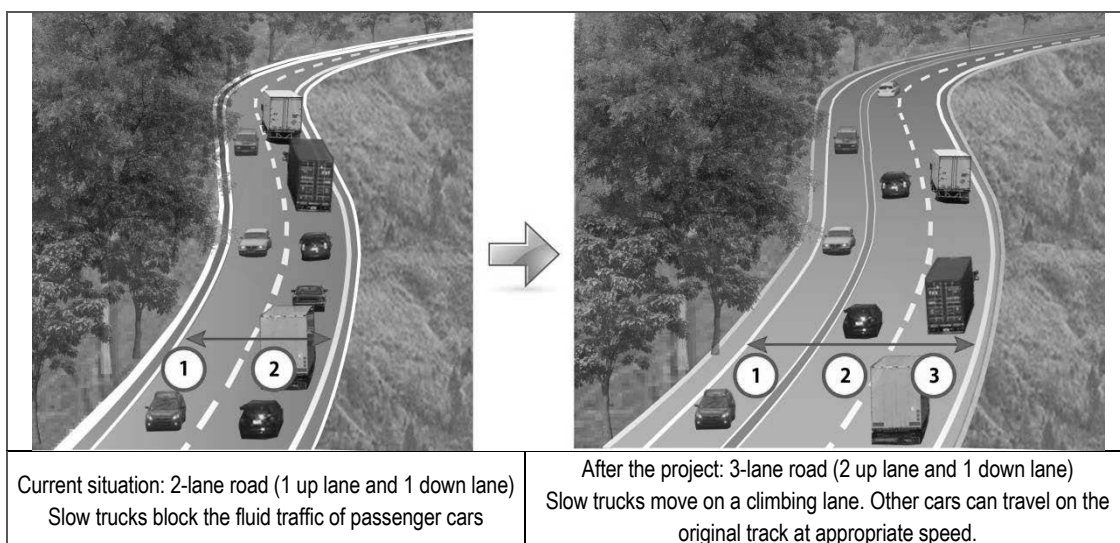
Land acquisition and implementation of resettlement plan are necessary.

(4) Project for Construction of Climbing Lane in Steep Slope Sections between Moramanga and Brickaville of National Road No.2 [E-R-04]

1) Rationale

Section with steep gradient exists continuously in NR2. Such steep gradient road sections reduce the travel speed of large trucks and affect the smooth travelling of other vehicles. To attract investment to Toamasina Agglomeration, accessibility from Antananarivo needs to be improved. By increasing the speed of passenger vehicles on NR2, the accessibility between Antananarivo Agglomeration and Toamasina Agglomeration will improve which will enhance the development of economy.

By implementing a climbing lane to sections with steep gradient, the travelling hour on NR2 will be shortened for passenger vehicles.



Source: JICA Study Team

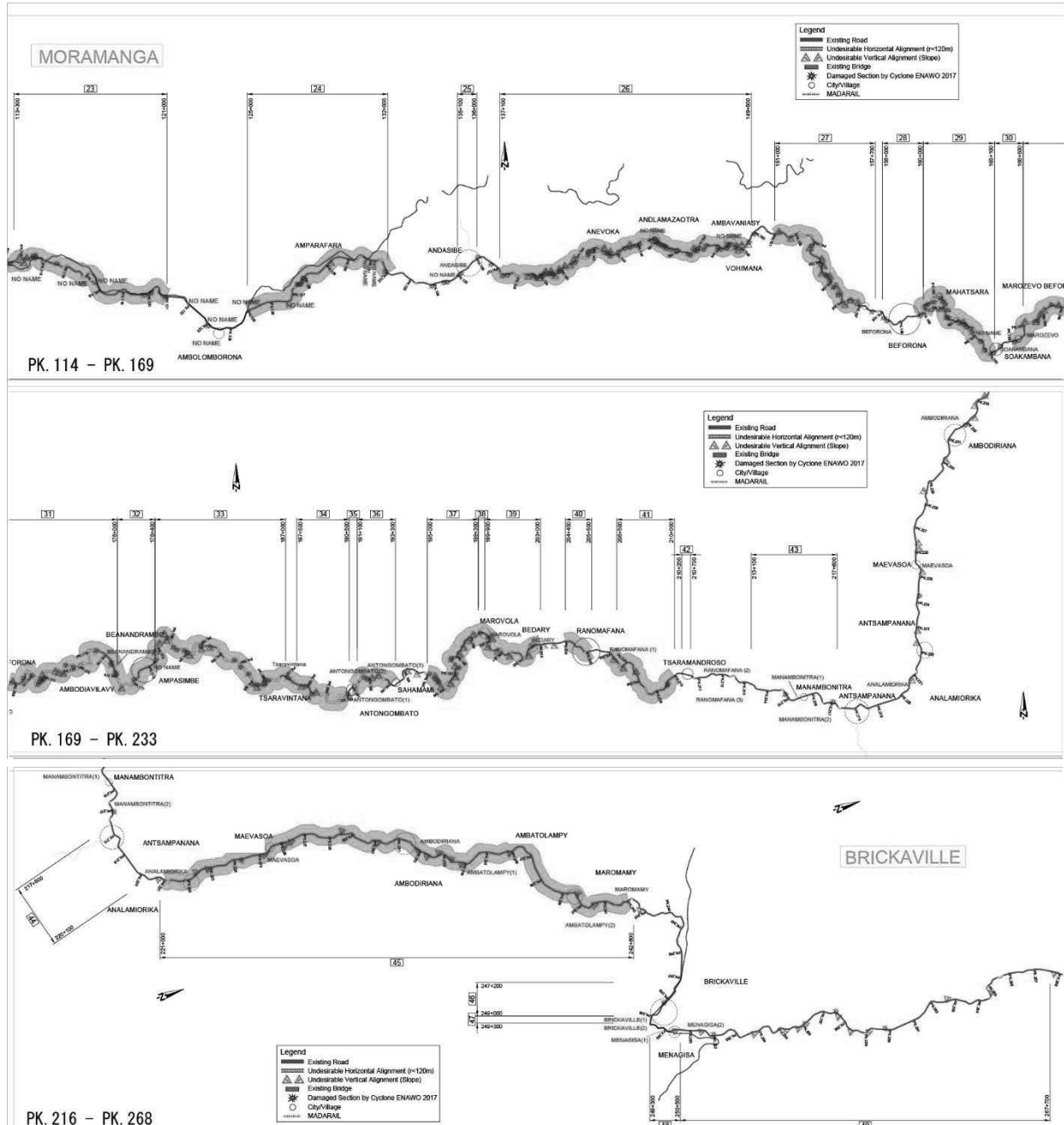
Figure 25.8.6 Example of Implementation of Climbing Lane

2) Objectives

The objective of this project is to increase the speed of passenger vehicles by development of climbing lane for heavy vehicles.

3) Project Description

Climbing lane on slope sections exceeding around 5% gradient between Moramanga and Brickville is to be constructed. A total length of 88 km is to be developed. The sections considered to need climbing lane are shown in Figure 25.8.7.



Source: JICA Study Team

Figure 25.8.7 Project Location for the Construction of Climbing Lane in Steep Slope Sections between Moramanga and Brickville of National Road No.2

Since the sections where climbing lane should be implemented are in mountainous area, the back slope of the road also has the risk to collapse. During the cyclone occurrence in 2017, NR2 suffered many damages due to slope collapse, prompting road closure. Therefore, slope stabilisation work

should be carried out for the part where the slope of the road is unstable, while the climbing lane is being implemented. For the slope stabiliser, an appropriate construction method should be selected according to the situation of road slope.

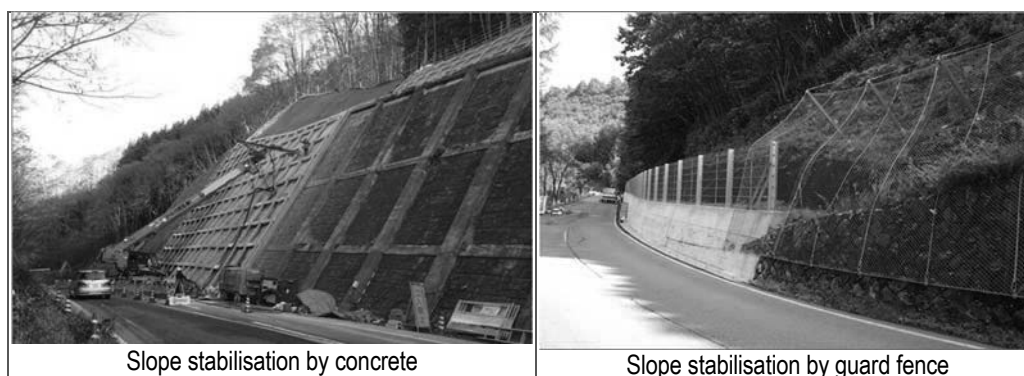


Figure 25.8 Examples of Slope Stabilisation Works in Japan

4) Expected Benefits

The implementation of climbing lane will reduce the number of traffic accidents and facilitate traffic to ensure safe and secure road spaces by separating high-speed and low-speed vehicles. By implementing slope stabilisation in necessary sections, the resilience of NR2 will also be reinforced.

5) Executing Agency and Related Institutes

MAHTP and ARM

6) Estimated Project Cost

200 million USD

7) Implementation Schedule

1st year: Selection of priority section, planning and cost estimation

2nd-7th year: Tender and implementation

8) Necessary Actions for Implementation / Critical Factor

Coordination with National Office for Risk and Disaster Management (BNGRC: *Bureau National de Gestion des Risques et des Catastrophes*)

9) Related Plans and Projects

None.

10) Social and Environmental Impacts

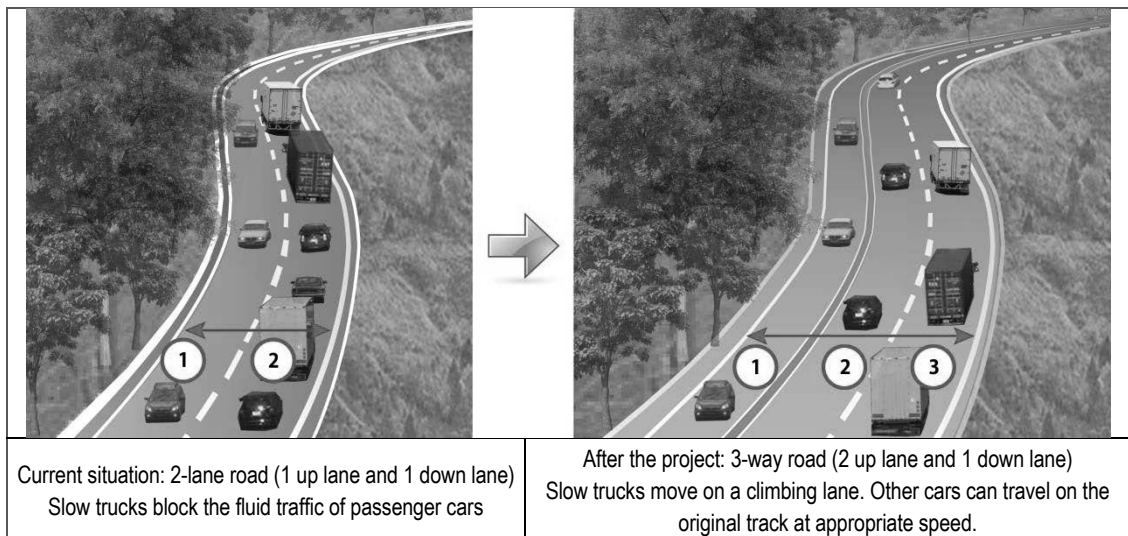
Land acquisition and impact to the natural environment due to cutting of back slope and change in landscape.

(5) Project for Construction of Climbing Lane in Steep Slope Sections between Antananarivo and Moramanga of National Road No.2 [E-R-05]

1) Rationale

Section with steep gradient exists continuously in NR2. Such steep gradient road sections reduce the travel speed of large trucks and affect the smooth travelling of other vehicles. Moramanga also has a plan to develop an industrial area in the north of its city. To attract investment to Moramanga, accessibility from Antananarivo needs to be improved. By increasing the speed of passenger vehicles on NR2, the accessibility between Antananarivo Agglomeration and Moramanga and Toamasina Agglomeration will improve which will enhance the development of the economy.

By implementing a climbing lane to sections with steep gradient, the travelling hour on NR2 will be shortened for passenger vehicles.



Source: JICA Study Team

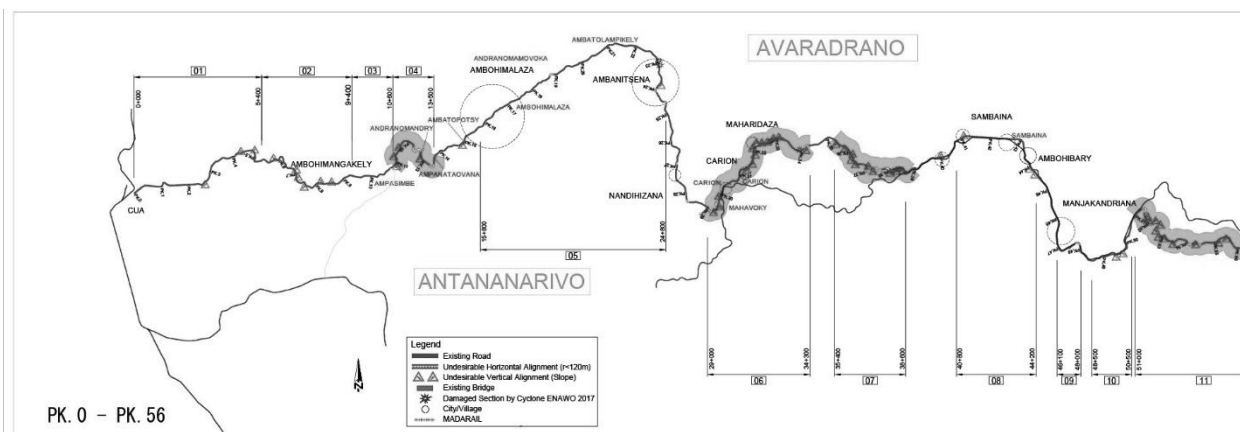
Figure 25.8.9 Example of Implementation of Climbing Lane

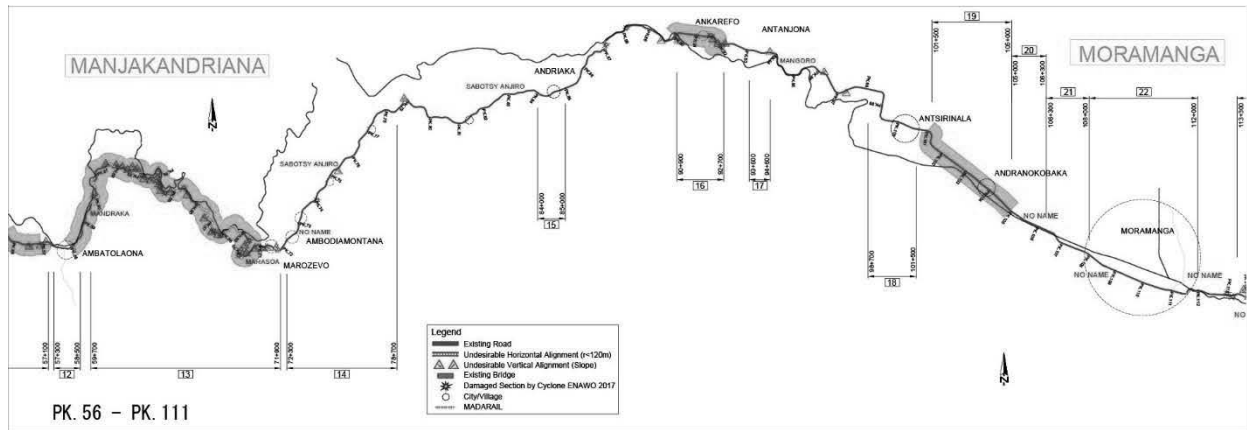
2) Objectives

The objective of this project is to increase the speed of passenger vehicles by development of climbing lane for heavy vehicles.

3) Project Description

Climbing lane on slope sections exceeding around 5% gradient between Antananarivo and Moramanga is to be constructed. A total length of 32 km is to be developed. The sections considered to need climbing lane are shown in Figure 25.8.10.





Source: JICA Study Team

Figure 25.8.10 Project Location for the Construction of Climbing Lane in Steep Slope Sections between Antananarivo and Moramanga of National Road No.2

Since the sections where the climbing lane should be implemented are in mountainous area, the back slope of the road also has the risk to collapse. During the cyclone occurrence in 2017, NR2 suffered many damages due to slopes that collapsed prompting road closure. Therefore, slope stabilisation work should be carried out in parts where the slope of the road is unstable, while the climbing lane is being implemented. For the slope stabiliser, an appropriate construction method should be selected according to the situation of road slope.

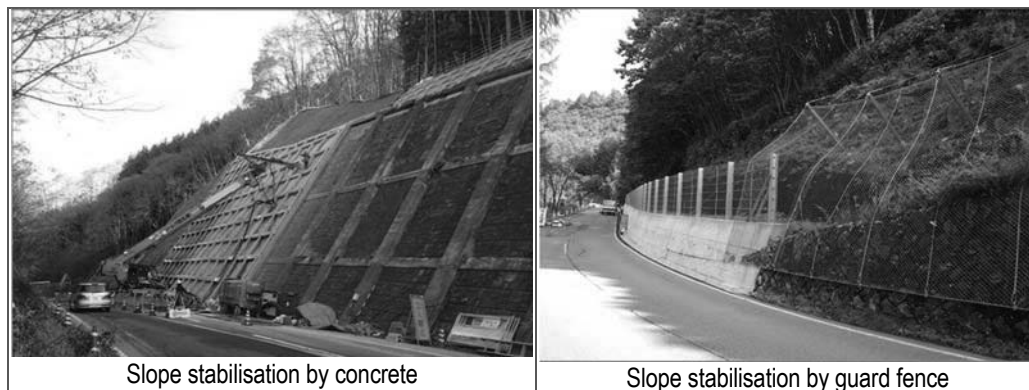


Figure 25.8.11 Examples of Slope Stabilisation Works in Japan

4) Expected Benefits

The implementation of climbing lane will reduce the number of traffic accidents and facilitate traffic to ensure safe and secure road spaces by separating high-speed and low-speed vehicles. By implementing slope stabilisation in necessary sections, the resilience of NR2 will also be reinforced.

5) Executing Agency and Related Institutes

MAHTP and ARM

6) Estimated Project Cost

75 million USD

7) Implementation Schedule

1st year: Selection of priority section, planning and cost estimation

2nd-4th year: Tender and implementation

8) Necessary Actions for Implementation / Critical Factor

Coordination with National Office for Risk and Disaster Management (BNGRC: *Bureau National de Gestion des Risques et des Catastrophes*)

9) Related Plans and Projects

None.

10) Social and Environmental Impacts

Land acquisition and impact to the natural environment due to cutting of back slope and change in landscape.

(6) Project for Construction of Moramanga Bypass Road [E-R-06]

1) Rationale

NR2 passes through the centre of the city of Moramanga. Therefore, all traffic on NR2 must pass through the urban area of Moramanga. The through traffic generates traffic congestion and traffic accidents in the city.

To solve this situation, bypass road should be constructed for the through traffic.

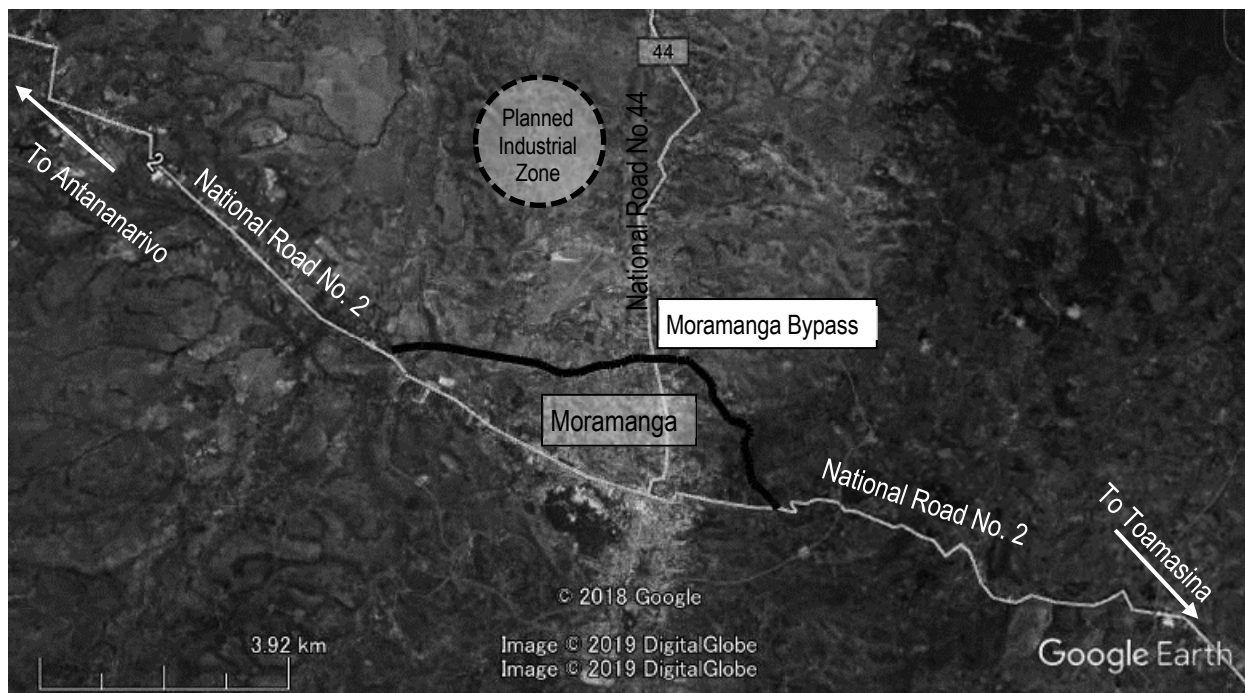
2) Objectives

The following objectives are determined for the development of Moramanga Bypass:

- To reduce through traffic in the urban area of Moramanga
- To realise efficient transportation on NR2
- To promote urban development of Moramanga

3) Project Description

The proposed route of Moramanga Bypass is approximately 8.0 km with 4 lanes.



Source: JICA Study Team

Figure 25.8.12 Project Location for the Construction of Moramanga Bypass Road

4) Expected Benefits

The following are expected benefits:

- Reduction of traffic congestion in urban area caused by through traffic
- Shorter transit time in urban area

5) Executing Agency and Related Institutes

MAHTP, ARM and Moramanga Commune

6) Estimated Project Cost

20 million USD (exclusive of land acquisition cost and compensation cost)

7) Implementation Schedule

1st-2nd year: Selection of priority section, planning and cost estimation

3rd-5th year: Tender, land acquisition and implementation

8) Necessary Actions for Implementation / Critical Factor

Cooperation of residents on land acquisition.

9) Related Plans and Projects

- PUDi for Moramanga
- Development of industrial park in Moramanga
- Development of rest area in Moramanga

10) Social and Environmental Impacts

Land acquisition and implementation of resettlement plan are necessary.

(7) Project for Construction of Brickaville Bypass Road [E-R-07]

1) Rationale

NR2 passes through the centre of the city of Brickaville. Therefore, all traffic streams on NR2 must pass through the urban area of Brickaville. The through traffic generates traffic congestion and traffic accidents in the city.

To solve this situation, bypass road should be constructed for the through traffic.

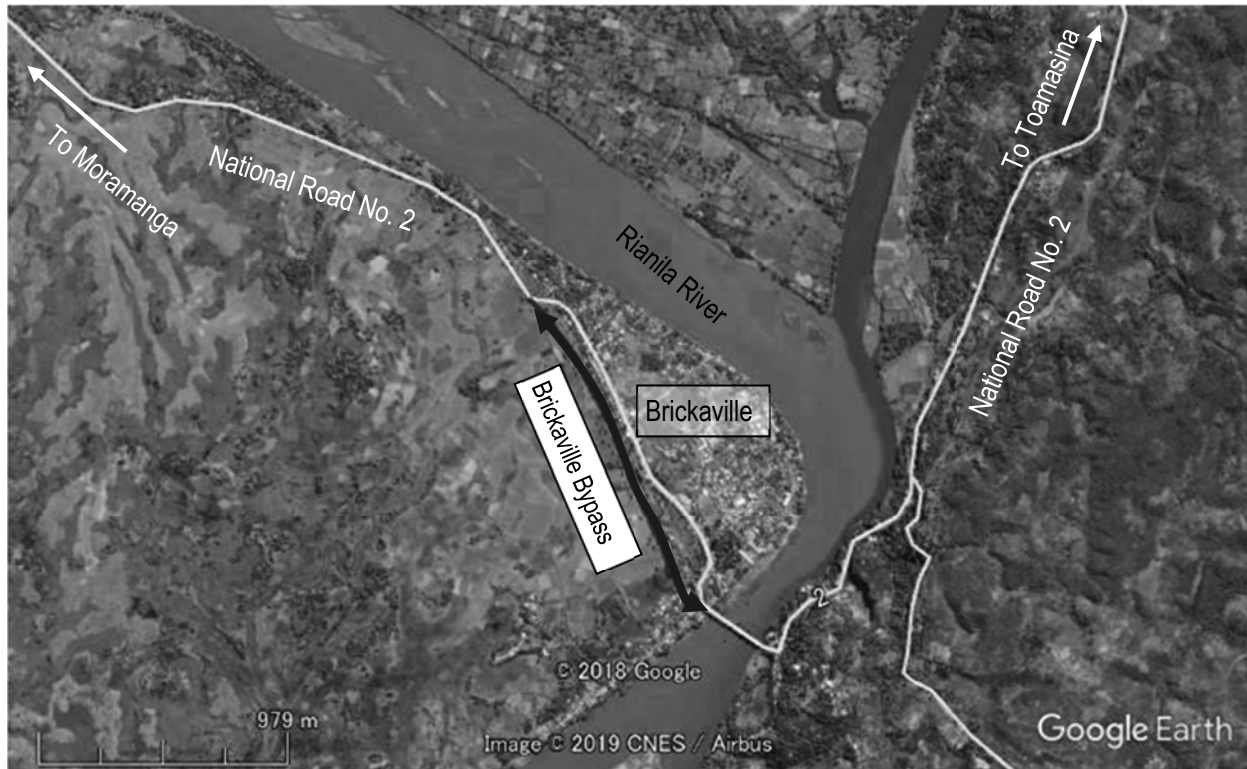
2) Objectives

The following objectives are determined for the development of Brickaville Bypass:

- To reduce through traffic in the urban area of Brickaville
- To realise efficient transportation on NR2
- To promote urban development of Brickaville

3) Project Description

The proposed route of Brickaville Bypass is approximately 3.0 km with 4 lanes.



Source: JICA Study Team

Figure 25.8.13 Proposed Route for the Construction of Brickville Bypass Road

4) Expected Benefits

The following are expected benefits:

- Reduction of traffic congestion in urban area caused by through traffic
- Shorter transit time in urban area

5) Executing Agency and Related Institutes

MAHTP, ARM and Brickville Commune

6) Estimated Project Cost

15 million USD (exclusive of land acquisition cost and compensation cost)

7) Implementation Schedule

1st-2nd year: Selection of priority section, planning and cost estimation

3rd-5th year: Tender, land acquisition and implementation

8) Necessary Actions for Implementation / Critical Factor

Cooperation of residents on land acquisition.

9) Related Plans and Projects

None

10) Social and Environmental Impacts

Land acquisition and implementation of resettlement plan are necessary.

(8) Projects for Construction of Short Bypass Roads on National Road No.2 [E-R-08]

1) Rationale

NR2 passes through certain number of towns. Therefore, all transit traffic on NR2 must pass through these towns. The road section going through the towns has narrow width and has no sidewalk. The through traffic generates traffic congestion and traffic accidents involving roadside residents. Furthermore, the efficiency for the through traffic is also low since this need to pass through traffic congestions.

2) Objectives

The following objectives have been determined for the construction of short bypass roads:

- To eliminate through traffic from the town
- To realise efficient transportation on NR2
- To realise safe and secure road along towns

3) Project Description

The short bypass roads to be constructed are approximately 2.0-3.0 km long each with two lanes.

Priority locations are Manjakandriana and Antsampanana.



Source: JICA Study Team

Figure 25.8.14 Project Location for Construction of Short Bypass Roads on National Road No.2

4) Expected Benefits

The following benefits are expected:

- Reduction of traffic congestion in urban areas caused by transit traffic
- Shorter transit time in urban area

5) Executing Agency and Related Institutes

MAHTP and ARM

6) Estimated Project Cost

6.0 million USD (exclusive of land acquisition and compensation costs).

7) Implementation Schedule

1st year: Selection of priority section, planning and cost estimation.

2nd-5th year: Tender, land acquisition and implementation.

8) Necessary Actions for Implementation / Critical Factor

Cooperation of residents on land acquisition

9) Related Plans and Projects

Urban development plan, industrial development plan such as SEZ.

10) Social and Environmental Impacts

Land acquisition and implementation of resettlement plan.

(9) Project for Development and Operation of Roadside Station on National Road No.2 [E-R-09]

1) Rationale

The total length of NR is 350 km, but there are no rest area which provides facilities for the road users before continuing with their journey. Therefore, besides the ones in actual tourist sites and existing towns or cities, there are no facilities along NR2 for travellers to rest while in transit between Antananarivo and Toamasina. In addition, although there are some small vendor stalls along NR2 selling fruits and vegetables, there are no facilities for the residents along NR2 to sell their products.

A roadside station, which has the function as rest area and for community development activities, provides not only restaurants and shops for the road users but also source of income for the residents of the towns and villages nearby.



Source: Joubon no Sato HP (<http://www.joubon.com/home/>)

Figure 25.8.15 Examples of Roadside Station in Japan

The objective of roadside station is to create the following three functions and the development of roadside station on NR2 that will improve its usability for all road users.

- Rest: Rest facilities that include free 24-hour parking and toilets. Other facilities such as restaurants and cafés for road users to rest should be implemented.
- Community Cooperation: Regional cooperation through sale of local products and local specialties, as well as cultural centres or tourist attractions to promote community development and cooperation.
- Information: Provides information on roads, tourism areas and emergency medical information.

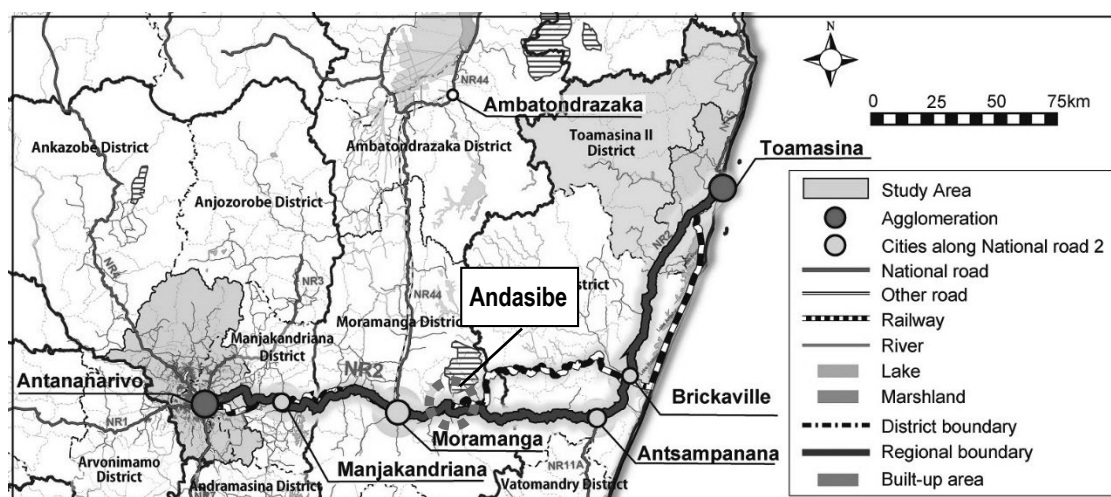
2) Objectives

The development of the roadside station aims to provide space where road users can take a rest as well as for the communes in the area to sell their specialties to promote their region.

3) Project Description

Andasibe which has the national park is a candidate site for implementing roadside station. Specific contents should be studied in the F/S study.

Facilities such as parking space for 200 vehicles, building for cafeteria, shop, toilets, etc. and fuel station are necessary.



Source: JICA Study Team

Figure 25.8.16 Project Location for Construction of Roadside Station on National Road No. 2

4) Expected Benefits

The following benefits are expected:

- Reduction of risk of traffic accidents
- Decreased number of street parking hindering traffic along NR2
- Improvement of the well-being and comfort of drivers and travellers
- Rural development for the communes near the roadside station

5) Executing Agency and Related Institutes

MAHTP and ARM.

6) Estimated Project Cost

2.0 – 5.0 million USD.

7) Implementation Schedule

1st year: Selection of site, planning and cost estimation.

2nd-3th year: Tender, land acquisition and implementation.

8) Necessary Actions for Implementation / Critical Factor

- Cooperation of residents on land acquisition.
- Public participation in operation management.

9) Related Plans and Projects

None

10) Social and Environmental Impacts

Land acquisition and implementation of resettlement plan.

(10) Project for Construction of a Motorway between Antananarivo and Toamasina (TaToM Motorway) [E-R-10]

1) Rationale

The growth scenario of TaToM needs the improvement of the transportation function of TaToM Economic Axis for promoting industrial development in both Antananarivo Agglomeration and Toamasina Agglomeration. Therefore, the upgrading of both speed of passenger cars and cargo

volume are required. The development of 4-lane, high-speed transportation network will be able to increase both passenger cars' speed and cargo volume.



Figure 25.8.17 Examples of Motorway Infrastructure for TaToM Economic Axis

The expansion of Toamasina Port and development of industrial park in Moramanga will bring also the possibility of increased volume of cargo to be transported to Antananarivo and Moramanga. Since it is assumed that the number of traffic will exceed the capacity of NR2 before 2038, it is necessary to increase its capacity. At the same time, the alignment of NR2 makes it difficult to widen the whole line to 4-lane road. Although it is necessary to maintain the current function of NR2, the motorway between Antananarivo and Toamasina will become a transportation infrastructure that will lift economic development of Madagascar to another level.

2) Objectives

The objectives for the construction of motorway between Antananarivo and Toamasina are as follows:

- To provide a high-speed transportation network that can connect Antananarivo and Toamasina in approximately 3 hours
- To provide a reliable road network that is more resistant to natural disasters and which have higher traffic safety than the existing NR2.

3) Project Description

The project descriptions are as follows:

- High standard highway with 250- 300 km road length
- Design speed: 80-120km/h, Road width: 4 lanes

4) Expected Benefits

The following benefits are expected:

- Reduction of travel time
- Reduction of vehicle operating cost
- Promotion of industrial development in Antananarivo and Toamasina

5) Executing Agency and Related Institutes

MAHTP and ARM.

6) Estimated Project Cost

1.5 – 2.0 billion USD (Depending on the route and structure such as bridges).

7) Implementation Schedule

The implementation should be conducted in two phases. It is recommended to construct the Toamasina side in the first phase, then the Antananarivo side in the second phase.

1st – 6th year: Planning Phases: F/S, D/D, EIA and study for scheme of realisation and O&M,

7th -16th year: Tender, land acquisition and construction.

8) Necessary Actions for Implementation / Critical Factor

It is necessary to study the legal system for the implementation of motorway: Scheme for implementation including PPP, organisation (project unite, regulators and operators), redemption plan considering traffic demand and fee policy, operation and maintenance, etc.

9) Related Plans and Projects

For utilising the motorway and increasing the beneficiary, the rehabilitation project of NR44 is important.

10) Social and Environmental Impacts

Large-scale land acquisition and natural impact study are necessary.

