

JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)

PREPARATORY SURVEY
ON
TRANS-GAMBIAN CORRIDOR UPGRADING PROJECT
IN
THE REPUBLIC OF SENEGAL

Final Report

MARCH 2011

INGÉROSEC CORPORATION
YACHIYO ENGINEERING CORPORATION

EID
CR(3)
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PREFACE

Japan International Cooperation Agency (JICA) conducted the preparatory survey on Trans-Gambian Corridor Upgrading Project in The Republic of Senegal.

JICA sent to Senegal a survey team from November 21 to December 21, 2010.

The team held discussions with the officials concerned of the Government of Senegal, and conducted a field study at the study area, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of The Republic of Senegal for their close cooperation extended to the teams.

March 2011

Kiyofumi KONISHI

Director General,
Economic Infrastructure Department
Japan International Cooperation Agency

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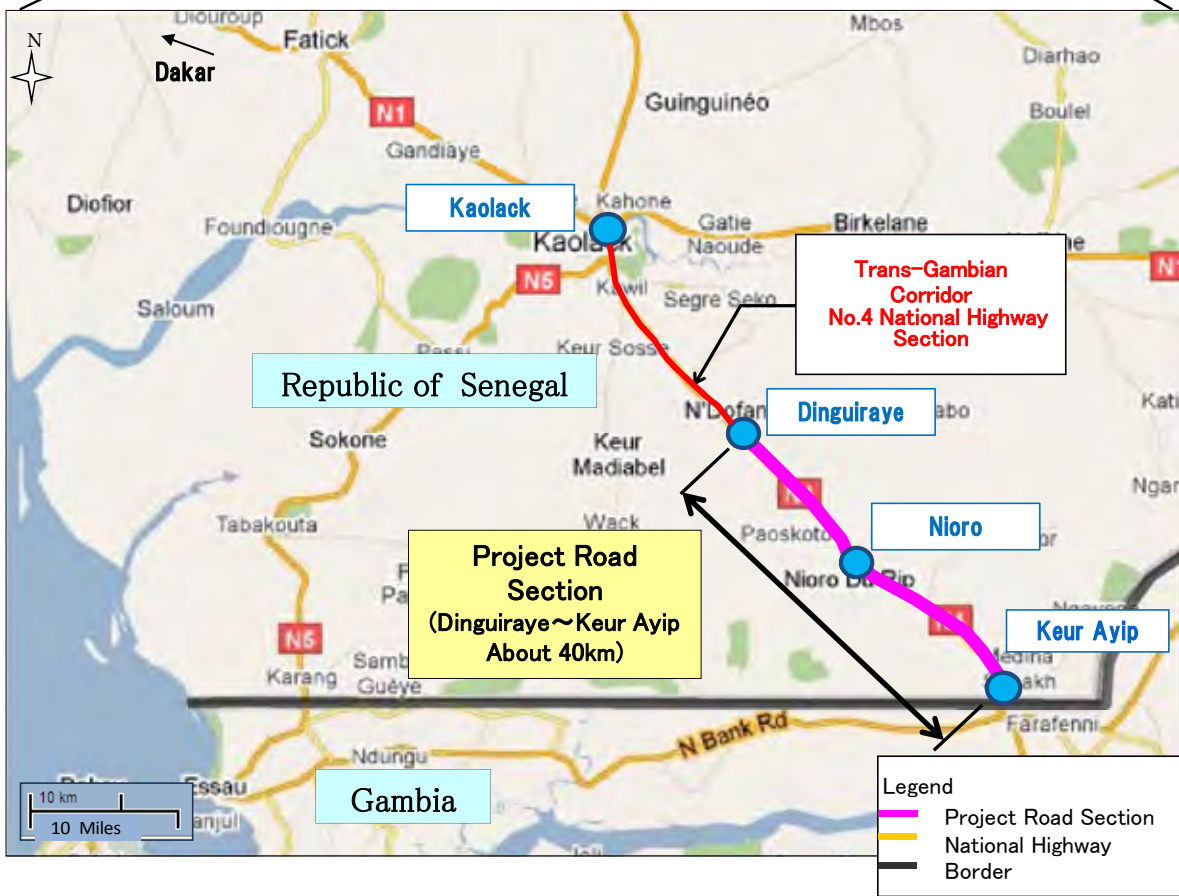
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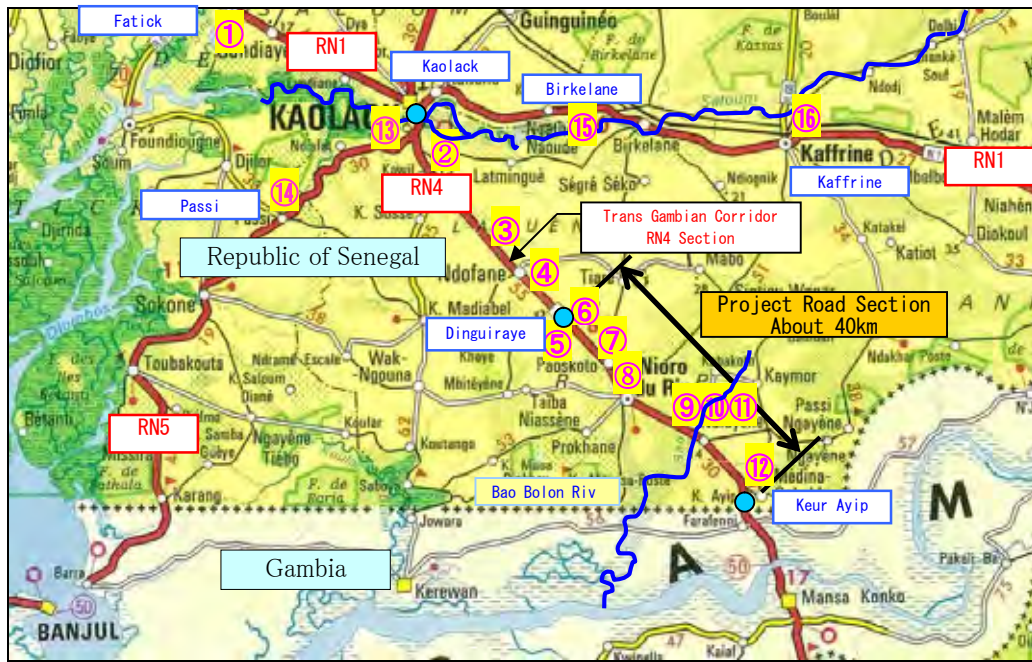
Republic of Senegal

- 1. AREA
- 2. POPULATION
- 3. CAPITAL
- 4. ETHNIES
- 5. LANGUAGES
- 6. RELIGION

197,161km² (50% OF JAPAN)
 12,700,000 INHABITANTS AS FOR 2008 (UNFPA)
 DAKAR
 WOLOFS (44%)、PEULS (23%)、SERERES (15%)、OTHERS (18%)
 FRENCH (OFFICIAL)、ETHNIC LANGUAGES
 ISLAM (95%)、CHRISTIANITY (5%)



Location Map



			
① Fatick-Kaolack(RN1)	② Traffic condition in Kaolack	③ Kaolack-Dinguiraye(RN4)	④ Kaolack-Dinguiraye(RN4)
			
⑤ Dinguiraye-Baobolon River(RN4)	⑥ Dinguiraye-Baobolon River(RN4)	⑦ Dinguiraye-Baobolon River(RN4)	⑧ Dinguiraye-Baobolon River(RN4)
			
⑨ Baobolon Riv. section(18/Sep/2010)	⑩ Baobolon Riv. section(26/Nov/2010)	⑪ Baobolon Riv. section (26/Nov/2010)	⑫ Road condition in Keur Ayip
			
⑬ Kaolack-Passi(RN5)	⑭ Kaolack-Passi(RN5)	⑮ Kaolack-Birkelane(RN1)	⑯ Kaffrine(RN1)

Site Photos (18/Sep/2010, 26,27/Nov/2010)

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ABBREVIATIONS

AAGR	Average Annual Growth Rate
AATR	Agence Autonome des Travaux Routiers
AC	Asphalt Concrete
AfDB	African Development Bank
AGEROUTE	Agence des Travaux et Gestion des Routes au Senegal
ANSD	Agence Nationale de la Statistique et de la Démographie
ASSHTO	American Association of State Highway and Transportation Officials
CBR	California Bearing Ration
CETUD	Council Executif des Transports Urbains de Dakar
DBST	Double Bituminous Surface Treatment
DSRP	Document on the Reduction of Poverty
ECOWAS	Economic Community of West African States
EIA	Environmental Impact Assessment
ESAL	Equivalent Single Axle Load
EU	European Union
FCFA	Franc de la Communauté Financière Africaine
FED	Fund of European Development
FERA	Founds d'Entretien Routier Autonome
GDP	Gross Domestic Product
GNP	Gross National Product
HDM	Highway Design Management
IRR	Internal Return Rate of Return
JICA	Japan International Cooperation Agency
LPST	Letter de politic Sectorielle desTransport
MCA	Millenium Challenge Account
MEPNBLA	Ministère de l'Environnement, de la Protection de la Nature, des Bassins de Rétention et des Lacs Artificiels
NEPAD	New Partnership for Africa's Development
NPV	Net Present Value
NR	National Road
OD	Origin-Destination

ODA	Official Development Assistance
OMVG	Gambia River Basin Development Organization
OMVS	Senegal River Basin Development Organization
PAST	Program of structural adjustment for transportation
PPP	Public Private Partnership
PST	Program for transportation sector
ROW	Right of Way
SBST	Single Bituminous Surface Treatment
SCA	Accelerated Growth Strategy
SV	Supervision
TOR	Terms of Reference
UMA	Union of the Maghreb Arab
VOC	Vehicle Operation Cost

Chapter 1

Background of the Project

Chapter1 Background of the Project

1-1 Background of the project

As the importance of the economic integration in Africa is increasingly advocated mainly in relation with the New Partnership for African Development (NEPAD), the Republic of Senegal is in a position to act as an economic and social leader of West African countries. Its capital, Dakar, located in the westernmost part of the African Continent, has been developed into a good harbor city. For Senegal, it is highly important to have an access to inland areas in order to take advantage of its geographic features and further promote ongoing development. Senegal is a country where the road network has been relatively well developed among other West African countries. The network has a total length of 14,600km, while only 29% of roadways have a paved surface. Although the national highway network is a backbone of Senegal's wide area network that connects major domestic cities as well as those of neighbouring countries and has a total length of 3,350km with a pavement ratio of approximately 85%, only 35% of its total length is in good service condition without any hindrance to traffic. Meanwhile, recently in Senegal, the number of motor-vehicles registered has grown at a rate of 5% to 10% per year, which indicates that the movement of both people and goods has been on the rise. The necessity to develop and maintain roadways, particularly for national trunk roadways, has been increasing in order that Senegal economy will be developed in a sustainable manner thus promoting the regional integration in Africa.