(11) Project for Rehabilitation of Antananarivo - Toamasina Railway [E-F-01]

1) Rationale

The railway was formerly functioning as a major logistics mode. However, existing railway functions are declining due to the aging of railroads and vehicles. The transportation volume since 2010 have decreased. The cargo volume handled in 2017 was 20 % of the volume compared to its peak point in 2010.

The growth scenario of TaToM needs the improvement of the transportation function of TaToM Economic Axis for promoting industrial development in both Antananarivo Agglomeration and Toamasina Agglomeration. Therefore, the upgrading of both the speed of passenger cars and cargo volume is required. The railway has the potential of functioning as the essential transport mode for large-sized goods (such as oil products, containers, construction materials, and agriculture products), complementing truck transport. The cost of railway transportation is also cheaper than truck transportation. By maintaining the railway as means of transport, it will also keep the cost competitiveness in TaToM Economic Axis.

The government of Madagascar also has the intention to continue to use this railway as a means of transport to support logistics of TaToM Economic Axis.

2) Objectives

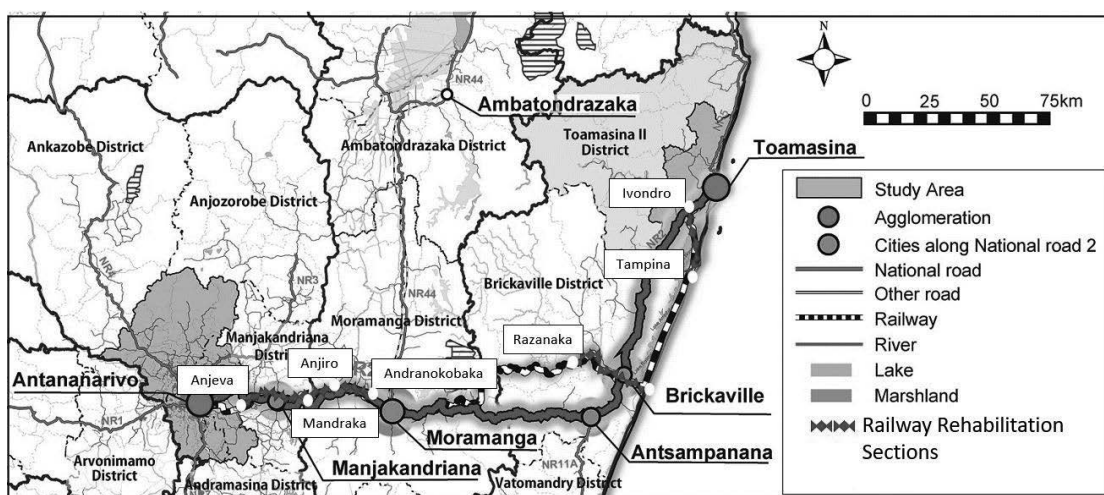
The objectives for rehabilitating the railway have been determined as follows:

- To reinforce the function of railway transport for passenger and cargo
- To reinforce the transportation function for maritime container and weight cargo such as oil products, mining products and construction materials

3) Project Description

The project includes rehabilitation of the aging infrastructure by replacing rail and sleepers. The following priority sections are selected since cargo cannot travel at a designed speed due to aged infrastructure:

- Ivondro-Tampina (40 km)
- Brickaville-razanaka (20 km)
- Andranokobaka-Anjiro-Mandraka (40 km)
- Mandraka-Anjeva (50 km)



Source: JICA Study Team

Figure 25.8.18: Location for the Rehabilitation of Antananarivo - Toamasina Railway

Other measures to be included in the project are listed below.

- Purchase of rolling stocks and wagons
- Reinforcement of operation and maintenance
- Installation of security system and traffic management system

4) Expected Benefits

The following benefits are expected:

- Improvement of safety operation and reduction of transportation lead time
- Improvement of regular operation

5) Executing Agency and Related Institutes

MTT and Madarail

6) Estimated Project Cost

105 million USD (Total cost for Phases 1, 2 and 3)

7) Implementation Schedule

The project is 15 years project.

8) Necessary Actions for Implementation / Critical Factor

Promoting of investors

9) Related Plans and Projects

None

10) Social and Environmental Impacts

None

(12) Project for Rehabilitation and Expansion of Runway for Toamasina Airport [E-A-01]

1) Rationale

The growth scenario of TaToM needs the improvement of the transportation function of TaToM Economic Axis for promoting industrial development in both Antananarivo Agglomeration and Toamasina Agglomeration. Besides the road infrastructure for upgrading the speed of passenger cars, air transport can also improve the accessibility from Antananarivo to Toamasina for passenger travel.

Due to deterioration of runway, Toamasina Airport currently can land only ATR aircraft which has a seat capacity of around 70 passengers, making it difficult to promote the international and regional line to improve efficiency of air transportation. Additionally, the terminal and its equipment are outdated to be used for the convenience of international and regional business persons and tourists.

The improvement of runway of Toamasina Airport will also enable Toamasina Airport to accommodate international flights from the surrounding countries, such as Mauritius and Reunion, which will enhance investment promotion in Toamasina Agglomeration.

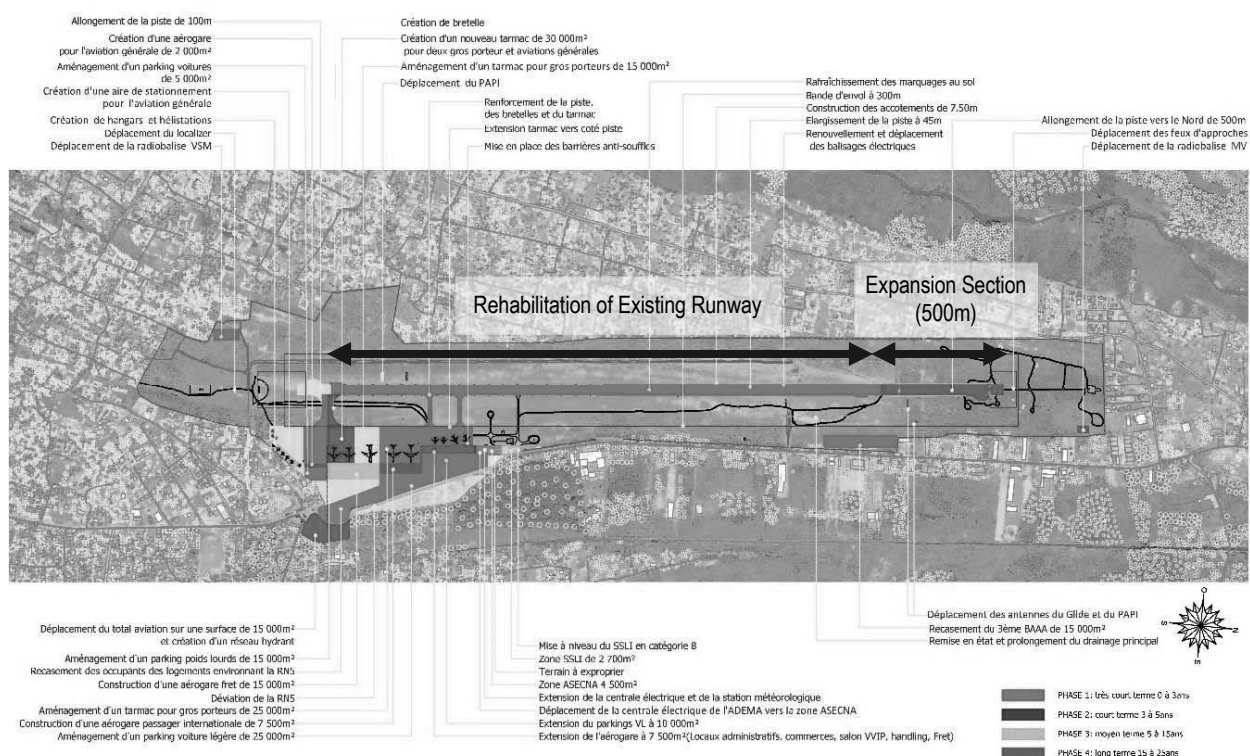
As of September 2018, a Chinese company, Anhui Foreign Economic Construction Co. (AFECC) has signed a contract with the Government of Madagascar to implement this upgrade plan for Toamasina Airport.

2) Objectives

The objective for the rehabilitation and expansion of runway is to enable Toamasina Airport to accommodate larger aircraft to increase its capacity for passenger travellers so as to attract investment.

3) Project Description

The project has two phases. The first phase is to rehabilitate the existing runway and the second phase is to expand the runway 500 m to the north.



Source: ADEMA, 2017

Figure 25.8.19 Runway Expansion Section of Toamasina Airport

4) Expected Benefits

The following benefits are expected:

- Improvement of safety operation
- Increase in the number of passengers coming to Toamasina

5) Executing Agency and Related Institutes

MTTM and ADEMA

6) Estimated Project Cost

30 million USD

7) Implementation Schedule

1st-3rd year: Rehabilitation of existing runway

3rd-5th year: Expansion of runway

8) Necessary Actions for Implementation / Critical Factor

Relocation of illegal occupants is necessary for expansion of the runway.

9) Related Plans and Projects

None

10) Social and Environmental Impacts

There are people illegally occupying the northern area of the airport, and their relocation is necessary.

Chapter 26 Development Strategies for Moramanga Urban Area

26.1 Present Situation in Moramanga Urban Area

26.1.1 Present Locational and Natural Characteristics of Moramanga

Moramanga is the largest city located along National Road No.2 (NR2). While a number of small towns exist along NR2, Moramanga and Brickville have a status of urban commune. Among these towns and cities, Moramanga has both the locational advantage of being on the cross road of NR2 and National Road No.44 (NR44).

Moramanga is located in the central east of Madagascar, connected to cities in four directions by national and inter-provincial roads. From Moramanga, 115 km to the west along the NR2 is the capital, Antananarivo, and 243 km to the east is the nation's second largest city, Toamasina. 157 km to the north along NR44 is Ambatondrazaka with land suitable for agriculture, and 72 km to the south along the Inter-provincial Road No. 23A is Anosibe An'Ala. This locational advantage gives Moramanga potentialities for economic and urban development.

The city of Moramanga is situated in the southern half of Alaotra-Mangoro Region, in the district of Moramanga. The Urban Commune of Moramanga is surrounded by Ambohibary Rural Commune. The commune has an area of 40.8 km² and is made up of 13 fokontany. The area covered by Urban Commune of Moramanga and Ambohibary Commune is determined as Moramanga Urban Area.

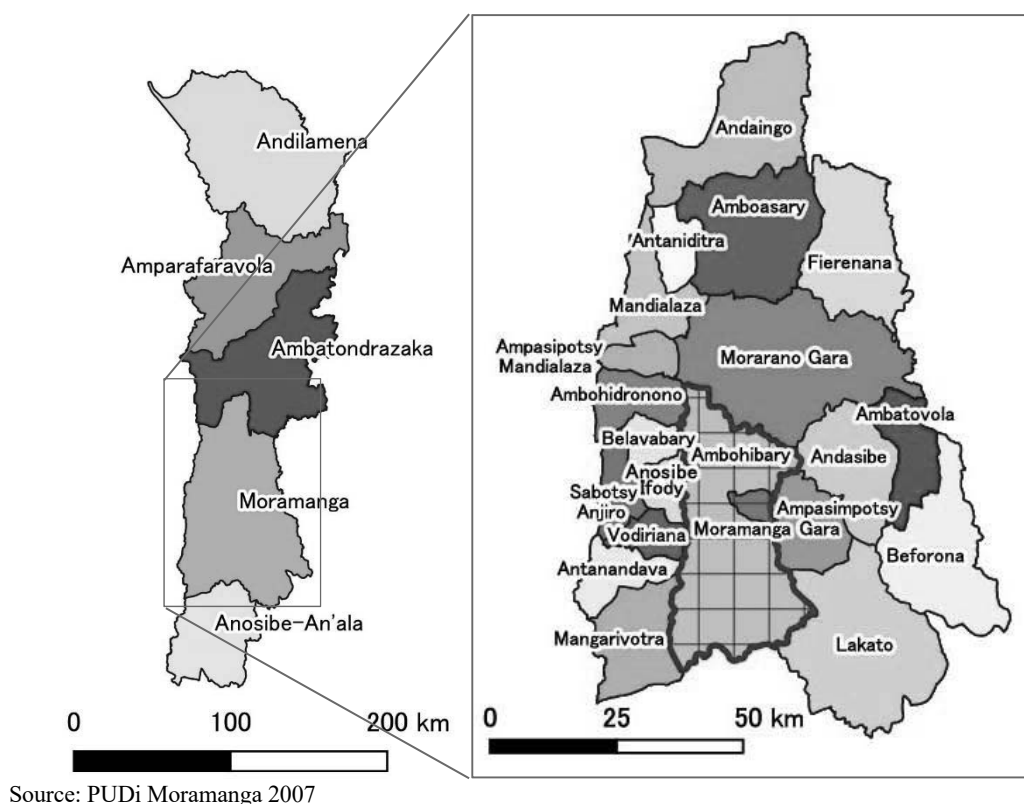
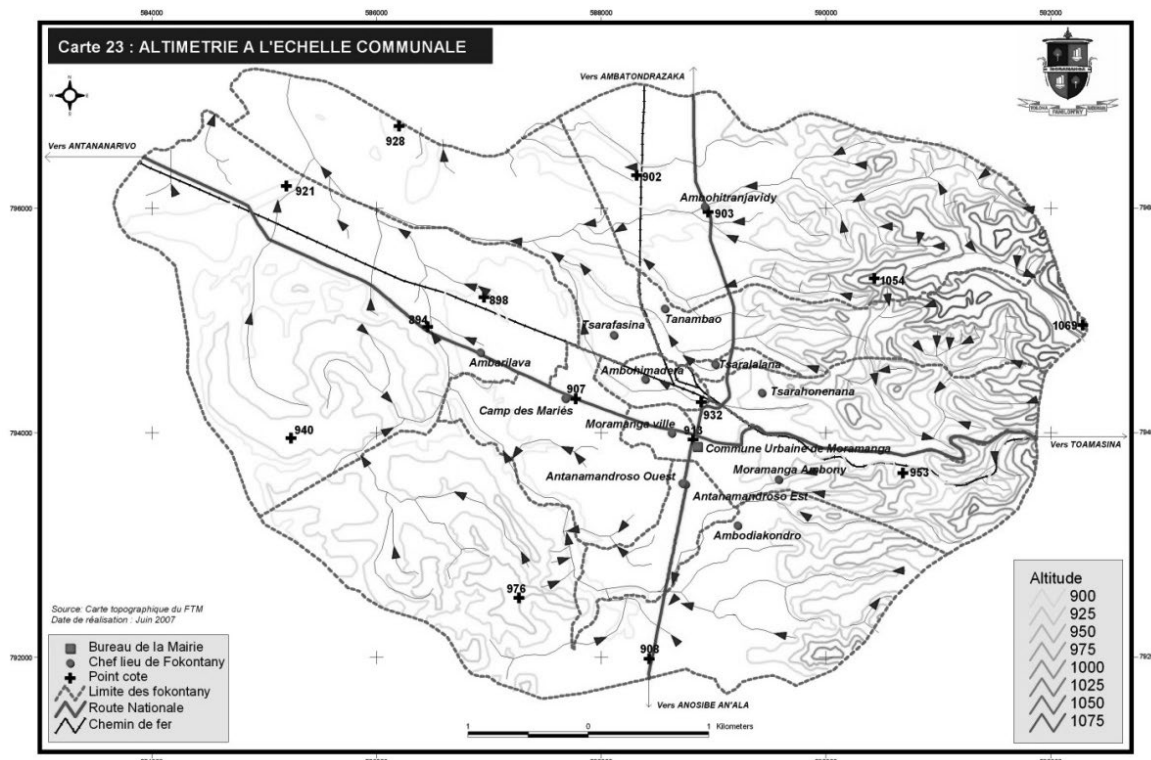


Figure 26.1.1 Location of Moramanga Urban Area

The city is located in the eastern part of the Mangoro Basin, at an altitude of 928m. On the east of the city lie the Betsimisaraka cliffs, while most part of the southern area is also mountainous. On the west is the Mangoro River, delimiting potential urban expansion (see Figure 26.1.2).



Source: PUDi Moramanga 2007

Figure 26.1.2 Topography of Moramanga Urban Commune

Moramanga Urban Commune (Moramanga City) has important administrative offices including the Moramanga District Office and the Moramanga Commune Office. Although the capital city of Alaotra-Mangoro Region is Ambatondrazaka, which is located in the northern part of the region, MAHTP also established its Regional Office in the commune of Moramanga recently.

26.1.2 Present Urban Characteristics of Moramanga Urban Area

(1) Population

The population of Moramanga Urban Commune and Ambohibary Rural Commune are projected to be 54,555 and 37,885 respectively, in 2018 based on preliminary result of housing and population census. The population of Moramanga District as a whole is assumed to be increasing with annual growth rate of approximately 2.71% per annum between 1993 and 2018, while the population of Moramanga Urban Area is increasing much rapidly with annual growth rate of 4.18%.

Table 26.1.1 Population of Moramanga Urban Area

Location	Population		Annual Growth Rate 1993-2018
	1993 (Census)	2018 (TaToM Projection)	
Moramanga Urban Commune	18,852	58,753	4.65%
Ambohibary Rural Commune	14,335	40,800	4.27%
Moramanga Urban Area	33,187	99,553	4.49%
Outside Moramanga Urban Area	134,536	253,321	2.56%
Moramanga District	167,723	352,874	3.02%

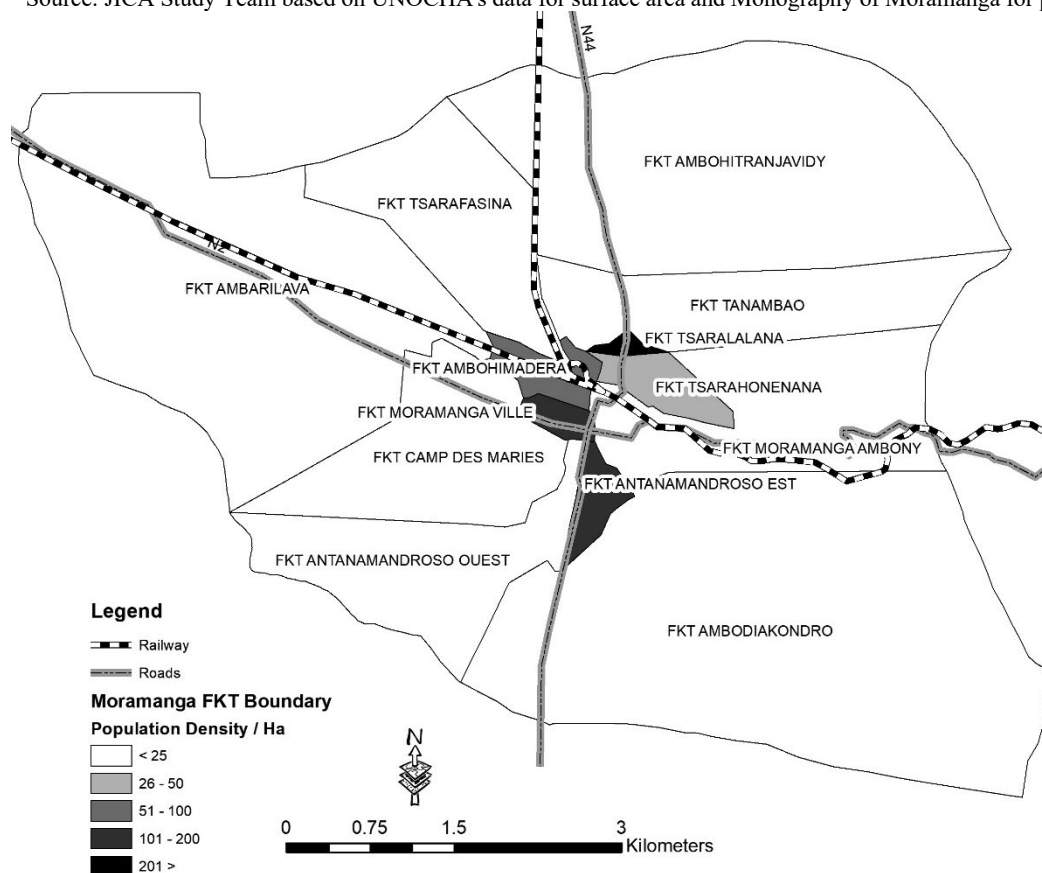
Source: JICA Study Team based on data from INSTAT

According to the monography of Moramanga in 2006, the population within Moramanga Urban Commune is concentrated in the area along NR2 and NR44, especially in fokontany of Tsarafasina, Camp des Maries, Tanambao and Moramanga Ambony. (See Table 26.1.2) On the other hand, the population density are relatively high in fokontany such as Tsaralalana, Antanamandroso Est and Moramanga Ville. (Figure 26.1.3)

Table 26.1.2 Population by Fokontany in Moramanga Urban Commune (2006)

Fokontany	Surface Area (ha)	Population 2006 (Monography)	Population Density (person/ha)
MORAMANGA VILLE	19	1,955	105.4
AMBOHITRANJAVIDY	750	1,242	1.7
TANAMBAO	243	3,356	13.8
TSARAFASINA	243	1,791	7.4
AMBARILAVA	845	2,748	3.3
TSARALALANA	7	2,050	276.7
AMBOHIMADERA	37	2,628	70.8
TSARAHONENANA	44	1,464	33.2
CAMP DES MARIES	257	6,314	24.6
MORAMANGA AMBONY	305	2,210	7.3
ANTANAMANDROSO EST	33	4,773	146.4
ANTANAMANDROSO OUEST	241	3,831	15.9
AMBODIAKONDRO	1,056	2,505	2.4
Moramanga Urban Commune	4,079	34,819	8.5

Source: JICA Study Team based on UNOCHA's data for surface area and Monography of Moramanga for population



Source: JICA Study Team based on UNOCHA's data for surface area and Monography of Moramanga for population

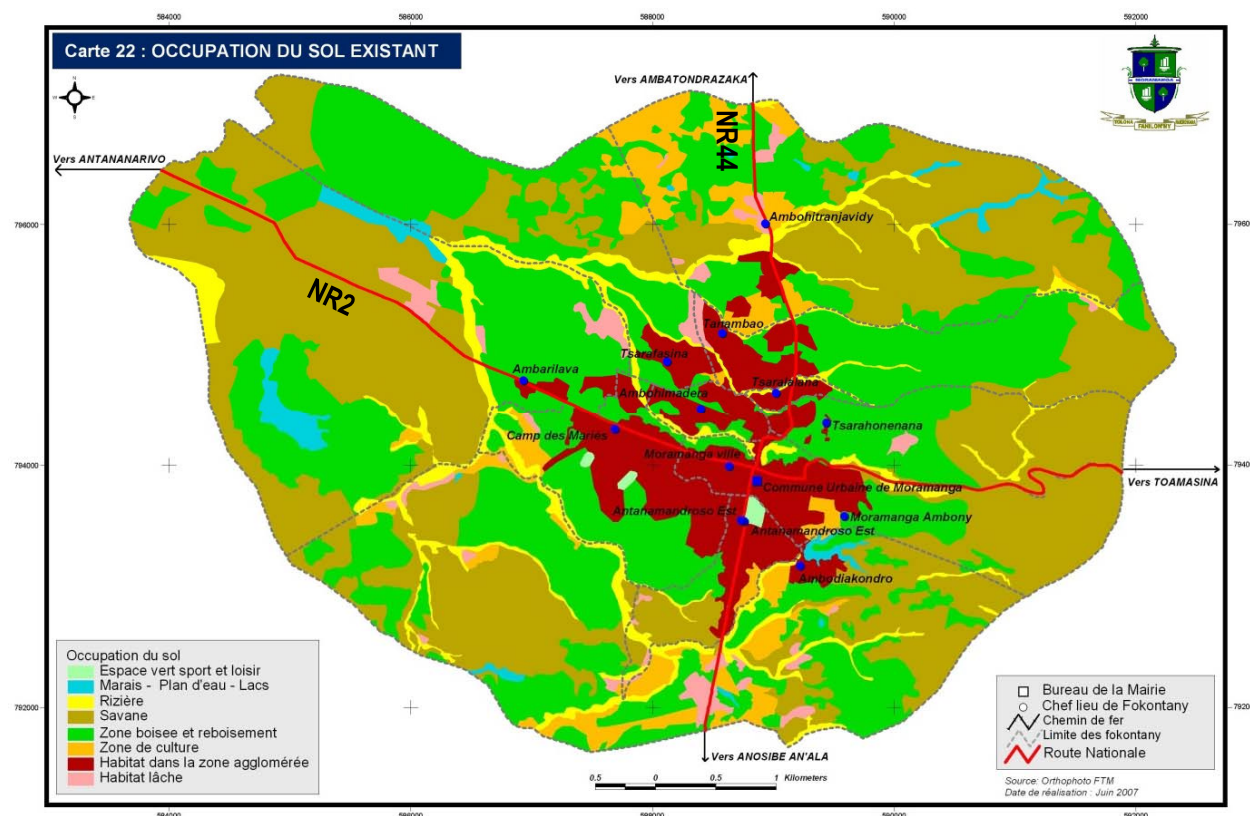
Figure 26.1.3 Population Density by Fokontany in Moramanga Urban Commune (2006)

(2) Urban Spatial Characteristics of Moramanga

The city centre of Moramanga is located close to the crossroad of the NR2 and NR44, where administrative buildings such as Moramanga Urban Commune Office and the Moramanga District Office are located. From this city centre, urban areas stretch around 2km to the west and 1km to the east along the NR2, and 2km to the north and south along the NR44 and Inter-provincial Road No.23A. The urban area is surrounded by mountainous land, especially by the Betsimisaraka cliffs close to the East boundary of the urban area. Commercial buildings such as small retail shops and hotels are mainly located along the NR2, while housing areas stretch both north and south, along the NR44 and Inter-provincial Road No.23A.

While the city of Moramanga is currently small, its locational and industrial advantage will help the development of the city. Currently, the dominant urban area of Moramanga is limited inside the Moramanga Urban Commune with some residential area extending to the south. However, the development of the TaToM Economic Axis will enhance the development of this city, possibly pushing the urban area to expand beyond the administrative boundary. Additionally, new industrial projects that are to start in and around the city will bring economic and demographic impact on the city.

However, in order to do so, access roads from the two national roads are necessary to provide land for urban development.



Source: PUDi Moramanga 2007

Figure 26.1.4 Present Land Use of Moramanga

(3) Existing Urban Development Plans

The most recent plan formulated concerning Moramanga Urban Commune is the Inter-communal Land Use Plan (*Schéma d'Aménagement InterCommunal*, SAIC) 2013, formulated together between Moramanga Urban Commune, Ambohibary Rural Commune and Morarano Rural Commune. Other recent plans concerning Moramanga are listed in Table 26.1.3.

Table 26.1.3 Existing Plans for Moramanga (2017)

Name of Plan	Formulated Year	Target Year
SRAT Alaotra-Mangoro Region	2008	2028
SAIC	2012	2026
PUDi (Currently under revision)	2007	2027
PRD	2005	

Source: JICA Study Team

1) SAIC for Communes of Moramanga, Ambohibary and Morarano

The SAIC for Communes of Moramanga, Ambohibary and Morarano was formulated as a master plan which directs development for the Rural Commune of Ambohibary which surrounds the Urban Commune of Moramanga and the Rural Commune of Morarano located north of Ambohibary in addition to Urban Commune of Moramanga. This SAIC also includes Economic Development Master Plan (PDDE: *Plan Directeur de Développement Economique*) for these three communes.

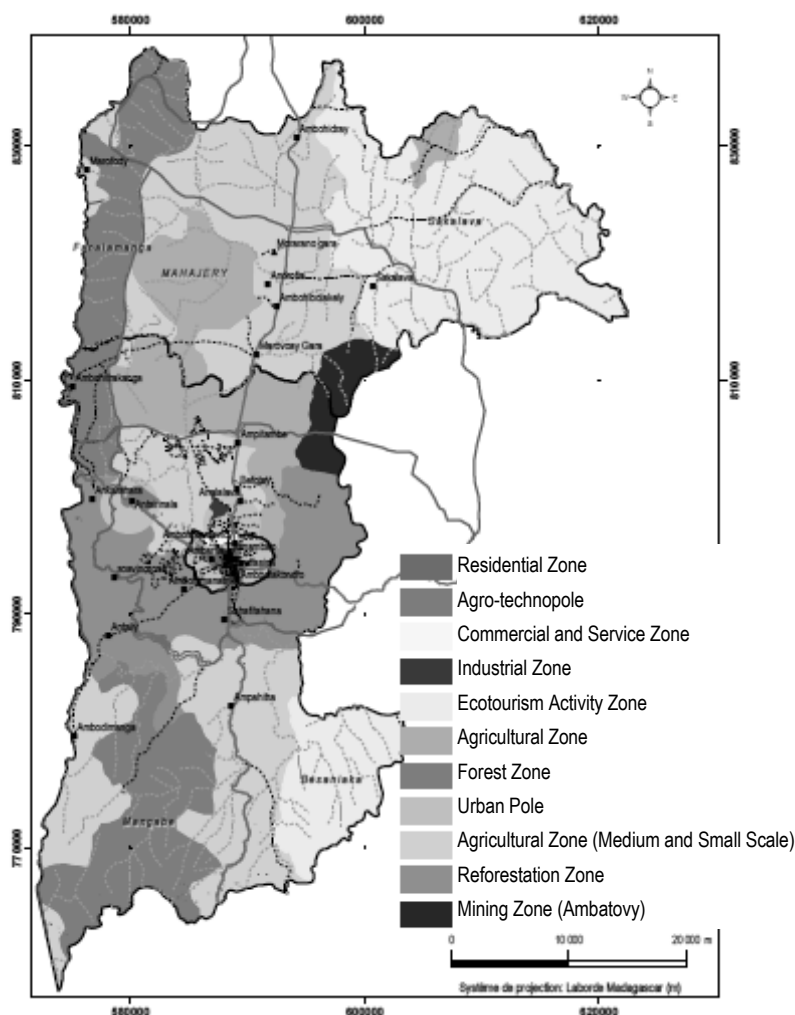
The vision stated in the SAIC for these three communes is as follows:

“Communes of Morarano, Ambohibary and Moramanga to grow industrial, green and reflection of cities”

These three communes have three major poles with the following characteristics:

- Moramanga City as administrative and commercial centre: Its location, its history and the dynamics of the territory will allow it to assert its leadership.
- Industrial hub in Ambohibary: The space at its disposal enables it to receive industrial units set up by investors from various backgrounds (local, national and even international). This industrialization will be supplied by the products of the commune itself and by Morarano for agribusiness.
- Agricultural cluster mainly in Morarano and the extreme north and south of Ambohibary, with food, vegetable and fruit production, meeting international standards and supplying regional consumption centres of Alaotra, Toamasina and Antananarivo, and the Ambatovy Project (125 tonnes of vegetables and fruits a year).

Figure 26.1.5 shows the general future land use plan for these three communes. The SAIC guides the location for manufacturing, commercial and service centre and technopole for agriculture.



Source: Madagascar Engineering Consultants, 2012, SAIC for Moramanga, Ambohibary and Morarano, Projet de Gouvernance des Ressources Minirales

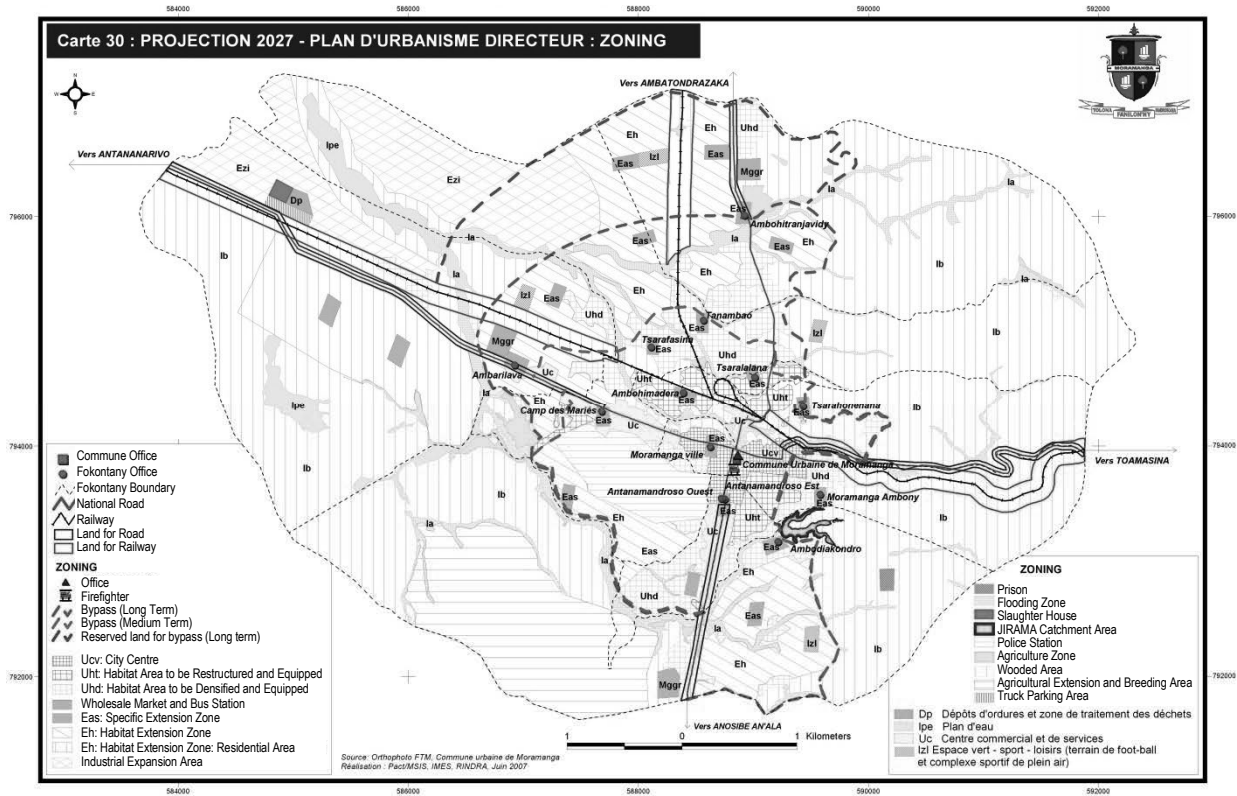
Figure 26.1.5 Future Land Use Plan for Moramanga, Ambohibary and Morarano

2) PUDi Moramanga Urban Commune

The Moramanga Urban Commune also has its own Urban Development Plan (PUDi: *Plan d'Urbanisme Directeur*), formulated in 2007. As the PUDi was created before the start of the Ambatovy Project, demographic projections and infrastructure plans do not match the reality of the city.

Some of the major infrastructures and facilities determined by PUDi for Moramanga Urbana Commune are the following:

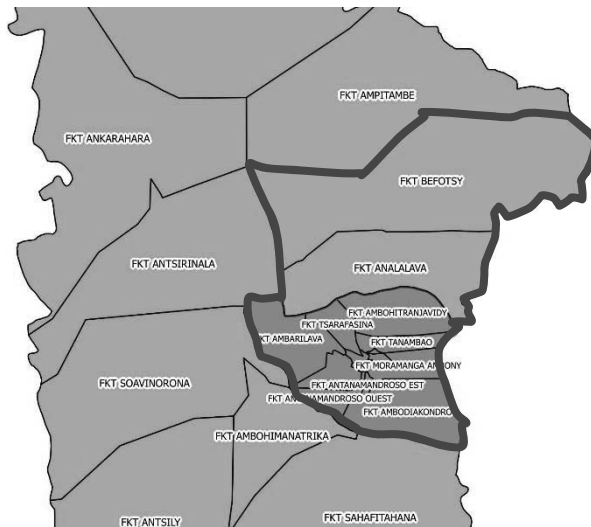
- Bypass roads for Moramanga Urban Commune
- Wholesale markets in the edge of the commune along the national roads
- Slaughter house along National Road No.2



Source: PUDI Moramanga 2007

Figure 26.1.6 Future Land Use Plan of Moramanga Urban Commune from PUDI 2007

Although, certain elements, such as the bypass road going around the city, are still relevant ideas that need to be considered in future plans, this PUDI is currently being revised. The revised PUDI for Moramanga now includes two fokontay in Ambohibary Rural Commune, namely Fokontany Analalava and Fokontany Befotsy, expanding the city towards the north.