The Trans Gambian Highway, a corridor running from Dakar passing the provincial city of Kaolack to a border town near Gambia, Keur Ayip, is an important and strategic road for commercial traffic between Senegal and Gambia. At the same time, the highway has another important role as part of the intraregional transportation network to connect the Senegalese capital of Dakar and Casamance region in southern Senegal behind Gambia.

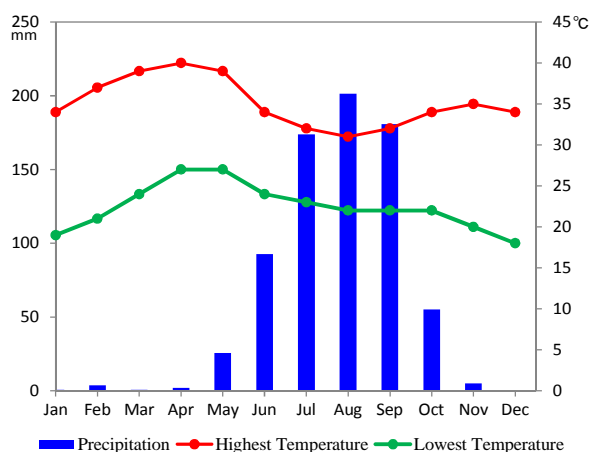
The Trans Gambian Highway is in good condition with no hindrance to traffic along almost all of its total length as a result of the support provided by the African Development Bank (ADB) and other organizations. Only a section of the highway running about 40km from Dinguiraye to Nioro and to Keur Ayip, however, is heavily damaged. This fact forces traffic on the road to slow down greatly and hence negatively affects the distribution of goods and creates great concerns for the safety of vehicles as well.

1-2 General situation in Senegal

1-2-1 General situation in Senegal

Senegal is located in the west part of the African continent with an area of 197,161Km² (half of Japan). Its Population is about 12.7 millions and its GNI per capita was 970US\$ according to the 2008 World Bank report. Although monsoons blow southeast in rainy season (from middle of June until middle of October) and temperatures exceed 30 degrees while humidity exceeds 90 % under their influence, temperatures around seaboard area in dry season (from November to May) are around 13 degrees because of the trade wind from northwest influenced by Canaries Current.

On the other hand, fiery airs from Sahara Desert (called Harmattan) blow in the midland.



Source: FORECA

Figure-1.1 General Weather Condition in Senegal

Although weather conditions in the northern and southern area are dry, annual rainfall around the estuary of Senegal River is about 500mm and annual rainfall in the southern area is 2000mm.

1-2-2 General situation of Kaolack region

(1) General overview

Kaolack is situated at the center of the peanut basin; it is limited in the north and the west by the region of Fatick, in the east by the new region of Kaffrine, in the northeast by the region of Diourbel and in the south by the Republic of Gambia.

By the administrative reform in 2002, the region consisted of 48 local collectivities (41 farming communities, 7 townships). Today, the region is divided into two: Kaolack Region includes the departments of Kaolack, Nioro and Guinguinéo. Kaffrine Region includes the departments of Kounghoul and Kaffrine.

The major industry of Kaolack is the production and processing of peanuts. Moreover, salt industry in the Saloum River is also active. RN1, RN4, and RN5 intersect in Kaolack, and these national roads have not only the function of national major arterial road but they also act as an international arterial road. Moreover, Kaolack has a port, where peanuts are transported. Kaolack is a traffic strategic location in Senegal as stated above.



Figure-1.2 Location of Kaolack region

(2) Demographic situation

The population of the region of Kaolack is estimated to be 750,853 in 2008 based on the 2002 census data.

The population is distributed between three departments. Most of them are in the department of Kaolack with a proportion of 25%, while Nioro department has 36.6% and Guinguinéo 13.1%. The majority of the population lives in the rural area. The population of the rural area represents 68.3% against 31.7% of the urban area.

The prefecture in RN4, the line place along railway-tracks, is A prefecture and B prefecture. The prefecture in RN4, the line route, is Kaolack and Nioro departments. The distribution of the population of both departments is shown in Table-1.2. The population of Kaolack department is 377,407. The population of Nioro department is 275,148. The population of Ard. Paoskoto in the project road section is 110,472, an area in which the population is concentrated.

Table-1.1 Distribution of the population of Kaolack region in 2008

	Population	%
Guinguinéo	98.299	13,1
Kaolack	377.406	50,3
Nioro	275.148	36,6
Region	750.853	100
Urban	237.808	31,7
Farming	513.045	68,3
Region	750.853	100

Table-1.2 Distribution of the population of Kaolack Dep. and Nioro du Rip Dep. in 2008

Administration	2008	Share		
		Dep.	Coms./Ard.	Com./Cr
DEPARTEMENT KAOLACK	377,407			
COMMUNES	203,736			
Commune GANDIAYE	9,740	58%	31%	-
Commune KAHONE	6,071			1%
Commune KAOLACK	178,243			27%
Commune NDOFFANE	9,682			1%
ARD. KOUMBAL	61,971			
CR KEUR MAKA	19,012	9%	9%	-
CR LATMINGUE	23,422			3%
CR THIARE	19,536			4%
ARD. NDIEDIENG	71,076			
CR KEUR SOCE	21,641	11%	11%	-
CR NDIADFATTE	26,988			3%
CR NDIEDIENG	22,447			4%
ARD. SIBASSOR	40,625			
CR DYA	18,524	6%	6%	-
CR NDIEBEL	9,937			3%
CR THIOMBY	12,163			2%
DEPARTEMENT NIORO	275,148			
COMMUNES	20,451			
Commune NIORO	14,041	42%	10%	-
Commune de KEUR MADIABEL	6,411			3%
ARD. MEDINA SABAKH	67,836			
CR KAYEMOR	18,304	17%	17%	-
CR MEDINA SABAKH	31,805			3%
CR NGAYENE	17,727			5%
ARD. PAOS KOTO	110,472			
CR GAINTHE KAYE	22,307	12%	12%	-
CR PAOS KOTO	43,375			4%
CR PROKHANE	24,224			3%
CR TAIBA NIASSENE	20,565			7%
ARD. WACK NGOUNA	76,388			
CR KEUR MABA DIAKHOU	23,135	12%	12%	-
CR KEUR MADONGO	6,281			1%
CR NDRAME ESCALE	18,717			3%
CR WACK NGOUNA	28,256			4%

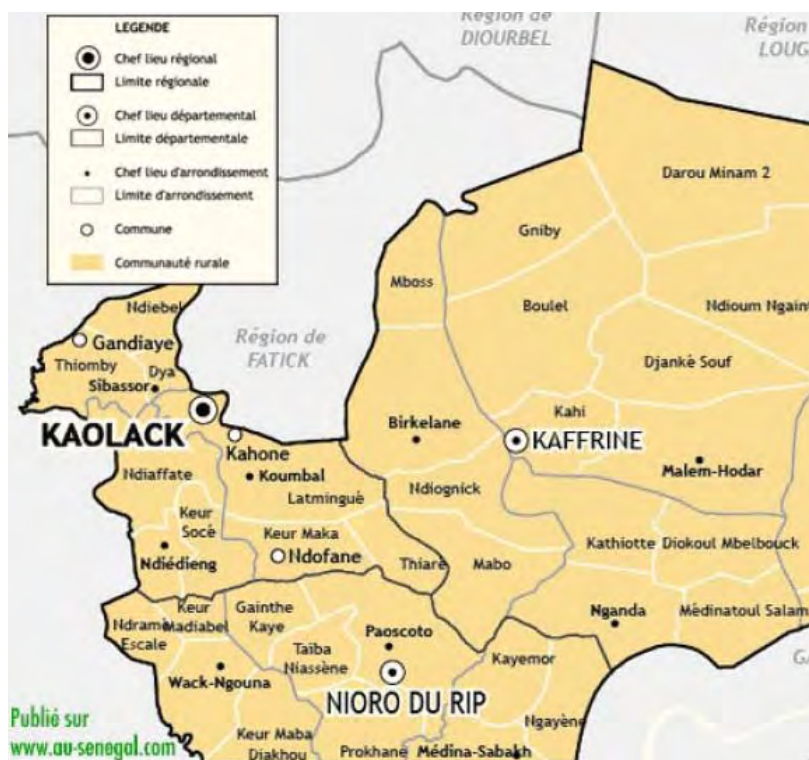


Figure-1.3 Location of. Kaolack and Nioro du Rip Departments

(3) Socioeconomic situation

1) Agricultural activities

Over 75% of the inhabitants are engaged in agriculture, in the of peanuts, watermelons, niébé, thousand souna, sorghum, corn, sesame, rice, fonio and the truck farming. Crops are dominated by peanuts, in spite of the difficulties of the path.