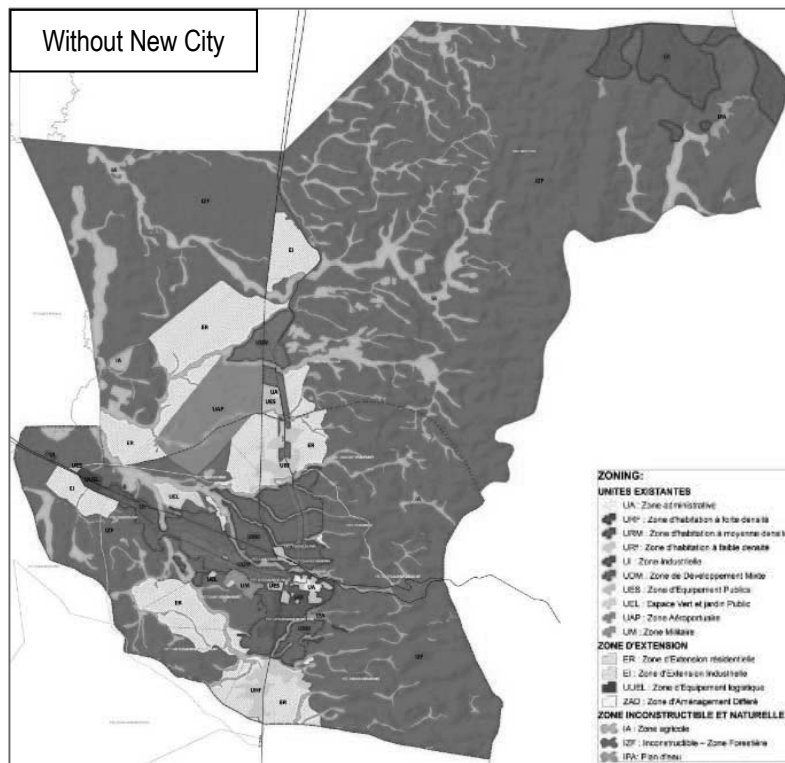
Source: JICA Study Team based on UNOCHA's data

Figure 26.1.7 Area Covered by Revised PUDI for Moramanga

At present two future structure are considered as shown in Figure 26.1.8. One considers the development of a new city in the north of the city, while the other does not.

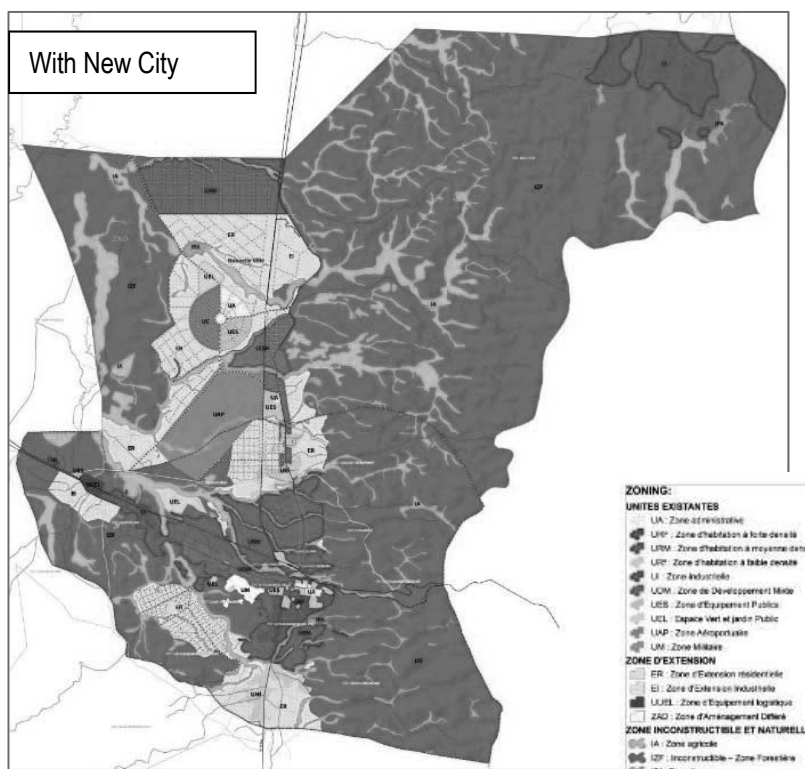
Major changes made in the revised PUDI for Moramanga besides the planning area are as follows:

- The route for Moramanga Bypass has been modified considering the landscape and available land in the east of Moramanga
- Location for Moramanga Airport is identified
- Residential area has expanded towards north and south from the city
- The land use for the city centre along NR2 and NR44 are designated as mixed development area
- New industrial areas are identified in the west of Moramanga and in Ambohibary Commune along the railway
- New city with residential area, administration centre and commercial area is planned in Ambohibary Commune



Source: Moramanga PUDi 2019

Figure 26.1.8 Proposed Development Option (With New City) in Revised PUDi 2019 for Moramanga Urban Area



Source: Moramanga PUDi 2019

Figure 26.1.9 Proposed Development Option (With New City) in Revised PUDi 2019 for Moramanga Urban Area

26.1.3 Development Potentials and Constraints for Economic Sectors in Moramanga Urban Area

(1) Present Situation of Economic Sectors in Moramanga Urban Area and Alaotra-Mangoro Region

The Ambatovy Project's nickel and cobalt open pit mine is located 10 km to the north of Moramanga city centre along the NR44, and 7 km to the east from the National Road No.44. From the mine, a pipe line carrying a mixture of ore and water runs 220 km along the NR2 to the Ambatovy refinery factory in Toamasina. The water used in the pipeline is taken from the Mangoro River, permitted to use up to 2% of the flow volume of the river.

The mine excavated under Ambatovy Project is said to last 30 years. However, Ambatovy relies its most workers and necessary services on out of Moramanga due to the lack of quality of local workers and service providers. Therefore, unfortunately, the city does not benefit any economic fallout from Ambatovy Project.

Along with the mining activity, Ambatovy has undertaken the management of large forested areas as biodiversity offsets.

Except for Ambatovy, industry in Mormanga is mostly dominated by JIRAMA, several sawmills and timber producers and exporters. FANALAMANGA S.A., the largest forestry company in Madagascar with 90% share of domestic timber market, manages the pine forest about 70,000 ha and eucalyptus about 4,000 ha in Alaotra-Mangoro Region. The company

employs about 1,600 people, and export 60% of its products to the surrounding countries including Mauritius, Reunion and South Africa¹.

Alaotra-Mangoro Region is the largest production area of rice in Madagascar with 100,000 ha cultivated area and about 257,000 tons production². Despite this fact, there are no major rice mills, packing facilities nor storages in Moramanga, which may be the regional hub for rice distribution. The World Bank is considering the rehabilitation of NR44 which will improve the connection between the rice production area and Moramanga.

Table 26.1.4 Production of Rice in the Alaotra-Mangoro Region (2016)

District	Cultivated Area (ha)	Production (Tonnes)
Ambatondrazaka	25,000	57,300
Amparafaravola	55,000	153,712
Andilamena	9,000	20,666
Moramanga	9,000	20,635
Anosibe an'ala	2,000	4,495
Region total	100,000	256,808

Source: Ministère de l'Economie et du Plan, *Monographie Regional Alaotra Mangoro Anee: 2016*

Other than rice, there are substantial production of various crops in the region, including maize, beans, groundnuts, cassava, fruits and vegetables.

Alaotra-Mangoro Region is also rich in tourist sites, most of which are parks and forest reserves, constituting habitats for the rich fauna and flora of the region. There are also lakes and waterfalls. In addition, there are excursion/camping sites and hiking trails. The region has a total of 305 hotel rooms and 106 bungalows, of which 125 rooms and 91 bungalows are in the district of Moramanga³. However, these accommodations are not enough to utilize the potential of tourism and increase the number of tourists and visitors.

Despite the above economic activities, informal jobs predominate in Moramanga. However, such informal job activities are beneficial to the economy as they provide employment for the poor.

(2) Present Situation and Problems of Infrastructures in Moramanga Urban Area for Development of Economic Sectors

Currently around 40% of the city has access to power supply⁴, created at the Mandraka Hydropower Plant and Anlekaleka Hydropower Plant. Under such situation, the houses for employees of the Ambatovy Project, which are provided by the Ambatovy Project, are equipped with seven solar panels.

To improve the power supply situation in Madagascar, JIRAMA is currently implementing with the assistance of World Bank, Least-Cost Electricity Access Development (LEAD) Project, which includes implementation of transmission line from Antananarivo Agglomeration to Toamasina via Moramanga. This transmission line will connect Moramanga with the national grid. Furthermore in 2024, Volobe Hydropower Station II will be developed to supply electricity to the national grid, providing enough electricity for Moramanga's industrial development.

On the other hand, the access to drinking water is adequate in Moramanga, however, the problem on water quality has been observed due to the pollution of source of water from Ambodiakondro.

¹ FANALAMANGA website (<http://www.fanalamanga.mg/accueil.html>) and the interview with the Director General of the company in June 2017.

² Ministère de l'Economie et du Plan, *Monographie Regional Alaotra Mangoro Anee: 2016*, September 2017.

³ Ministère de l'Economie et du Plan, *Monographie Regional Alaotra Mangoro Anee: 2016*, September 2017.

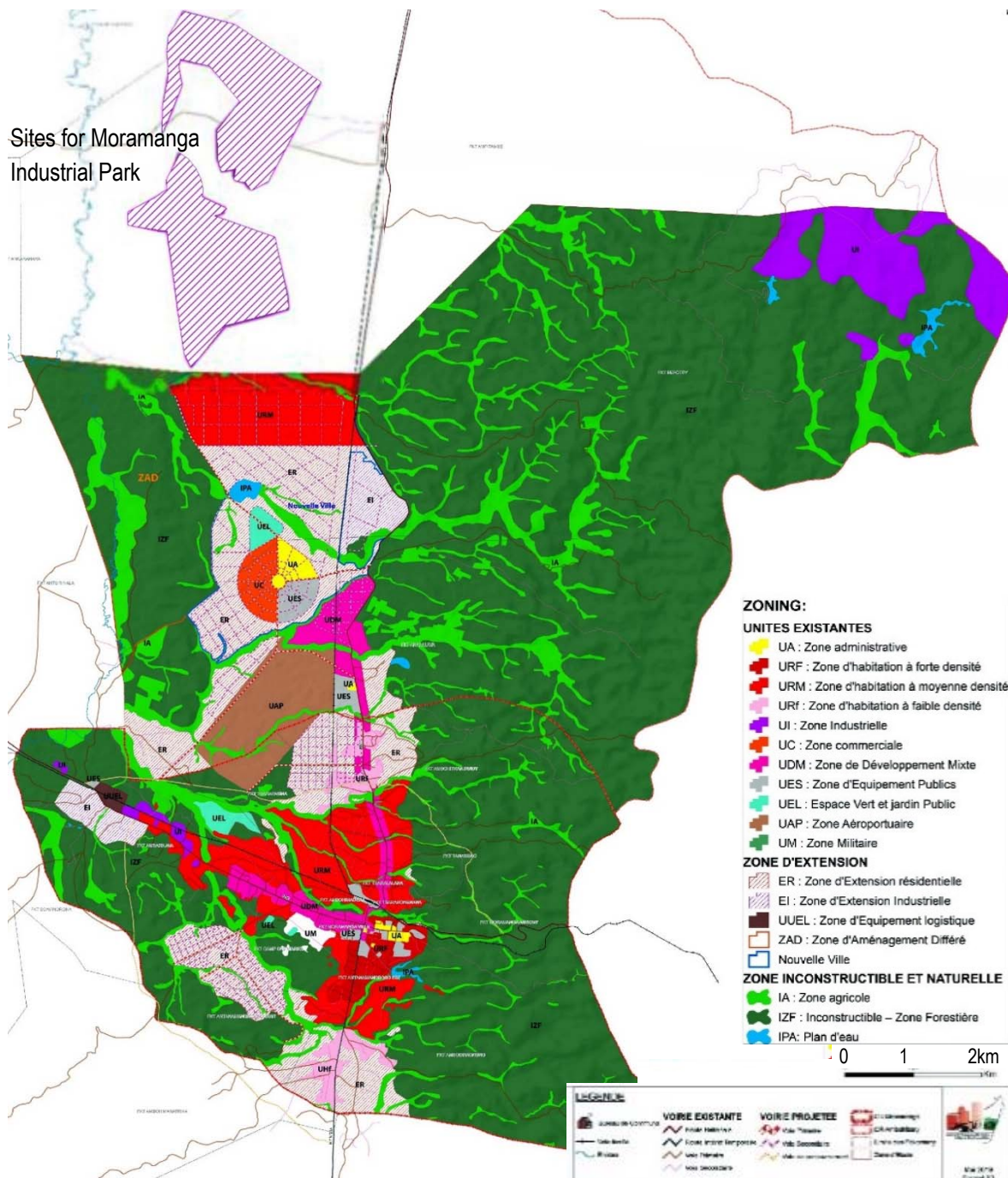
⁴ This information is based on the interview with the members of Moramanga Commune on the 6th June 2016.

Road networks, including drainage systems, are inadequate and outdated.

(3) Existing Project for Economic Sectors in Moramanga Urban Area

In Moramanga, financial study for establishment of Textile Industrial Park has been conducted. A Memorandum of Understanding was signed between EDBM and Mauritius Africa Fund Ltd. for the development of 80 ha of this industrial park during the last Business Forum Madagascar-Mauritius in March 2019.

Unfortunately, PUDi which is currently been revised for Moramanga does not include the area for the Textile Industrial Park planned in Fokontany Ampitambe.



Source: JICA Study Team based on information from MAHTP

Figure 26.1.10 Proposed Site for Textile Industrial Park in Moramanga

In addition to the Textile Industrial Park Project, another industrial park is planned to be developed with the cooperation between Moramanga Urban Commune and Chinese private companies. A feasible study for the industrial park is already completed but still needs to determine the location for the industrial park since the location identified was the same site as the Textile Industrial Park.

The project by the Chinese private companies aims to:

- Set up 25 to 30 factories on a plot of 200ha
- Build social housing for employees
- Create 500,000 jobs in space of 2 years from 2018
- Set up a farm and agriculture on a plot of 20ha

In terms of energy, the industrial park will use heavy oil. A partnership agreement with Madagascar Oil has already been signed.

(4) SWOT Analysis of Moramanga Urban Area

SWOT analyses for Moramanga Urban Area was conducted in order to see the possibilities to attract investments to economic sectors and to manage the development of economic sectors as shown in Table 26.1.5.

Table 26.1.5 SWOT Analysis of Moramanga Urban Area

Strengths	Weaknesses
<ul style="list-style-type: none"> • Moramanga area has tree plantations and natural forests for timber production. • Ambatoby mining site of nickel and cobalt is located near Moramanga. • Moramanga is a junction between NR2 and NR44. NR44 connects with Alaotra Lake Area, which is a good rice-producing area. • Moramanga is accessible to Toamasina Port by both road and rail. • The climate of Moramanga is mild and more comfortable compared to Toamasina 	<ul style="list-style-type: none"> • The condition of economic infrastructure (such as those for power supply, water supply and access roads) is poor. As a result, it is difficult to attract investments to economic sectors. Development of the economic sectors is not well promoted. • With only economically active population less than 200 thousand existing in Moramanga District, there are not enough workforces, nor have most people received any training to work in the manufacturing industries. Therefore, it is necessary for Moramanga to accommodate an influx of migrant people with training and skills, while it is also important train local people for incoming industries. • The two-lane NR2 currently functions as a major urban road for the residents. However, many heavy vehicles use the same road to travel between Antananarivo and Toamasina, disturbing the city function.
Opportunities	Threats
<ul style="list-style-type: none"> • Moramanga has good access with some of the major tourist destinations in Madagascar, such as Andasibe and Alaotra Lake, which are accessible from Moramanga by both rail and road. • Mauritius Government has agreed to develop a Textile Industrial Park in Moramanga, which can benefit the local people. • Chinese private companies also have a plan to develop an industrial park in Moramanga. • These possibilities of development by economic sectors in Moramanga will be enhanced by the prospective expansion of Toamasina Port. • There is a large area in the north of Moramanga where potential of agriculture production in various crops is not yet fully exploited. • A new power substation will be constructed in Moramanga so as to connect a power transmission line between Antananarivo and Toamasina. Then the increased power supply will be available in Moramanga. Because of the relative proximity to Toamasina Port and the availability of improved power, Moramanga will be able to attract investments to its economic sectors. 	<ul style="list-style-type: none"> • There is a possibility that more fund for infrastructure development will be used intensively for Antananarivo Agglomeration and Toamasina Agglomeration, and not for Moramanga, partly because of development policies, and partly because of Madagascar's limited financial budgets for development.

Source: JICA Study Team

26.2 Vision and Socio-economic Framework for Moramanga Urban Area

26.2.1 Future Vision for Moramanga Urban Area

A future vision for Moramanga in 2033 is set as follows:

Statement of Future Vision

Based on its function to be enhanced as a major urban centre and its strategic location between Antananarivo and Toamasina, Moramanga will be an industrial and tourist city endowed with rich nature and mountainous landscape.

Guided by the vision statement, the goals for Moramanga are specified in order to articulate the development directions.

Goals

- Moramanga will host textile and agro-processing industries targeting regional consumers' markets in Africa and Indian Ocean, as well as Europe and USA utilising its locational advantage compared with Antananarivo.
- Moramanga will provide its residents and visitors with healthy and comfortable living environment so that people and businesses could enjoy Moramanga's potentiality for social and economic development.
- Development of Moramanga will support economic growth of Madagascar by providing a new destination for international investors, utilising its strategic location which is closer to Toamasina than Antananarivo and also is closer to Antananarivo than Toamasina.

26.2.2 Population Framework for Moramanga Urban Area

Table 26.2.1 shows the future population framework of Moramanga Urban Area consisting of Moramanga Urban Commune and Ambohibary Rural Commune, for the short, medium and long terms. The population framework is prepared based on past trend of population growth in each commune, as well as taking in consideration of the planned development related to Textile Industrial Park in Ambohibary Rural Commune.

Table 26.2.1 Future Population Framework for Moramanga Urban Area

	Population				Average Annual Growth Rate of Population		
	2018	2023	2028	2033	2018-23	2023-28	2028-33
Moramanga Urban Commune	58,753	72,693	90,092	111,731	4.35%	4.39%	4.40%
Ambohibary Rural Commune	40,800	50,096	62,562	79,010	4.19%	4.54%	4.78%
Moramanga Urban Area	99,553	122,789	152,654	190,741	4.28%	4.45%	4.56%
Urban Areas Outside Moramanga	253,321	282,495	317,533	358,723	2.20%	2.37%	2.47%
Moramanga District	352,874	405,284	470,187	549,464	2.81%	3.02%	3.17%

Source: JICA Study Team

26.3 Development Scenario for Moramanga Urban Area

Development efforts at economic sectors for Moramanga will take advantage of NR2 to be upgraded and railway to be rehabilitated for the purpose of economic sectors development in both Antananarivo Agglomeration and Toamasina Agglomeration.

Target economic sectors for Moramanga includes textile and agro-processing industries to be newly developed, as well as wood industry and tourism industry existing in Moramanga and its surrounding areas.

1) Phase 1: 2019-2023

Existing industries such as wood industry, which has been one of the major economic activities in Moramanga as well as tourism industry utilising the existing railway to Andasibe will be promoted. The first phase of the construction work for Moramanga Industrial Park in Fokontany Ampitambe is planned to start by 2020. To prepare for the operation of the industrial park, human resources of the local personnel should be developed. Moramanga will also be connected with national grid by 2022 and will be able to not only provide power supply for industry but also for improving the living standard of the residents in Moramanga Urban Area. In addition, the construction of Moramanga Bypass will not only benefit the through traffic of Moramanga but also improve the urban mobility and safety in Moramanga.

2) Phase 2: 2024-2028

The operation of Moramanga Industrial Park will start in 2025, while the construction of Phase 2 will continue. Textile industries will be promoted in Moramanga. For local SMEs to benefit from the industrial park, a linkage between textile companies in the industrial park and local SMEs should be promoted.

3) Phase 3: 2029-2033

Agro-processing industries will be promoted as new industries. Development of Moramanga Industrial Park is planned to be completed by 2035.

Table 26.3.1 Phased Development Scenario for Economic Sectors of Moramanga Urban Area

Phase	Phased Development of Moramanga's Economic Sector	Infrastructures to be Implemented for Economic Sectors
Phase 1 (2019-2023)	<ul style="list-style-type: none"> Human Resources Development of Local Personnel for Tourism, Wood and Textile Industries Tourist Promotion for Moramanga by taking advantage of Mantadia National Park and by operating Tourism Railway connecting Moramanga and Andasibe Reviving of Tree Plantations and Wood Processing Industries 	<p><u>Projects to be Completed</u></p> <ul style="list-style-type: none"> Development of Hotels for Business and Tourism in Moramanga Urban Area Rehabilitation of Railway Section between Moramanga and Andasibe New Substation in Moramanga Transmission Line between Antananarivo and Toamasina via Moramanga <p><u>Projects Under Construction</u></p> <ul style="list-style-type: none"> Moramanga Bypass Road Moramanga Industrial Park (Textile City in Moramanga)
Phase 2 (2024-2028)	<ul style="list-style-type: none"> Continuation of Tourism Development Continuation of Tree Plantations and Wood Industries Promotion of Investment to Textile Industries in Moramanga Industrial Park Promotion of Linkage between Textile Companies and Local SMEs/ Local Personnel 	<p><u>Projects Under Construction</u></p> <ul style="list-style-type: none"> Expansion of Moramanga Industrial Park (Textile City in Moramanga)
Phase 3 (2029-2033)	<ul style="list-style-type: none"> Continuation of Tourism Development Continuation of Tree Plantations and Wood Industries Promotion of Textile Industries in Moramanga Industrial Park Promotion of Agro-processing Industries in Moramanga Industrial Park Promotion of Linkage between Textile Companies and Local SMEs/ Local Personnel 	<p><u>Projects Under Construction</u></p> <ul style="list-style-type: none"> Expansion of Moramanga Industrial Park (Textile City in Moramanga)

Source: JICA Study Team

26.4 Strategies for Economic Sectors in Moramanga Urban Area

26.4.1 Objectives for Economic Sectors in Moramanga Urban Area

The objectives for economic sector in Moramanga Urban Area are defined as follows:

- To prepare necessary infrastructure not only to support industrial development but also to accommodate the migrant workers and tourists from outside Moramanga
- To construct a bypass road for Moramanga not only for avoiding through traffic from the city centre, but also for ensuring the safety of residents of Moramanga
- To promote harmonized development by providing chance to the current residents of Moramanga to work in the Economic Development Zone (for attracting investment to economic sectors) and / or Industrial Park, as well as by promoting agriculture and tourism.

26.4.2 Strategies for Supporting the Development of Economic Sectors in Moramanga Urban Area

The strategies for the development of economic sector in Moramanga are as follows:

(1) Manufacturing and its Related Service Sector

- To prepare necessary water and electricity for manufacturing development
- To prepare necessary social infrastructure for the future increasing population
- To develop bypass road which will shorten the travel time not only between Antananarivo and Toamasina, but also between industrial areas of Moramanga and both Antananarivo and Toamasina
- To support Technical and Vocational Education and Training (TVET) institutes for providing chance to the residents of Moramanga to work as skilled labour force
- To promote linkage between large-scale incoming investment projects and local industries by creating company database of local SMEs and by matching both of these

(2) Agriculture and Agro-processing Sector

- To intensify supervisory and support action for agriculture and agro-processing
- To promote and revitalize farmers organizations
- To promote linkage with existing research and training centers for agriculture and forestry in the region
- To promote major agriculture sector programmes (CASEF, PROSPERE, DEFIS, etc.) to be extended to the region
- To enhance the function as a logistics hub for rice and agriproducts distribution

(3) Tourism Sector

- To develop and upgrade necessary accommodations for tourists and visitors for research and training in Moramanga Urban Area
- To promote linkage between tourism industry and local providers of food, linen, transportation and other services in Moramanga Urban Area
- To collaborate with reforestation and forest conservation activities by forestry and mining industries (FANALAMANGA and Ambatovy) in promotion of ecotourism in Andasibe and Aloatra Lake.

26.4.3 Projects for Supporting the Development of Economic Sectors in Moramanga

The necessary projects for supporting the development of economic sectors in Moramanga Urban Area is listed below.

- [E-I-01] Project for Establishment of Moramanga Industrial Park
- [E-I-02] Project for Promoting Linkage between Large Companies and Local SMEs in Moramanga Urban Area
- [E-I-03] Project for Development of a Centre for Technical and Vocational Education and Training (TVET) in Moramanga
- [E-E-04] Project for Environmental Protection of Ambodiakondro Water Source
- [E-T-01] Project for Rehabilitation of Railway between Moramanga and Andasibe for Tourists as part of [E-F-01] Project for Rehabilitation of Antananarivo-Toamasina Railway
- [E-P-01] Project for Installation of New Transmission Line between Tana Nord 2 Substation and New Moramanga Substation as part of [A-P-06] Installation of New Transmission Lines for Antananarivo Agglomeration Phase 1
- [E-P-02] Project for Installation of New Moramanga Substation as part of [A-P-07] Installation of New Substations Phase 1

Besides the above, the following capacity development project for communes along TaToM Economic Axis should be considered.

- [E-DC-01] Capacity Development for Commune Officers along TaToM Economic Axis for Promoting TaToM Development Strategies

26.4.4 Project Profiles of Priority Projects for Supporting the Development of Economic Sectors in Moramanga

(1) Project for Establishment of Moramanga Industrial Park

1) Rationale

The content of a Bill for industrial area is currently being discussed in Malagasy Government. In addition, Economic Development Board of Madagascar (EDBM) obtained a loan from the African Development Bank, to finance the implementation of the Investment Promotion Support Project (PAPi).

This project aims to support the Government's efforts to create the conditions for strong, inclusive and sustainable economic growth, through the initiative of private investment in priority sectors, and the establishment of a public-private partnership (PPP) framework to mobilize resources for development and modernization of infrastructure.

In this context, EDBM launched a feasibility study on the establishment of an industrial park in Moramanga, and in agreement with the general programme of the State based on the Initiative for the Emergence of Madagascar (IEM), which promotes the country's industrialization and the improvement of production and industrial processing through dedicated areas.



Figure 26.4.1 Perspective view of Moramanga Industrial Park

2) Objective

The main objective of the industrial park project is to create development synergies, attract local and foreign private investment, to increase production and exports volume, and stimulate job creation.

The challenges and specific objectives of the project are:

- To develop industrial value chains in a healthy and sustainable policy framework
- To reduce dependence on imports and better meet demand through domestic production
- To encourage the development of dedicated areas
- To reduce overall production costs for industrial facilities
- To enhance the benefits of technology transfer between small and medium-size companies throughout the industrial value chain

3) Project Description

The Malagasy Government plans to establish an industrial park, called "Textile City" in Moramanga Urban Area, in the Rural Commune of Ambohibary, Fokontany Ampitambe.

The proposed location for the Economic Sectors Development Zone (for attracting investments for economic sectors) is state-owned land approximately 10km north of Moramanga city centre near National Road No. 44 (See Figure 26.4.2). The total area of this state-owned land is approximately 700 ha.

Oriented textile, industrial park is expected to develop in three phases over a total area of about 680 ha of land belonging to the state, roughly an area of 200 ha to be operated by phase.

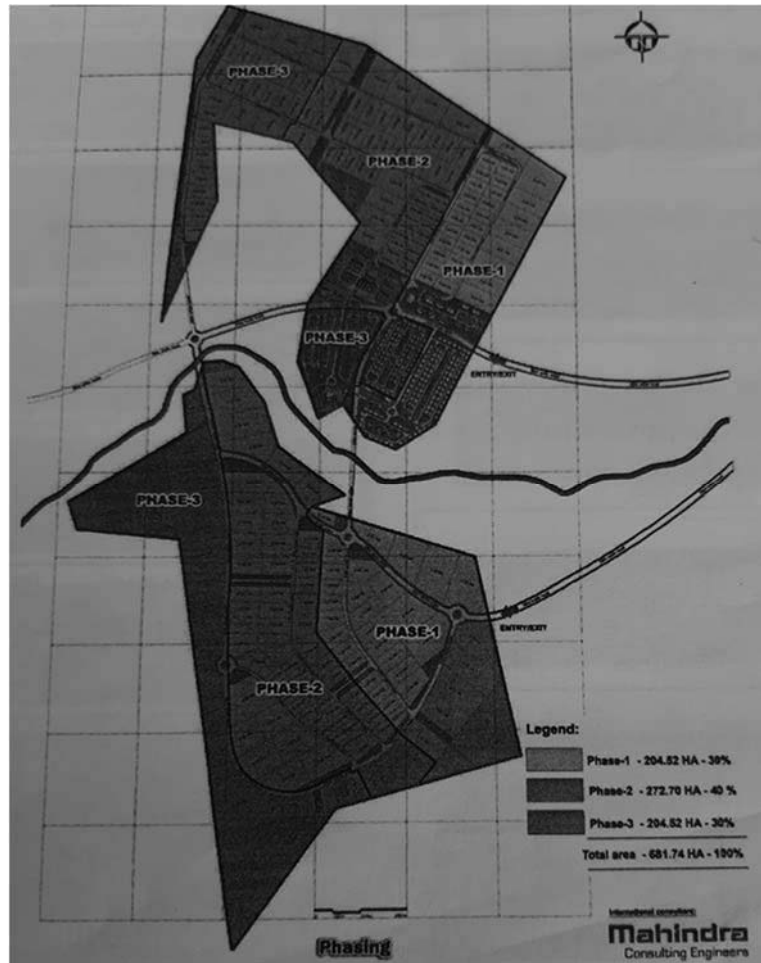


Figure 26.4.2 Project Development by Phase for Moramanga Industrial Park

4) Expected Benefits

The following benefits are expected:

- Provide job opportunities for the residents of Moramanga Urban Area
- To diversify the concentration of people, goods, capital and information in Antananarivo Agglomeration to other areas in Madagascar
- In terms of job creation, this project is expected to generate approximately 382,000 direct jobs generated until 2035, after the absorption phase.

5) Executing Agency and Related Institutes

The Economic Development Board of Madagascar (EDBM), as an agency for investment promotion, is the main designer of the project.

The EDBM working to this end in close collaboration with sectoral ministries, including the Ministry of Industry (MICA), the Ministry of Energy (MEEH), the Ministry of the Environment (MEDD) and the Ministry of Spatial Planning (MAHTP).

6) Estimated Project Cost

The development cost of this project is estimated at around 325 million Euro, this does not include the cost of land acquisition.

7) Implementation Schedule

In the feasibility study, a timing assumptions was developed and for each phase (of 200 ha), the construction period is estimated at 5 years, and absorption begins one year after the start of construction.

If the project is implemented from 2020, it is assumed that the absorption will be complete by 2035.

8) Necessary Actions for Implementation / Critical Factor

In addition to the feasibility study and identification of the regulatory framework to be adopted, the steps required for the implementation of the project are:

- Environmental and social impact study,
- Design and the estimation of off-site infrastructure, for the development of the industrial park,
- Defining rules to control the development of the park,
- Selection of the developer,
- Implementation of a one-single desk
- Construction of the industrial park,

9) Related Plans and Projects

Besides the industrial components (manufacturing area, specialized infrastructure area, logistics area), the park will also be composed of administration block, exhibition pavilions, residential areas, greenery and open spaces

10) Social and Environmental Impacts

From the planning phase, an environmental and social impact assessment is intended to assess risks and establish measures to be adopted to counteract the negative effects or to reduce them to acceptable levels, and also to maximize the positive effects.

During the first visit on field, EDBM team have already identified the presence of some settlements in the northeast of the area, which should be moved. A resettlement programme is already expected.

Furthermore, the design and development of this site will meet the principles of environmental sustainability: minimum use of water and energy resources, rainwater recovery, treatment of wastewater, the concept of green building, etc.

(2) Project for Promoting Linkage between Incoming Large Companies and Local SMEs in Moramanga Urban Area

1) Rationale

Moramanga Urban Area is considered a strategic area for industrial development and tourism development. It is expected to accommodate a large-scale textile industrial park and other industrial estates. Furthermore, taking advantage of its proximity to Andasibe and other forest areas, it is considered to establish a tourist base (hotels and guesthouses) where tourist overnight in Moramanga and enjoy its surrounding natural areas.

However, since Moramanga Urban Area does not have enough capable and skilled labour forces at present, it is inevitable to accommodate incoming workers from outside Moramanga Urban Area. At the same time, it is essential to train local personnel and local SMEs by providing working and business opportunities with incoming large companies.

2) Objective

The objective of this project is to promote linkages between large-scale incoming investment projects (companies) and local SMEs and local personnel.

3) Project Description

For this purpose, company directories of both large-scale companies and local SMEs are to be prepared, and matching of both parties will be done.

UNIDO has support programmes in various countries to establish company databases, which will be utilised for creating linkages and for providing business consultation.

PART VI

IMPLEMENTATION PLAN FOR TATOM

Chapter 27 Planning and Implementation Frameworks for Madagascar and TaToM

27.1 Introduction

This chapter contains a variety of institutional aspects related to land administration, planning, and implementation of socio-economic and spatial development plans. This chapter also proposes an implementation framework for TaToM's development plans and priority projects.

27.2 Planning Framework in Madagascar

27.2.1 Development Planning System of Madagascar

There are three types of planning systems in Madagascar, which are socio-economic development plans, physical development plans and urban development plans. The socio-economic development plans have three tiers which are National Development Plan (PND: Plan National de Développement), Regional Development Plan (PRD: Plan Régional de Développement) and Communal Development Plan (PCD: Plan Communal de Développement).

These development plans should be formulated at the level shown in Table 27.2.1. This section describes the socio-economic development plans, while Sections 27.2 and 27.3 describe the physical development planning system and urban planning system respectively.

Table 27.2.1 Planning System of Madagascar

	Socio-economic Development Plan	Physical Development Plan	Urban Development Plan
National	National Development Plan (PND)	National Land Use Plan (SNAT: Schéma National d'Aménagement du Territoire)	
Province		Provincial Land Use Plan (SPAT: Schéma Provincial d'Aménagement du Territoire)	
Region	Regional Development Plan (PRD)	Regional Land Use Plan (SRAT: Schéma Régional d'Aménagement du Territoire)	
Inter-Commune		Inter-communal Land Use Plan (SICAT: Schéma Inter Communal d'Aménagement du Territoire) ¹	Urban Master Plan (PUDi: Plan d'Urbanisme Directeur)
Commune	Communal Development Plan (PCD)	Communal Land Use Plan (SCAT: Schéma Communal d'Aménagement du Territoire) ² / Local Land Use Plan (PLOF: Plan Local d'Occupation Foncière)	PUDi / Detailed Urban Plan (PUDé: Plan d'Urbanisme Détail)
Local		PLOF	PUDé

Note 1: SICAT is defined in the new planning law Act No. 2015 – 051 and was previously known as Inter-Communal Physical Development Plan (SAIC: Schéma d'Aménagement Inter Communal)

Note 2: SCAT is defined in the new planning law Act No. 2015 – 051 and was previously known as Communal Physical Development Plan (SAC: Schéma d'Aménagement Communal)

Source: JICA Study Team based on Act No. 2015 – 051

(1) National Development Plan

National Development Plan (PND: *Plan National de Développement*) translates the General Policy of the State (PGE: *Politique Générale de l'Etat*) into tangible objectives and strategies. PGE is a plan each new Government prepares at the beginning of its administration period.

(2) Regional Development Plans

A Regional Development Plan (PRD: Plan Régional de Développement) is to be prepared for each region every five years. According to Act No. 2014-018 Article 30, the region is responsible for preparing the PRD.

(3) Communal Development Plan

According to the Act No. 2014-018 Article 28, a commune is responsible for preparing a Communal Development Plan (PCD: Plan Communal de Développement).

Most communes formulated PCD for their commune for the period of 2004-2009. However, most communes have not updated their PUDs.

27.2.2 Spatial Planning System

In order to better control territorial management and spatially harmonize economic development, two laws of framing and orientation have been promulgated: the Laws of Orientation of Land Use Planning (LOAT: 2015-051), which is the land-use planning guideline, constitutes the first reference legal framework for regional planning. And the Law on Urbanism and Housing (LUH: 2015-052), which is a reform of the old urban planning code.

There are also two policy documents related to spatial planning in Madagascar which are National Land Use Policy and National Urban Development Policy.

(1) The Law 2015-051; Guidance Concerning the Planning (LOAT)

The Law 2015-051: Guidance Concerning the Planning (LOAT) is geared towards spatial planning and sets the general legal framework for national land-use planning with a view to sustainable development.

It aims to:

- Ensure a balanced distribution of population and activities within the national territory;
- Ensure the spatial coherence of public and private activities contributing to the development of the territory; and
- Generate conditions for development adapted to regional and local specificities

The LOAT, as a guideline law, defines the guiding principles, the objectives, the various tools, the means of implementation of the Territorial Development according to the PNAT. It then applies to all operations relating to the occupation of space, to the allocation or distribution of activities, infrastructures, equipment and services on the national territory. Finally, it determines the competences of all actors in terms of land use planning.

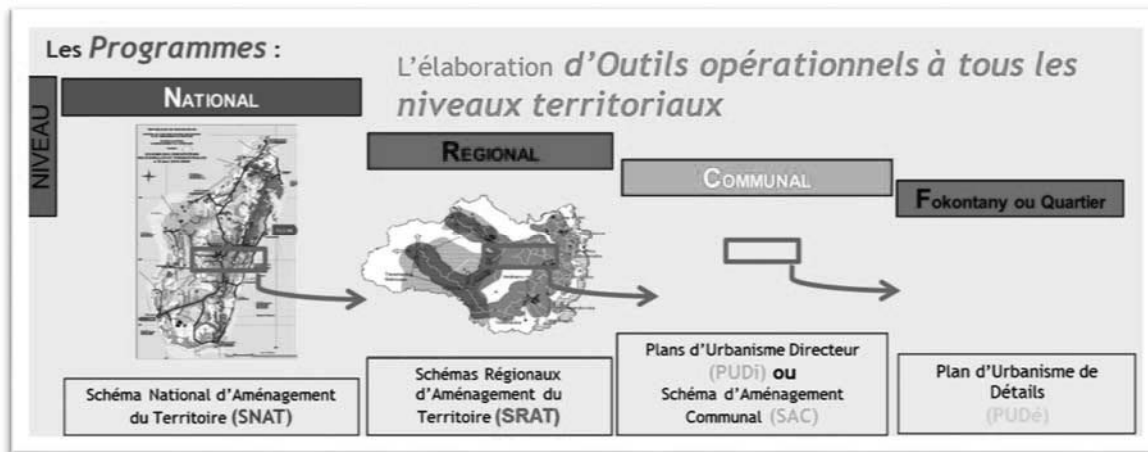
The planning tools set out in the LOAT (Title III, Article 32) are as follow:

- National policy of spatial planning (PNAT)
- National land policy (PNF)
- National land use planning scheme (SNAT)
- Provincial land use planning plan (SPAT)
- regional land use planning (SRAT)
- inter-municipal land-use planning scheme (SAIC)
- municipal planning scheme (SAC)
- strategic orientations plan for the development of metropolitan areas or agglomerations whose urbanization encroaches on several municipalities;
- town planning plans (PUDi, PUDé)
- local land-use plan (PLOF)

These tools are mandatory for spatial planning actors and serve as a reference framework for the policies, programs and projects of the ministries and the CTDs (Regional and local authorities).

All legislative and regulatory texts currently being drafted or revised must conform to the provisions of the LOAT (Art. 75).

Figure 27.2.1 and Table 27.2.2 summarizes the hierarchical relationship of spatial plans.



Source: JICA Study Team

Figure 27.2.1 Relationship of Plans at Levels from National, Regional and Communal to Fokotany

Table 27.2.2 Spatial Planning Framework of Madagascar

	Land use plan (Spatial plan)	Urban plan (Spatial plan)
National	National Land Use Policy (Politique Nationale de l'Aménagement du Territoire: PNAT)	National Urban Development Policy (PNLU)
National	National Land Use Plan (Schéma National de l'Aménagement du Territoire: SNAT)	-
Provincial	Provincial Land Use Plan (Schéma Provincial de l'Aménagement du Territoire: SPAT)	-
Regional	Regional Land Use Plan (Schéma Régional de l'Aménagement du Territoire: SRAT)	-
Inter- commune	Inter-commune Land Use Plan (Schéma Inter-communal de l'Aménagement du Territoire: SAIC)	Urban Development Plan (Plan d'Urbanisme Directeur: PUDI)
Agglomeration	P.O.S.	-
Communal	Commune Land Use Plan (Schéma Communal de l'Aménagement du Territoire: SAC)	Urban Development Plan (PUDI)
Urban Sector / Fokotany	P.A.F.	Detailed Urban Plan (Plan d'Urbanisme de Détail: PUDé)

Source: JICA Study Team

(2) The Law on Urban Planning and Housing 2015-052 (LUH)

The Law on Urban Planning and Housing 2015-052 (LUH) is a recast of the old urban planning code. It innovates in three directions, emphasizing the effective decentralization to the municipalities of planning and urban planning, Institutional arrangements by clarifying the roles of each entity, in particular the National Committee for Regional Development, the Provincial Committee, the Regional Planning Committee and the growing role of the Region in the implementation of regional planning And urban planning. Such notions of planning and town planning lead in the third direction, which, in a concern for rigor and control of space, is to relativize the use of these notions whose urban planning occupies a constantly increasing place in spatial planning.

The LUH revolves around the following basic considerations:

- Implementation of the responsibility of the municipalities, both urban and rural, in urban

development;

- Elaboration of the various territorial planning tools accessible to urbanized or urbanizing municipalities;
- Coverage of all agglomerations through the national planning regulations dictating any granting of building permits in the Commons;
- Development of certain provisions of the former Urbanism and Housing Code that are useful in the current context;
- Introduction of new planning systems such as the Delimited Development Zone and the Concerted Development Zone;
- Improvement of the procedures for issuing the building permit in the sense of simplifying and shortening the processing time of the related files; and
- Upward revision of the quantum of penalties for offenses relating to urban planning and housing.

As mentioned above, the urban planning system in Madagascar is stipulated in the Urban Planning and Housing Law 2015-502 (LUH).

LUH, in Art. 29, provides that the master plan sets out strategic planning guidance for an agglomeration whose development is to be a comprehensive study because of the interdependence of its various spatial components in the economic, social and environmental. The agglomeration may include one or more urban communes and/or part or all of one or more adjacent rural communes. At the same time, the master plan determines the general purpose of land and, where necessary, the nature and layout of the facilities and infrastructure, in particular transport, the location of important services and activities.

Art 30 states that it sets out general guidelines for the extension of urbanization and the restructuring of urbanized areas, as guidance plan for the next fifteen (15) years. And the Master Plan shall be established taking into account the guidelines of National Land Use Plan (SNAT) and the Regional Land Use Plan (SRAT).¹

1) Urban Master Plan (PUDi)

Article 31, for the agglomeration concerned, that the Urban Master Plan shall include the following information:

- Objectives and management options for new territories to be urbanized and priorities for their opening to urbanization;
- Territories where urbanization is prohibited;
- Agricultural land and forest areas to be preserved;
- Territories to be preserved, such as natural, historical or archaeological sites;
- Land development schemes;
- Programming of equipment and structuring roads;
- Large equipment;
- Principles of organization of transport and travel;
- Territories in which the State, the Commons or the public institutions;
- Land reserves;
- Principles of sanitation and main points of discharge of waste water; and
- Places for domestic waste disposal.

The master plan also determines the share of social housing to be provided in each of the sectors and the parts of territory in which detailed plans should be drawn up.

¹ LUT Article 30

2) Detailed Urban Plan

The Detailed Urban Plan (PUDé: *Plan d'Urbanisme de Détail*) is stipulated in Articles 33 through 35 of the LUH. Article 33 provides the detailed urban plan studies of particular areas of the director or urban plan of the commune according to the specific sectors or neighbourhoods. And it is used for local use, and the preparation of a detailed urban development plan is preceded by the establishment of the Local Tenure Plan of the sector or district concerned.

The PUDé, as provided in Art. 34, is applied to the specific area (territory) in a ten-year perspective, and set out land use regulations, and defines the following:

- Particular patterns of land use and density of occupation;
- Development and development of neighborhoods;
- Actions to revitalize urban areas and to reduce unhealthy habitat;
- Concerted development zones;
- Delimitations of the deferred management zones and provisional perimeters;
- Sectors where the State and the municipalities can constitute land reserves;
- Safeguard areas and buffer zones;
- Methods of preventing pollution and nuisances of any kind;
- Layout of main, secondary and tertiary public thoroughfares, fire lanes, their right-of-way and characteristics, excluding lanes intended only for serving buildings;
- Rules and easements of buildings justified by the character of the premises or the necessities of the operation of the public services;
- Preliminary detailed projects for supply of drinking water and sanitation to the district concerned;
- Estimate of the operations envisaged by the plan;
- the urgency of the operations provided for in the said plan;
- Locations of hydrants; and
- Security perimeters of strategic sites such as barracks and military maneuvering areas.

(3) National Land Use Policy

The PNAT expresses the will and commitment of Madagascar to develop the territory with a view to its optimal use, its rational economic stabilization for the welfare of its people in the perspective of sustainable development concerned with the quality of the environment. The PNAT aims to:

- Define and lead development challenges,
- Fighting poverty, which is a national priority,
- Contribute to the implementation of the Millennium Development Goals (MDGs),
- Controlling the economic and
- Support the opening-up and development of the market economy.

In terms of urban development, the main axes and orientations t are:

- The extension of the existing and the creation of new cities at all scales and for all types of cities without exception;
- The drawing up and adoption by all cities of a Urban Planning Scheme, a Director Urban Planning Plan, Detailed Urban Planning Plans and, in general, any Based on the Local Land Use Plan (PLOF)
- The constitution of land reserves for housing,
- Habitat development on the basis of an annual program.

The PNAT recommends that the coherence of the actions of management and development of the territory will be done through an overall scheme which is the SNAT. At the regional level, this national policy is consolidated by the development of a regional land use scheme (SRAT), which constitutes a consensual territorial management tool according to the principle of localization and use of the land.

(4) National Urban Development Policy (PNUD)

According to the Concept Note: “Toward a National Urban Development Policy (PNDU) for Madagascar”, PNUD has the following objectives and scope:

- The PNUD must firstly lay the foundations for a better organization of demographic and spatial growth of cities, both large and small, to avoid chaotic development and, and secondly improve and gradually equip existing neighborhoods.
- Restructuring and improving of precarious neighborhoods, even to the point of relocating their inhabitants when necessary, must remain a major focus of public policy intervention to improve living conditions and reduce the vulnerability of the poorest people.
- The PNDU fits into the overall national development policy. The PNDU should provide a framework for developing relevant urban models to needs and context of the country, economically efficient, socially just, resilient and sustainable, in line with rural and regional development.
- This policy should define institutional arrangements to better plan and manage cities and their extensions in line with decentralization and identify the principles for efficient and transparent mobilization of necessary resources, a transparent and efficient organization of public-private partnerships, a strengthening of citizen participation in order to facilitate everyone’s access to basic services and development opportunities.
- The PNDU is for all citizens, economic and community actors, as well as all state institutions. It spells out main principles of intervention and roles of the State, regional and local authorities, private sectors and communities, and organizes the way they interact among them in the urban territory. The guidelines and principles of the PNDU will allow better coordination of sectoral policies on urban spaces to ensure integrated development. The PNDU will also help to better articulate actions and projects initiated by various stakeholders, both public and private. Necessary actions to be carried out in the short and medium term by the various stakeholders will be included in a National Strategy for Urban Development (SNDU).
- The PNDU is to be implemented nationally, regionally and locally through (i) a framework and some prospective strategic planning tools in order to organize the future around a vision of cities shared by all, (ii) laws, plans and regulatory tools to ensure the daily management of cities, organize their extensions and ensure the sustainability of public and private investment, and (iii) governance mechanisms, financing and management of development projects, infrastructure and urban services.
- The PNDU is to guide the strategies, programs and actions of the state, its ministries and its agencies, as well as regional and local authorities (CTDs), for the development, planning and urban management, in coordination with other policies, strategies, plans and public regulatory frameworks on land use planning, decentralization, economic development, private sector and employment, land management, water and sanitation, housing and shelter, prevention of natural hazards, rural development, PPP, etc.
- In particular, the synergy of land reform policy with long-term goals of urban policy is essential. Indeed, possession or occupation of land focuses interests and economic, social,

environmental and cultural issues, present and future like no other property. Management of land issues is one of the most limiting factors for sustainable, fair and economically efficient urban development. Good land management that goes beyond securing land i.e. promoting private investment, is essential for mobilization of physical, financial and fiscal resources for the development of cities.

- The PNDU also aims to build a national consensus on urban issues and to support cultural changes linked with the urban transition in the country, providing a framework to private and community stakeholders and all citizens to develop their own strategies and projects at local, regional and national level.

27.2.3 Development Control, Land Tax and Land Tenure System in Madagascar

(1) Building Permit System

According to Article 179 of the Law on Town Planning and Housing (Law No. 2015-052), obtaining a building permit is required for anyone wishing to build a new construction, or to modify the configuration of the soil in an urban area with a town plan

The same permit is required for fences, exterior modifications to existing constructions, rework and repairs of major works, elevations, change of destination and use of all or part of existing construction, as well as for work involving a modification of the internal distribution of buildings and sanitary facilities.

It should be noted that for all constructions to be built along a public road, the owner is required to ask beforehand the alignment of his property, and this before the instruction of the file of building permit.

The building permit is issued by the Mayor, with the approval of the Regional Service in charge of urban planning and housing, for constructions with a floor area of less than 500 m².

The decision on building permits is, however, within the competence of:

- the regional government when the floor area exceeds 500m² or for buildings built on behalf of the region;
- the ministry in charge of urban planning and housing (currently MAHTP) when the floor area exceeds 1,000m² or for constructions built on behalf of the state

However, in all cases, the application for a building permit is first sent to the Mayor of the commune where the work will be carried out.

The building permit cannot be issued if the applicant cannot justify the right of property ownership (land title, land certificate or cadaster). The application must be signed by the owner of the land, his agent or the tenant who justifies a title authorizing to build.

In addition, a ministerial decree will have to fix the model of application for a building permit to be used in all the communes, according to article 186 of the LUH,

In the absence of this model, the communes use their own form, like CUA, while other municipalities do not have any sample for the application.

In general, the instruction of the building permit relates to:

- National urban planning regulations and urban planning requirements indicated in the PUDI
- General building regulations in terms of safety, safeguarding, hygiene and aesthetics

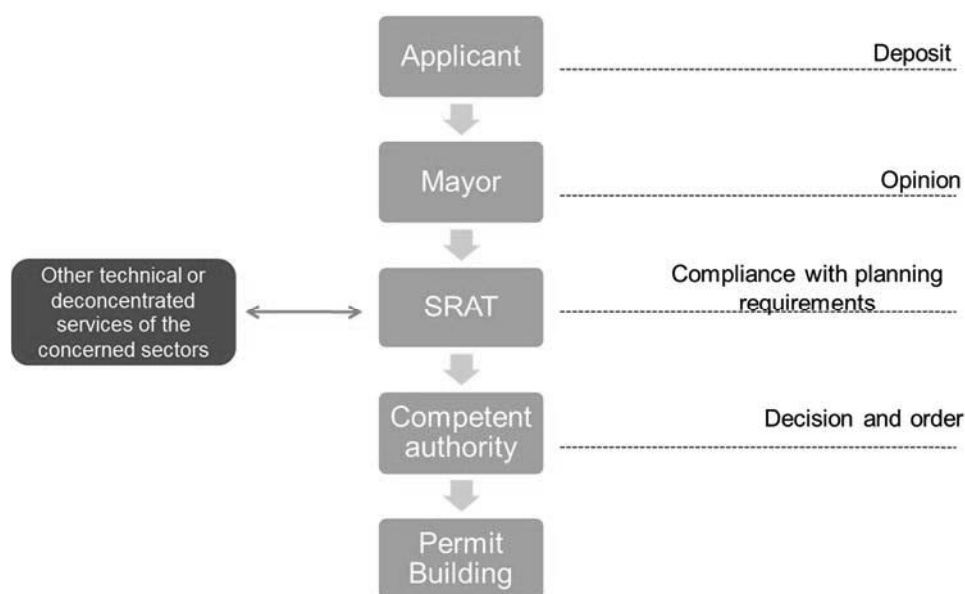
In the case of the CUA, a maximum of 407 requests per year were registered from 2005 to 2018, and a maximum of 306 building permits issued in 2008.

Table 27.2.3 Building Permits Requested and Issued by CUA (2006-2018)

(Year)	(Number of building permit requested)	(Number of building permit issued)
2005	398	148
2006	320	194
2007	350	254
2008	373	306
2009	397	182
2010	275	NA
2011	369	NA
2012	378	69
2013	407	129
2014	351	131
2015	241	119
2016	251	114
2017	330	97
2018	352	96

Source : CUA, Direction de l'Urbanisme

The building permit loses its validity if the constructions are not undertaken within one year as from the date of its delivery or if the works are interrupted for a delay greater than one year.



Source: MAHTP

Figure 27.2.2 Process for Issuing Building Permit in Madagascar

After the completion of the works, the owners can file a declaration with the commune in order to obtain the certificate of conformity. For residential buildings, the certificate of conformity is equivalent to residence permit.

(2) Land and Building Taxes

The general tax code in accordance with the 2018 Finance Act defines property taxes on land (IFT) and property taxes on built properties (IFPB) as local taxes that are levied for the benefit of decentralized territorial communities

This is an annual tax established on the basis of the facts existing on January 1 of the tax year and collected in favour of the budget of the local municipalities.

All land regardless of legal status and assignment is taxable to the IFT on behalf of the owners or beneficial occupants on January 1 of the tax year.

However, following lands are permanently exempt from property tax on land (IFT):

- All land owned by the State, decentralized communities, other public institutions that are assigned to a public service
- The land exclusively allocated to free medical or social works or to the teaching or the practice of worship
- Land forming necessary and immediate dependence of buildings such as yard, passage, garden, not exceeding 20 ares
- The lands which are taxable on the IFPB

On the other hand, all constructions whatever the nature of the materials used and all land use including industrial or commercial are taxable by the IFPB. The following buildings are permanently exempt from the property tax on built property:

- All buildings belonging to the state, communities or other public institutions that are assigned to a public service or of general interest and are unproductive.
- Buildings or parts of buildings exclusively assigned for voluntary works of a social and medical nature, for teaching or for the practice of worship

On the other hand, new constructions, reconstructions, extensions, may be exempted from the IFPB for five years from the year of completion, but it is subject to the provision of a residence permit

27.2.4 Land Tenure System in Madagascar

(1) Land Registration Types²

Law No. 2005-019 is the framework law setting the principles governing land status in Madagascar.

The land statuses are divided into:

- Land belonging to State, decentralized authorities and other legal entities governed by public law
- Land of private persons
- Land constituting areas subject to a specific legal protection regime (investment zone, protected area, etc.)

(2) Domains of State, Decentralized Authorities and Other Legal Entities Governed by Public Law

The land owned or held by the State, the decentralized communities are subject, according to their nature, to the rules applicable either to the public domain or to the private domain

The public domain of the State is governed by the Law n ° 2008 - 013. It is subdivided in three fractions:

- The natural public domain (sea, sea shore, ponds, rivers, etc.)
- The artificial public domain (ports, shoreline protection works, canals, public roads, etc.)
- The regulatory public domain resulting from a specific classification procedure.

The private domain of the state is governed by Law No. 2008-01. It is divided into two fractions:

² According to the interview with Mr. Rivo Andrianirina Ratsialonana, Senior Land Administration Specialist, the World Bank, on 4 Oct. 2018

- The private domain affected, including the lands given to the various public services for the accomplishment of their mission
- The unaffected private domain, including all other properties

(3) Lands of private persons

The lands of private persons are divided into:

- Land subject to a property right recognized by a land title. The land title established by a registration procedure in the forms and conditions determined by the laws and regulations is final and unassailable;
- Land held by virtue of an untitled property right that can be established / recognized by an appropriate procedure (it is in fact occupied land but which is not yet registered in the land register and which are likely to be recognized by a deed)

The legal regime of untitled land ownership is governed by Law 2006-031 of 04 November 2006.

There are two types of land document, namely: “land certificate” and “land title.” In general, land in the urban area is issued “land title” and that in rural area, “land certificate”. Any plot of land has either “land title” or “land certificate” without any duplication.

The land title is issued by the Land Estate Office (usual document), especially the area which has been urbanized since long before. Land title is issued to rice field or residential land. In Antananarivo, it is estimated that 80~90% of land is registered. And it seems that actual land occupation and registered land title match about only 20 to 40% in new urbanized area while that in the old urbanized area 90 to 100 %.

The land certificate is issued by the rural communes, which were given the power to issue land certificated after the agricultural reform of 2006 as part of decentralization.

(4) Land Right and Construction Permit³

Unless land ownership is clear, no permission for construction is given, or if land use rights are clear, construction permits are given.

27.3 Local Government Structure of Antananarivo Agglomeration and Toamasina Agglomeration

27.3.1 Decentralisation in Madagascar

The Organic law (2014-018) enacted in 2014 and the Constitution enacted in 2010 form the framework of the decentralisation policy of Madagascar. After the local administrative organisations of Madagascar were reorganised through these laws, there have been two lines in the current local administration of Madagascar: one is deconcentration from the central government to the local branches (deconcentrated administration), and the other one is local autonomy (decentralized administration).

There are three levels of deconcentrated administration: Prefecture, District, and Fokontany. Specifically, there are 22 prefectures, 119 districts, and 18,251 fokontany in Madagascar. On the other hand, in the decentralised administration, the three levels of Province, Region, and Commune have 6, 22 and 1,695 local government bodies, respectively. However, no local administration has been established yet at the province level. The local governments of province, region and commune do not have a hierarchical relationship because of the parallel structure of deconcentrated administration and local administration.

³ According to the interview with Chef du Service de l'Urbanisme Reglementaire (SUR), M2PATE, on 15 February 2017

Based on the newly enacted decree (2015-593), the local administrative system has been reorganised to the four-layer structure of Provinces, Prefectures, Districts and Administrative districts. Prefectures follow the former regions, and Districts include several former Communes.

In the line of deconcentrated administration, the chief is decided by nomination from the President. On the other hand, all the chiefs of local decentralised governments should be elected by direct election under the Constitution. But as of April 2016, it was the President that had been directly appointing the chiefs except for the mayors, and it had been the presidential cabinet that decided the SG (Secrétaire General), DG (Directeur Général), and the Director of the General and Territorial Administration of the Regions at the local government.

In the line of local autonomy, there is a Provincial Council (Conseil Provincial), a Regional Council (Conseil Régional), and a Commune Council (Conseil Municipal). Members of the Senate and the House of Representatives have the right to become a member of the Provincial and Regional Councils in their constituencies, with some overlap between the actors of central and local administrations. The Constitution amended in 2010 defines each decentralised administration as follows:

- **Province:** The Provinces are Decentralized Territorial Collectivities endowed with juridical personality, and with administrative and financial autonomy. In collaboration with the public and private organs, they direct, make dynamic, coordinate and harmonize the economic and social development of the whole Province and assure, as such, the planning, the territorial development and the implementation of all the actions of development. (Part of Article 157)
- **Region:** The Regions have an essentially economic and social vocation. In collaboration with the public and private organs, they direct, make dynamic, coordinate and harmonize the economic and social development of all their territorial resort and assure the planning, the territorial development and the implementation of all the actions of development. (Article 153)
- **Commune:** The Regions have an essentially economic and social vocation. In collaboration with the public and private organs, they direct, make dynamic, coordinate and harmonize the economic and social development of all their territorial resorts and assure the planning, the territorial development and the implementation of all the actions of development. (Article 149)

In 2014, besides the newly enacted organic law, two laws on decentralisation were passed: the law on the authority and financial resources of the local government (2014-020), and the law on the representative of the state in local administration (2014-021). Also, three decrees were created under the organic law in 2014, and these laws strengthen the independence of local governments.

Local governments have multiple financial resources. Fiscal resources include land usage fees and inheritance tax, 100% of which are allocated to communes. Also, mineral resource income such as royalty and a part of crop income can be collected as tax; but this tax needs to be returned to local administration services. Participative Budget Process is prevalent throughout the country and some communes follow the democratic method while resources are scarce.

27.3.2 Urban Groups for Antananarivo Agglomeration and Toamasina Agglomeration

A commune can formulate its own PUDi under the urban planning law of 2015. On the other hand, when a commune is part of an urban agglomeration together with other communes, it can formulate a PUDi for the urban agglomeration in collaboration with other communes which are part of the urban agglomeration.

For the purpose of formulating a PUDi for an urban agglomeration, an urban group of communes which composed the urban agglomeration has been formed by the initiative of MAHTP. In order to officially do so, MAHTP issued a ministerial decree for forming an urban group of communes.

In the beginning of formulation of PUDi for Antananarivo Agglomeration and PUDi for Toamasina Agglomeration, MAHTP formed two urban groups: the one for Antananarivo Agglomeration and the other is for Toamasina Agglomeration.

The two Urban Groups have played important roles in the process of formulating the two PUDi for the two agglomerations. It is considered that the two Urban Groups are also important in implementing PUDi for the two agglomerations.

27.4 Implementation Framework for TaToM

27.4.1 General Design of Implementation Framework for TaToM

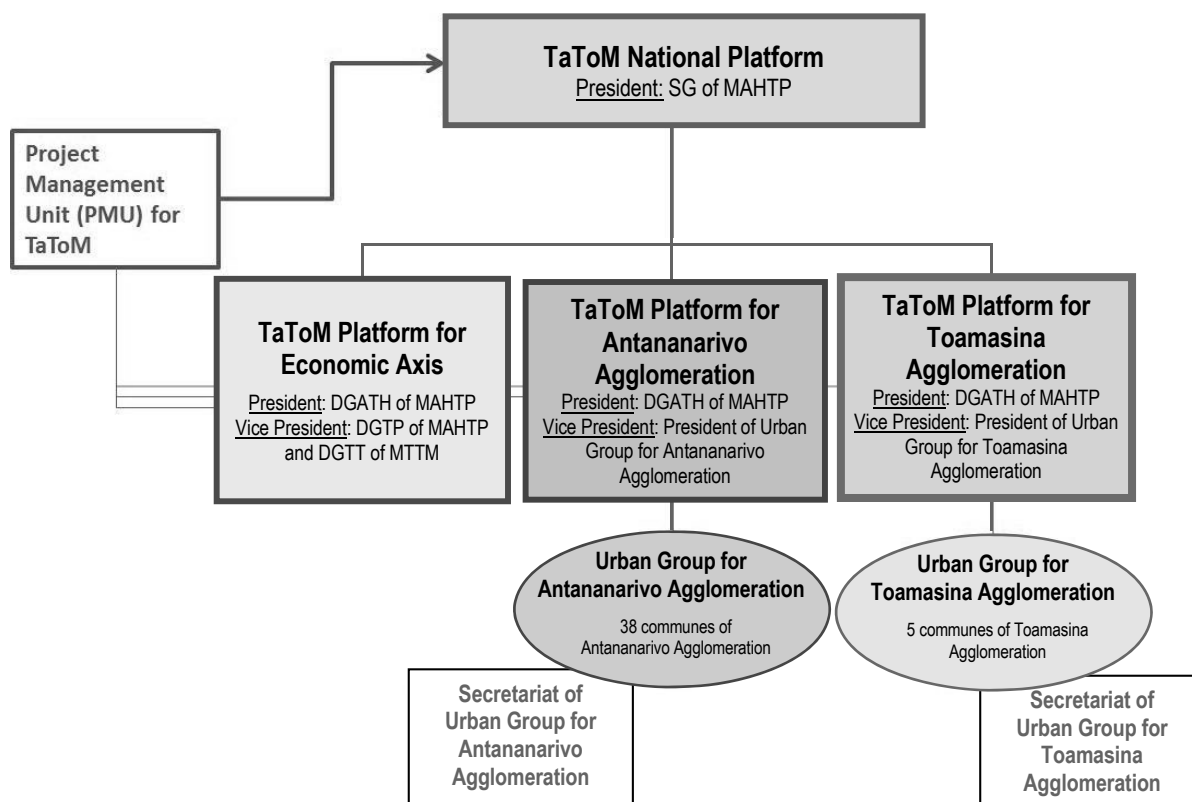
An implementation framework for TaToM is recommended by Project TaToM as presented in Figure 27.4.1, based on the framework for formulating the plans under Project TaToM. The National Steering Committee and the three Local Steering Committees for the planning phase should be transformed into TaToM National Platform and three TaToM Platforms for each plan. The general design of the implementation framework for TaToM presented in Figure 27.4.1 is accepted by MAHTP.

This recommended implementation framework of TaToM has the following characteristics:

- Multi-sectoral coordination is possible.
- Participation of communes is strong.
- Knowledge and information obtained through the Project for formulating plans for TaToM can be utilized at the stage of implementation of TaToM.
- Promotion of integrated development is possible.

In order to make the implementation framework operational and effective, the following elements are to be added to the four platforms:

- Project Management Unit (PMU) for TaToM
- Secretariat for Urban Group of Antananarivo Agglomeration
- Secretariat for Urban Group of Toamasina Agglomeration



Source: JICA Study Team

Figure 27.4.1 Implementation Framework for TaToM

27.4.2 Roles, Responsibilities and Members of Elements composing the Implementation Framework for TaToM

In this section, roles, responsibilities and members of the elements composing the Implementing Framework for TaToM are explained:

(1) TaToM National Platform

TaToM National Platform has the following roles and responsibilities:

- To make decision makings on mobilization of financial resources in implementation of projects of the three components
- To make decision makings on major strategies in integrated development for TaToM
- To make decision makings on priorities in implementation of projects of the three components of TaToM
- To make decision makings on modification of land use zoning plans of Antananarivo Agglomeration and Toamasina Agglomeration
- To promote coordination among the three components of TaToM
- To monitor situation of implementation of projects of the three components of TaToM by receiving regular and non-regular reports from TaToM Local Platforms

TaToM National Platform is to have the members given in Table 27.4.1.

Table 27.4.1 President and Members of TaToM National Platform

President	• Secretary-General, Ministry of Regional Development, Building, Housing and Public Works (MAHTP)
Member	• Director General of Spatial Planning and Housing (DGATH), Ministry of Regional Development, Building, Housing and Public Works • Secretary General, Ministry of Interior and Decentralization • Secretary General, Ministry of Transport, Tourism and Meteorology

	<ul style="list-style-type: none"> • Secretary General, Ministry of Industry, Trade and Handicrafts • Secretary General, Ministry of Economy and Finance • Secretary General, Ministry of Environment and Sustainable Development • Secretary General, Ministry of Energy, Water and Hydrocarbons • Secretary General, Ministry of National Education and Technical and Professional Education • Secretary General, Ministry of Public Health • Director General, Toamasina Autonomous Port Authority (SPAT) • Executive-Secretary, National Office of Disaster Risk Management (BNGRC) • Chief of Region of Analamanga • Chief of Region of Atsinanana • Chief of Region of Alaotra Mangoro • The Office of Urban Group for Antananarivo Agglomeration, as Vice President of TaToM Platform for Antananarivo Agglomeration • The Office of Urban Group for Toamasina Agglomeration, as Vice President of TaToM Platform for Toamasina Agglomeration • Director-General of Land Transport, Ministry of Transport, Tourism and Meteorology, as a Vice President of TaToM Platform for Economic Axis • Director General of Public Works (DGTP/MAHTP), as a Vice-President of TaToM Platform for Economic Axis
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(2) TaToM Local Platforms

TaToM Local Platform for Antananarivo Agglomeration, TaToM Local Platform for Toamasina Agglomeration and TaToM Local Platform for Economic Axis have the following roles and responsibilities:

- To monitor activities related to each component of TaToM
- To coordinate with related ministries and agencies for implementation of priority projects
- To promote the implementation of priority projects
- To report results of discussions at TaToM Local Platforms to TaToM National Platform

The three TaToM Local Platforms are to have the members given in Table 27.4.2, Table 27.4.3 and Table 27.4.4.