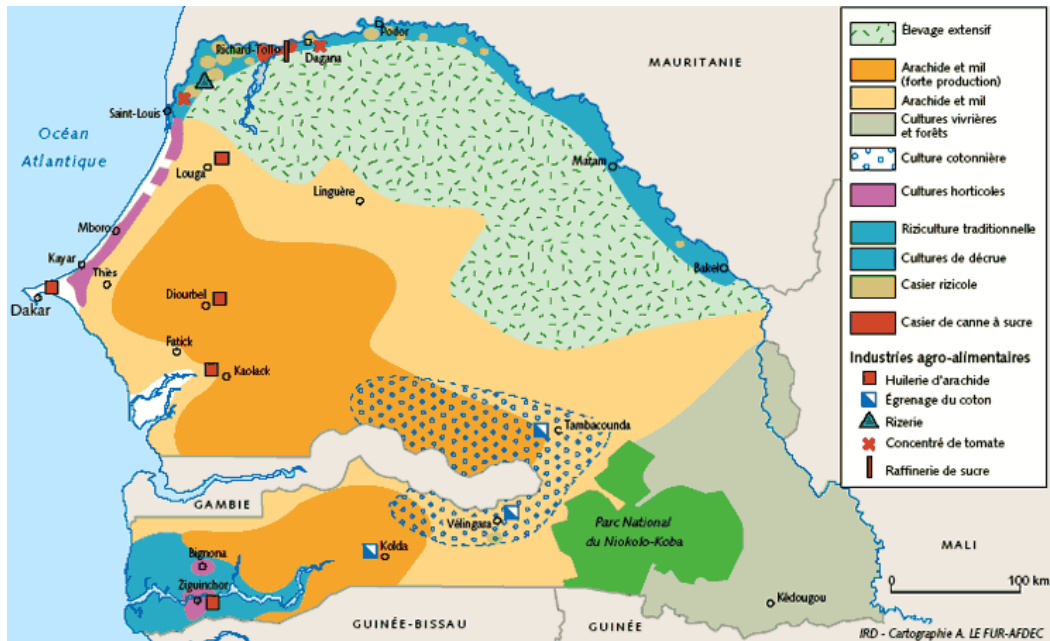


Figure-1.4 Map of agricultural production

2) Livestock industry

Livestock, even extensive, is constituted of cattle, sheep, equine, chicken and hog. However, the development of pasture for the livestock industry is underway.

3) Fisheries

Two types of fishing are practiced in the region. It is about sea fishing and continental fishing. Sea fishing produces close to 800 tons of fish per year and the essential of the regional consumption comes from other regions. As for continental fishing practiced in the lakes and pools of the region, it has a negligible production.

4) Forest industry

Forest operators produce firewood for charcoal, fuel and various picking products. However, it is necessary to recognize that the region is closed to forest industry.

5) Industrial and traditional activities

The industrial structure of the region is less thriving, but the situation will eventually be satisfactory if compared with other regions. It includes the National Society of Merchandising of Senegal Oleaginous (SUNEOR. Lyndiane), NOVASEN, the New Society of Saline of the Sine Saloum (NSSS), Senegalese Industry of Cycle (ISENCY), specialized in the assembly of bicycles and mopeds (today in cessation of activities), African Society of Soap Factory MAHAWA (SASMA), producing soaps, Society for the Development of Textile Fibers (SODEFITEX) and Powerhouse.

The three types of handicraft (production, art and service) coexist and some craftsmen are registered at the professional association of the region.

6) Commercial activities

According to the national index, the home trade is prosperous in the region of Kaolack, as attested by the strength of retailers and wholesalers, the multiplication of enterprises and associations. The foreign trade is also flourishing with billions of imports and exports per year.

7) Transportation

The road extension is 1,677 km, and a high density road network is formed. The road network gives to the region enough accessibility. The railway network is not very important. The rail system is not developed except between Guinguinéo and the border with Kaffrine; as for maritime transportation, in decline, it is based on Diorhane and Lyndiane, the two branches for the port of Kaolack.



Figure-1.5 Senegal Road Network Map

1-3 General situation of the Road Sector in Senegal

1-3-1 Administration and institution of the Road Sector

In 1994, the government of Senegal transferred the construction works and the maintenance of the roads, which so far, were under the direct management of the State, toward a system of contract transfer with private enterprises. It triggered a set of restructurings on a big scale in the sector of Senegalese roads. Besides, further to the organizational reforms started by the Program of structural adjustment for transportation (hereinafter referred to as PAST) the maintenance of the road infrastructures has been handed over in 2000 to the autonomous agency of roadworks (hereinafter referred to as AATR). Otherwise, congestions in Dakar are a serious problem that worsens with the increase of the population in the capital and economic activities resulting from the economic growth. To address the issue, the Executive Council for Urban Transportation of Dakar (hereinafter referred to as CETUD) was created in 2000. Following these organizational reforms, the services of road networks in Senegal are currently made up of the three following entities.

(1) The Direction of public works

The maintenance of road infrastructures has been transferred in 2000 to AATR (present "AGEROUTE"), an independent agency. Therefore, the direction of public works for the Ministry of International Cooperation, Regional Development, Air Transportation and Infrastructures is in charge of the development of the infrastructure plans, of budgeting the regulations in the road

sector, of the adjustment of policies, etc. However, its staff being limited in number, for main tasks, it has to work with dependent agencies, including AATR below.

(2) The autonomous agency for roadworks (AGEROUTE)

AATR, established in 2000, is an organization specialized in the management of the road network. In 2010, AATR changed its name to AGENCE DES TRAVAUX ET DE GESTION DES ROUTES DU SENEGAL (hereinafter referred to as AGEROUTE). It enjoys certain autonomy, including staff and wages, and the right to manage the road network in a scientific and rational manner without undergoing the influence of politics. The maintenance of the road network executed by AATR had to be financed by the income derived from the use of the road, namely the taxes on fuel, and the tax on the possession of car, etc., but since 2008, the tax on fuel was assigned to AATR by the Ministry of Finance after funds had been cashed first by the public treasure; following the government's financial situation, the budget allocated to the maintenance of the road network proved to be insufficient. With the introduction, in 2009, of the "road Fund of the second generation (FERA)", the income derived from the use of the road, namely the tax on fuel collected by the newly established autonomous road maintenance Fund (hereinafter referred to as FERA) as the organization in charge of collecting the tax on fuel, and the resources composed of the traditional government funds enabled AATR to finalize a system for scheduling, constructing, and maintaining road infrastructures. This system benefitted at the time of its introduction of the support of donors, especially the World Bank, EU, and ADB. The establishment of FERA allowed to ensure that the tax on fuel paid by the road users supplies "directly" the road Fund as financial resources assigned to the maintenance of the truck driver network to be implemented by AGEROUTE, without passing by the public treasure with the risk of being diverted to other expenses. Since the board of FERA directors includes representatives of the civil and the transport sector, it is a mechanism in which the opinions of the users are also reflected with regard to the use of its funds. Thus, with the income derived from the use of the road, particularly the tax on fuel, as resources, the principle of maintenance of the road network looks as if it were that of a company .

(3) Executive Council for Urban Transportation of Dakar (CETUD)

CETUD was established in 1997 following a program aiming for the urban transportation and the reinforcement of capacities, in collaboration with the World Bank. CETUD, an organization for decision-making and RETRAD consultation concerning the public transportation and development plans, is composed of 6 national representatives, 5 representatives from townships and 6 representatives from associations of the public transportation, of users, etc. It is in charge of the implementation and the reforms of the Program of improvement for urban mobility (hereinafter referred to as PAMU).

PAMU, implemented with the help of the World Bank, is a program that addresses the issues of transportation especially with the growth of the population in Dakar and the geographical widening of the capital.

PAMU is currently in its implementation stage.

(4) Public Private Partnership (PPP)

In accordance with the national strategy of Senegal, especially the revitalizing of the economy through competitiveness and a wide range of financings, the Public Private Partnership (hereinafter referred to as PPP) is even introduced in the management of the road network. First of all, the mechanism financed by the income derived from the use of the road, particularly the tax on fuel paid by the road users and consisting in managing the ordinary road network as if it were a company, following the creation of AATR and FERA, is considered in itself as a kind of PPP. Besides, the business-like management of roads through concessions is planned for the construction of the freeways and the introduction of the system of measures against overload. PPP for the freeways is financed by the rights of tolls, and the freeway on the Pikine – Diamniadio section in the suburb of Dakar is currently under construction within the PPP framework.

Otherwise, still within the PPP framework for the system of measures against overload, the possibility to finance it by fines for violation of the vehicle load and the amounts assigned to the

repairing of the pavements damaged by the overload that would be reduced thanks to the implementation of controls (the amount of the economy of the maintenance expenses should be valued with the help of HDM program for the management of road networks) is under study.