Table 27.4.2 President, Vice President and Members of TaToM Local Platform for Antananarivo Agglomeration

President	<ul style="list-style-type: none"> • Director General of Spatial Planning and Housing (DGATH), Ministry of Regional Development, Building, Housing and Public Works (MAHTP)
Vice President	<ul style="list-style-type: none"> • President of Urban Group for Antananarivo Agglomeration
Member	<ul style="list-style-type: none"> • Director General of Land Services (MAHTP) • Director General of Infrastructures and Presidential Projects (MAHTP) • Director General of Public Works (MAHTP) • Director General of Land Transport (MTTM) • Director General of Ministry of Public Health (MSP) • Director General of Education (MENETP) • Director General of Industry (MICA) • Director General of Energy (MEEH) • Director General of Environment (MEDD) • Director General of National Environment Office (ONE) • Technical Director General in MEEH • Director General of Local Development Fond • Executive Secretary of National Office of Disaster Risk Management (BNGRC) • Executive Secretary of Unit of prevention and urgencies management (CPGU) • Director General of Road Authority of Madagascar (ARM) • Director General of Agency of Land Transport Agency (ATT) • Director General of Flood Protection Authority of the Antananarivo Plain (APIPA) • Director General of Autonomous Maintenance Service of the City of Antananarivo (SAMVA) • Chief of Analamanga Region • Inter-Regional Director of MAHTP in Analamanga • Chief of Regional Service of Land Use in Analamanga • Chief of Regional Service of Domain in Analamanga • Chief of Regional Service of Topography in Analamanga • Members of Urban Planning Group of Antananarivo (mayors and technical officers of 38 communes) • President of Chamber of Commerce • President of GEM (Enterprise Group of Madagascar) • President of SIM (Industrial Syndicate of Madagascar)

	<ul style="list-style-type: none"> • President of FIVMPAMA (Group of Malagasy Employers) • Director General of Economic Development Board of Madagascar (EDBM) • Representatives of civil society • Members of Urban Sector Group of Development Partners • President of the Architects' Association
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Table 27.4.3 President, Vice President and Members of TaToM Local Platform for Toamasina Agglomeration

President	<ul style="list-style-type: none"> • Director General of Spatial Planning and Housing (DGATH), Ministry of Regional Development, Building, Housing and Public Works (MAHTP)
Vice President	<ul style="list-style-type: none"> • President of Urban Group for Toamasina Agglomeration
Member	<ul style="list-style-type: none"> • Inter-Regional Director of MAHTP • Inter-Regional Director of MTTM at Toamasina • Inter-Regional Director of Ministry of Industry, Trade and Handicrafts at Toamasina • Inter-Regional Director of Ministry of Economy and Finance at Toamasina • Inter-Regional Director of Ministry of Environment and Sustainable Development at Toamasina • Inter-Regional Director of Ministry of Energy, Water and Hydrocarbons at Toamasina • Inter-Regional Director of Ministry of National Education and Technical and Professional Education at Toamasina • Director-General of Local Development Fond • Executive-Secretary of National Office of Disaster Risk Management (BNGRC) • Chief of Atsinanana Region • Chief of Regional Service of Land Use in Atsinanana • Chief of Regional Service of Domain in Atsinanana • Chief of Regional Service of Topography in Atsinanana • Members of Urban Planning Group of Toamasina (mayors and technical officers of 5 communes) • Director-General of Toamasina Autonomous Port Authority (SPAT) • Director-General of Road Authority of Madagascar (ARM) • Director-General of Agency of Land Transport Agency (ATT) • President of Chamber of Commerce • President of GEM (Enterprise Group of Madagascar) • President of SIM (Industrial Syndicate of Madagascar) • President of FIVMPAMA (Group of Malagasy Employers) • Director-General of Economic Development Board of Madagascar (EDBM) • Representatives of civil society • Members of Urban Sector Group of Development Partners • President of the Architects' Association

Table 27.4.4 President, Vice Presidents and Members of TaToM Local Platform for Economic Axis

President	<ul style="list-style-type: none"> • Director General of Spatial Planning and Housing (DGATH), Ministry of Regional Development, Building, Housing and Public Works (MAHTP)
Vice President	<ul style="list-style-type: none"> • Director General of Land Transport, Ministry of Transport, Tourism and Meteorology • Director General of Public Works (DGTP/MAHTP)
Member	<ul style="list-style-type: none"> • Director General of Decentralization (MID) • Director General of Environment • Director General of National Environment Office • Director General of Local Development Fond • Chief of Analamanga Region • Chief of Atsinanana Region • Chief of Alaotra-Mangoro Region • Inter-Regional Director of MAHTP in Analamanga • Inter-Regional Director of MAHTP in Atsinanana • Executive Secretary of National Office of Disaster Risk Management (BNGRC) • Director General of Road Authority of Madagascar (ARM) • Director General of Agency of Land Transport Agency (ATT) • Mayor of Manjakandriana Urban Commune • Mayor of Moramanga Urban Commune • Mayor of Brickaville Urban Commune • Chief of Regional Service of Land Use in Analamanga • Chief of Regional Service of Domain in Analamanga • Chief of Regional Service of Topography in Analamanga • Chief of Regional Service of Land Use in Atsinanana • Chief of Regional Service of Domain in Atsinanana • Chief of Regional Service of Topography in Atsinanana • Chief of Regional Service of Land Use in Alaotra-Mangoro • Chief of Regional Service of Domain in Alaotra-Mangoro • Chief of Regional Service of Topography in Alaotra-Mangoro

	<ul style="list-style-type: none"> • President and Vice Presidents of Urban Planning Group of Antananarivo • President and Vice Presidents of Urban Planning Group of Toamasina • President of Chamber of Commerce • President of GEM (Enterprise Group of Madagascar) • President of SIM (Industrial Syndicate of Madagascar) • President of FIVMPAMA (Group of Malagasy Employers) • Director General of Economic Development Board of Madagascar (EDBM) • Representatives of civil society • Members of Urban Sector Group of Development Partners • President of the Architects' Association
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(3) Project Management Unit (PMU) for TaToM

A Project Management Unit (PMU) should be established for the purpose of technically supporting TaToM National Platform and the three TaToM Local Platforms, in promotion and coordination for the implementation of the three development plans of TaToM.

Under the supervision of MAHTP in coordination with MTTM, the PMU will provide technical support to TaToM National Platform and the three TaToM Local Platforms which are responsible for promotion and coordination of implementation of land use zoning plans of PUDi and priority projects of the three development plans.

The PMU is not to directly implement the priority projects. However, different ministries and agencies are responsible for implementing actual priority projects under the technical assistance to be provided by the PMU.

(4) Secretariat for Urban Group for Antananarivo Agglomeration

With the support of MAHTP, the urban group of Antananarivo Agglomeration should form a secretariat for promotion and coordination of implementation of PUDi and priority projects. The Urban Agency for Antananarivo Agglomeration, which has been established by MAHTP and communes with assistance of AFD, could play a role of the Secretariat for Urban Group for Antananarivo Agglomeration.

(5) Secretariat for Urban Group for Toamasina Agglomeration

With the support of MAHTP, the urban group of Toamasina Agglomeration should form a secretariat for promotion and coordination of implementation of PUDi and priority projects. At the moment, no Secretariat for Urban Group for Toamasina Agglomeration has been established yet. However, MAHTP is interested in creating a Secretariat for Urban Group for Toamasina Agglomeration.

(6) Urban Agency for Antananarivo Agglomeration

The Urban Agency is a kind of think tank which has been formed with financial input from communes of Antananarivo Agglomeration, with the assistance of AFD. The Urban Agency for Antananarivo Agglomeration is to provide technical support to the urban group for Antananarivo Agglomeration.

(7) Urban Agency for Toamasina Agglomeration

It is necessary to establish an Urban Agency for Toamasina Agglomeration to be functional as a Secretariat for Urban Group for Toamasina Agglomeration. The financial mechanism for establish and operationalize this Urban Group for Toamasina Agglomeration is the same as the Urban Agency for Antananarivo Agglomeration.

PART VII

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Chapter 28 Strategic Environmental Assessment (SEA)

28.1 Environmental Management System of Madagascar

28.1.1 Review of Environmental Policies concerning Spatial Development

(1) The Malagasy Environment Charter

The present Malagasy Environment Charter (Act No. 2015-003) was established in January 2015 to update the previous Charter which was published in 1990. The new Charter takes into consideration new environmental risks including climate change and needs of environment management for various sources of pollution.

The purpose of the Malagasy Environment Charter is to define the principles and general framework for environmental actors and development actors as well as the principles and strategic guidelines of the country's environmental policy.

The Environment Charter affirms the participation of the country in solving global environmental problems translates into compliance with international commitments through the effective implementation of ratified international environmental conventions and that all legislative texts, sectoral policies, plans, programmes and projects must take into account of the following:

- Climate change and transfer of technology in its management, and that of the environment in general:
- Risk and disaster management:
- Integrated water resources management
- Integrated wetland management
- Management of sustainable tourism
- Sustainable management of renewable and non-renewable natural resources:
- Equitable sharing of benefits from environmental services through:
 - the use of the genetic and biological resources of Madagascar
 - the use of income derived from carbon
- Protection of genetic and biological resources against invasive species and genetically modified organisms which present serious risks to the modification and extinction of spaces and to health and the environment
- Management of different pollution sources
- Integrated management of maritime and coastal areas
- Soil erosion control and watershed management
- Fight against desertification and land degradation
- Interaction between the environment on the one hand and the exploration and exploitation of mining and petroleum resources on the other
- Combating illegal destruction, exploitation and marketing of biodiversity, as well as other terrestrial and halieutic resources
- Health risks related to environment

(2) Other Laws and Decrees related to Environment concerning Spatial Planning in Madagascar

1) Protected Areas

Act No. 2015-005 Revised Protected Areas Management Code has been revised on 22nd January 2015. Protected areas are defined as a terrestrial, marine, coastal or aquatic territory with weigh a particular biological, natural, aesthetic, morphological, historical, archaeological, cultic or religious value which needs a multifaceted preservation.

Protected areas include Integral Natural Reserve, National Park, Natural Park, Natural Reserve, Special Reserve, Harmonious Protected Landscape and Natural Resources Reserve.

The Act defines the protected areas listed above and also describes the criminal provisions against these protected areas.

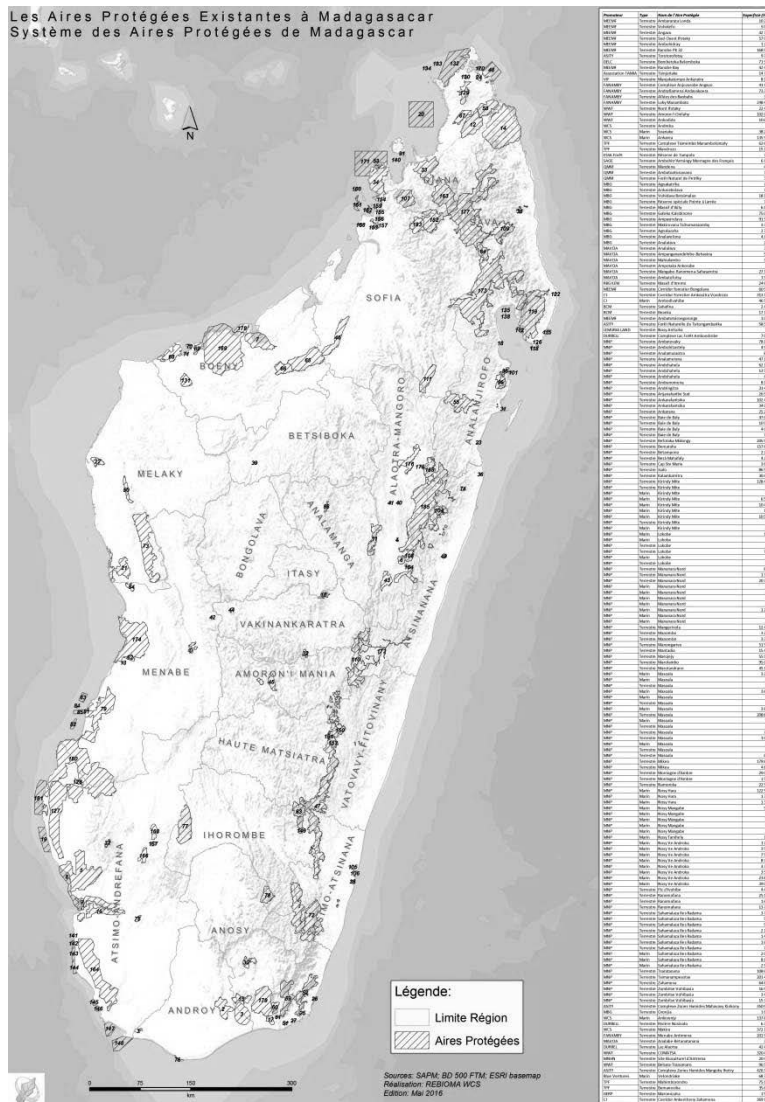


Figure 28.1.1 Protected Areas in Madagascar

2) Sensitive Areas

Order No. 4355/97 defines the definition and delimitation of sensitive areas. Sensitive areas include coral reefs, mangroves, islands, tropical forests, areas prone to erosion, arid and semi-arid areas prone to desertification, swamp areas, natural conservation areas, perimeters for

protection drinking water, mineral water or groundwater and paleontological, archaeological and historical sites.

In accordance with Order No. 4355/97 of 13 May 1997, sensitive forest areas are determined as the areas included in the referenced map in Figure 28.1.2. The sensitive forest areas are distributed wildly across the country. However, the inland area where the altitude is relatively high only has limited areas of such.



Source: Ministère de l'Environnement, des Eaux et Foerts, 2004, Arrêté No. 18177 / 04

Figure 28.1.2 Sensible Forest Areas

28.1.2 Strategic Environmental Assessment (SEA) in Madagascar

(1) History of SEA in Madagascar

The consideration of impact assessment including Strategic Environmental Assessment (SEA) started in Madagascar when the Convention on Biological Diversity was signed in 1992 at Rio de Janeiro which explicitly foresees the use of Environmental Impact Assessment (EIA) and SEA as tools to minimize negative impacts of development on biodiversity.

Since then, Madagascar has used environmental assessment to integrate environmental concerns into investment projects. However, the delay in environmental assessment to the project stage limited the opportunities to identify strategic choices of leading to a more sustainable outcome to reduce risks to the environment. Therefore, the necessity of environmental assessment at the level of policies, plans and programmes (PPPs) has emerged.

SEA responds to this demand and enables environmental considerations to be integrated into strategic decision-making as well as social and economic aspects for development at the earliest possible stage.

In 2008, SEA Guideline was prepared by National Office of Environment (ONE: *Office National pour l'Environnement*) to facilitate dialogue between all stakeholders.

The guideline states that SEA should be applied to evaluate policy decisions in programmes and policy plans for key sectors such as transport, energy, agriculture, water management, irrigation, fisheries, forestry, solid waste management, health, education, tourism, industry, infrastructure, telecommunications, spatial planning or land use planning, trading, natural conservation and modern biotechnology.

Since the SEA Guideline was introduced to Madagascar in 2008, there have been approximately 20 SEA studies conducted in Madagascar.

(2) Definition of SEA

SEA is defined as a decision-making tool for sustainable development in the Malagasy Environmental Charter.

It is also mentioned in the SEA Guideline that SEA is "a systematic process for assessing the environmental impact of a proposed policy, plan or programme to ensure that these consequences are duly taken into account at the beginning of the decision-making process, in the same way as economic and social considerations. "

The procedure for SEA is largely determined by the circumstances in which it operates. Therefore, it is necessary to select an SEA approach and corresponding tools according to a particular decision context.

(3) Institutional Framework for Environmental Management

The National Office of Environment (ONE) is an operational body, as well as delegated contracting authority for investment compatibility with the environment, under the supervision of the Ministry of the Environment, Water and Forestry.

As part of the responsibility of ONE, Article 4 of the Decree No. 2014-1569 Creation and Organization of National Office of Environment states that ONE is responsible for promoting the implementation of SEA.

(4) Legal Framework

In Article 20 of the new Malagasy Environmental Charter adopted on 20th January 2015, the necessity of SEA is stated as a process which assures good environmental governance. The Charter also states SEA as the systematic process of assessing the environmental consequences of proposals for policies, plans, or programmes at the earliest possible stage of decision-making, considering as much as the economic and social consequences.

However, Madagascar, at present, does not have an Act or a Decree for SEA.

28.2 SEA Study for TaToM Project

28.2.1 Background

Strategic Environmental Assessment (SEA) is emerging as the major tool for developing and analysing Policies, Plans and Programmes (PPPs) to ensure that environmental and social consideration are integrated.

In the Records of Discussion for the Project signed by the Government of Madagascar and Government of Japan, SEA is recognized as part of the principal activities of the Project. Therefore, in the TaToM Project, SEA is carried out as part of the process of each planning component.

The SEA will be in compliance with the following:

- Relevant existing laws, regulations, systems and institutions concerning SEA in Madagascar
- SEA Guideline in Madagascar
- JICA Guidelines for Environmental and Social Considerations.

Since the master plan requires subjecting the plan interventions to SEA study, the JICA Study Team has subcontracted a local firm to carry out a specific SEA in order to satisfy the Malagasy requirements and or regulations.

28.2.2 Target Areas for SEA Studies

Project TaToM has three following components which need to conduct SEA:

- Formulation of PUDi for Antananarivo Agglomeration
- Formulation of PUDi for Toamasina Agglomeration
- Formulation of Transport and Territorial Development Plan for TaToM Economic Axis

The above three plans together compose the Master Plan for Economic Axis of TaToM.

28.2.3 Objectives of the SEA Study

The broad objective of this SEA study is to ensure that sustainability issues i.e. natural resources, economic, socio-cultural and institutional dimensions are integrated into the Master Plan for Economic Axis of TaToM.

The specific objectives are as follows:

- To identify the risks and opportunities associated with the Master Plan for Economic Axis of TaToM and present necessary guidelines and recommendations to enhance opportunities and to minimize risks
- Incorporate environmental/sustainability issues into the master plan
- Identify potential sensitive environmental areas and provide guidance for their protection;
- Establish benchmarks for assessing cumulative environmental effects
- Outline mitigation and monitoring requirements that establish best practices and ensure effective impact management for the Master Plan for Economic Axis of TaToM.

28.3 Activities of SEA Study

The following works were carried out for SEA:

- Technical Working Group (TWG) meeting for SEA to determine the Terms of Reference (TOR) of the SEA Study
- TWG meeting for SEA to identify the stakeholders
- Stakeholder meetings to discuss on issues
- Preparation of Scoping Report
- TWG meeting to review the Scoping Report
- Stakeholder meetings to assess the scenarios for each plan
- Stakeholder meetings to assess the strategies of each plan
- Preparation of SEA Report
- TWG meeting to review the Draft SEA Report

Detail of progress for each planning component is described in the section below.

28.3.1 Technical Working Group

(1) First TWG Meeting for SEA in Antananarivo

The first TWG meeting for SEA in Antananarivo was held on 27th February 2017. The purpose of this meeting was to explain the function of the TWG for SEA and to discuss on the SEA procedure for determining the TOR for the SEA study in TaToM Project.

(2) First TWG Meeting for SEA in Toamasina

The first TWG meeting for SEA in Toamasina was held on 2nd March 2017. The purpose of this meeting was to explain the function of the TWG for SEA in TaToM Project.

(3) Second TWG Meeting for SEA in Toamasina

The second TWG meeting for SEA in Toamasina was held on 6th June 2017. The purpose of the meeting was to conduct stakeholder analysis for selecting the stakeholder to be invited to the stakeholder meetings.

(4) Second TWG Meeting for SEA in Antananarivo

The second TWG meeting for SEA in Antananarivo was held on 13th June 2017. The purpose of the meeting was to conduct stakeholder analysis for selecting the stakeholder to be invited to the stakeholder meetings.

(5) Third TWG Meeting for Reviewing the Baseline and Scoping Report

The third TWG meeting for SEA (fifth TWG meeting including TWG meetings for both Antananarivo and Toamasina) was held on 7th July 2018. The purpose of the meeting was to review the Scoping Report and to discuss on the assessment tools.

(6) Fourth TWG Meeting for Reviewing the Draft SEA Report

The fourth TWG meeting for SEA was held on 2nd August 2019. The purpose of the meeting was to review the Draft SEA Report and collect comments to improve the contents.

28.3.2 Stakeholder Meetings for Formulation of PUDI for Antananarivo Agglomeration

(1) First Series of Stakeholder Meetings for SEA Study in Antananarivo

The first series of stakeholder meetings in Antananarivo Agglomeration for both the planning as well as the SEA was held in the four districts of Antananarivo Agglomeration. The meetings were held in collaboration with the counterpart institution, M2PATE. The objectives of these meetings were to commence the participatory process of planning and understand the following types of issues:

- What are the current and future problems and issues in the development of Antananarivo Agglomeration
- What are the current and future environmental problems and issues for Antananarivo Agglomeration

The summary of the meetings conducted is described below.

1) Atsimondrano District

The first stakeholder meeting for Atsimondrano District was held on 28th June 2017 at Les Herons.

The major issues and challenges raised for future urban development in Atsimondrano District are as follows:

- Redefinition of the land use and allocation of functions for areas such as economic activities, agriculture and residence.
- Process of land regularization including reform and facilitating administrative procedures
- Management of population growth and control of new construction (especially illegal buildings along the banks of rivers and landfill areas)
- Necessity of inter and intra communal roads
- Public transport especially for the management and use special lane and bus stations
- Necessity of considering multimodal transport
- Necessity of administration and social services for communes
- Necessity of extending water supply network from Alakamisy to Fenoarivo, Ambatomirahavavy and further
- Necessity of ICT

The major social and environmental issues and challenges raised for Atsimondrano District related to urban development are as follows:

- Establishment of solid waste management system and adequate sanitation and systematic planning
- Better balance between measures taken on the environment and human development
- Adapting to developments and appropriate land uses: use of Betsimitatatra Plain as a pilot zone
- Creation of green space in built-up areas
- Management of hydrological risks by dredging Ikopa and Sisaony Rivers

2) Avaradrano District

The first stakeholder meeting for Avaradrano District was held on 29th June 2017 at Lion d'OR.

The major points raised as existing issues in the development of Antananarivo Agglomeration in Avaradrano District were as follows:

- Lack of spatial planning tools and the communal development plan is not in compliance with the building standards and is also expansion of residential areas.
- No respect for regulations related to urbanization and administrative delays are causing uncontrolled urbanization
- The boundaries of communes and fokontany limit is not defined clearly causing territorial management conflicts
- Insufficient land reserve in some communes such as Sabotsy-Namehana and Ilafy
- Lack of infrastructures for interconnection between neighbouring communes and the narrowness of national roads
- Blockage of drainage channels due to household waste discharge
- Insufficient or inadequate public transport
- Need of rehabilitation of non-paved interconnections roads
- Access to clean water is a general problem for all communes in Avaradrano District
- Electricity access is an issues due to the instabilities of voltage

The major social and environmental issues and challenges raised for Avaradrano District related to urban development are as follows:

- Uncontrolled backfilling at Laniera Plain and Ambohimanambola where water discharge into the plains of Antananarivo
- Deforestation of vegetation in the hill areas creating frequent landslides

- Proliferation of illegal dumping site
- Andralanitra final disposal site constitutes main source of air, water and soil pollution
- Air pollution due to the existence of informal slaughter sites, farms, traffic and factories
- Water pollution due to lack of drainage systems
- Difficulty of access to health services and lack of equipment at the health centres
- Insecurity due to people migrating from other areas

3) Ambohidratrimo District

The first stakeholder meeting for Ambohidratrimo District was held on 30th June 2017 at Art Gout.

The major points raised as existing issues in the development of Antananarivo Agglomeration in Ambohidratrimo District were as follows:

- Road infrastructures which are aged, in poor condition and inadequate causing congestion, increased travel time and transportation costs. As a result it prevents the flow of local products.
- Saturation of urbanized area due to illegal constructions
- Out of date and inadequate planning documents such as zoning plans and land use plans
- Lack of facilities such as communal and intercommunal markets, drinking water supply systems and schools
- Land conflicts and problems in the administrative process

The major social and environmental issues and challenges raised for Ambohidratrimo District related to urban development are as follows:

- Pollution due to insufficiency or even non-existence of public dumping site / landfill in Cas d'Ivato and Talatamaty
- Inadequate location of landfills resulting in pollution of Ikopa River and surrounding rice fields in Ambohitrimanjaka
- Direct discharge of wastewater into Anosilava Lake in Ambatolampy
- Merging of runoff water and wastewater linked the lack of wastewater drainage channels.
- Soil degradation
- Risk of flooding linked to the hydrological variation of rivers, breakage of protective dykes and illegal occupation of liable to flooding areas
- Social problems linked to proliferation of illegal constructions
- Air pollution from smokes produced by industrial and manual brick manufacturers
- Water pollution

4) Antananarivo-Renivohitra District

The first stakeholder meeting for Antananarivo-Renivohitra District was held on 4th July 2017 at Café de la Gare.

The major points raised as existing issues in the development of Antananarivo Agglomeration in Antananarivo-Renivohitra District were as follows:

- Insufficient and inadequate of basic infrastructure in relation to the population increase
- Insufficient road infrastructure (roads are too narrow)
- Obstruction in the sanitation channels
- Difficulty in installation of portable base station for mobile network
- Old sewerage networks and inadequacy of networks
- High pressure of urbanization towards areas which are not constructible

- Lack of a clearly defined legal and institutional framework
- Lack of zoning and land use planning
- Lack of mayors' capacity in giving building permits etc.
- Construction standard, right-of-way and planning requirements are not respected
- Lack of future vision at the level of local authorities
- Concentration of economic and administrative activities in the CUA causing traffic congestion
- Parking problem
- Problem of increased cost of transport due to congestion.
- Public transport is not compatible with the needs of the population

The major social and environmental issues and challenges raised for Antananarivo-Renivohitra District related to urban development are as follows:

- Air pollution by car exhaust
- Necessity of more ecological means of transport such as bicycle in the city and less taxi-be
- Necessity of creating some green areas such as garden and park
- Sanitation and wastewater management
- Necessity of water treatment and wastewater management
- Contamination of groundwater due to waste from textile enterprises
- Necessity of flood management in the city

(2) Second Stakeholder Meeting for SEA Study in Antananarivo

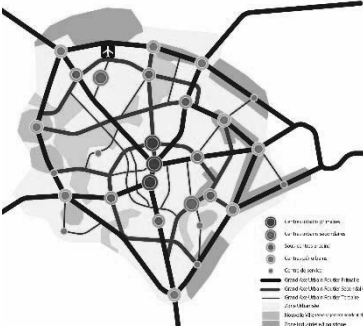
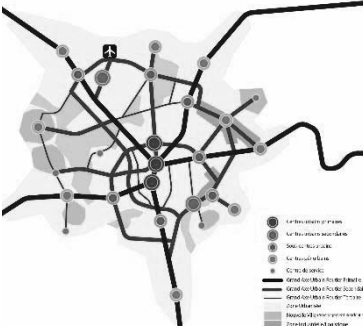

The second stakeholder meeting for SEA (called Third Stakeholder Meeting¹) for the revision of PUDi for Antananarivo Agglomeration was held on 17th July 2018. The purpose of this meeting was to conduct scenario assessment based on the three scenarios proposed in the first preliminary draft of Revised PUDi for Antananarivo Agglomeration prepared in June 2018.

The three scenarios described in Table 28.3.1 are prepared based on discussed in Section 6.1.4 of this report.

Table 28.3.1 Future Growth Scenarios Used in Scenario Analysis for PUDi for Antananarivo Agglomeration

	Growth Scenario A	Growth Scenario B	Growth Scenario C
Growth Scenario	This scenario aims to develop Antananarivo Agglomeration to a maximum extent. Development efforts for economic sectors will be concentrated in Antananarivo Agglomeration, while Toamasina Agglomeration will be treated as a functional gateway to Antananarivo, by narrowly focusing on development of the Port of Toamasina and its logistics function. In Scenario A, almost all functions will be gathered in Antananarivo Agglomeration. It will be not only the hub of business, finance, and trade and commerce, but also the location of major industries in the country. Large-scale industrial parks will be developed along a newly developed Outer Ring Road which connects to National Road No.2.	In the Growth Scenario B, besides being the national capital, Antananarivo Agglomeration will be developed as the centre of service and trade not only for living people in Antananarivo Agglomeration, but also for businesses and industries for Madagascar as a whole including Antananarivo Agglomeration. On the other hand, new industrial development efforts will be made in Toamasina Agglomeration, Moramanga and other regional capitals. However, a few industrial areas will be located in Andranovelona and Betsiaraina. The function of the urban centre of CUA will be strengthened to provide finance and business supporting services not only to Antananarivo Agglomeration but also to Toamasina Agglomeration and other regional capitals.	Antananarivo Agglomeration will accommodate a variety of economic sectors aiming at balanced development of the two agglomerations. With construction of the Outer Ring Road, industrial areas will be developed in the north of Ivato Airport and the area along the Outer Ring Road from Ambohimarina to NR No. 7. However, some of bypass roads connecting the National Roads will not be constructed and development of industrial parks is lesser extent, compared with Scenario A. The function of the urban centre of CUA will be strengthened to provide finance and business supporting services not only to Antananarivo Agglomeration but also to Toamasina Agglomeration and other regional capitals.

¹ The second series of Stakeholder Meeting for Antananarivo Agglomeration were held for the planning purpose in September 2017.

	<p>The function of the urban centre of CUA will be strengthened to provide finance and business supporting services not only to Antananarivo Agglomeration but also to Toamasina Agglomeration and other regional capitals.</p>		
Urban Structure			

Source: JICA Study Team

Some of the major points raised regarding each scenario are summarized below.

- Scenario A
 - The concentration of economic sector in Antananarivo Agglomeration will continue to bring population pressure in Antananarivo Agglomeration, increasing the risk of insufficient water resources and the risk of flooding due to land filling.
 - Due to high concentration of industrial activities in Antananarivo Agglomeration, there may also be lack of electricity and the issue of air pollution and sewerage treatment may arise. This can degrade the quality of life already vulnerable in the city.
 - The national GDP will be poorly distributed
 - Social problems will be created due to demographic concentration
- Scenario B
 - There will be less significant impacts on the environment compared with Scenario A and C as Antananarivo Agglomeration will not change the economic activities in the city greatly.
 - The population pressure to Antananarivo Agglomeration will be eased.
- Scenario C
 - This scenario seems appropriate taking in consideration of current economic situation of Antananarivo Agglomeration.
 - It will help to attract many investors to come to Antananarivo Agglomeration.
 - Capacity building and training to support social development, especially for communal leaders is important to realize this scenario.
 - Land management will be the issue for implementing this scenario.

The result of this meeting is stated in Section 28.4.1 of this chapter.

(3) Third Stakeholder Meeting for SEA Study in Antananarivo

The third stakeholder meeting for SEA (called Fourth Stakeholder Meeting²) for the revision of PUDi for Antananarivo Agglomeration was held on 2nd and 3rd April 2019 in Antananarivo. The purpose of this meeting was to assess the strategies which were interpreted into priority

² The Third Stakeholder Meeting for Antananarivo Agglomeration were held on 17th July 2018 as written in the previous section.

projects composing the PUDi for Antananarivo Agglomeration. The list of priority projects³ which were assessed are listed below.

- Project for Widening the North-South Airport Access Road
- Project for Road Construction between Ivato East and NR3 (A-R-05: Project for Construction of Ambodifasina - Sabotsy Namehana Section of the Outer Ring Road between Tsarasaotra Road and NR3)
- Project for Construction of Flyover at Anosizato Intersection on NR4 (A-R-09: Project for Construction of Flyover at Anosizato Intersection of NR4 and NR1)
- Project for Construction of Bypass Road for NR4
- Project for Construction of Bypass Road for NR3
- Project for Construction of Outer Ring Road (Section Soanierana-Sabotsy Namehana) (A-R-06: Project for Construction of Soanierana-Sabotsy Namehana Section of the Outer Ring Road between NR3 and NR2)
- Project for Development of Amoronakona Multi-Modal Terminal (A-F-01: Project for Development of Multi-Modal Cargo Transport Terminal in Amoronakona for Antananarivo Agglomeration)
- Project for Urban Passenger Rail Development between Ankorondrano and Tanjombato (A-F-02: Project for Urban Passenger Railway Development between Ankorondrano – Tanjombato)
- Project for Upgrading of Urban Passenger Railway between Ankorondrano and Tanjombato by Double Tracking
- Project for Development of Ankorondrano New City Centre (A-C-01: Project for Promotion of Development of Ankorondrano Primary Urban Centre)
- Project for Development of Urban Sub-Centres (A-C-02: Project for Promotion of Development of Ambodifasina Urban Sub-Centre, A-C-03: Project for Promotion of Development of Namehana Urban Sub-Centre, A-C-04: Project for Promotion of Development of Amoronakona Urban Sub-Centre, A-C-05: Project for Promotion of Development of Tanjombato Urban Sub-Centre, A-C-06: Project for Promotion of Development of Ampitatafika Urban Sub-Centre, A-C-07: Project for Promotion of Development of Tana Masoandro Urban Sub-Centre, A-C-08: Project for Promotion of Development of Ambohidratrimo Urban Sub-Centre)
- Project for Improvement of Living Environment in High-Density Residential Areas in CUA
- Project for Development of New Residential Areas in New Town of Western Antananarivo Agglomeration (A-H-02: Project for Development of Fenoarivo South New Town)
- Project for Upgrading of Mandroseza II Water Treatment Plant (A-E-01: Project for Doubling the Capacity of Mandroseza 2 Water Treatment Plant)
- Project for Construction of Laniera Water Treatment Plant (A-E-03: Project for Construction of Water Treatment Plant in Laniera)
- Project for Construction of Water Treatment Plant using Subsoil Water in Southern and Western Antananarivo (A-E-02: Project for Construction of Two Water Treatment Plants using Groundwater from Tana Plain)
- Project for Development of Parks for Flood Controlling in CUA (A-G-01: Project for Development of Ankorondrano Lake and Waterfront Park, A-G-02: Project for Development

³ The name of each project has been revised after the Fourth Stakeholder Meeting. The names in the bracket are the names determined for the Draft Final Report.

of Ankazomanga Atsimo Lake and Waterfront Park, A-G-03: Project for Development of Andavamamba Anatihazo II Lake and Waterfront Park)

- Project of Development of Education Hub in Antananarivo Agglomeration (A-D-01: Project of Development of Education Hub at Ankorondrano Primary Urban Centre, A-D-02: Project of Development of Education Hub at Namehana Urban Sub-Centre, A-D-03: Project of Development of Education Hub at Amoronakona Urban Sub-Centre, A-D-04: Project of Development of Education Hub at Tana Masoandro Urban Sub-Centre)
- Project for Development of District Referral Hospital in Urban Sub-Centres (A-S-01: Project for Development of New District Hospital in Ambodifasina Urban Sub-Centre, A-S-02: Project for Relocation and Expansion of the District Hospital in Namehana Urban Sub-Centre, A-S-03: Project for Expansion of the District Hospital in Tanjombato Urban Sub-Centre)
- Project for Formulation of Implementation Plan for Other Sanitary Final Disposal Sites (A-W-03: Project for Formulation of Implementation Plan for Other Recycling Factories and Sanitary Final Disposal Sites)

The assessment result are stated in Section 28.4.2 of this chapter.

28.3.3 Stakeholder Meetings for Formulation of PUDi for Toamasina Agglomeration

(1) First Stakeholder Meeting for SEA Study in Toamasina

The first stakeholder meeting in Toamasina Agglomeration for both the planning as well as the SEA was held on 19th June 2017 at Toamasina Urban Commune. The meetings were held in collaboration with the counterpart institution, M2PATE. The objectives of these meetings were to commence the participatory process of planning and understand the following types of issues:

- What are the current and future problems and issues in the development of Toamasina Agglomeration
- What are the current and future environmental problems and issues for Toamasina Agglomeration

The major points raised as existing issues in the development of Toamasina Agglomeration were as follows:

- Extremely limited capacity of existing urban area to cope with population increase
- Narrow road lane due to illegal street vendors and illicit construction
- Lack of employment
- Health and insecurity problems due to increase of population
- Incapacity of the CUT to manage the situation of urban environmental management such as solid waste management
- Rapid increase of illegal land grabbing
- Unclear delimitation of the administrative boundaries between CUT and the four peripheral communes leading to conflict in land management and other administrative issues
- Poor and inadequate infrastructure such as sewage and drainage network, poor condition of access roads etc.
- While port development is going on fast, slow development of urban infrastructure
- Expanding implementation of industrial zones
- Lack of political will in applying the standards and laws

The major social and environmental issues and challenges raised for Toamasina Agglomeration related to urban development are as follows:

- Problem of urban environmental management
 - Proliferation of urban waste
 - Obstruction of evacuation channels and sanitation
 - Pollution of the Pangalanes Canal, which has become a waste disposal area
 - Lack of green space
- Degradation of the coastal ecosystem
 - Disappearance of marshland areas and mangroves due to illegal occupations
- Degradation of water resources
 - Pollution of groundwater resources (water non-drinkable since 2005)
 - Water level rises during humid season
- Degradation of air quality
 - Bad smell
- Disaster Risk
 - Flooding problem (affecting 90% of the CUT)
- Health Issue
 - Risk of contamination by bacteria
- Social Issues
 - Risk of ethnic conflict
 - Proliferation of prostitution
- Poor Living Conditions
 - Extreme poverty of the rural population
 - Unsuitable housing being constructed
 - Absence of hygiene and sanitation (toilets etc.)

(2) Second Stakeholder Meeting for SEA Study in Toamasina



The second stakeholder meeting for SEA (called Third Stakeholder Meeting⁴) for the revision of PUDi for Toamasina Agglomeration was held on 5th July 2018. The purpose of this meeting was to conduct scenario assessment based on the two scenarios proposed in the first preliminary draft of Revised PUDi for Toamasina Agglomeration prepared in June 2018.

The two scenarios described in Table 28.3.2 are prepared based on discussed in Section 16.1.4 of this report.

Table 28.3.2 Future Growth Scenarios Used in Scenario Analysis for PUDi for Toamasina Agglomeration

	Growth Scenario A	Growth Scenario B
Growth Scenario	<p>In this scenario, Toamasina Agglomeration will be developed to specialize in logistics function.</p> <ul style="list-style-type: none"> • Taking advantage of the expansion of the Port of Toamasina, logistics and related facilities will be located near the port and along NR No.2 to enhance the port functions and to improve efficiency of shipment, transport, and handling of goods. • Economic sectors such as small-scale industries including agro-processing, logistics industry, and tourism will be developed. <p>The role as a gateway to support Antananarivo Agglomeration will be more emphasized in the development of Toamasina</p>	<p>The Growth Scenario 2 aims to develop economic sectors in Toamasina Agglomeration for nurturing self-reliant regional economy, in addition to logistics industry.</p> <ul style="list-style-type: none"> • Develop light industry and agro-processing for export and transshipment targeting the regional markets in Africa and around the Indian Ocean. • Industrial areas will be expanded to suburban areas of CUT and in adjacent communes. Tourism will be also promoted by developing tourism SEZs along the coast where luxury hotel resorts, shopping malls, and leisure facilities will be located. • Toamasina Agglomeration will be a vibrant hub of industry and shall be an attractive coastal tourism town, while supporting the

⁴ The Second Stakeholder Meeting for Toamasina Agglomeration was held for the planning purpose in September 2017.

	<p>Agglomeration. (An objective of development of Toamasina Agglomeration would be to maximize the efficiency of the port and transport of goods and commodities which are necessary to promote development of industries and economic activities in Antananarivo Agglomeration.)</p>	<p>economy of Antananarivo.</p>
<p>Urban Structure</p>		

Source: JICA Study Team

The result of this meeting is stated in Section 28.4.1 of this chapter.

(3) Third Stakeholder Meeting for SEA Study for Toamasina Agglomeration in Antananarivo

The third stakeholder meeting for SEA (called Fourth Stakeholder Meeting⁵) for the revision of PUDi for Toamasina Agglomeration was held on 2nd and 3rd April 2019 in Antananarivo. The purpose of this meeting was to assess the strategies which were interpreted into priority projects composing the PUDi for Toamasina Agglomeration.

The assessment result are stated in Section 28.4.2 of this chapter.

28.3.4 Stakeholder Meetings for Formulation of Transport and Territorial Development Plan for TaToM Economic Axis

(1) First Stakeholder Meeting for SEA Study in Moramanga

The first stakeholder meeting in TaToM Economic Axis, including Development Strategies for Moramanga for both the planning as well as the SEA, was held in Moramanga on 22nd September 2017. The meeting was held in collaboration with the counterpart institution, M2PATE. The objectives of the meeting were to commence the participatory process of planning and understand the following types of issues:

- What are the problems and challenges on the present and future development of Moramanga's economy?
- What are the challenges if industrial parks are to be established in Moramanga or in the surrounding communes of Moramanga?
- What are the problems and challenges on the present and future development of transport in Moramanga?
- What are the present and future environmental problems and challenges related to the

⁵ The Third Stakeholder Meeting for Toamasina Agglomeration were held on 5th July 2018 as written in the previous section.

development of Moramanga?

The major points raised as existing issues in the development of Moramanga were as follows:

- Employment issues
 - High rate of unemployment and less job offers
 - Emergence of tension between locals and migrants when looking for employment
- Insecurity and urban environmental management due to population expansion
- Proliferation of slums linked to less purchasing power and inflation
- Anarchic development of city
 - Food insecurity
 - Low productivity
 - Low quality and lack of standards on agricultural production
 - Abandonment of agricultural activity
- Non-existence of economic benefits from the Ambatovy and Fanalamanga Plants
- Exploitation of very limited non-tax resource
- Lack of market for local products

The major social and environmental issues and challenges raised for Moramanga related to the development of economic axis were as follows:

- Problems on urban environmental management
 - Proliferation of urban waste due to lack of solid waste management personnel and equipment
 - Noise and wood particles from sawmills
- Degradation of water resources
 - Pollution due to exploitation of Mangoro River.
- Degradation of forest resources
 - Increase in deforestation and clearing of forested areas
 - Disappearance of primary flora species and endemic fauna
 - Passage of bypass roads in wooded areas and private lands
- Degradation of air quality
 - Pollution related to urban livestock and solid waste (foul odor)
 - Air pollution due to traffic and traffic jams (emissions from vehicles)

In addition to the meeting held at Moramanga, during the 2nd Local Steering Committee Meeting for Economic Axis held in Antananarivo on 26th September 2017, the following social and environmental-related issues and challenges due to the development of TaToM Economic Axis were raised:

- Landownership is important and a sensitive concern in Malagasy. As for the economic zone, it is highly probable that there would be many privately owned plots of land across the project area.
- Necessity of capacity building through education and training for project-affected people as a preparation for development
- The emphasis should not be only on the textile industry. There are many other potentialities, for instance agriculture and handicraft, for the diversification of economic profile.
- As for the development of highway route, impacts on Mandraka Mountain need to be taken into consideration.
- Cultural potentialities and project impacts on the current cities like Manjakadriana, Antsampanana, etc. need to be identified.

(2) Second Stakeholder Meeting for SEA Study for Transport and Territorial Development Plan in Antananarivo

The second stakeholder meeting for SEA for the formulation of Transport and Territorial Development Plan was held on 17th July 2018 together with the third stakeholder meeting for Revision of PUDi for Antananarivo Agglomeration. The purpose of this meeting was to conduct scenario assessment based on the three scenarios proposed in the first preliminary draft of Transport and Territorial Development Plan prepared in June 2018.

The three scenarios described in Table 28.3.3 are prepared based on discussed in Section 25.5.1 of this report.

Table 28.3.3 Future Growth Scenarios Used in Scenario Analysis for PUDi for Antananarivo Agglomeration

	Growth Scenario A	Growth Scenario B	Growth Scenario C
Growth Scenario	In Scenario A, the TaToM Economic Axis plays a vital role in supporting the development of new manufacturing industries in Antananarivo Agglomeration. Therefore, the TaToM Economic Axis should provide a safe and resilient transportation route between the port and Antananarivo Agglomeration, as well as increasing its cargo volume by widening the NR 2 to 4 lanes. While the widening of the priority sections from Brickaville to Toamasina should start in Phase 2, and the widening of the rest sections of NR2 should continue throughout Phases 3 and 4. Since the widening work of the NR2 is extremely expensive, this should be selectively implemented. To support the cargo transport, railway infrastructure will be rehabilitated step by step, starting from Phase 1.	In Scenario B, the main objective of the TaToM Economic Axis is to provide smooth transportation means for passengers travelling between Antananarivo Agglomeration and Toamasina Agglomeration. Therefore, climbing lanes will be constructed, starting from the priority sections between Moramanga and Brickaville.	In Scenario C, the improvement of the transportation function of TaToM Economic Axis is required for promoting industrial development in both Antananarivo Agglomeration and Toamasina Agglomeration. Therefore, the upgrading of both passenger cars' speed and cargo volume is required. However, due to limited financial resources, the installation of climbing lanes on the priority sections between Moramanga and Brickaville, and the rehabilitation of railway infrastructure should be prioritized. The road widening to 4 lanes will come only after Phase 3.
Phased Development	<p>[Phase 1 (2019-2023)] A safe and resilient connectivity between Antananarivo and Toamasina is ensured through installation of safety devices and implantation of work for resilience on NR2. The railway infrastructure will be rehabilitated in order to increase cargo volume from the port to Antananarivo.</p> <p>[Phase 2 (2024-2028)] The upgrading of cargo transport volume of the TaToM Economic Axis by widening of National Road No.2 to 4 lanes is selectively started on the sections between Brickaville and Toamasina, and railway infrastructure is further improved.</p> <p>[Phase 3 (2029-2033)] The upgrading of cargo transport volume is done by selective road widening to four lanes for NR2.</p>	<p>[Phase 1 (2019-2023)] A safe and resilient connectivity between Antananarivo and Toamasina is ensured through installation of safety devices and implantation of work for resilience on NR2. Climbing lanes will be installed for Greater speed of the vehicles is ensured thanks to the construction at the level of the tracks on priority sections of 77km of the NR2 between Moramanga and Brickaville. The air transport will be improved to enhance passenger transport between Antananarivo and Toamasina.</p> <p>[Phase 2 (2024-2028)] Further upgrading of passenger cars' speed is attained through the construction of climbing lanes on necessary selected sections of 115km. This work will start in Phase 2 and continue in to Phase 3.</p> <p>[Phase 3 (2029-2033)] The upgrading of cargo transport volume is done by selective road widening to four lanes for NR2.</p>	<p>[Phase 1 (2019-2023)] A safe and resilient connectivity between Antananarivo and Toamasina is ensured through installation of safety devices and implantation of work for resilience on NR2. The air transport will be improved to enhance passenger transport between Antananarivo and Toamasina.</p> <p>[Phase 2 (2024-2028)] Passenger cars' higher speed is ensured through the construction of climbing lanes on the 77km prioritized sections of National Road No.2 between Moramanga and Brickaville. This construction work will start in the middle of Phase 1, and continue throughout Phase 2.</p> <p>[Phase 3 (2029-2033)] Cargo transport volume is upgraded by road widening of NR.2 to four lanes selectively between Brickaville and Toamasina, and also by continuing the rehabilitation of railway infrastructure.</p>

Source: JICA Study Team

The result of this meeting is stated in Section 28.4.1 of this chapter.

(3) Third Stakeholder Meeting for SEA Study for Transport and Territorial Development Plan for TaToM Economic Axis in Antananarivo

The third stakeholder meeting for SEA (called Fourth Stakeholder Meeting⁶) was held on 2nd and 3rd April 2019 in Antananarivo. The purpose of this meeting was to assess the strategies which were interpreted into priority projects composing the Transport and Territorial Development Plan for TaToM Economic Axis.

The assessment result are stated in Section 28.5.2 of this chapter.

28.4 Baseline and Scoping Study

Having concluded the initial stakeholders' workshops, the contracted National Consultants conducted and submitted the Baseline Reports and Scoping Report. The Scoping Report put into perspective the following issues:

- Definition of the extent of the study
- Identification of the key issues
- Identification of the main stakeholders
- Baseline conditions of the study areas
- Implementation time scheduling

The Scoping Report was generally approved by the members of TWG for SEA held on 7th July 2017.

28.5 Assessment Results

28.5.1 Scenario Analysis

The scenarios for each plan were evaluated using the compatibility matrix with the following sustainability pillars:

- Environment and natural resources
- Economic development
- Socio-culture and culture
- Institution and governance

(1) Scenario Analysis for PUDi for Antananarivo Agglomeration

Based on the scenario analysis result in Table 28.5.1, Scenario C⁷ was selected as the growth scenario for Antananarivo Agglomeration. (See Table 28.3.1 for description of each growth scenario)

Table 28.5.1 Scenario Analysis Result of PUDi for Antananarivo Agglomeration

Sustainability Pillars	Scenario A	Scenario B	Scenario C
Environment and Natural Resources			
Effect on natural resources (water bodies, biodiversity, climate etc.)	<ul style="list-style-type: none"> • Risk of leaving less primary forests, fauna and flora left in the agglomeration (parks, conservation areas and forest shreds) 	<ul style="list-style-type: none"> • Environmental management will be easier compared with other scenarios • Less significant environmental 	<ul style="list-style-type: none"> • Less environmental risk compared with scenario A • Although the impact towards natural environment is less than

⁶ The third stakeholder meeting for SEA for the formulation of Transport and Territorial Development Plan for TaToM Economic Axis was conducted together with other two plans as the Fourth Stakeholder Meeting.

⁷ Antananarivo Agglomeration will accommodate a variety of economic sectors aiming at balanced development of the two agglomerations.

	<ul style="list-style-type: none"> Biodiversity needs to be taken into account (protection and conservation is necessary) Water resources can be polluted due to drainage problem (direct discharge to Ikopa River without treatment.) 	problems will be caused compared to other scenarios	scenario A, good natural resources and water resources management is necessary
Pollution (air, sound, smell etc.) and Waste Management (industrial waste etc.)	<ul style="list-style-type: none"> More air pollution from factories Increase of solid waste due to population increase and industry development 	<ul style="list-style-type: none"> The pollution will be limited compared to other scenarios 	<ul style="list-style-type: none"> Although it may be less than scenario A, more air pollution from factories Increase of solid waste due to population increase and industry development
Risk of Disaster	<ul style="list-style-type: none"> Increase the risk of flooding caused by land pressure However, development of infrastructure and strong promotion of economic activities can promote decentralization from city centre, which will ease the land pressure in CUA 	<ul style="list-style-type: none"> Although land pressure may be less than other scenarios, population increase in this scenario will also increase the risk of flooding. The measures against disaster risk reduction and management may take more time to be implemented due to less economic activities (less generation of GDP) 	<ul style="list-style-type: none"> Increase the risk of flooding caused by land pressure However, development of infrastructure and strong promotion of economic activities can promote decentralization from city centre, which will ease the land pressure in CUA
Climate Change	<ul style="list-style-type: none"> More CO₂ emission due to increase of factories and number of traffic. 	May cause more CO ₂ emission due to less road infrastructure measure	<ul style="list-style-type: none"> Although less than scenario A, there will be more CO₂ emission due to increase of factories and number of traffic.
Economic Development			
Infrastructure Development	<ul style="list-style-type: none"> Infrastructure development will be concentrated in Antananarivo Agglomeration to develop towards proposed urban structure in scenario A 	<ul style="list-style-type: none"> Infrastructure development will be limited 	<ul style="list-style-type: none"> Infrastructure development will be more than scenario B but less than scenario A.
Development of Economic Activities (agriculture, tourism etc.)	<ul style="list-style-type: none"> Disadvantage for the other areas of Madagascar due to concentration of economic activities in Antananarivo Agglomeration Industrial development in Madagascar has always occurred in location close to resources. It may not be easy to promote concentration of economic activities in Antananarivo Agglomeration Less people in the surrounding areas of Antananarivo Agglomeration will continue agriculture due to more job opportunity (less fresh vegetable and fruit will be available for the residents and tourists in the city) 	<ul style="list-style-type: none"> Tourism sector and service sector will have potential to develop. More land in the peripheral areas of Antananarivo Agglomeration will remain as agricultural land since less economic development will happen in those areas in this scenario. 	<ul style="list-style-type: none"> Ease of access to CUA and other areas of Madagascar from Ivato Airport which will develop tourism sector.
Investment Environment	<ul style="list-style-type: none"> The infrastructure development will improve the investment environment of Antananarivo Agglomeration, furthermore Madagascar as a whole. 	<ul style="list-style-type: none"> Improvement in investment environment will be limited. 	<ul style="list-style-type: none"> The infrastructure development will improve the investment environment of Antananarivo Agglomeration, furthermore Madagascar as a whole.
Improvement of Standard of Living	<ul style="list-style-type: none"> More job opportunity will be available which will increase the income of households. 	<ul style="list-style-type: none"> Less job opportunity than the other scenarios for unskilled labour. 	<ul style="list-style-type: none"> More job opportunity will be available which will increase the income of households.
Relationship with Existing Projects	<ul style="list-style-type: none"> No major conflict with existing projects 	<ul style="list-style-type: none"> Some existing long term projects such as railway development will not be necessary for this scenario. Therefore, they may not be implemented as planned. 	<ul style="list-style-type: none"> No major conflict with existing projects
Transport	<ul style="list-style-type: none"> Connectivity and mobility will improve 	<ul style="list-style-type: none"> Connectivity and mobility will not improve significantly 	<ul style="list-style-type: none"> Connectivity and mobility will improve
Socio-culture and Culture			
Human Resources	<ul style="list-style-type: none"> Huge investment in human resources development is necessary for various economic sectors 	<ul style="list-style-type: none"> Human resources development to increase high skilled office workers is necessary 	<ul style="list-style-type: none"> Huge investment in human resources development is necessary for various economic

			sectors
Impact on Land Use (Land Use Zoning, Resettlement etc.)	<ul style="list-style-type: none"> Some resettlement will occur to implement the major infrastructure projects. More areas are necessary for economic development (industrial areas) 	<ul style="list-style-type: none"> Urban sprawl along the major arterial roads will occur more significantly than now 	<ul style="list-style-type: none"> Some resettlement will occur to implement the major infrastructure projects.
Access to Various Services (Electricity, Water, Administration etc.)	<ul style="list-style-type: none"> Promotes urbanisation in various areas of Antananarivo Agglomeration without social infrastructure 		<ul style="list-style-type: none"> Promotes urbanisation in various areas of Antananarivo Agglomeration without social infrastructure
Improvement of Public Safety (Traffic Accidents, Theft etc.)	<ul style="list-style-type: none"> Risk of social segregation in the new developed cities 	<ul style="list-style-type: none"> Risk of social segregation in the new developed cities 	<ul style="list-style-type: none"> Risk of social segregation in the new developed cities
Demographic (Population Migration etc.)	<ul style="list-style-type: none"> More people will migrate to Antananarivo Agglomeration from all over Madagascar seeking job opportunities. 	<ul style="list-style-type: none"> Less migration compared with other scenarios 	<ul style="list-style-type: none"> More people will migrate to Antananarivo Agglomeration from all over Madagascar. However less than scenario A
Impact on Culture, Habits and Customs	<ul style="list-style-type: none"> More people with different cultural background will migrate to Antananarivo Agglomeration. 		<ul style="list-style-type: none"> More people with different cultural background will migrate to Antananarivo Agglomeration.
Institutional and Governance			
Laws and Regulations in Force	<ul style="list-style-type: none"> Strong political will is necessary for realisation of this scenario 	<ul style="list-style-type: none"> This scenario is the result of development without any political will for industrial development. 	<ul style="list-style-type: none"> Strong political will is necessary for realisation of this scenario
Local Government Management (Structure, Capacity, Resources etc.)	<ul style="list-style-type: none"> Improvement of communes' capacity for human resources development, funding resources management is required. 	<ul style="list-style-type: none"> Since the economic sector development is centred in CUA, less necessity of local government capacity development. 	<ul style="list-style-type: none"> Improvement of communes' capacity for human resources development, funding resources management is required.
Administration Services (Decentralisation)	<ul style="list-style-type: none"> The infrastructure development will bring chance of developing service centres in Antananarivo Agglomeration. Therefore, people in Antananarivo Agglomeration will have more chance to have polycentric urban structure 	<ul style="list-style-type: none"> Administration service will concentrate in CUA 	<ul style="list-style-type: none"> The infrastructure development will bring chance of developing service centres in Antananarivo Agglomeration. Therefore, people in Antananarivo Agglomeration will have more chance to have polycentric urban structure
Taxation	<ul style="list-style-type: none"> More communes will get benefit from industrial area, increasing their tax income. 	<ul style="list-style-type: none"> Less communes will get benefit compared with other scenarios 	<ul style="list-style-type: none"> More communes will get benefit from industrial area, increasing their tax income.

Source: JICA Study Team based on Second SEA Stakeholder Meeting Report for Antananarivo Agglomeration and TaToM Economic Axis

(2) Scenario Analysis for PUDi for Toamasina Agglomeration

Based on the scenario analysis result in Table 28.5.2, Scenario B⁸ was selected as the growth scenario for Toamasina Agglomeration. (See Table 28.3.2 for description of each growth scenario)

Table 28.5.2 Scenario Analysis Result of PUDi for Toamasina Agglomeration

Sustainability Pillars	Scenario A	Scenario B
Environment and Natural Resources		
Effect on natural resources (water bodies, biodiversity, climate etc.)	<ul style="list-style-type: none"> No major effect on natural resources 	<ul style="list-style-type: none"> More threats to water resources due to industrial discharges compared with the other scenario. Impact on biodiversity and disappearance of agricultural land compared with the other scenario There will be impact on the vulnerable areas in the northern area of Toamasina Agglomeration.
Pollution (air, sound, smell etc.) and Waste Management (industrial waste etc.)	<ul style="list-style-type: none"> Less pollution compared with the other scenario. 	<ul style="list-style-type: none"> Increased economic activities will cause pollution.

⁸ Economic sectors in Toamasina Agglomeration will develop for nurturing self-reliant regional economy, in addition to logistics industry.

Risk of Disaster	<ul style="list-style-type: none"> Coastal protection is necessary by preservation of forests and green space 	<ul style="list-style-type: none"> Coastal protection is necessary by preservation of forests and green space
Economic Development		
Infrastructure Development	<ul style="list-style-type: none"> Limited measures will be implemented necessary for logistics, but will not promote development outside CUT. 	<ul style="list-style-type: none"> Infrastructure development is necessary for industrial development. The infrastructure developed for industrial sector can benefit the local population. More costly to implement the necessary infrastructure Development of infrastructures outside CUT will dedensify the population in CUT.
Development of Economic Activities (agriculture, tourism etc.)	<ul style="list-style-type: none"> Less formal job compared to the other option There is no change in industrial structure of Toamasina Agglomeration 	<ul style="list-style-type: none"> Fast development is expected to be seen Coordination and promotion of vocational training for the local population is necessary
Investment Environment	<ul style="list-style-type: none"> Less attractive 	<ul style="list-style-type: none"> Securing supply for industrial development is necessary
Improvement of Standard of Living	<ul style="list-style-type: none"> More job opportunity will be available which will increase the income of households. 	<ul style="list-style-type: none"> Less people will have chance of
Relationship with Existing Projects	<ul style="list-style-type: none"> No conflict with existing projects 	<ul style="list-style-type: none"> No conflict with existing projects
Transport		
Socio-culture and Culture		
Human Resources	<ul style="list-style-type: none"> No need to enhance capacity of workforce 	<ul style="list-style-type: none"> Lack of human resources. Need to promote skilled workers to relocate to Toamasina or to enhance capacity of workforce in Toamasina Agglomeration
Impact on Land Use (Land Use Zoning, Resettlement etc.)	<ul style="list-style-type: none"> Not much impact 	<ul style="list-style-type: none"> It is necessary to enforce the law for realising the plan More land pressure compared with the other scenario
Access to Various Services (Electricity, Water, Administration etc.)	<ul style="list-style-type: none"> The area for expansion of social services are limited 	<ul style="list-style-type: none"> Industrial Development will enable more areas in Toamasina Agglomeration to access to the basic services such as electricity and water supply.
Improvement of Public Safety (Traffic Accidents, Theft etc.)		<ul style="list-style-type: none"> Creation of job will improve the safety of Toamasina Agglomeration
Demographic (Population Migration etc.)	<ul style="list-style-type: none"> Less migration compared with the other scenario 	<ul style="list-style-type: none"> More migration will occur.
Impact on Culture, Habits and Customs	<ul style="list-style-type: none"> Not big impact 	<ul style="list-style-type: none"> Tourism development in Toamasina Agglomeration can promote the cultural crafts
Impact to Cultural and Sacred Sites	<ul style="list-style-type: none"> Not big impact 	<ul style="list-style-type: none"> Trano Manara

Source: JICA Study Team based on Second SEA Stakeholder Meeting Report for Toamasina Agglomeration

28.5.2 Strategy Assessment

Strategies implicated by priority projects for each plan were assessed using the opportunities and risk matrix. Through the assessment of priority projects no major comments from the stakeholders were given.

The overall assessment results for each plan are summarised in the following tables. When implementing each projects, the following impacts should be considered.

(1) Antananarivo Agglomeration

Table 28.5.3 Overall Environmental Impacts and General Measures for PUDi for Antananarivo Agglomeration

	Overall Impacts	Comprehensive Environmental Measures and Good Practices
1.Environment and Natural Resources		
1. Protected areas, forest areas, biodiversity, sensitive areas, landscape	<ul style="list-style-type: none"> The biggest effect could be the landfilling in wetlands and low lands for developing necessary roads and urban centres causing loss of natural function Although less significant, implementation of new infrastructures such as multi-modal cargo terminals, roads, parks, etc. could also change the landscape 	<p>Although Antananarivo Agglomeration does not have specific conservation areas, it has many sensitive areas that deserve special attention and environmental measures Therefore, the implementation of PUDi should be accompanied with sensitization and providing information to the residents and private sector.</p> <p>Areas determined as non-development areas should be respected as important conservation measure.</p>
2. Water resources and soil	<ul style="list-style-type: none"> There is a possibility that exploitation of groundwater could affect the surrounding wells and rice fields The availability (quantity impacts), quality and flow regime of 	<p>These resources and their areas of influence need to be systematically monitored in order to examine their evolution and evolution in the surrounding areas and other uses,</p>

	<p>surface water could potentially be affected by water exploitation works and the implementation of new water treatment plants</p> <ul style="list-style-type: none"> - Improvements to drainage and sanitation systems through projects could preserve the quality of groundwater in Antananarivo Agglomeration. 	
3. Pollution and Waste	<ul style="list-style-type: none"> - Household waste will increase due to population increase. - Industrial wastes and hazardous wastes can potentially increase in urban centers, suburban centres and industrial zones. 	<ul style="list-style-type: none"> - PUDI includes projects to set up and promote treatment and recycling centers in Manandriana and Andoharanofotsy. This will vision will strengthen the solid waste management system in Antananarivo agglomeration. - Industrial, hazardous and hospital wastes should also have a specific management system since they should not be treated with other (non-hazardous) wastes.
4. Risk of Disaster and climate change	<ul style="list-style-type: none"> - By reducing the congestion in many areas of Antananarivo Agglomeration CO₂ emission rate could potentially decrease - The risks of flooding and landslides could increase due to implementation of infrastructures on the wetland. 	<ul style="list-style-type: none"> - Enhancement of public awareness towards disaster management is necessary
2. Infrastructure and Economy		
1. Socio-economic Infrastructure, Urban Structure and Basic Infrastructures	<p>Most of the priority projects and new zonings will solve the problems currently existing in the urban areas of Antananarivo Agglomeration such as:</p> <ul style="list-style-type: none"> - Increase the number of basic infrastructures (roads, water treatment plant, health facilities, education facilities and recreation facilities) adequate and necessary for the development of the agglomeration - Improve connectivity and urban mobility conditions and at the same time reducing congestion, - Improve availability and access to basic services 	<p>Maintenance plan for infrastructures could also be implemented in Antananarivo Agglomeration.</p>
2. Economic Activities	<p>Increase in economic activities are expected due to improved infrastructure.</p> <ul style="list-style-type: none"> - SMEs, tourism, light industries and other income-generating activities can be developed. - Some centres will have the change to develop as growth pole in Antananarivo Agglomeration - Development of new investment projects - The increase in economic activities could improve revenues and various taxes for the government. - Through the promotion of new urban centres, synergistic development within Antananarivo Agglomeration can be created/ 	<p>The quality of life and economic attractiveness can be ensured through the continuous improvement of the various economic sector</p>
3. Investment	<ul style="list-style-type: none"> - Improving access to basic services and infrastructures could attract more development by both national and international investors. 	<ul style="list-style-type: none"> - While attracting investment in different areas, economic activities which could harm the environment should be well monitored.
4. Employment and Living Standard	<ul style="list-style-type: none"> - Opportunities for direct and indirect job creation 	<ul style="list-style-type: none"> - The availability of adequate human resources must be ensured through the establishment of technical and vocational training institutions focusing on potential offers.
5. Urban Mobility and Transport	<p>Significant improvement in urban mobility and transport is expected through the following projects:</p> <ul style="list-style-type: none"> - Upgrading of existing road infrastructures - Construction of new roads - New zoning plan and development of the urban centers - Promoting urban rail transport (Tanjombato - Ankorondrano line) 	<ul style="list-style-type: none"> - To reduce air emissions from motor vehicles and to ensure mobility, implementation of well-organized public transport system should be encouraged. - Road maintenance capacity should be improved.
3. Socioculture and Religion		
1. Demography	<ul style="list-style-type: none"> - Migration and squatting phenomena could occur - Illegal street vendors, prostitution etc. can increase - Pressure on housing will arise. - However, PUDI could significantly reduce urban pressure in Antananarivo Agglomeration through development of multi nucleus development - PUDI will also encourage to have balance in the urban centres and in the suburban centres 	<ul style="list-style-type: none"> - The new land use plan is an effective tool for organising land use within the agglomeration.
2. Land Tenure and Land Use	<ul style="list-style-type: none"> - Increase in land pressure and land conflicts related to development could arise. - The price of land will increase due to development of urban centres and new economic activities 	<ul style="list-style-type: none"> - Compensation is necessary for the people affected due to land used for public utilities etc. - Resettlement plans should be prepared.
3. Access to Basic Services	<ul style="list-style-type: none"> - Improvement in access to various services is expected through the implementation of priority projects. 	
4. Public Safety	<ul style="list-style-type: none"> - Risk of traffic accidents can increase - New risks of accident could also occur due to new passenger transport such as railway. - Risk of insecurity could be reduced due to the improvement of the economic conditions and standard of living of the population and to the presence of various infrastructures 	<ul style="list-style-type: none"> - To avoid the risk of traffic accidents, appropriate signaling devices should be implemented on the road. - Setting up an accident database system to promote good and efficient traffic accident management can be recommended. - A joint and coordinated effort is needed from all stakeholders involved in urban security management.
5. Culture and	<ul style="list-style-type: none"> - No impacts on culture and customs 	

Customs		
4. Institution and Governance		
1. Administration	- All administrative services could potentially be improved.	- In terms of governance and accountability, with all the planned projects, it would be rational to ensure the capacity building and the means of intervention of officials and local authorities.

(2) Toamasina Agglomeration

Table 28.5.4 Overall Environmental Impacts and General Measures for PUDi for Toamasina Agglomeration

	Overall Impacts	Comprehensive Environmental Measures and Good Practices
1. Environment and Natural Resources		
1. Protected areas, forest areas, biodiversity, sensitive areas, landscape	- The reduction in coverage of vegetation in the planning areas leading to possible loss of habitat and species	- The land use zoning plan should be respected, especially for areas determined as non-development area. - Some investment promotion projects could promote ecological tourism to develop the sensitive areas of special ecological interest.
2. Water resources and soil	- Although the impact is not assumed to be significant, water pollution due to contamination by solid waste and industrial waste	- Special monitoring during the implementation of Volobe Hydro-Power Plant is necessary. - Measures to protect soil contamination in industrial zones are recommended.
3. Pollution and Waste	- The establishment and operation of industrial areas could cause various kinds of waste including solid, liquid effluents, industrial waste - Significant amount of waste could be generated in the urban centres.	- Specific management system for hazardous waste should be implemented.
4. Risk of Disaster and climate change	- Tangible and intangible damage caused by cyclones could increase.	- Enhancement of public awareness towards disaster management is necessary
2. Infrastructure and Economy		
1. Socio-economic Infrastructure, Urban Structure and Basic Infrastructures	- Social infrastructure and economic (industrial, tourist facilities, commercial establishments ...) will be both standardized, multiplied, diversified and spread evenly throughout the metropolitan area.	- Maintenance plan for public infrastructures could be implemented Toamasina Agglomeration.
2. Economic Activities	Increase in economic activities are expected due to improved infrastructure. - SMEs, tourism, light industries and other income-generating activities can be developed. - The increase in economic activities could improve revenues and various taxes for the government.	The quality of life and economic attractiveness can be ensured through the continuous improvement of the various economic sector
3. Investment	- Improving access to basic services and infrastructures could attract more development by both national and international investors.	- While attracting investment in different areas, economic activities which could harm the environment should be well monitored. - An effective and sustainable investment in Toamasina Agglomeration is necessary.
4. Employment and Living Standard	- It is likely that the implementation of projects for Toamasina Agglomeration will create various direct and indirect jobs. This could increase income and purchasing power of some of the local population	- It is necessary to ensure the availability of adequate human resources through the establishment of institutions of technical and professional training.
5. Urban Mobility and Transport	Significant improvement in urban mobility and transport is expected through transport projects.	- To reduce air emissions from motor vehicles and to ensure mobility, implementation of well-organized public transport system should be encouraged. - Road maintenance capacity should be improved.
3. Socioculture and Religion		
1. Demography	- People migrating to Toamasina Agglomeration can increase. - People may squatter near new infrastructures and industrial zones. - Various informal activities might increase causing insecurity issues.	- The new land use plan is an effective tool for organising land use within the agglomeration. - Measures should be prepared to avoid people to squatter.
2. Land Tenure and Land Use	- The risks of land disputes related to expropriations due to infrastructure development and issues caused by zoning allocation may arise.	- Resettlement plans or resettlement action plans should be well prepared. - The new zoning system should be well known to the public.
3. Access to Basic Services	- The major problems in Toamasina such as access to drinking water and electricity can be resolved.	- The improvement of basic services should not only be in the urban areas but also be improved in the suburban areas.
4. Public Safety	- Risk of accidents on the new roads can be created. - Since residential areas, commercial and industrial areas will be provided with various services (electricity, access roads etc.),	- To avoid the risk of traffic accidents, roads must be implemented with necessary equipment such as speed limit signs etc. - A joint and coordinated effort is needed from all stakeholders involved in

	through the implementation of PUDI, the risk of insecurity may decline.	urban security management.
5. Culture and Customs	- The risk of sex tourism could increase with the promotion of tourism	- The actions against sex tourism could be conducted in conjunction with local authorities, services and organizations in the protection of women and children.
4. Institution and Governance		
1. Administration	- Through the components of PUDI, a significant improvement facilitating administrative organization can be expected.	- With all planned projects of PUDI, it would be rational to ensure capacity building and means of intervention of officials and local authorities
2. Institutional responsibilities and Governance	- PUDI has strategies advocating good governance in all sectors.	

Source: JICA Study Team based on SEA Report for PUDI for Toamasina Agglomeration

(3) TaToM Economic Axis

Table 28.5.5 Overall Environmental Impacts and General Measures for Transport and Territorial Development Plan for TaToM Economic Axis

	Overall Impacts	Comprehensive Environmental Measures and Good Practices
1. Environment and Natural Resources		
1. Protected areas, forest areas, biodiversity, sensitive areas, landscape	- The reduction of forest and vegetation - Some negative effect to certain conservation areas (Zahamena Forest Corridor) - Temporary disturbance to faunal species during project implementation periods. - Facilities such as introduction of roadside stations could significantly make the landscape more attractive	- Well detailed studies on biodiversity and existing species should be conducted before the implementation of priority projects. - Some investment projects could promote ecological tourism to develop the sensitive areas of special ecological interest.
2. Water resources and soil	- The implementation of the plan will not cause significant impact on the water resources. - Road improvements could increase the risk of landslide.	- Along NR2, implementation of slope stabilization must be conducted for sections with risk of erosion as proposed in the project.
3. Pollution and Waste	Road stations and industrial areas could increase pollution and waste such as the following: - Solid waste from the rest areas and roadside stations - Industrial waste (solid and liquid) from the industrial area in Moramanga	- An effective solid waste management system should be set up in cities and town along the economic axis. - For industrial waste, it would also provide a specific management system for hazardous waste since they will not be treated with other waste (non-hazardous).
4. Risk of Disaster and climate change	- Risks of landslide exist along economic axis.	- These risks could be managed by identifying any areas susceptible to erosion and studying the implementation of protective measures such as retaining walls and biological slope protection.
2. Infrastructure and Economy		
1. Socio-economic Infrastructure, Urban Structure and Basic Infrastructures	- All proposed priority projects will improve the transport and infrastructure of TaToM Economic Axis. - The new facilities are designed to modernize, standardize and ensure the sustainability of local services.	- To protect critical public transport infrastructures, a maintenance programme should be systematically implemented along TaToM Economic Axis.
2. Economic Activities	- The upgrading of TaToM Economic Axis could enhance sustainable development of transport and logistics activities along the economic axis - The development of TaToM Economic Axis can promote development of potential economic activities in cities and towns along NR2 such as tourism, agriculture, commerce and manufacturing.	- The quality of life and economic attractiveness can be ensured through the continuous improvement of the various economic sector - It is necessary to ensure the effective establishment of the Special Economic Zone to improve the business climate. Such zone should also ensure the creation of added value by promoting local products and processing.
3. Investment	- Many investors both domestic and international may be attracted to TaToM Economic Axis once the infrastructures are improved.	
4. Employment and Living Standard	- It is likely that the planned projects create various direct and indirect jobs. This could also increase income and purchasing power of a part of the local population	- Establishment of institutions of technical and professional training is necessary.
5. Urban Mobility and Transport	- The congestion in cities along NR2 will be improved.	
3. Socioculture and Religion		
1. Demography	- Migration and squatting phenomena could occur - Illegal street vendors, prostitution etc. can increase	- Measures should be prepared to avoid people to squatter.
2. Land Tenure and Land Use	- Issues caused by zoning allocation may arise.	- Resettlement plans or resettlement action plans should be well prepared.
3. Access to Basic Services	- The transportation improvement within the economic axis could improve the access to basic services	
4. Public Safety	- The number of accidents along NR2 could decrease.	