1-3-2 Road classification

The categories of roads in Senegal are following:

- National Road: Roads forming the road structure of the country.
- Regional Road: Roads linking between them the main urban areas
- Department Road: Roads inside one department
- The other road: Roads of access toward the villages in rural areas
- City road: Roads inside cities

Roads are distributed in 5 categories, and there are no categories of roads according to the traffic volume or the purpose of transportation. Table-1.3 shows the length of the road network by category of road and by the type of pavement. With the exception of urban road networks, all roads are under the control of AGEROUTE, but those whose maintenance is assured are national roads and regional roads. Road networks in cities are governed by small towns, but rehabilitation works are executed in collaboration with AGEROUTE. In the case of Dakar city, the major roads of the capital city are managed by AGEROUTE.

Table-1.3 The length of roads in Senegal

Unit :km

	Paved	Non-Paved	Total
National Road	2,857	507	3,364
Regional Road	573	619	1,192
Department Road	859	4,781	5,640
City Road	241	6	247
The other road	192	4,106	4,298
Total	4,722	10,019	14,741

Source : AGEROUTE Web site

1-3-3 Road network

(1) Density of the road network

Dakar being surrounded by several cities, the demographic density in the region is raised, and the density of the road network is also strong in proportion to the population. However, the planning of the freeway network in the metropolitan region of Dakar does not correspond to the needs, : congestions are striking. The second region after Dakar where the density of roads is raised corresponds to the departments along the Atlantic coast spreading from Dakar to St.Louis in which the demographic density is raised in relation to the rear country. The demographic density in the zones spreading from the rear country in the border areas with Mauritania, Mali and Guinea is weaker in relation to the coastline region, but the density of roads; there is higher than on the coast.

(2) Road network all over the country

As shown in the above Figure-1.5, with regard to Senegalese freeway network, the radial routes leave from Dakar in 3 directions, and these road axes bifurcate in the main provincial urban zones. Besides, the radial roads that bifurcate in the main provincial urban areas join neighbouring cities. The cities expanded around road knots. Those road knots are often roundabouts, or squares. To cope with the increase of the traffic volume of these last years, numerous peripheral roads are arranged in the main urban areas. These peripheral roads are arranged on a circular route at the outskirts of the main urban zones and help eliminate the transit traffic and preserve the functions of the intercity highways.

1-3-4 General Situation of trunk roads

With regard to the road traffic on roads other than on the Dakar – Saint-Louis axis and the axis of south Dakar - Bamako, the daily traffic volume is often lower than 500 vehicles, and in this case the pavement of asphalt used is the minimum thickness. With the deterioration of the asphalt and the increase of the traffic of heavy goods vehicles, the damage of the pavement accelerates.

(1) Dakar – St.Louis

It is about the road that crosses the Atlantic departments while passing by Thiès, Tivaouane, Mékhé, Louga etc., and other cities. This road is the north-south main axis. It is the access road toward the rear country from the cities it crosses and international road to the port of Dakar toward Mauritania.

(2) Dakar - Bamako (Mali)

This road crosses Senegal from East to West. It connects the main provincial urban areas that are Mbour, Kaolack and Tambacoundas and goes all the way to Mali and Burkina etc., and other landlocked areas. A railway and a parallel road to the north from Tambacounda are under construction.

A road to the south, Tambacounda until Bamako is currently under construction, and the Senegalese section of the road is nearly finished. When the section on the Malian side is finished, Dakar - Bamako will be shortened 2 hours. It is expected to join Mali, Burkina and other landlocked areas.

(3) Passageway of the North (St.Louis) - Road of Kidara

It is located along the Senegal River which is bordering Mauritania. It is a circular road that joins peripheral areas of Senegal while going through the borders with Mauritania and Mali from Saint-Louis and while offering a connection on Dakar - Bamako road. It is an important road for OMVS (Organization for the Development of the Senegal River).

Besides, it is connected to the road network from the neighbouring Mauritania to several places by river ferry. The interconnection of these road networks will offer an adjusting on the Europe-Africa link fixes and constitute roads for transportation playing an important role for the regional economic integration with the Union of the Maghreb Arab (UMA) and the Economic Community of West African States (ECOWAS). It is also expected to form vital arteries that revitalize economic activities.

(4) Ferry in Rosso

Among the points of crossing of the Senegal River, the more used is the Ferry of Rosso close to Saint-Louis. The width of the river at the crossing point by ferry is about 400 m, and the current there is quiet. Currently, only one ferry is available to cross the river (the other one is out of order). The service is available twice in the morning and twice in the afternoon, but according to the needs, special crossings are also offered. The capacity of loading by the ferry is 80 tons, equivalent to 4 trucks (with variations according to the weight of the cargos). According to the construction schedule of the bridge of Rosso, the number of vehicles transported per day is 71 and the number of passengers is 1000 people. According to the ferry crew, when the demand is high, the waiting time can go up to one week. Many travellers just use some canoes instead of the ferry to cross the river.

(5) Present situation of the construction plan for the bridge of Rosso

In November 2001, the memorandum between Senegal - Mauritania relative to the bridge crossing the Senegal River was ratified, and the schedule for the bridge survey coordinated by both countries was set in motion with the help of the African Development Bank. In 2008, the contract for the general design was signed with a Portuguese consultant, and the work is nearing completion. There are 4 alternatives concerning its tracing and the factors of the general design, currently under preparation by the consultant, are following.

- Length of the bridge: 600-900 m
- Maximum span: 70 m (a fairway of 55 m is assured)
- Clearance: 15.5 m of the support.
- Width of the bridge: Two proposals of structure, a proposal for 4 ways, and both include a cycle path and a sidewalk.

The Direction of Senegal Public Works will examine the implementation of the design-construction method, if there is a subsidy.

(6) Kaolack - Bignona road

It is about the international road that crosses Gambia and a landlocked country in Senegal. This road is of first importance as a supply route since it contributes to the development and the renewal of supplies in the south of Senegal.

1-3-5 Structure of road in Senegal

(1) State of the pavement of roads

Table-1.4 shows the state of the pavement of roads by category of road, classified in 3 levels (good, poor, very poor) according to the criteria of roughness, on basis of the information collected by AGEROUTE. Among national roads, the rate of paved roads reached 85%. However, whereas 35% among them have a pavement in good state, for the remaining 65%, the pavement must be rehabilitated. Therefore, the national roads paved and in a good state are of 29.7%, which is little. Among the regional roads, the rate of paved roads is of 52%, and 34% among them have a pavement in good state. However, in relation with the total of regional roads, the rate of paved roads in good condition are 17.7%, which is even less than that of the national roads. Otherwise, among regional roads, the rate of paved roads is weak with 16%, and 36% among them have a pavement in good condition or 5.6% out of the total. That is, the pavement of roads is in an extremely poor condition on the whole. The traffic on national roads in provinces is weak with less than 500 vehicles per day, but the proportion of heavy goods vehicles, namely trucks, is extremely high. Otherwise, cars used are very old, and judging by road accidents, injuries attributable to the pavement of roads would also go up.

Table-1.4 Pavement condition in each type of road

Unit :%

	Percentage of paved	good		poor		very poor	
		paved	non paved	paved	non paved	paved	non paved
National Road	85	35	0	14	1	51	99
Regional Road	52	34	20	24	8	42	72
Department Road	16	36	24	24	14	40	62
City Road	93	27	0	22	0	51	100
The other road	5	50	8	47	10	3	82
Average	33	15	15	18	12	47	73

Source :AATR 1998

good : condition of pavement is good and there are few cracks

poor : there are many cracks and potholes are found

very poor : there are many potholes

(2) Standards of road structures

The road standard of international roads in Senegal is adopted for Economic Community of West African States (ECOWAS). The standard newly adopted for roads with two ways are 7.2 m (3.6m x 2) wide with Shoulder of 1.5 m x 2 but the sections on which they are used are still scarce. Most main freeways are complying with old standards, mainly 1 way of 2.5 – 3.5 m wide. On busy freeways, as the north-south freeway, the passing lane on the right lines is a way arranged in the center of the road capable to be used alternately by vehicles circulating in both directions.

(3) Structure of the pavement of roads

The pavement of roads whose traffic volume per day is lower than 500 vehicles consists of a pavement made of asphalt on a foundation strengthened by a mixture of laterite and cement, and this relatively costly pavement is used on numerous roads. Furthermore, no measure whatsoever to reinforce the pavement in the sections endowed with constructions crossing the roads or with problems of resistance at the level of the foundations has been planned. Therefore, in some sections many potholes are visible, and in certain places, even the initial pavement is missing.

(4) Measures against overload

In order to preserve the quality of roads, it is necessary to regularize the overload which is the main reason of deterioration of roads. There is, among ECOWAS countries, an agreement regarding the implementation of measures against overload. In Senegal, the implementation of control in 8 different areas across the country with the help of weighbridges is under survey. For the implementation of measures against overload, the cooperation with carriers and owners of cargos is necessary. The elimination of overload and the maintenance of good quality roads can also benefit carriers and owners of cargos. According to EU, some regulations exist in Senegal concerning the measures against overload. There is also a weight control station at Dakar airport, but no ruling is respected. And EU wishes to act in concert with JICA so that the strengthening of overload controls should be a condition for the support of road projects.-

1-4 Development strategy and trend of road in Senegal

(1) Basic strategy for the development in Senegal

The government of Senegal formulated in 2003 its Document on the Reduction of Poverty (DSRP).

The second Poverty Reduction Strategy Papers (PRSP II: 2006-2010) .revised in 2006 has been presented to the boards of directors of IMF and the World Bank who approved it. The Senegalese government formulates its requests for assistance from donors for the development based on this Document. PRSP II focuses on the integration of the economic growth and development, and introduces 4 main axes, which are as follows: 1) wealth creation, 2) basic social services, 3) healthy public management and regional development, and 4) social protection, the prevention and the management of accidents. With regard to axis 1 in particular, the Senegalese government launched, on the initiative of the Prime Minister, the Accelerated Growth Strategy (SCA), the main principle of which being the "reduction of poverty by an accelerated economic growth." Besides, SCA concretely proposes the industrial promotion on the development principle, especially product distribution, tourist development, and industrial groups, etc.