5. Culture and Customs	- New development may touch cultic and cultural sites	- Before the implementation of projects, it is recommended to identify the cultic and cultural sites and make the necessary steps in site relocation
4. Institution and Governance		
1. Administration	- There is no significant impact.	- It is necessary to ensure capacity building of local authorities.
2. Institutional Responsibility and Governance	- The establishment of security structures could contribute to the improvement of the responsibilities of relevant institutions in the management and governance of road safety	

Source: JICA Study Team based on SEA Report for TaToM Economic Axis

28.6 Implication from SEA to the Three Plans of TaToM

Through the activities conducted for SEA with stakeholder participation, some implications were suggested from the SEA study. The plans formulated in Project TaToM took in consideration of these implications and have made necessary revision to the plans.

28.6.1 Implication from SEA to Revised PUDi for Antananarivo Agglomeration

There are following five major implications from SEA to the Revised PUDi for Antananarivo Agglomeration:

- Since the ongoing Sanitation Master Plan (PIAA 2) for outside CUA, will not finish the hydrological simulation prior to end of TaToM Project, it is necessary for TaToM Project to make sure that the proposal in the PUDi will not threaten the flooding of the plain of Antananarivo Agglomeration.
- The future population of Antananarivo Agglomeration is to reach five million by 2033 and further nine million by 2050. Therefore, it is necessary to secure enough land for final disposal site as well as recycling centre to reduce the waste amount of Antananarivo Agglomeration
- Job creation is essential to improve the quality of life for the future population of Antananarivo Agglomeration. The implementation of infrastructure is necessary to promote investment.
- Necessary measures to ban brick making activities in the wet land and Ikopa River which cause air pollution and underproductive agriculture land should be included in PUDi
- Enough park and green space should be kept in the city

28.6.2 Implication from SEA to Revised PUDi for Toamasina Agglomeration

There are following major implications from SEA to the Revised PUDi for Toamasina Agglomeration:

- Necessary measures should be included for protecting the mangrove in the marshland area in north of Toamasina Agglomeration
- Buffer should be provided between industrial area and residential area

28.6.3 Implication from SEA to Transport and Territorial Development Plan

There are following major implication from SEA to the Transport and Territorial Development Plan:

- The development of the existing railway should maintain its priority, since the existing railway is the most important means of transport for the people living in the rural villages along the railway line.
- The highway route between Antananarivo and Toamasina must take in good consideration of the existing mountain area between the two cities to protect the forest areas. Furthermore, the construction of a highway connecting two major cities in the country could encourage

migration to areas close to the highway affecting the biodiversity. Careful social and environmental study is necessary prior to implementing this project.

28.7 Recommendations from SEA

The following points were recommended from SEA upon implementing the plans formulated in Project TaToM:

- SEA is a useful tool to support decision making during plan formulation process. However, the impacts assessed in SEA study are general and environmental measures proposed are overall measures. Therefore, it is necessary to conduct Environmental Impact Assessment (EIA) prior to implementing each priority projects.
- The effectiveness of the implementation of Project TaToM largely requires taking responsibility, participation and involvement of all stakeholders including local authorities. In this perspective, SEA recommends the mobilization of all stakeholders through capacity building and enhancement of awareness.

PART VIII

CONCLUSIONS AND RECOMMENDATIONS

Chapter 29 Conclusions and Recommendations

29.1 Conclusions

(1) Integrated Development Master Plan for the Overall TaToM Area

Project TaToM formulated the following three development plans:

- Urban Development Master Plan (PUDi) for Antananarivo Agglomeration
- Urban Development Master Plan (PUDi) for Toamasina Agglomeration
- Transport and Territorial Development Plan for TaToM Economic Axis

These development plans were prepared to promote development of these three areas in an integrated manner under a future vision of the Overall TaToM Area. That is, these three development plans composed an integrated development master plan for the Overall TaToM Area.

(2) Establishment of Implementation Framework for TaToM

Since Project TaToM identified the necessity to promote integrated development for the Overall TaToM Area, and prepared the integrated development master plan consisting of three development plans, it is concluded that an implementation framework should be established for promotion and coordination for implementation of the integrated development master plan for the Overall TaToM Area.

The implementation of integrated development master plan requires an institutional framework similar to the framework used for formulating the three development plans in an integrated manner.

(3) Necessity of Transformation of Economic Structures and Spatial Structures of the Overall TaToM Area

Having suffered from political crises in the last 25 years or more, Madagascar could not have attracted much private investment in its economic sectors and much official government assistance for its infrastructure sectors. As a result, Madagascar has not been able to spend enough money for maintenance and new construction of infrastructure not only for supporting people's life but also for promoting economic development.

Now, it is time for Madagascar to re-start its country's territorial and economic development by utilising external development assistance and private investments. Taking advantage of these opportunities, it is important for Madagascar to strategically promote infrastructure development in order to transform economic structures and spatial structures of Antananarivo Agglomeration, Toamasina Agglomeration and TaToM Economic Axis, rather than simply concentrating on maintenance and rehabilitation of infrastructure.

(4) Importance of Economic Sector Development in Toamasina Agglomeration and Upgrading of Transport System of TaToM Economic Axis

Project TaToM selected a growth scenario for the Overall TaToM which emphasises the importance of economic sector development in Toamasina Agglomeration, especially light industry and tourism, taking advantage of development of logistics infrastructure centering on Toamasina Port. For realising this growth scenario of the Overall TaToM, it is concluded that the upgrading of transport system of TaToM Economic Axis, including the construction of a climbing

lane for National Road No.2 in selected sections and rehabilitation of railway between Antananarivo and Toamasina, is essential, rather than simply doing road maintenance.

These upgrading interventions for National Road No.2 and railway of the Economic Axis are particularly important for promoting Project TaToM.

(5) Formulation of Urban Development Master Plan (PUDi) for Antananarivo Agglomeration covering 38 communes and Urban Development Master Plan (PUDi) for Toamasina Agglomeration covering 5 communes

Project TaToM has completed the formulation of two Urban Development Master Plans (PUDi) through a series of steering committee meetings and stakeholder meetings in a coordinated and participatory manner.

Each of the two master plans was prepared for an urban agglomeration consisting of a central commune (central city) and their surrounding communes, while communes are entitled to formulate their own urban development master plans (PUDi) under the decentralisation system of Madagascar and the Urban Planning and Housing Law of Madagascar (Law No.2015-052). An urban planning group was officially composed of member communes for the urban agglomeration on the basis of the issuance of a ministerial decree by the minister in charge of territorial development. This method of forming urban groups is effective to prepare PUDi for urban agglomerations covering more than two communes.

(6) Development Master Plans for Creation of Sustainable and Resilient Areas

Antananarivo Agglomeration, Toamasina Agglomeration and TaToM Economic Axis are water-related disaster-prone areas. Project TaToM pays attention not only to social, economic and environmental sustainability, but also to resilience against water-related disasters of the Overall TaToM Area.

The transformation of spatial structures by development of outer ring roads/ bypass roads and urban centres will strengthen the resilience of Antananarivo Agglomeration and Toamasina Agglomeration in the following aspects:

- Redundancy can be improved by providing outer ring roads and bypass roads, and also by developing additional hydropower stations and substations.
- Diversity can be enhanced by developing multi-nucleus urban structure in an urban agglomeration.
- Strength is being developed against inundation by implementing the drainage master plan of PIAA.
- Collaboration is possible to respond to disasters in partnership with stakeholders under the Implementation Framework for TaToM

(7) Selection of High Priority Projects

TaToM Project identified 78 high priority projects. The total cost of implementing these projects is approximately 3 billion USD which is equivalent to 25%-30% of Madagascar's development budget in the next 10 years, and this excludes the projects which should be implemented through PPP. Since the Overall TaToM Area is estimated to generate 60% of national GDP by 2028, and to further increase to 65% by 2033, it is important for the government to allocate enough budget to these high priority projects of TaToM.

29.2 Recommendations

(1) Necessity to Use a Set of Common Land Use Zoning Categories and Regulations for Madagascar's Cities

Project TaToM proposed a set of common land use zoning categories and regulations to be utilised for both Antananarivo Agglomeration and Toamasina Agglomeration. The land use zoning categories and regulations were formulated to enable more people to easily apply for construction permits and to enable government officers to easily check and issue construction permits. The proposed land use zoning categories and regulations are recommended to be utilised for all other cities in Madagascar.

(1) Necessity to Revise the Present Law on Urban Planning and Housing Law (Law No.2015-052)

Urban development and related activities are strongly influenced by regulations provided by the Urban Planning and Housing Law. Some of such existing regulations are not realistic to guide urban development in the present days.

Article 19 of Law No.2015-052 related to Urban Planning and Housing says that construction permits may be granted only for construction in the following cases:

- It is built on a land of more than 150 m². (Minimum lot size for buildings should be 150 m².)
- The lot width should not be less than ten meters in order to be buildable.
- The height of buildings (H) should not exceed the width of road (L) in front of the buildings.
- The built-up area should not exceed 70% of one subdivision. (Building coverage ratio should not exceed 70%.)

We strongly recommend that all of these regulations should be revised or amended, considering the following:

- In high-density residential areas, it is difficult for most land owners to comply with the minimum lot size of 150 m² and the minimum lot width of 10 m, when they want to reconstruct their residential buildings. In high-density residential zones, the minimum lot size of 100 m² should be allowed. In high-density residential zones, the regulation on minimum lot width should be abolished.
- Within urban centres, commercial zones should allow a larger height of buildings than their road width. It is recommended to allow that the building height (H) should be shorter than 2L (2 times of the road width).
- Building coverage ratio should be increased to 80% in high-density residential areas.

(2) Relationship between Urban Development Master Plan (PUDi) and Detailed Urban Development Plan (PUDé)

The PUDi should guide the preparation of PUDé within a city or an urban agglomeration. When a PUDi is revised, the revision of existing PUDé should be considered accordingly at the same time.

Under a revised PUDi, the adjustment or partial revision of a PUDé should be easier than the case of full revision of a PUDé. Therefore, it is necessary to establish a system of relatively easy revision of PUDé in case when PUDi is revised.

(3) Tertiary Arterial Roads

The network of tertiary arterial roads is the basic foundation for the urban structure at the commune level. Each commune (represented by the technical officer and mayor) should examine and revise, if needed, the tertiary roads shown in the revised PUDi of Antananarivo Agglomeration and

Toamasina Agglomeration, so that government budget can be properly allocated for improvement of designated tertiary roads.

(4) Promotion of Investments to Establish “Economic Development Zones”

Currently, a law is being created for designation of “Economic Development Zones” in undeveloped lands. In such designated Economic Development Zones, incentives are to be given to investments for estate development for economic sectors. However, it is recommended to establish a law by which to designate “Economic Development Zones” in either developed or undeveloped lands.

(5) Limited Utilisation of Wetlands for Urban Development

Since Antananarivo Agglomeration is surrounded by wetlands and it is prone to inundation due to heavy rainfall and river flooding, it is necessary to carefully utilise wetlands by land filling for infrastructure provision and urban centre development.

For Antananarivo City, a Sanitation Master Plan was prepared by PIAA. Project TaToM utilised the analysis and proposals of the Sanitation Master Plan for determining the extent of land filling in wetlands within CUA. However, since a Sanitation Master Plan for the area outside Antananarivo City has not been finished yet, it is recommended to determine which wetlands to allow for land filling in the area outside CUA by utilising the result of PIAA Phase 2 (for outside Antananarivo City).

(6) Involvement of Six More Communes outside the 38 Communes of Antananarivo Agglomeration

Considering the future population and land availability in Antananarivo Agglomeration, the future urbanization is expected to take place beyond the boundaries of the 38 communes of the current Urban Group for Antananarivo Agglomeration. Therefore, the land use zoning plan prepared by Project TaToM covers parts of the following six communes located surrounding Antananarivo Agglomeration.

- Merimandroso Commune
- Mahitsy Commune
- Iarinarivo Commune
- Fiadanana Commune
- Ambohimalaza Commune
- Fieferana Commune

In the implementation phase, these six communes should also become members (or observers) of the Urban Group for Antananarivo Agglomeration. At the same time, these communes also should be involved in the approval process of the revision of the PUDi for Antananarivo Agglomeration.

(7) Careful Determination of the Timing for Expressway Construction between Antananarivo and Toamasina

Although the construction of a 4-lane expressway between Antananarivo and Toamasina is considered based on a financial assistance by the Chinese government, the future forecast traffic volume might not be large enough to support a necessary cost of construction of the expressway. As a result, the expressway construction might generate a large negative impact on Malagasy government’s financial situation as well as to the Malagasy economy, if it is done at a too early phase. Therefore, it is strongly recommended not to start the construction of the expressway at an earlier period until 2028, when the Toamasina Port expansion project is to be completed.

(8) Development Permission System

Madagascar does not have such a development permission system, in which the government examines and gives approval to a development plan over a certain size, including high-rise buildings of 20 storeys within primary urban centres. It is recommended to establish such development permission system for those whose developments are over certain sizes.

(9) People's Participation

During the period of master plan formulation for Project TaToM, a continuing coordination and participation among stakeholders have been promoted. Although the master planning process involved a variety of government ministries, agencies and communes, it did not involve so many nongovernmental institutions and community organisations. At the stage of implementation of the master plans of Project TaToM, it is necessary to promote wide participation of people in various activities.

APPENDICES

Appendix A Planning Study's Activities

A.1 Phases of the Project

The Project has the following four phases which are scheduled as follows:

- **Phase 1:** Analysis of Present Conditions and Identification of Issues
From January 2017 until September 2017.
- **Phase 2:** Formulation of Growth Scenarios for the Overall TaToM Area, and Formulation of Growth Scenarios, Future Urban Structures and Basic Development Strategies for Antananarivo Agglomeration, Toamasina Agglomeration and TaToM Economic Axis
From September 2017 until July 2018.
- **Phase 3:** Formulation of Draft PUDi of Antananarivo Agglomeration, Toamasina Agglomeration, and Draft Transport and Development Plan for the TaToM Economic Axis
From July 2018 until June 2019.
- **Phase 4:** Finalisation of PUDi for Antananarivo Agglomeration, PUDi for Toamasina Agglomeration, and Transport and Development Plan for the TaToM Economic Axis
From June 2019 until July 2019.

Currently, the study of Phase 3 was finished. This Draft Final Report was prepared based on the study results of Phase 1, Phase 2 and Phase 3.

A.2 Progress Made in Phase 1

A.2.1 National Steering Committee and Local Steering Committee Meetings

(1) **First Joint Meeting for the National Steering Committee (NSC) and the Local Steering Committees (LSCs) of Component 1 and Component 3**

The First Joint Meeting for the National Steering Committee and Local Steering Committees for Antananarivo Agglomeration (Component 1) and TaToM Economic Axis (Component 3) was held to launch the TaToM Project at Carlton Hotel, Anosy on the 27th of January 2017. The Inception Report was presented, followed by a question and answer session. The importance of the participation and contribution from the stakeholders towards the project were emphasised by the Director General of Spatial Planning and Equipment (DGATE: Directeur Général de l'Aménagement du Territoire). In total, 128 people participated in the meeting.

(2) **First Meeting for the Local Steering Committee of Component 2**

The First Meeting for the Local Steering Committee for Toamasina Agglomeration (Component 2) was held to launch the TaToM Project at the Conference Room of Toamasina Urban Commune (CUT: Commune Urbaine de Toamasina) on the 1st of February 2017. The Inception

Report was presented, and several questions on the methodology and process of the project were presented and answered. In total, 59 people participated in the meeting.

A.2.2 Stakeholder Meetings

(1) First Stakeholder Meeting for Formulation of PUDi for Toamasina Agglomeration

The JICA Study Team prepared and held the First Stakeholder Meeting for Formulation of PUDi for Toamasina Agglomeration, along with the Ministry Attached to the Presidency in charge of Presidential Projects, Territorial Planning and Equipment (M2PATE: Ministère auprès de la Présidence en charge des Projets Présidentiels, de l'Aménagement du Territoire et de l'Équipement).

1) Objectives

- To initiate a series of stakeholder meetings for planning and SEA (Strategic Environmental Assessment) in Toamasina Agglomeration
- To explain and discuss the objectives, approaches and scope of the Project
- To discuss issues on present and future development of Toamasina Agglomeration, and environmental issues related to development of Toamasina Agglomeration.

2) Date

The meeting was held on the 19th June 2017.

3) Venue

The meeting was held in the conference room of Neptune Hotel in Toamasina.

4) Participants

The total number of participants was 39 including the following participants:

- 9 participants from communes
- 15 participants from ministries
- 1 participant from private sector
- 1 participant from development partners
- 13 participants from other entities (including JICA Study Team)

(2) First Stakeholder Meeting in Atsimondrano District for Formulation of PUDi for Antananarivo Agglomeration

The JICA Study Team prepared and held the First Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Atsimondrano District, along with M2PATE.

1) Objectives

- To initiate a series of stakeholder meetings for planning and SEA in Atsimondrano District and Antananarivo Agglomeration
- To explain and discuss the objectives, approaches and scope of the Project
- To discuss issues on present and future development of the district of Atsimondrano and the Antananarivo Agglomeration, and environmental issues related to development of Atsimondrano District and Antananarivo Agglomeration.

2) Date

The meeting was held on the 28th June 2017.

3) Venue

The meeting was held in the conference room of Les Heronsin Vontovorona, Atsimondrano District.

4) Participants

The total number of participants was 51 including the following participants:

- 33 participants from communes
- 4 participants from ministries
- 1 participant from private sector
- 14 participants from other entities (including JICA Study Team)

(3) First Stakeholder Meeting in Avaradrano District for Formulation of PUDi for Antananarivo Agglomeration

The JICA Study Team prepared and held the First Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Avaradrano District, along with M2PATE.

1) Objectives

- To initiate a series of stakeholder meetings for planning and SEA for Antananarivo Agglomeration in Avaradrano District
- To explain and discuss the objectives, approaches and scope of the Project
- To discuss issues on present and future development of the district of Avaradrano and the Antananarivo Agglomeration, and environmental issues related to development of Avaradrano District and Antananarivo Agglomeration

2) Date

The meeting was held on the 29th June 2017.

3) Venue

The meeting was held in the conference room of Lion d'OR in Avaradrano District.

4) Participants

The total number of participants was 42 including the following participants:

- 20 participants from communes
- 4 participants from ministries
- 1 participant from other regional entities
- 17 participants from other entities (including JICA Study Team)

(4) First Stakeholder Meeting in Ambohidratrimo District for Formulation of PUDi for Antananarivo Agglomeration

The JICA Study Team prepared and held the First Stakeholder Meeting for Formulation of PUDi of Antananarivo Agglomeration in Ambohidratrimo District, along with the M2PATE.

1) Objectives

- To initiate a series of stakeholder meetings for planning and SEA for Antananarivo Agglomeration in Ambohidratrimo District
- To explain and discuss the objectives, approaches and scope of the Project
- To discuss issues on present and future development of the district of Ambohidratrimo and the Antananarivo Agglomeration, and environmental issues related to development of Ambohidratrimo District and the Antananarivo Agglomeration

2) Date

The meeting was held on the 29th June 2017.

3) Venue

The meeting was held in the conference room of Espace Art-Ivato in Ambohidratrimo District.

4) Participants

The total number of participants was 36 including the following participants:

- 15 participants from communes
- 6 participants from ministries
- 1 participant from private sector
- 1 participant from development partners
- 1 participant from other regional entities
- 12 participants from other entities (including JICA Study Team)

(5) First Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Antananarivo Renivohitra District

The JICA Study Team prepared and held the First Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Antananarivo Renivohitra District, along with M2PATE.

1) Objectives

- To initiate a series of stakeholder meetings for planning and SEA for Antananarivo Agglomeration in Antananarivo Renivohitra District
- To explain and discuss the objectives, approaches and scope of the Project
- To discuss issues on present and future development of the district of Antananarivo Renivohitra (Antananarivo Urban Commune) and Antananarivo Agglomeration, and environmental issues related to development of Antananarivo Renivohitra District and Antananarivo Agglomeration

2) Date

The meeting was held on the 29th June 2017.

3) Venue

The meeting was held in the conference room of Café de la Gare in Antananarivo.

4) Participants

The total number of participants was 69 including the following:

- 4 participants from communes
- 29 participants from ministries
- 11 participants from private companies
- 2 participant from development partners
- 3 participants from NGOs and universities
- 4 participants from other regional entities
- 16 participants from other entities (including JICA Study Team)

A.2.3 Technical Working Group Meetings

Sectoral Technical Working Groups (TWGs) have been organized for formulation of each of the three plans and have held several meetings for coordination and detailed discussion on various issues and proposals at the technical level. For each of the five sector groups, namely, urban, road and transport, social, disaster risk reduction and SEA, relevant agencies have been chosen through close discussion between M2PATE and the JICA Study Team. The Technical Working Group Meetings conducted in Phase 1 are listed in Table 4.1.1.

Table A.2.1 Technical Working Group Meetings held in Phase 1

Date	TWG Meeting	Venue	Number of Participants
23rd February, 2017	First Disaster Risk Reduction TWG Meeting in Antananarivo	M2PATE conference room	14 (5 from communes, 7 from ministries, 2 from private companies)
24th February, 2017	First Road and Transport TWG Meeting in Antananarivo	M2PATE conference room	28 (9 from communes, 13 from ministries, 5 from private sector, 1 from donors)
27th February, 2017	First SEA TWG Meeting in Antananarivo	M2PATE conference room	15 (5 from communes, 10 from ministries)
2nd March, 2017	First Joint TWG Meeting for SEA and Social in Toamasina	CUT meeting room	13 (5 from communes, 5 from ministries, 3 from other municipal entities)
6th March, 2017	First Social TWG Meeting in Antananarivo	M2PATE conference room	14 (4 from communes, 9 from ministries, 1 from other entities)
7th March, 2017	First Joint TWG Meeting for Road and Transport, and Urban in Toamasina	CUT meeting room	14 (3 from communes, 7 from ministries, 1 from private sector, 1 from private sector, 1 from other municipal entities, 1 from other entities)
13th March, 2017	First Urban TWG Meeting in Antananarivo	M2PATE conference room	19 (1 from communes, 12 from ministries, 2 from private sector, 2 from donors, 1 from other municipal entities, 1 from other entities)
6th June, 2017	Second SEA TWG Meeting in Toamasina	CUT meeting room	14 (5 from communes, 4 from ministries, 1 from private sector, 5 from other entities)
13th June, 2017	Second SEA TWG Meeting in Antananarivo	M2PATE conference room	17 (14 from ministries, 3 from other entities)
20th June, 2017	Joint Second TWG Meeting for Social, Road and Transport and Urban, and First TWG Meeting for Disaster Risk Reduction in Toamasina	CUT meeting room	14 (6 from communes, 10 from ministries, 1 from other municipal entities, 3 from other entities)
5th July, 2017	Second Urban TWG Meeting in Antananarivo	M2PATE conference room	32 (4 from communes, 23 from ministries, 2 from private sector, 2 from donors, 1 from other municipal entities, 1 from other entities)
5th July, 2017	Second Road and Transport TWG Meeting in Antananarivo	M2PATE conference room	16 (4 from communes, 11 from ministries, 1 from private sector)

Source: JICA Study Team

A.2.4 Surveys Conducted in Phase 1

(1) Commune Visit Survey

A commune visit survey was conducted in the first phase of the project by the JICA Study Team. The methodology was discussed between the JICA Study Team and M2PATE in order to utilize the survey as an opportunity to collect data held by the communes.

1) Objectives

- To provide brief explanation on the TaToM Project to the communes inside Antananarivo Agglomeration and Toamasina Agglomeration

- To obtain data from communes on demography, urban planning, infrastructure, social condition, economy and disaster management as well as to collect current plans and documents such as Communal Development Plans (PCD: Plan Communal de Développement) and Monography reports
- To discuss urban issues with the communes
- To discuss development visions of the communes

2) Period

The Commune Visit Survey began in Antananarivo Agglomeration on the 30th of March 2017 and finished on the 21st of April 2017. The Commune Visit Survey in Toamasina Agglomeration was conducted from the 15th of May 2017 to 19th of May 2017.

3) Methodology

Two to five of experts visited the communes, and received data and held discussions on the development visions of the commune and the wider agglomeration. The information was then accumulated in to a survey sheet, accommodated with a simplified map to show the physical location of the commune facilities and areas. The collected data is compiled in the Annex of this report.

4) Record of Commune Visit Survey

In Antananarivo Agglomeration, two to three experts visited the 37 rural communes inside the Agglomeration (see Table A.2.2). For the Antananarivo Urban Commune (CUA), a coordinated meeting with different sectors has not yet been done. In Toamasina, 4 rural communes were visited during the survey (Table A.2.3). For Toamasina Urban Commune (CUT), experts of different sectors collected data from relevant directions of the CUT on different dates.

Table A.2.2 Dates for Commune Visit Survey conducted in Antananarivo Agglomeration

Date	Communes Visited by Team 1	Communes Visited by Team 2
30th March 2017	-	AM: Ampitatafika Rural Commune PM: Fenoarivo Rural Commune
31st March 2017	AM: Anosiala Rural Commune PM: Ambohidratrimo Rural Commune	AM: Talatamaty Rural Commune PM: Ivato Rural Commune
3rd April 2017	AM: Soavina Rural Commune PM: Tanjombato Rural Commune	AM: Anosy Avaratra Rural Commune PM: Manandriana Rural Commune
5th April 2017	AM: Andranonahoatra Rural Commune PM: Anosizato Andrefana Rural Commune	AM: Bemasoandro Rural Commune
6th April 2017	AM: Ankadimanga Rural Commune PM: Fiombonana Rural Commune	AM: Ambohitrimanjaka Rural Commune PM: Ampangabe Rural Commune
7th April 2017	AM: Ambohidrapeto Rural Commune	AM: Andoharanofotsy Rural Commune
10th April 2017	PM: Ankarobato Rural Commune	PM: Antehiroka Rural Commune
12th April 2017	AM: Itaosy Rural Commune PM: Ambavahaditokana Rural Commune	AM: Ambatolampy Tsimahafotsy Rural Commune PM: Ankadikely Ilafy Rural Commune
13th April 2017	AM: Soalandy Rural Commune	AM: Ambohimanambola Rural Commune
14th April 2017	AM: Ambohijanaka Rural Commune	AM: Ambohimagakely Rural Commune
18th April 2017	AM: Tsiafahy Rural Commune PM: Bongatsara Rural Commune	AM: Ampanefy Rural Commune
19th April 2017	AM: Ambohimanga Rova Rural Commune	AM: Alakamisy Fenoarivo Rural Commune PM: Ambatomirahavavy Rural Commune
20th April 2017	-	AM: Alasora Rural Commune
21st April 2017	AM: Sabotsy Namehana	-

Source: JICA Study Team

Table A.2.3 Dates for Commune Visit Survey conducted in Toamasina Agglomeration

Date	Visited Communes
15th May 2017	AM: Amboditandrroho Rural Commune PM: Fanandrana Rural Commune
19th May 2017	AM: Antetezambaro Rural Commune PM: Suburban Toamasina Rural Commune

Source: JICA Study Team

(2) Traffic Surveys

Two traffic surveys were conducted in order to obtain better data on the traffic situation inside Antananarivo Agglomeration, Toamasina Agglomeration and along the national road No.2. The traffic survey was conducted by Malagasy sub-consultants. The Traffic Count Survey started on the 3rd of February 2017 and is still on-going. The Road Inventory Survey also started on the 3rd of February 2017 and completed on the 22nd of June 2017. The survey results are compiled in the road and transportation section of this report.

A.2.5 Preparation of Base Maps and Present Land Use Maps

To fully understand the Agglomerations' current conditions and to formulate a precise present land use map, a base map is currently being prepared by Japanese sub-consultants and Malagasy experts. The project will produce the following;

- 1/10,000 Ortho Image, Basemap and Present Land Use Map for the Urban Area and the Peri-Urban area in Antananarivo Agglomeration and Toamasina Agglomeration
- 1/50,000 Ortho Image and Basemap for the Study Area with some additional areas in Antananarivo Agglomeration

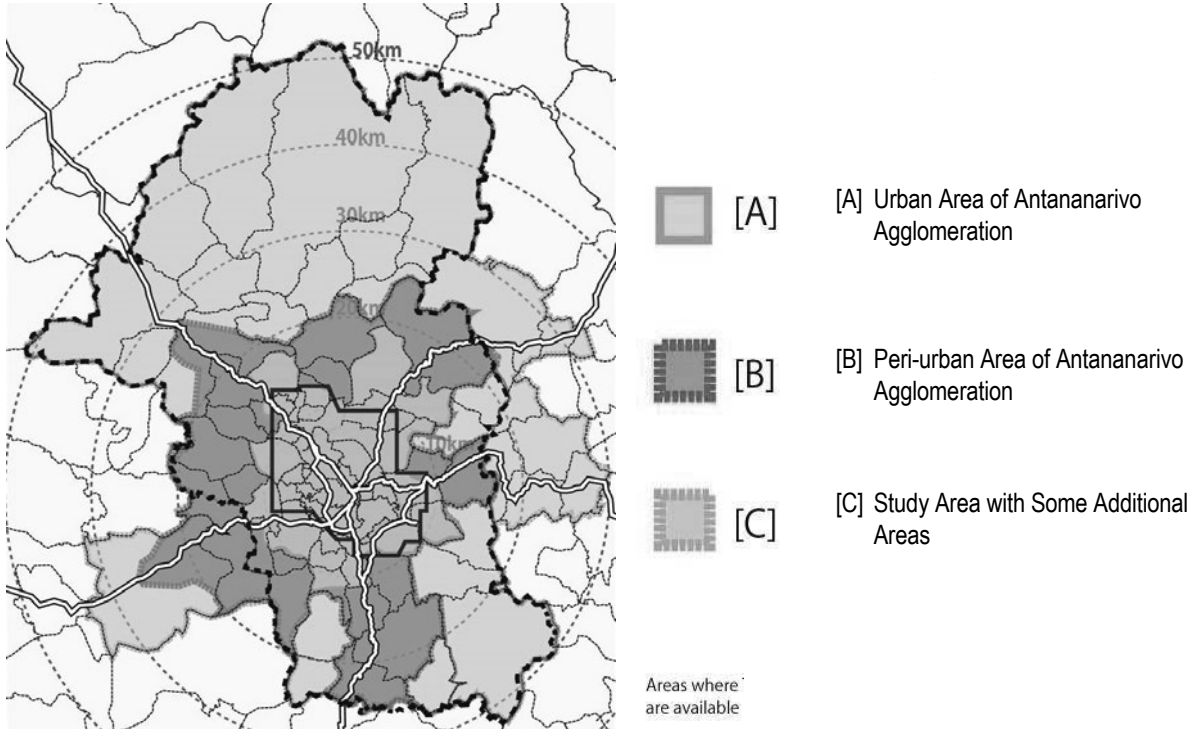
Currently, the ortho images and contours have been obtained, and the production of the basemaps for both agglomerations are at its final stage. The land use maps have been prepared based on the ortho images, but are currently being updated by Malagasy experts.

Table A.2.4 show the specifications of each map, and Figure A.2.1 and Figure A.2.2 show the areas these maps will be prepared for.

Table A.2.4 Specifications of Maps to be produced

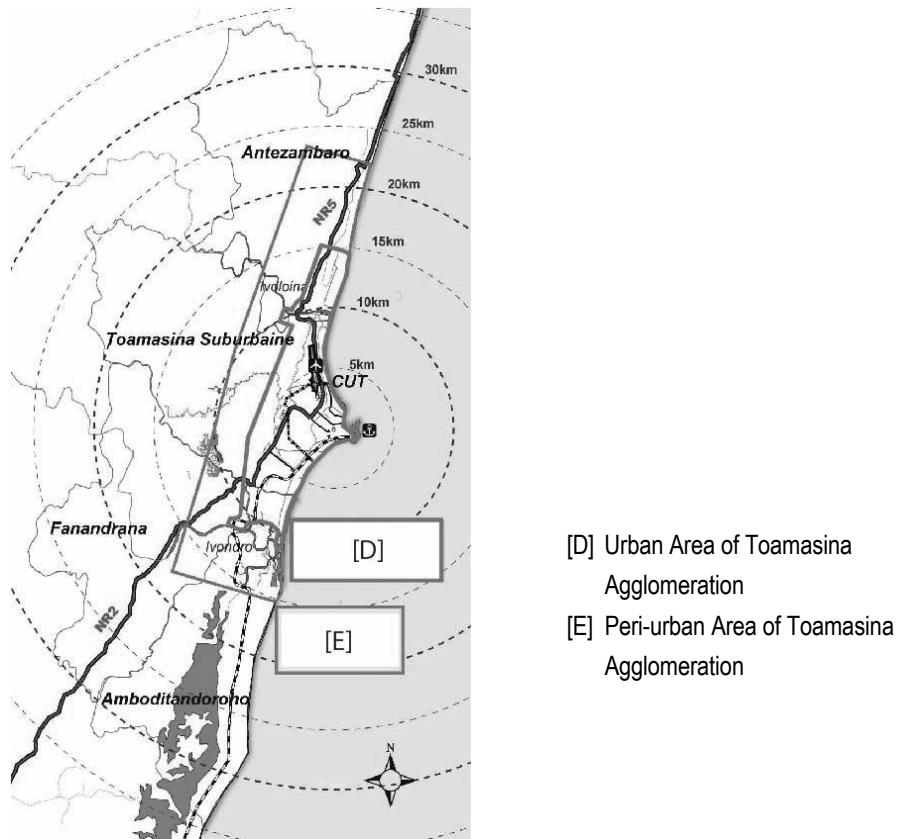
Area (Extent)	Color Ortho	Basemap	DTM/Contour	Present Land Use
Antananarivo Agglomeration				
[A] Urban Area (596km ²)	Color ortho images (1/10,000) , Mosaic image of 3 scenes from World View 2 taken in 2016	Basemap shall include roads, railways, buildings, and contour lines.	2.5m contour lines shall be drawn, using DTM data (2m),	Present land use map shall be prepared.
[B] Peri-Urban Area (611 km ²)			5m contour lines shall be drawn, using DTM data (5m),	
[C] Study Area with additional areas (1,872 km ²)	Color ortho images (1/50,000). A mosaic of Dove images taken in 2016 and 2017.	Basemap shall include roads, railways, buildings, and contour lines.	-	-
Toamasina Agglomeration				
[D] Urban Area (122 km ²)	Color ortho images (1/10,000) , Mosaic image of several scenes from World View 2 and World View 3, taken in 2016. Geo-Eye images are used to cover cloud shadows.	Basemap shall include roads, railways, buildings, and contour lines.	Use DTM data (2m) , generate 2.5m contour line	Present land use map shall be prepared by the Japanese subcontractor
[E] Peri-urban Area (196 km ²)			Use DTM data (5m) , generate 5m contour line	

Source: JICA Study Team



Source: JICA Study Team

Figure A.2.1 Areas of the Different Basemaps and Present Land Use Maps for Antananarivo Agglomeration



Source: JICA Study Team

Figure A.2.2 Areas of the Different Basemaps and Present Land Use Maps for Toamasina Agglomeration

A.3 Progress Made in Phase 2

A.3.1 Stakeholder Meetings

(1) Second Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Ambohidratrimo District

1) Objectives

- To present the identified issues of Antananarivo Agglomeration
- To discuss the future direction of economic development for Antananarivo Agglomeration
- To discuss the future direction of urban structure for Antananarivo Agglomeration

2) Date

The meeting was held on the 18th September 2017.

3) Venue

The meeting was held at Le Relais des Plateaux in Ivato Rural Commune.

4) Participants

There were 44 participants in total, including;

- 15 participants from communes
- 8 participants from M2PATE
- 3 participants from other ministries
- 2 participants from private sectors
- 1 participant from other public entities
- 15 participants from other entities (including JICA Study Team)

(2) Second Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Avaradrano District

1) Objectives

- To present the identified issues of Antananarivo Agglomeration
- To discuss the future direction of economic development for Antananarivo Agglomeration
- To discuss the future direction of urban structure for Antananarivo Agglomeration

2) Date

The meeting was held on the 19th September 2017.

3) Venue

The meeting was held at Le Lion d'Or in Anosy Avaratra Rural Commune.

4) Participants

There were 51 participants in total, including;

- 21 participants from communes
- 13 participants from M2PATE
- 5 participants from other ministries
- 3 participants from private sectors
- 1 participant from other public entities
- 8 participants from other entities (including JICA Study Team)

(3) Second Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Atsimondrano District

1) Objectives

- To present the identified issues of Antananarivo Agglomeration
- To discuss the future direction of economic development for Antananarivo Agglomeration
- To discuss the future direction of urban structure for Antananarivo Agglomeration

2) Date

The meeting was held on the 20th September 2017.

3) Venue

The meeting was held at Les Colonnades in Ambohijanaka Rural Commune.

4) Participants

There were 86 participants in total, including;

- 47 participants from communes
- 15 participants from M2PATE
- 8 participants from other ministries
- 2 participants from private sectors
- 1 participant from development partners
- 2 participant from other public entities
- 11 participants from other entities (including JICA Study Team)

(4) Second Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration in Antananarivo Renivohitra District

1) Objectives

- To present the identified issues of Antananarivo Agglomeration
- To discuss the future direction of economic development for Antananarivo Agglomeration
- To discuss the future direction of urban structure for Antananarivo Agglomeration

2) Date

The meeting was held on the 21st September 2017.

3) Venue

The meeting was held at Hotel de Ville in Analakely Rural Commune.

4) Participants

There were 95 participants in total, including;

- 29 participants from communes
- 13 participants from M2PATE
- 11 participants from other ministries
- 6 participants from private sectors
- 3 participants from development partners
- 2 participants from NGOs and universities
- 3 participant from other public entities
- 28 participants from other entities (including JICA Study Team)

(5) First Stakeholder Meeting for Formulation of Development Plan for TaToM Economic Axis in Moramanga

1) Objectives

- To announce the commencement of formulation of “Transport and Land Development Plan for TaToM Economic Axis” which includes formulation of development strategies for economic and transport development in Moramanga.
- To discuss problems and issues of Moramanga related to development with wide stakeholders
- To discuss social and environmental problems and issues on development of Moramanga with wide stakeholders

2) Date

The meeting was held on the 22nd September 2017.

3) Venue

The meeting was held at Espace Diamant in Moramanga Urban Commune.

4) Participants

There were 32 participants in total, including;

- 8 participants from communes
- 8 participants from M2PATE
- 4 participants from other ministries
- 1 participants from private sectors
- 2 participants from NGOs and universities
- 1 participant from other public entities
- 8 participants from other entities (including JICA Study Team)

A.3.2 National Steering Committee and Local Steering Committee Meetings

(1) Second Local Steering Committee (LSC) for Component 3

The Second Local Steering Committee for TaToM Economic Axis (Component3) was held at Café de la Gare in Antananarivo Urban Commune, on the 26th of September, 2017. The Progress Report was presented, followed by a discussion on the contents of the Progress Report.

59 participants attended the meeting from the following institutions.

- 9participants from communes
- 10 participants from M2PATE
- 6 participants from other ministries
- 1 participants from development partners
- 12participant from other public entities
- 21 participants from other entities (including JICA Study Team)

(2) Second Local Steering Committee (LSC) for Component 1

The Second Local Steering Committee Meeting for Component 1, revision of the Antananarivo Agglomeration PUDi was held at Café de la Gare in Antananarivo Urban Commune, on the 26th of September, 2017. The Progress Report was presented, followed by a discussion on the contents of the report.

39 participants attended the meeting from the following institutions.38 participants from communes

- 4 participants from M2PATE
- 5 participants from other ministries
- 12 participant from other public entities
- 18 participants from other entities (including JICA Study Team)

(3) Second Local Steering Committee (LSC) for Component 2

The Second Local Steering Committee Meeting for Component 2, revision of the Toamasina Agglomeration PUDi was held at Gare des Manguiers in Toamasina Urban Commune, on the 29th of September, 2017. The Progress Report was presented, followed by a discussion on the contents of the report.

48 participants attended the meeting from the following institutions.

- 7 participants from communes
- 4 participants from M2PATE
- 12 participants from other ministries
- 4 participants from private sector
- 1 participant from development partners
- 6 participant from other public entities
- 14 participants from other entities (including JICA Study Team)

(4) Second National Steering Committee (NSC)

The Second National Steering Committee was held on the 6th of October, at Ibis hotel in Ankorondrano. The contents of the Progress Report, along with the discussions held in the Local Steering Committee's and Stakeholder Meetings, were presented to the National Steering Committee.

34 participants attended the meeting from the following institutions.

- 6 participants from communes
- 2 participants from M2PATE
- 7 participants from other ministries
- 2 participants from private sector
- 2 participants from development partners
- 1 participant from NGOs and universities
- 2 participant from other public entities
- 12 participants from other entities (including JICA Study Team)

A.3.3 Technical Working Group Meetings

Sectoral Technical Working Groups (TWGs) have been organized for formulation of each of the three plans and have held several meetings for coordination and detailed discussion on various issues and proposals at the technical level. For each of the five sector groups, namely, urban, road and transport, social, disaster risk reduction and SEA, relevant agencies have been chosen through close discussion between M2PATE and the JICA Study Team. The Technical Working Group Meetings conducted in Phase 2 are listed in Table A.2.1.

Table A.3.1 Technical Working Group Meetings held in Phase 2

Date	TWG Meeting	Venue	Number of Participants
5 th September, 2017	Third Transportation TWG in Antananarivo	M2PATE conference room	12 (2 from communes, 2 from M2PATE, 8 from other entities (including JICA Study Team))
6 th October, 2017	Second Social Infrastructure TWG Meeting in Antananarivo	M2PATE conference room	22 (1 from communes, 4 from M2PATE, 4 from other ministries, 1 from Development Partners, 1 from NGOs and Universities, 2 from other Public institutions and 9 from other entities (including JICA Study Team))
6 th March, 2018	Fourth Transportation TWG in Antananarivo	M2PATE conference room	14 (4 from communes, 9 from ministries, 1 from other entities)
7 th March, 2018	Third Transportation TWG in Toamasina	CUT meeting room	14 (3 from communes, 7 from ministries, 1 from private sector, 1 from private sector, 1 from other municipal entities, 1 from other entities)

A.3.4 Japan Study Tour

The Japan Study Tour was held from the 26th January, 2018 until the 11th February 2018. Fifteen participants came to Japan to attend the tour.

(1) Objective

To build the capacity of the participants' organizations by sharing knowledge gained from the training with colleagues including urban planning, housing policy, city and harbour development, disaster management, inter-city logistics planning and intra-city transportation, and the Japanese experiences on making and implementing urban master plans.

(2) Schedule

Schedule and Tentative Content of Training Programme					
No. of days	Date	Time	Schedule	Location	Accommodation
1	29 th Jan (Mon)	9:00 ~ 12:00	Orientation (1.5h: Briefing on the stay, 0.5h: Program opening ceremony, 1h: Explanation on the objective of the program)	JICA Yokohama	Hotel Monterey Yokohama
		13:30 ~ 15:00	Lecture on Yokohama Port Development (Lecture in meeting room on board a ship)	Port of Yokohama (City of Yokohama)	
		15:15 ~ 16:30	Yokohama International Passenger Terminal site visit	Yokohama Customs (City of Yokohama)	
2	30 th Jan (Tue)	9:00 ~ 10:00	Lecture on the overview of urban development of Kawasaki city (Operation Policy of Machizukuri Bureau, Structure of city development operations)	City of Kawasaki, Machizukuri Bureau	Hotel Monterey Yokohama
		10:15 ~ 11:45	Lecture on urban planning in Kawasaki (urban master plan, land use plan, district plan, urban design)	City of Kawasaki, Machizukuri Bureau	
		15:00 ~ 17:00	Site visit around Musashikosugi station redevelopment site	Kawasaki City	
3	31 st Jan (Wed)	10:00 ~ 12:00	Lecture on outline of housing supply and urban development in Japan. Introduction to UR's roles.	Urban Renaissance Agency (UR)	Hotel Monterey Yokohama
		13:30 ~ 15:30	UR's new town development (site visit in Kohoku New Town)	Kohoku New Town	
		16:30 ~ 19:00	Reflection session and discussion on TaToM Project	JICA Yokohama	
		20:00 ~ 21:30	Exchange of opinions	Yokohama Red Brick Warehouse	
4	1 st Feb (Thu)	10:00 ~ 12:00	Lecture and site visit on intra-city logistics and truck terminals	Keihin Truck Terminal	Hotel Monterey Yokohama
		14:00 ~ 16:00	Site visit on the improvement of water quality and watershed flood control measures of Tsurumi River	Keihin River Bureau	
5	2 nd Feb (Fri)	9:00 ~ 10:00	Reflection Session	JICA Yokohama	Matsumoto city
		10:30 ~ 15:00	Move from Tokyo to Matsumoto on the Chuo express way (stop by at service area for site visit and lunch)		
		15:30 ~ 16:00	Lecture and site visit on industrial parks in the City of Matsumoto	Matsumoto City, Department of	

				Commerce and Industry	
		16:00 ~ 17:30	Visit company inside Matsumotoshirinkuu Industrial Park (Takano Inc.)	Matsumotoshirinkuu Industrial Park	
6	3 rd Feb (Sat)	9:00 ~ 10:45	Site visit in Matsumoto city (Matsumoto castle)	Matsumoto City	Toyama city
		10:45 ~ 17:00	Move from Matsumoto to Toyama	City of Takayama	
7	4 th Feb (Sun)		Day-off		
8	5 th Feb (Mon)	9:00 ~ 12:00	Lecture on Toyama City's experience in compact city policies, intra-city transport, port and harbor development, industrial parks and attracting businesses	City of Toyama	Toyama city
		13:30 ~ 16:00	Site visit on light rail transit system	Inside Toyama City	
9	6 th Feb (Tue)	10:30 ~ 12:00	Lecture on the historical heritage preservation plan and Tourism strategy of the City of Takayama	City of Takayama	Nagoya city
		13:30 ~ 14:45	Lecture on the development and maintenance of national roads in mountainous regions	Takayama National Road Office	
		15:00 ~ 16:00	Site visit on historical heritage preservation zones in Takayama city	Takayama City	
		16:00 ~ 19:30	Move from Takayama to Nagoya by railway		
10	7 th Feb (Wed)	9:00 ~ 12:00	Site visit at Yokkaichi Pollution and Environment Museum	Yokkaichi City	Nagoya city
		14:30 ~ 17:00	Site visit on Nagoya city, urban parks and surrounding industrial areas (while moving back to Nagoya)	Between Yokkaichi and Nagoya, inside Nagoya City	
11	8 th Feb (Thu)	11:00 ~ 13:30	Move from Nagoya to Tokyo by bullet train		Hotel Monterey Yokohama
		14:00 ~ 17:30	Logistics Museum		
12	9 th Feb (Fri)	10:00 ~ 16:00	Reflection Session	JICA Yokohama	Hotel Monterey Yokohama
		16:00 ~ 17:30	Evaluation of training program, Ending Ceremony	JICA Yokohama	

(3) Members

	Organisation / Position	Name
1	Directeur des Villes, de l'Habitat et de la Planification territoriale	Mr. Harimanana RABE
2	Chef du Service de la Planification Territoriale	Mrs. Tahina Harisoa RATELOSON
3	Chef du Service Regional de l'Amenagement du Territoire	Mr. Heriniaina ANDRIAMAMPIANINA
4	Chef de la Circonscription Topographique d' Ambanja	Mr. Randriamijoro MARINTSAINA
5	General Director of Public Works	Mr. Eric RAFIRINGA
6	Directeur Général des Transports Terrestres	Mrs. Vola RAJAOFERA
7	Deputy Mayor of Antananarivo Urban Commune, acting for President, Mayor of Urban Commune of Antananarivo	Mrs. Emilien RAMBOASALAMA
8	Vice President, Mayor of Rural Commune of Ampitatafika	Mr. Rado RAMPARAOELINA
9	President, Mayor of Suburban Commune of Toamasina	Mr. Jean Nicaise RAZAFINDRAMOSA
10	Vice President, Mayor of Rural Commune of Fanandrana	Mr. Maurice Emmanuel SOLO
11	Chef de Service au sein de la Direction de l'Urbanisme et Développement	Mrs. Hariniaina SOLOARIVELO
12	Directeur de l'Aménagement, de la Programmation et de l'Environnement	Mr. Vincent Emmanuel RABE
13	Chef du Service du Renouvellement Urbain / Head of Urban Redevelopment Department	Mrs. Elodie SELAMANANA
14	Commune Technician / Agent voyer	Mr. Justin RAKOTOARISOA

A.4 Progress Made in Phase 3

A.4.1 National Steering Committee and Local Steering Committee Meetings

(1) Third Local Steering Committee (LSC) Meeting for Component 3 (TaToM Economic Axis)

1) Objectives

To present the Interim Report for Component 3 (TaToM Economic Axis), and to discuss the Future vision, alternative development strategies and priority projects for TaToM Economic Axis.

2) Date

The meeting was held on the 3rd of July, 2018.

3) Venue

The meeting was held at PANORAMA Hotel, Antananarivo.

4) Participants

There were 44 participants in total, including;

- 4 participants from communes
- 16 participants from MATSF
- 4 participants from other ministries
- 2 participants from private sectors
- 4 participants from other public entities
- 14 participants from other entities (including JICA Study Team)

(2) Third Local Steering Committee (LSC) Meeting for Component 2 (Toamasina Agglomeration)

1) Objectives

To present the Interim Report for Component 2 (Toamasina Agglomeration), and to discuss the Future vision, alternative development strategies and priority projects for Toamasina Agglomeration.

2) Date

The meeting was held on the 5th of July 2018.

3) Venue

The meeting was held at Gare des Manguiers, Toamasina.

4) Participants

There were 54 participants in total, including;

- 9 participants from communes
- 7 participants from MATSF
- 8 participants from other ministries
- 6 participants from private sectors
- 4 participants from other public entities
- 19 participants from other entities (including JICA Study Team)

(3) Third Local Steering Committee (LSC) Meeting for Component 1 (Antananarivo Agglomeration)

1) Objectives

To present the Interim Report for Component 1 (Antananarivo Agglomeration), and to discuss the Future vision, alternative development strategies and priority projects for Antananarivo Agglomeration.

2) Date

The meeting was held on the 10th of July, 2018.

3) Venue

The meeting was held at PANORAMA Hotel, Antananarivo.

4) Participants

There were 111 participants in total, including;

- 60 participants from communes
- 10 participants from MATSF
- 9 participants from other ministries
- 6 participants from private sectors
- 12 participants from other public entities
- 13 participants from other entities (including JICA Study Team)

(4) National Steering Committee (NSC) Meeting

1) Objectives

To present the Interim Report and to discuss on the Future vision, alternative development strategies and priority projects for TaToM Economic Axis.

2) Date

The meeting was held on the 12th of July, 2018.

3) Venue

The meeting was held at IBIS Hotel, Antananarivo.

4) Participants

There were 51 participants in total, including;

- 10 participants from communes
- 7 participants from MATSF
- 9 participants from other ministries
- 2 participants from private sectors
- 8 participants from other public entities
- 15 participants from other entities (including JICA Study Team)

A.4.2 Stakeholder Meetings

(1) Third Stakeholder Meeting for Formulation of PUDi for Toamasina Agglomeration (SEA Stakeholder Meeting)

1) Objectives

To assess the alternative growth scenarios for Toamasina Agglomeration from the social and environmental aspects using SEA tools with various stakeholders.

2) Date

The meeting was held on the 5th of July 2018.

3) Venue

The meeting was held at Gare des Manguiers, Toamasina.

4) Participants

There were 54 participants in total, including;

- 9 participants from communes
- 7 participants from MATSF
- 8 participants from other ministries
- 6 participants from private sectors
- 4 participants from other public entities
- 19 participants from other entities (including JICA Study Team)

(2) Third Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration and Formulation of Development Plan for TaToM Economic Axis (SEA Stakeholder Meeting)

1) Objectives

To assess the alternative growth scenarios for Antananarivo Agglomeration and TaToM Economic Axis from the social and environmental aspects using SEA tools with various stakeholders.

2) Date

The meeting was held on the 17th of July, 2018.

3) Venue

The meeting was held at PANORAMA Hotel, Antananarivo.

4) Participants

There were 116 participants in total, including;

- 53 participants from communes
- 9 participants from MATSF
- 13 participants from other ministries
- 10 participants from private sectors
- 13 participant from other public entities
- 15 participants from other entities (including JICA Study Team)

(3) Joint Fourth Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration, Formulation of PUDi for Toamasina Agglomeration and Formulation of Development Plan for TaToM Economic Axis (SEA Stakeholder Meeting)

1) Objectives

To discuss and evaluate among various stakeholders, the environmental and social impact of the strategies for Antananarivo Agglomeration, Toamasina Agglomeration and TaToM Economic Axis using SEA tools.

2) Date

The meeting was held on the 2nd and 3rd of April, 2019

3) Venue

The meeting was held at CERCLE DES CHEMINOTS, PK0, Antanimena, Antananarivo.

4) Participants

There were 99 participants in total, including;

- 37 participants from communes
- 11 participants from MAHTP
- 6 participants from other ministries
- 3 participants from private sectors
- 15 participants from other public entities
- 21 participants from other entities (including JICA Study Team)

A.4.3 Technical Working Group Meetings

Sectoral Technical Working Groups (TWGs) have been organized for formulation of each of the three plans and have held several meetings for coordination and detailed discussion on various issues and proposals at the technical level.

Table A.4.1 Technical Working Group Meetings held in Phase 3

Date	TWG Meeting	Venue	Number of Participants
9th of July, 2018	Third TWG for Strategic Environmental Assessment	M2PATE conference room	14 (3 from communes, 6 from ministries, 5 from other entities (including JICA Study Team))
19th of April, 2019	Fifth Transportation TWG for Antananarivo Agglomeration	Individual consultation conducted	Ministry of Territorial Planning and Public Works , Ministry of Transport, Tourism and Meterology

A.4.4 Urban Group Meetings

A series of urban group meetings were held for both agglomerations, to discuss technical matters with the technical officers of the communes related to both agglomerations.

(1) Urban Group Meeting for Formulation of PUDi for Toamasina Agglomeration

1) Objectives

- To share and discuss the preliminary new land use zoning system and regulations, especially for residential areas, mixed use areas and preservation areas.
- To share and discuss the preliminary major priority projects and development phases.

2) Date

The meeting was held on the 3rd of October, 2018.

3) Venue

The meeting was held at Conference Room, CUT, Toamasina.

4) Participants

There were 25 participants in total, including;

- 7 participants from communes
- 4 participants from M2PATE
- 3 participants from other public entities
- 11 participants from other entities (including JICA Study Team)

(2) Urban Group Meeting for Formulation of PUDi for Antananarivo Agglomeration

1) Objectives

- To share and discuss the preliminary new land use system and regulations, especially for residential zones and mixed use zones.
- To share and discuss the preliminary major priority projects and development phases.

2) Date

The meeting was held on the 4th of October 2018.

3) Venue

The meeting was held at LE PAVE Hotel, Antaninarenina, Antananarivo.

4) Participants

There were 72 participants in total, including;

- 48 participants from communes
- 8 participants from M2PATE
- 1 participant from other public entities
- 15 participants from other entities (including JICA Study Team)

(3) Urban Group Meeting for Formulation of PUDi for Toamasina Agglomeration

1) Objectives

- To share and discuss the new land use zoning system in comparison to the current zoning system, along with the preliminary land use plan for Toamasina Agglomeration
- To share and discuss the revised major priority projects and development phases for Toamasina Agglomeration.

2) Date

The meeting was held on the 27th of March 2019.

3) Venue

The meeting was held at Conference Room, CUT, Toamasina.

4) Participants

There were 30 participants in total, including;

- 16 participants from communes
- 3 participants from M2PATE
- 11 participants from other entities (including JICA Study Team)

A.4.5 Technical Meetings with Antananarivo Urban Commune

In order to discuss technical details on topics such as building permits and land use zoning, a series of technical meetings were held between the technical officers of Antananarivo Urban Commune and the JICA Study Team. Record of the meetings are listed in Table A.4.2.

Table A.4.2 Technical Meetings with Antananarivo Urban Commune

Date	Objective	Venue	Number of Participants
19 th of July, 2018	<ul style="list-style-type: none"> • To discuss the present situation of construction permits and zoning categories. • To discuss about alignments that should be applied in PUDi 2019 	CUA	12 from CUA, 8 from JICA Study Team

26th of July, 2018	<ul style="list-style-type: none"> To continue to discuss in detail about the present issues of construction permits and zoning categories. To continue to discuss about alignments that should be applied in PUDi 2019 	CUA	12 from CUA, 8 from JICA Study Team
3rd of October, 2018	<ul style="list-style-type: none"> To share and discuss the preliminary strategy for residential areas inside CUA To share and discuss the preliminary high priority projects To share and discuss the preliminary strategy for wetland conservation and retention pond construction inside CUA formed between the PIAA project and TaToM project, 	CUA	14 from CUA, 11 from JICA Study Team
21 st of March, 2019	<ul style="list-style-type: none"> To share and discuss the new zoning categories to be applied in PUDi 2019 	CUA	15 from CUA, 8 from JICA Study Team
28 th of March, 2019	<ul style="list-style-type: none"> To discuss the current tax on land and building property To further discuss the new zoning system for PUDi 2019 	CUA	2 from CUA, 8 from JICA Study Team

A.5 Progress Made in Phase 4

A.5.1 National Steering Committee and Local Steering Committee Meetings

(1) Fourth Local Steering Committee Meeting for Component 3 (TaToM Economic Axis)

The Fourth Local Steering Committee Meeting for Component 3 was held on the 16th of July 2019, at Carlton Hotel. The Draft Final Report was presented, and comments were given from the participants to be incorporated in the Final Report. The content of the Development Plan for Economic Axis of TaToM was generally accepted by the Steering Committee Members.

1) Date

The meeting was held on the 16th of July 2019.

2) Venue

The meeting was held at Carlton Hotel, Antananarivo.

3) Participants

There were 50 participants in total, including;

- 7 participants from communes
- 22 participants from MAHTP
- 2 participants from other ministries
- 2 participants from private sectors
- 1 participants from NGOs and universities
- 5 participants from other public entities
- 11 participants from other entities (including JICA Study Team)

(2) Fourth Local Steering Committee Meeting for Formulation of PUDi for Antananarivo Agglomeration

The Fourth Local Steering Committee Meeting for Component 1 was held on the 17th of July 2019, at Carlton Hotel. The Draft Final Report was presented along with the Future Land Use Plan for Antananarivo Agglomeration, and comments were given from the participants to be

incorporated in the Final Report. The content of the PUDi for Antananarivo Agglomeration was generally accepted by the Steering Committee Members.

1) Date

The meeting was held on the 17th of July 2019.

2) Venue

The meeting was held at Carlton Hotel, Antananarivo.

3) Participants

There were 112 participants in total, including;

- 64 participants from communes
- 16 participants from MAHTP
- 6 participants from other ministries
- 2 participants from private sectors
- 4 participants from Development partners
- 1 participants from NGOs and universities
- 9 participants from other public entities
- 10 participants from other entities (including JICA Study Team)

(3) Fourth Local Steering Committee Meeting for Formulation of PUDi for Toamasina Agglomeration

The Fourth Local Steering Committee Meeting for Component 2 was held on the 19th of July 2019, at Carlton Hotel. The Draft Final Report was presented along with the Future Land Use Plan for Toamasina Agglomeration, and comments were given from the participants to be incorporated in the Final Report. The content of the PUDi for Toamasina Agglomeration was generally accepted by the Steering Committee Members.

1) Date

The meeting was held on the 19th of July 2019

2) Venue

The meeting was held at Calypso Hotel, Toamasina

3) Participants

There were 42 participants in total, including;

- 11 participants from communes
- 4 participants from MAHTP
- 6 participants from other ministries
- 2 participants from private sectors
- 3 participants from NGOs and universities
- 5 participants from other public entities
- 11 participants from other entities (including JICA Study Team)

(4) Fourth National Steering Committee

The Fourth National Steering Committee Meeting was held on the 21st of July 2019, at Carlton Hotel. The Draft Final Report was presented, along with the comments given in each Local Steering Committee Meeting. Comments were given from the participants which should be incorporated in the Final Report. The content of the Draft Final Report was generally accepted by the Steering Committee Members.

1) Date

The meeting was held on the 23rd July 2019

2) Venue

The meeting was held at Carlton Hotel, Antananarivo.

3) Participants

There were 50 participants in total, including;

- 7 participants from communes
- 12 participants from MAHTP
- 9 participants from other ministries
- 4 participants from development partners
- 7 participants from other public entities
- 11 participants from other entities (including JICA Study Team)

A.5.2 Final Seminar

The Closing Seminar was held on the 25th of July 2019, at Carlton Hotel, in order to present the Development Strategies and Priority Projects of the TaToM Project to a wider range of stakeholders not included in previous meetings. Comments were given from the participants, to be taken in to consideration in the Final Report.

1) Date

The meeting was held on the 25th of July 2019

2) Venue

The meeting was held at Carlton Hotel, Antananarivo.

3) Participants

There were 82 participants in total, including;

- 13 participants from communes
- 15 participants from MAHTP
- 9 participants from other ministries
- 8 participants from private sectors
- 4 participants from development partners
- 4 participants from NGOs and universities
- 20 participants from other public entities
- 9 participants from other entities (including JICA Study Team)

A.5.3 Donor Round Table Meeting

The Donor Round Table Meeting was held on 26th July 2019, at Colbert Hotel, in order to present the results of the Project TaToM and share the information on priority project to a wide range of donors. The main objective of the meeting was to attract various donors to priority projects that were to be implemented with the collaborative effort between different donors.

1) Date

The meeting was held on the 26th of July 2019

2) Venue

The meeting was held at Colbert Hotel, Antananarivo.

3) Participants

There were 39 participants in total, including;

- 2 participants from communes
- 9 participants from MAHTP
- 2 participants from other ministries
- 19 participants from development partners
- 9 participants from other entities (including JICA Study Team)

A.5.4 Technical Working Group Meetings

Sectoral Technical Working Groups (TWGs) have been organized for formulation of each of the three plans and have held several meetings for coordination and detailed discussion on various issues and proposals at the technical level.

Table A.5.1 Technical Working Group Meetings held in Phase 4

Date	TWG Meeting	Venue	Number of Participants
2nd of August, 2019	Fourth TWG for Strategic Environmental Assessment	MAHTP Meeting Room	18 (1 from commune, 8 from the ministries, 9 from other entities (including JICA Study Team))

Appendix B PUDé Ankorondrano

B.1 Guidance Provided from PUDi for Antananarivo Agglomeration to PUDé Ankorondrano

The PUDi has a role to guide the formulation of PUDés inside its planning area. For PUDé Ankorondrano, the TaToM Team closely collaborated with the PUDé Ankorondrano Team, throughout its formulation process. The following three main ideas were delivered from the TaToM Team to the PUDé Ankorondrano Team;

- To incorporate the ring road to go through the PUDé Ankorondrano Area, which was necessary for the overall road structure for the Antananarivo Agglomeration.
- To secure necessary areas of retention ponds to sustain the rain water storage capacity which would decrease due to the landfilling in the Ankorondrano Area.
- To introduce large public infrastructures which is not only for the population inside the Ankorondrano area, but also the population in the surrounding areas.

B.2 Record of discussion between the PUDé Ankorondrano Project and TaToM Project

(1) Kick-off Meeting for PUDé Ankorondrano Project (7th of November, 2017)

The kick-off meeting for the PUDé Ankorondrano Project was held by MAHTP (then M2PATE), in which the land owner association named A2P4R (Association des Propriétaires fonciers et riverains du Périmètre compris entre la RN4, la Route des hydrocrabures, la Route du pape, les Rives du boulevard de l'Europe et du lac Masay) was reformulated. Antananarivo based staff from the TaToM Project participated in this meeting.

(2) Meeting for PUDé Ankorondrano Project for the Contracting of Consultant (13th of November, 2017)

A meeting was held to decided internal formation of the A2P4R, and the contract of the consultant to work on the project. Antananarivo based staff from the TaToM Project participated in this meeting.

(3) Third Stakeholder Meeting for Formulation of PUDi for Antananarivo Agglomeration and Formulation of Development Plan for TaToM Economic Axis (17th of July, 2018)

The TaToM Project invited the ARRHP members to the Third Stakeholders meeting, to which 5 members

(4) Discussion with Filatex from A2P4R, (19th of July, 2018)

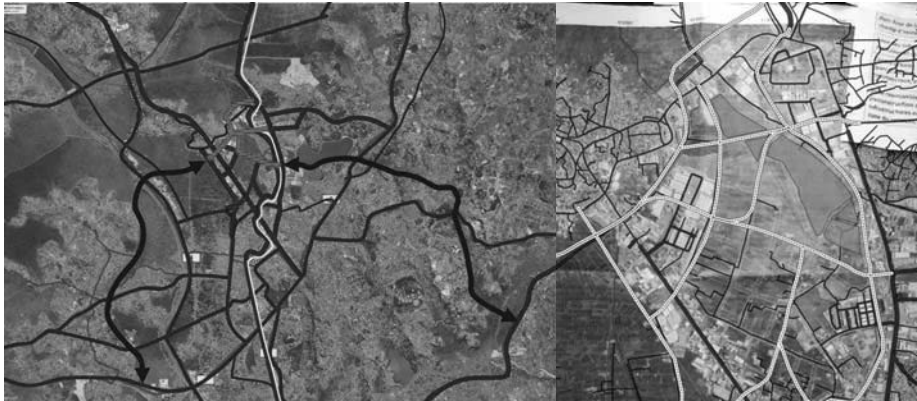
The TaToM Project team members presented the content of the preliminary priority projects to the Filatex group, in order to facilitate the understanding towards the macro scale planning that is conducted in the TaToM Project.

(5) Technical Meeting with Rafano Cabinet (11th of October, 2018)

Technical discussion was held in the TaToM office in Anosy, between the TaToM team and technical team of Ankorondrano PUDé. The progress of the Ankorondrano PUDé was shared and discussed, and TaToM team gave recommendations towards including the ring road and retention pond inside the Ankorondrano PUDé area.

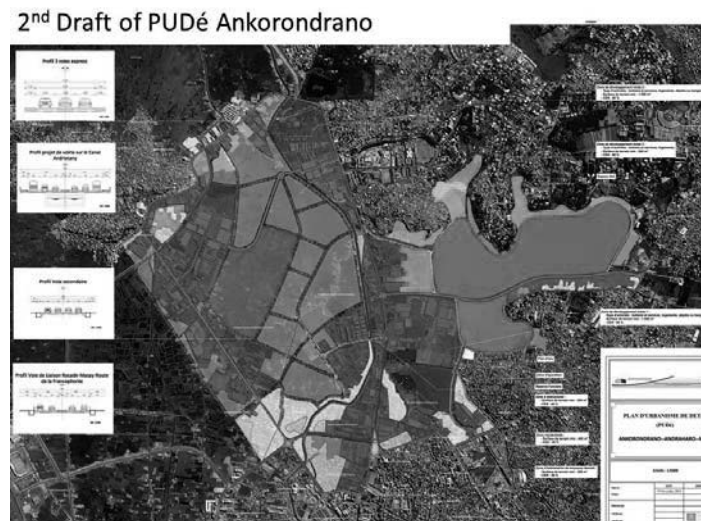
(6) Technical Meeting with Rafano Cabinet (20th of November, 2018)

The TaToM Project prepared an alternative proposal for the road network inside the Ankorondrano Area, in order to incorporate the idea of having a ring road go through the area.



Source: JICA Study Team

Figure B.2.1 TaToM Proposal on the 20th of November, 2018 for Ring Road and Retention Pond inside Ankorondrano

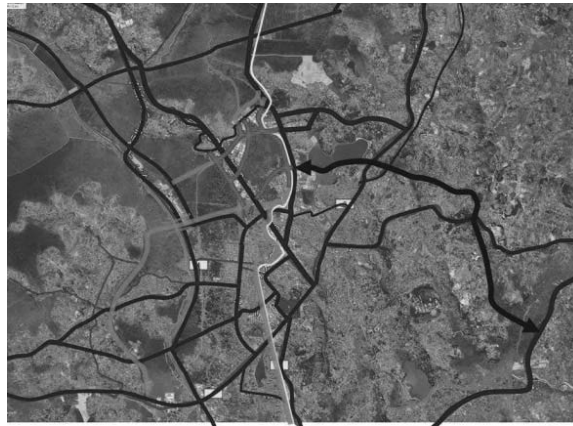


Source: Cabinet Rafano

Figure B.2.2 Revised Draft Ankorondrano PUDé Proposed by Rafano Cabinet on 20th of November, 2018

(7) Technical Meeting with Rafano Cabinet (11th of January, 2019)

After exchanges of ideas through email, the Ankorondrano PUDé team prepared a revised presentation including ring roads and retention ponds. The TaToM team participated either physically, or by skype.



Source: JICA Study Team

Figure B.2.3 Revised Proposal from TaToM on 3rd of December 2018 for Ring Road inside Ankorondrano

3. Principes directeurs des occupations des sols

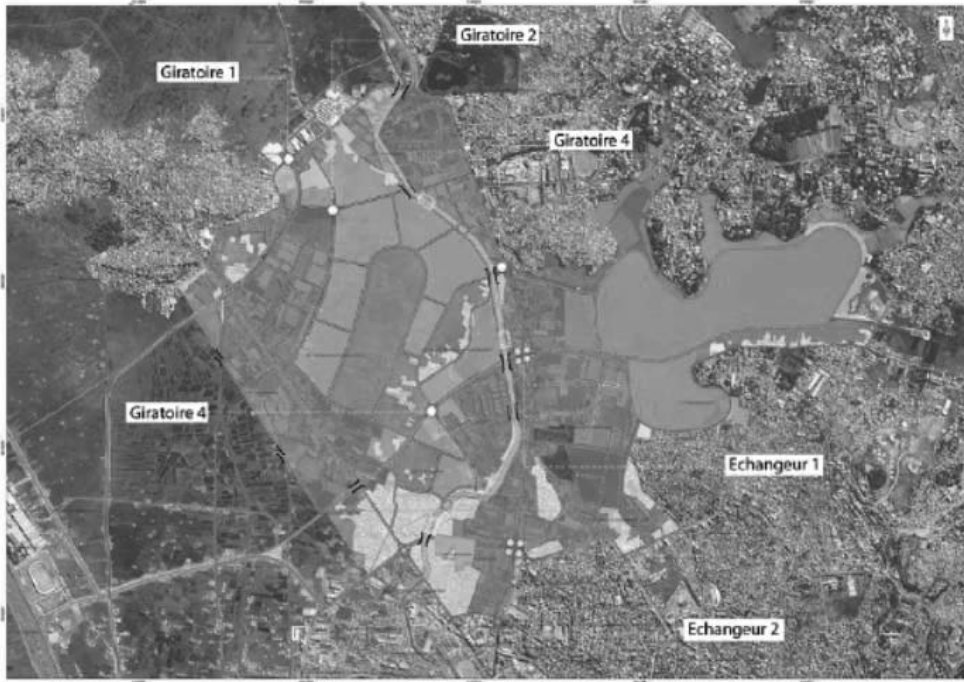


Source: Cabinet Rafano

Figure B.2.4 Revised Draft Ankorondrano PUDé Proposed by Rafano Cabinet on 11th of January, 2019

(8) Final Presentation for PUDé Ankorondrano (18th of June, 2019)

The Ankorondrano PUDé Team held the final presentations, to which the TaToM team participated.



Source: Cabinet Rafano

Figure B.2.5 Final Draft of Ankorondrano PUDé Presented by Rafano Cabinet on (18th of June, 2019)