(2) Measures for the higher level plan for road development

1) Contribution to the creation of a hub of commodity distribution

Senegal capital, Dakar, located in the westernmost part of the African Continent has been developed into a good harbor city. For Senegal, it is highly important to have an access to inland areas in order to take advantage of its geographic features and further promote ongoing development. It is necessary to connect them to the transafrican network that crosses landlocked countries, especially the neighbouring ones. Presently, the planning of Dakar north-south – Saint-Louis road along the Atlantic coast, of north Dakar - Bamako passageway and some roads in the south is already finished. The rehabilitation of the passageway of the north, the central

passageway and the road toward Gambia is well underway.

2) Contribution to the development of tourism

Many conservation parks of fauna and flora, marvels of the cultural heritage and picturesque landscapes are scattered in the Senegalese territory, but their difficult access negatively impacts the tourist industry. With road development towards places of interest, it is necessary to tackle the improvement of the access and the security of transportation.

3) Assistance for the development of industrial groups

It is necessary to build some roads in cities and their suburbs as well as between the main urban areas that would encourage the industrial development in the main urban areas where most shopping malls of agricultural products are located.

4) Healthy public management and regional development

It is necessary to reinforce communal roads to improve the access toward production areas and urban shopping malls that sustain farming development and to heighten the residential environment in the cities.

5) Social Protection, prevention and management of accidents.

As road development in Senegal indicates, the rate of development of practicable roads for all seasons is low, and numerous regions are isolated during the rainy season, and when natural disasters occur, famine becomes common. The need of an adequate road development to ensure a line of life must be met. .

(3) Measures to answer the needs in roads

According to SCA that foresees a growth of GNP for 7% the number of registered vehicles in Senegal in 2020 will reach 2.9 times the number of registered vehicles in 2010 that is of 335.000 vehicles or 1.9 times if GNP continues to grow at 3.75%, its growth rate during the last 8 years (2009). It means that if GNP evolves in its current average yearly rate, the traffic volume in 10 years will be more than doubled, and the measures that will be necessary are indicated below. The projects aiming to satisfy the demand that increases are foreseeable on the itinerary, the situation of which approaches or already reached the traffic demand.

1) Metropolitan Region of Dakar

Introduction of freeways, planning of a freeway network

2) Main Cities

Introduction of beltways and peripheral circular roads

3) Network freeway (north-south passageway, east-west passageway)

Expansion of passing lanes, measures for the road traffic

4) Other freeways

Improvement of the mobility and measures for road safety

(4) Strategy for the development of the sector of transportation and the road sector

Within the government, the Ministry of Economy, the Ministry of Finance and that of Plan and the Ministry of Equipment and Surface Transport signed the Policy Letter for the Transport Sector (LPST) as the document of general policy for the development of the transportation sector according to PRSP. Considering the situation in which the transportation sector is, the LPST mentions the need to reorganize the institutional and legal framework in transportation, finance, and the public transportation, as well as the training of human resources. Improvements concerning infrastructures and basic social services as well as the action plan are indicated in a concrete manner as measures.

In the road sector, in response to the LPST, a list of 5-year projects within the Program for

transportation sector (PST) is being developed under the supervision of the World Bank and other institutions. The third five-year Program (PST III) was worked out in April 2010 and is being currently discussed.

Chapter 2

The Circumstances surrounding the Project

Chapter 2 Circumstances surrounding the Project

2-1 Circumstances surrounding the Project Site

2-1-1 Road conditions in the surrounding area

Road conditions in the surrounding area are shown in Table-2.1 below.

The road network is shown in Figure-2.1.

Table-2.1 Road Conditions in the surrounding area

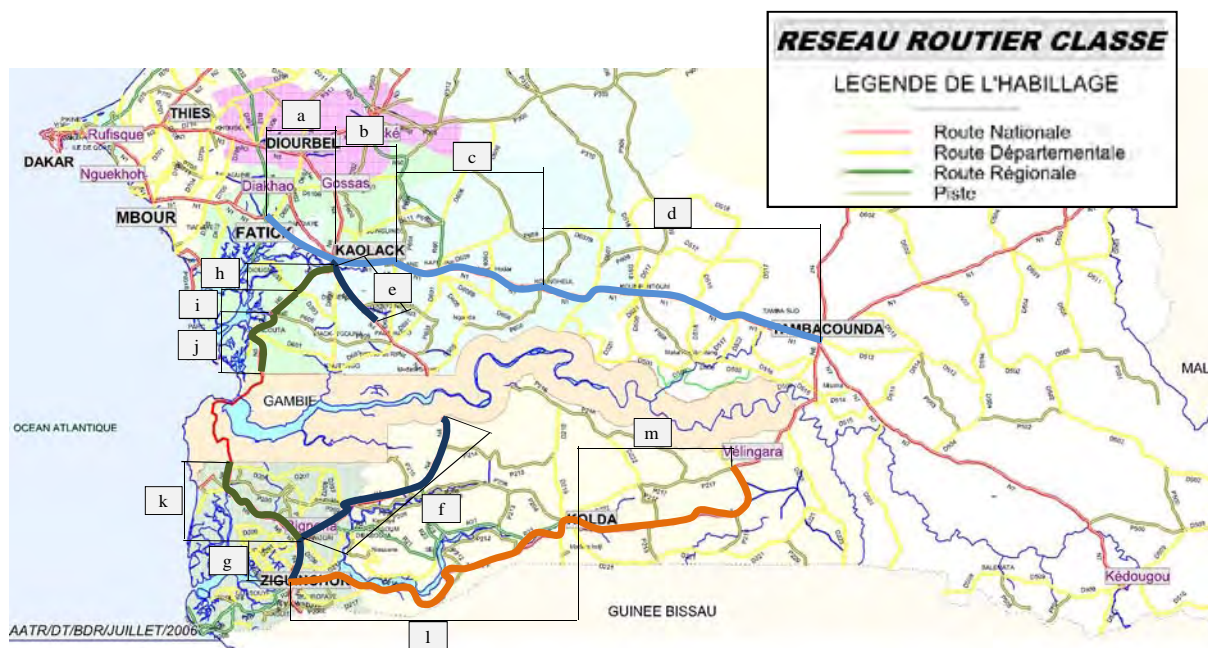
	National Road	Section	Distance (km)	Pavement* ¹	Condition	Donor* ²	Remarks
a	1	Fatick - Kaolack	42	AC	Deteriorated	AfDB	Completed in 2004
b	1	Kaolack - Birkelane	37	AC	Good	EDF	Completed in 2010
c	1	Birkelane - Kounghoul	110	AC	Good	EDF	Completed in 2010
d	1	Kounghoul - Tambacounda	127	AC	Good	EDF	Completed in 2010
e	4	Kaolack - Dinduiraye	46	AC	Good	AfDB	Completed in 2010
f	4	Senoba - Bignonal	114	DBST	Deteriorated		Completed in 1998
g	4	Bignona - Ziguinchor	30	DBST			Completed in 1998
h	5	Kaolack – Passi	18	AC	Good	AfDB	Completed in 2010
i	5	Passi - Sokone	24			EDF	
j	5	Sokone - Karang	40			EDF	Completed in 2003
k	5	Seleti - Bignona	70	DBST	Fair	EDF	Completed in 2003
l	6	Ziganchor - Kolda	183	AC	Deteriorated	MCA	Be completed in 2013
m	6	Kolda - Velingara	134	AC		MCA	Be completed in 2013

Source: AGEROUTE

Legend: *1 AC=Asphalt Concrete, DBST=Double Bituminous Surface Treatment

*2 ADB=African Development Bank, EDF=European Development Fund,

MCA=Millennium Challenge Account



Resource: AGEROUTE

Figure-2.1 The Road Network Neighboring National Road 4

2-2 Current Situation of the Road Project and Issues

(1) Situation of the Road Project

The Trans Gambian Route, a corridor running from Dakar passing the provincial city of Kaolack to a border town near Gambia, Keur Ayip, is an important and strategic road for trade route between Senegal and Gambia. At the same time, the route has another important role being part of the intraregional transportation network to connect the Senegalese capital of Dakar and Casamance region in southern Senegal behind Gambia.

The Trans Gambian Route is in good condition with no hindrance to traffic along almost all of its total length as a result of the support provided by the African Development Bank (ADB) and other organizations. Only a section of the route running about 40km from Dinguiraye to Nioro and to Keur Ayip, however, is heavily damaged. This fact forces traffic on the road to slow down greatly and hence negatively affects the distribution of goods and creates great concerns for the safety of vehicles as well.

(2) Issues of the Project Road

1) Deterioration on the Surface of the Road

The condition of the section between Kaolack and Dinduiraye is now good due to the project of rehabilitation that was financed by ADB and completed in 2010. However, remaining section between Dinduiraye and Keur Ayip is still deteriorated.

2) Baobolong River Section

Baobolong River section was flooded by water level rising and this caused traffic blocking 48hours from 7th Oct. 2010 to 8th Oct. 2010. According to AGEROUTE Kaolack Office, flood does not occur every year, but the latest one occurred ten years ago.

Chapter 3
Traffic Demand Analysis

Chapter 3 Traffic Demand Analysis

3-1 Present Traffic Conditions

3-1-1 Traffic survey

(1) Survey items

1) Traffic volume counting survey

- Survey Date : November 30 (Tue) - December 1 (Wed)
- Survey Point : point 1 : Dinguiraye-Nioro du Rip, point2 : Nioro du Rip-Keur Ayip
- Survey method : Tube type traffic counter



Photo Traffic Volume Counting Survey situation

2) Roadside OD interview survey

- Survey date : December 1 (Wed)
- Survey point : RN4 : Dinguiraye-Nioro du Rip, RN5: Kaolack-Passy
- Survey method : driver interview



Photo Roadside OD Interview Survey situation

3) Travel speed survey

- Survey date : November 30 (Tue)
- Survey point : RN4 : Kaolack -Dinguiraye-Keur Ayip
- Survey method : gathering of probe data



Figure-3.1 Traffic survey points

3-1-2 Results of traffic counting survey

(1) Traffic Volume Counting Survey

The cross-sectional traffic volume of cars between Dinguiraye and Nioro du Rip is 850 vehicles/day. The ratio of large-size vehicles to all vehicles is 24%. In terms of vehicle type, passenger cars account for 61% and buses for 15%. The total traffic volume including motorbikes, etc. is 1,6345 vehicles/day. In terms of vehicle type, motorbikes account for 43%, followed by passenger cars which account for 32%.

Table-3.1 Result of Traffic Volume Counting Survey; post (1) Dinguiraye-Nioro du Rip

Type of Vehicle	way 1	way 2	total	%Total	%Total(without AC,Moto)
1 Animal cart	39	39	78	5%	-
2 Motorbikes	351	355	706	43%	-
3 Passenger car	256	260	516	32%	61%
4 Bus, Auto car	64	65	128	8%	15%
5 Truck with 2 axles	27	28	55	3%	6%
6 Truck over 2 axles	32	29	60	4%	7%
7 Trailer	45	47	91	6%	11%
8 Total	813	822	1,634	100%	-
9 Total(without AC,Moto)	423	428	850	-	100%
10 Total large size(type5-7)	103	103	206	-	-
11 % Poids Lourds(without AC,Moto)	24.3%	24.1%	24.2%	-	-

The cross-sectional traffic volume of cars between Nioro du Rip and Cool Ive is 473 vehicles/day. The ratio of large-size vehicles to all vehicles is 27.4%. In terms of vehicle type, passenger cars account for 58% and buses for 15%. The total traffic volume including motorbikes, etc. is 537 vehicles/day. In terms of vehicle type, passenger cars account for 51%, followed by buses which account for 13%.

Table-3.2 Result of Traffic Volume Counting Survey; post (2) Nioro du Rip-Keur Ayip

Type of Vehicle	way 1	way 2	total	%Total	%Total(without AC,Moto)
1 Animal cart	7	6	13	2%	-
2 Motorbikes	31	20	51	9%	-
3 Passenger car	146	127	272	51%	58%
4 Bus, Auto car	38	34	72	13%	15%
5 Truck with 2 axles	16	14	30	6%	6%
6 Truck over 2 axles	26	22	47	9%	10%
7 Trailer	23	30	53	10%	11%
8 Total	286	251	537	100%	-
9 Total(without AC,Moto)	248	226	473	-	100%
10 Total large size(type5-7)	65	65	130	-	-
11 % Poids Lourds(without AC,Moto)	26.1%	28.8%	27.4%	-	-

(2) Results of Roadside OD Interview Survey

Looking at the results of the roadside Origin-Destination survey in the target section (Nioro du Rip), approximately 60% of respondents use the road for movement within Kaolack Province. Meanwhile, more than 20% is traffic heading to the south of the country over the border; specifically 14% between Dakar and Ziguinchor, 4% between Dakar and Kolda, 3% between Kaolack and Ziguinchor, 2% between Dakar and Sedhiou, 2% between Kaolack and The Gambia and so on. According to the survey that was conducted on Route 5 at the same time, it was found that there is no traffic to the south of the country across The Gambia. In view of these findings, it is concluded that the Trans-Gambian Route 4 serves as the longitudinal route for linking the central and southern areas of Senegal.

Moreover, it is estimated that between 3,000 - 4,000 people, cars, carriages and motorbikes use this road every day.

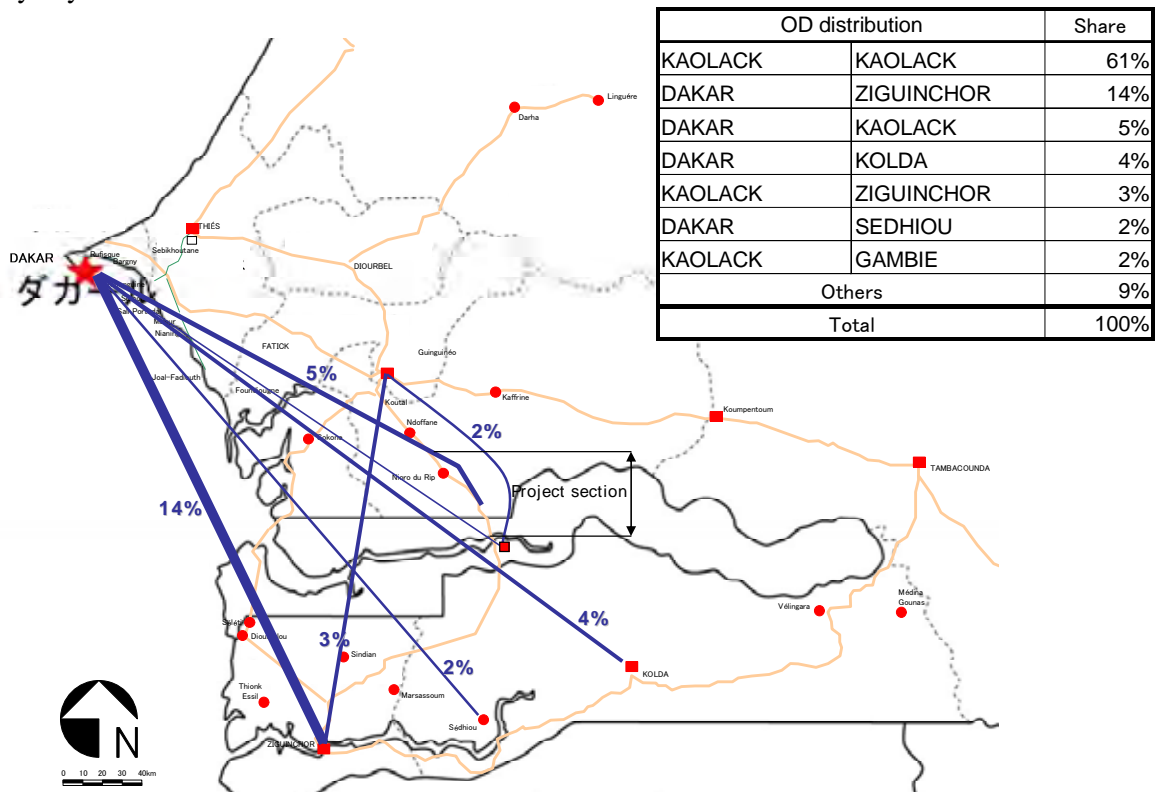


Figure-3.2 Origin-Destination distribution on NR4

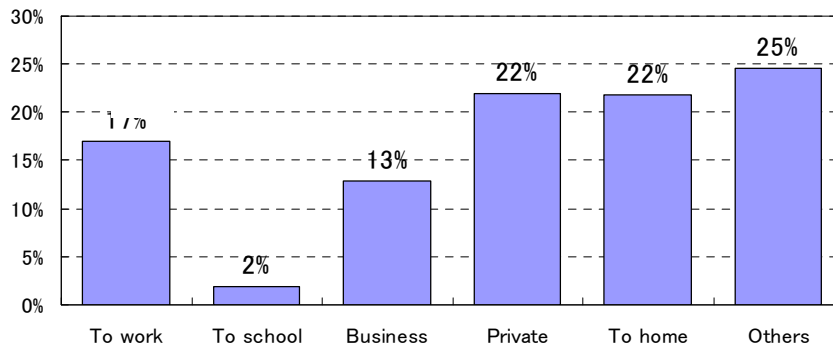


Figure-3.3 Trip purpose on NR4

(3) Travel speed

The travel speed is observed based on the driver’s probe information that has been collected during traffic counting survey by JICA survey team. The vehicle used is SUV (Sport Utility Vehicle) type that can be accommodated comparatively even to the bad road condition.

As a result, the average travel speed is 38km/h along the entire section according to each sub-section, Dinguiraye-Nioro du Rip: 47km/h, Nioro du Rip-Grand BaoBôlong: 38km/h and BaoBôlong-Keur Ayip: 32km/h, respectively.

On the other hand, average speed of 75km/h is observed in the section of Dinguiraye - Kaolack with a quite good pavement condition. As the legal speed limit is 90km/h in this section, it is possible to drive over 75 km/h.

Accordingly, total travel time of the project road section (39 km) is estimated about 60 minutes by the result of the travel speed survey.

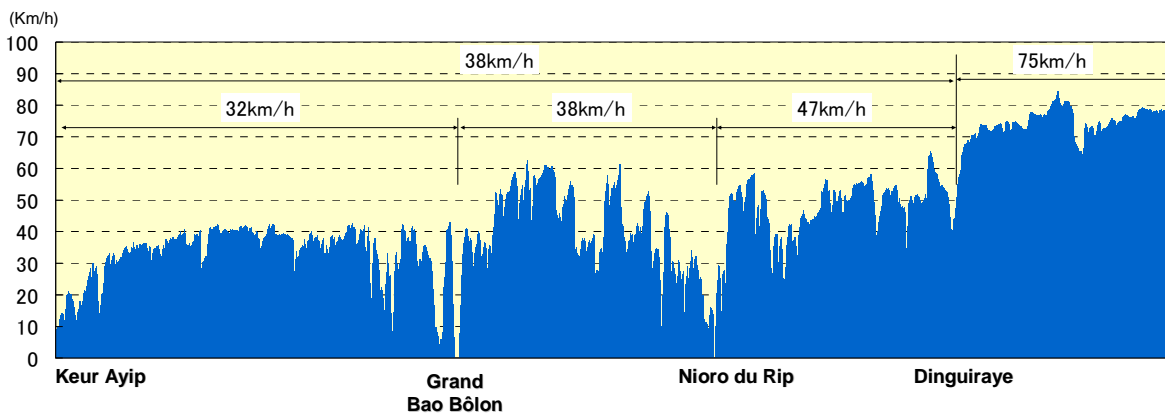
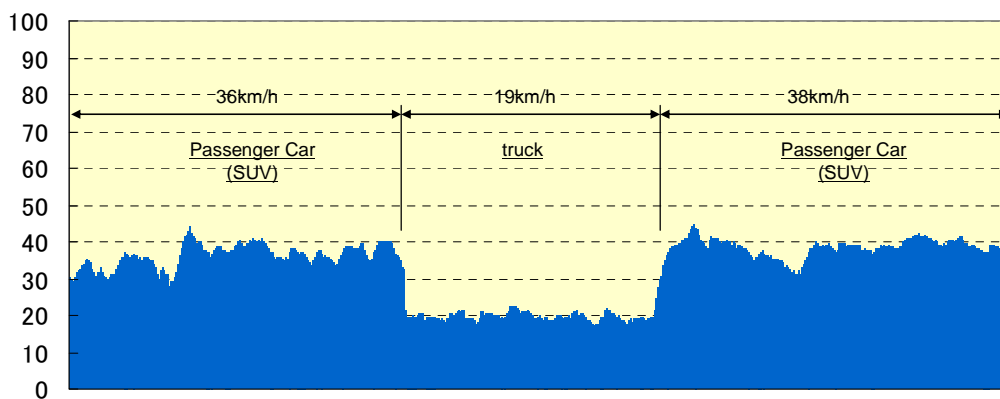


Figure-3.4 Result of Travel Speed Survey (Passenger Car)

Meanwhile, the travel speed of trucks is controlled at the low-speed of 19km/h even in the section where passenger cars can keep 36-38km/h. It is almost a half level of passenger car. Though data could not be collected this time, we can assume that buses are also compelled to rather low running speed, because they are old vehicles and their occupancy is almost full.



r). Section of truck; drive followed by interviewer’s car. The survey section is about 5km (Keur Ayip to BaoBaôlong River)

Figure-3.5 Result of the Travel Speed Survey (Truck)

3-1-3 Present Traffic Volume

The present average daily traffic of the project road section (Dinguiraye - Nioro du Rip - Keur Ayip; 39km) is estimated with both results of the traffic survey by JICA Survey Team (2010, Nov. and Dec.) and traffic surveys by AGEROUTE (2010). The present traffic volume of the project road is illustrated in the Figure: In this traffic volume, motorcycles/bikes and animal carts are excluded.

-The traffic volume of NR4, at the section near Kaolack counted 3,244 veh./day in 2007. Average annual growth rate (AAGR) between 1996 and 2007 is 3.7%.

-The traffic volume between Dinguiraye and Nioro du Rip counted 850 veh./day in 2010.

-The traffic volume between Nioro du Rip and Grand BaoBôlong counted 938 veh./day in 2010. AAGR is 5.1% after 1996.

-The traffic volume of Grand BaoBôlong - Keur Ayip section counted 473 veh./day in 2010.

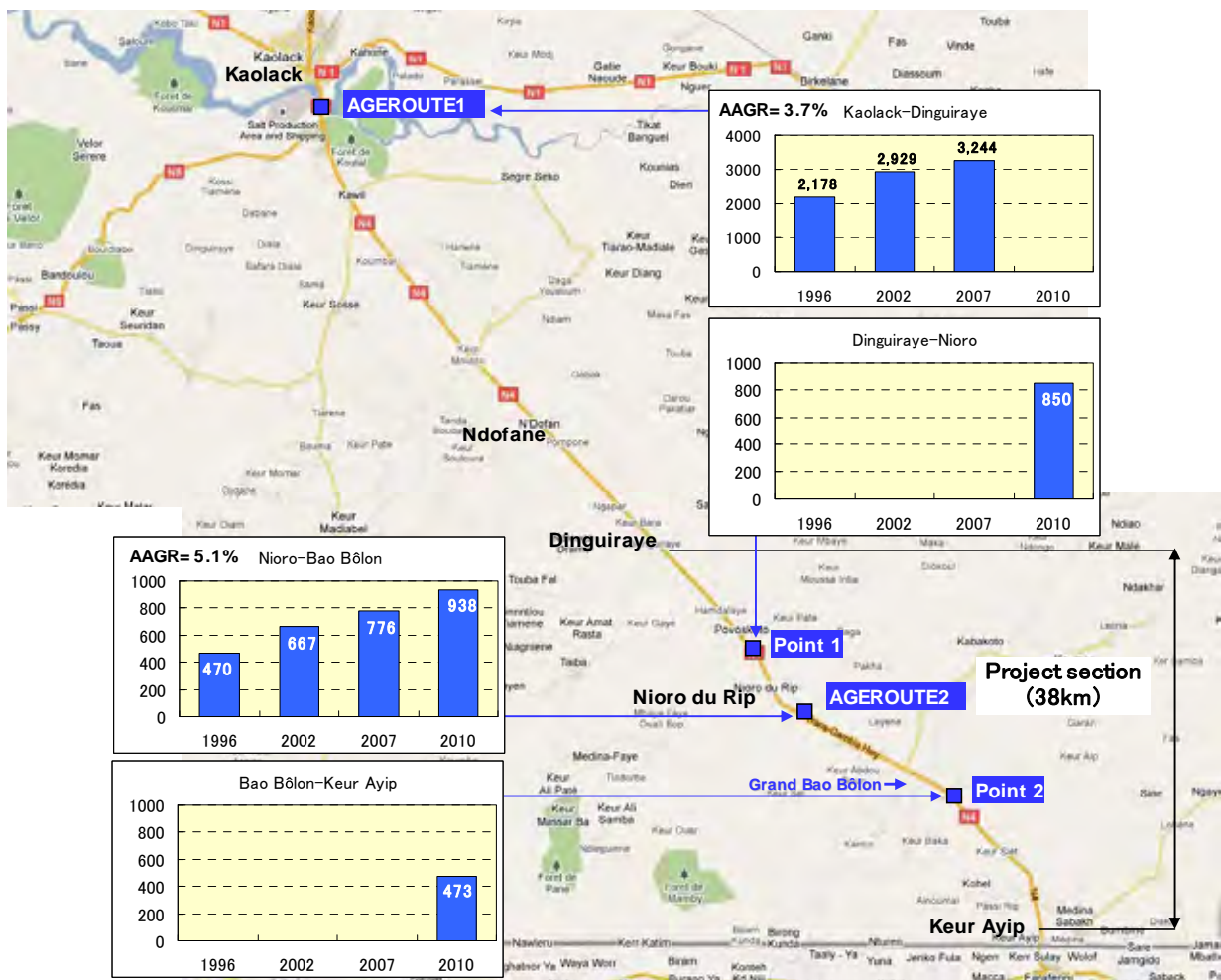


Figure- 3.6 Present Traffic Volume

The traffic volume of NR4, Trans-Gambian Corridor, is increasing every year, and it is thought that needs of the movement have risen. Moreover, the proportion of the truck is about 25% and it is one of the major goods distribution routes in Senegal.

The average daily traffic of Dinguiraye - Nioro du Rip - Keur Ayip is estimated by the result of traffic survey. The result is obtained by the weighted average based on the distance and traffic volume of each section. As a result, the average daily traffic volume of the project road section is estimated 731veh./day in 2010.

Table-3.3 Average Daily Traffic of the Project Road Section (2010)

Section	Distance (km)	Total	Passenger car		Freight car	
		Traffic Volume	Traffic Volume	Traffic volume X Distance	Traffic Volume	Traffic volume X Distance
Dinguiraye - Nioro	15	850	644	9,653	206	3,090
Nioro - Bao Bolon	10	938	732	7,322	206	2,058
Bao Bolon - Keur Ayib	15	473	344	5,153	130	1,943
Total	40	730	553	22,127	177	7,091

Source: JICA Survey Team

3-2 Trends of Socio-economic Indicators related to Traffic demand

Some trends of socio-economic indicators of Senegal that have rather close relation to traffic demand are arranged. In concrete terms, trends of population, GDP and the number of automobile, etc. are collected.

3-2-1 Population Trends

The following figure shows movements in the population of Senegal between 1976 and 2008. After 1976, the population displayed steady increase, growing from 4.96 million in 1976 to 11.84 million in 2008, thus increasing by approximately 2.4 times over 32 years. The annual average growth rate (AAGR) over this period was 2.8%. From 2002 onwards, the AAGR has been 3.1%, indicating an accelerating rate of growth in recent years. The population forecast for 2012 by ANSD is 13.21 million and the AAGR from 2008 onwards is 2.77%.

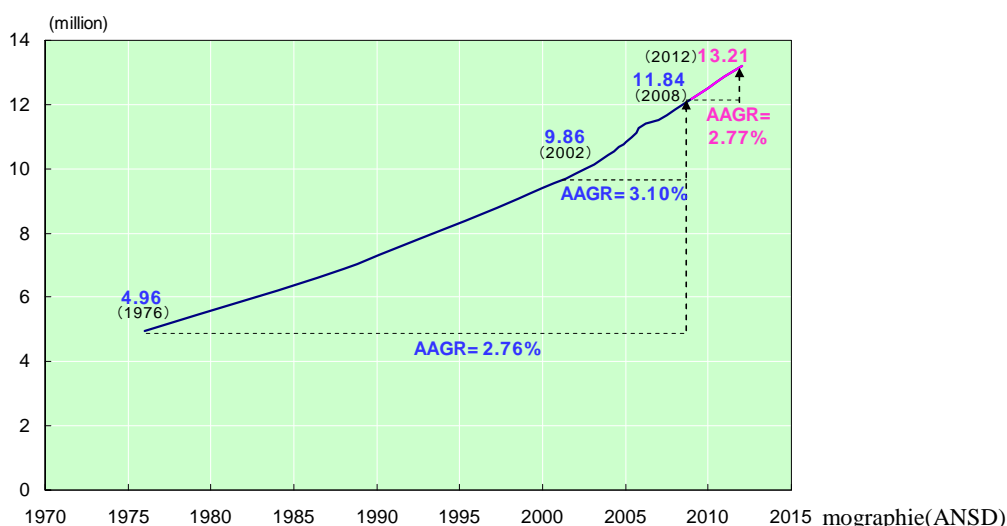
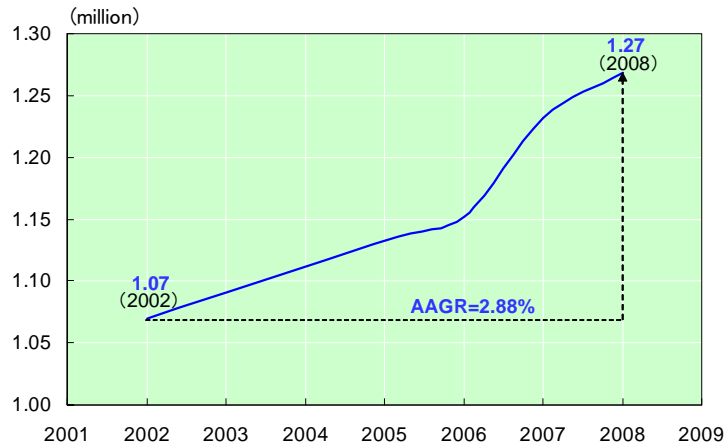


Figure-3.7 Population Movements in Senegal

In Kaolack, where the target section is located, population increased by roughly 200,000 over six years, from 1.07 million in 2002 to 1.27 million in 2008. During this period, the AAGR was 2.89%, which was slightly lower than the national level.

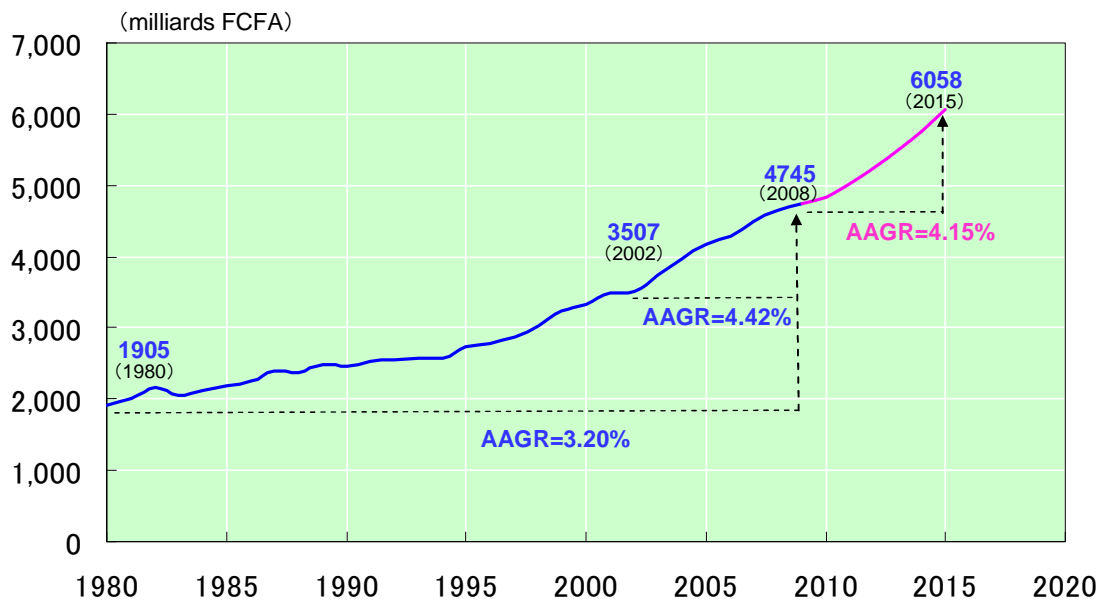


Source : Agence Nationale de la Statistique et de la Démographie(ANSD)

Figure-3.8 Population Movements in Kaolack Region

3-2-2 Trends in GDP

The following figure shows movements in the actual GDP of Senegal between 1980 and 2009. After 1980, GDP displayed steady growth, increasing from 1,905 billion FCFA in 1980 to 4,750 billion FCFA in 2009, thus growing by approximately 2.9 times over 32 years. The annual average growth rate (AAGR) over this period was 3.2%. From 2002 onwards, the AAGR has been 4.42%, and economic growth accelerated in the years following the economic reforms of 1995. According to the economic prospects for 2008 to 2015 published by the Government of Senegal, it is projected that the economy will continue to grow at a rate of 4.15% up to 2015.

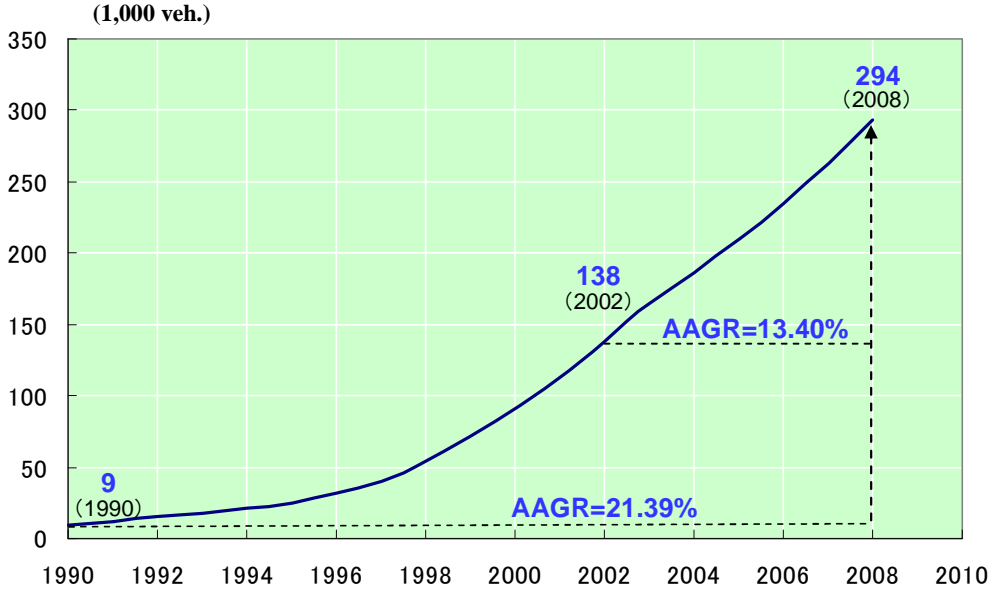


Source : La Direction de la Prévision et des Etudes Economiques (DPEE)

Figure-3.9 GDP Movements in Senegal

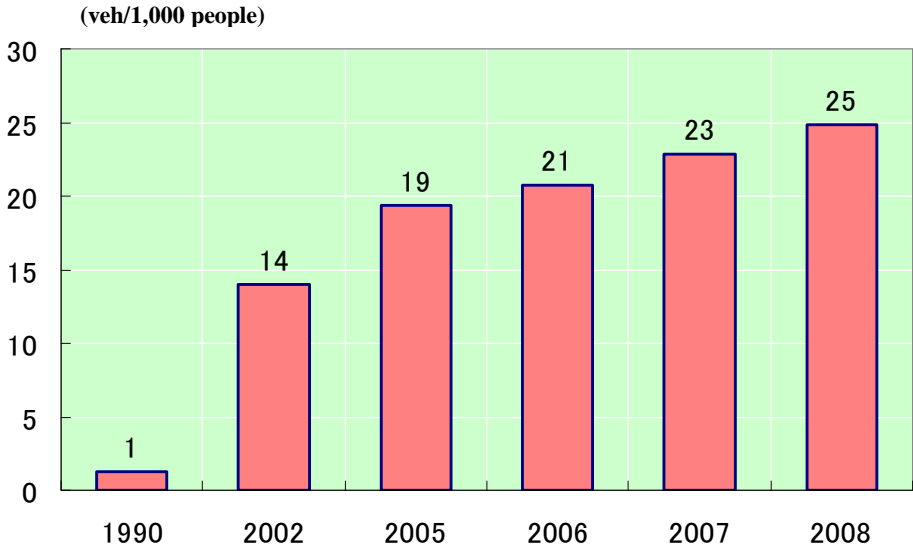
3-2-3 Trends in Car Ownership

Car ownership has been growing at a dramatic rate in Senegal: the AAGR between 1990 and 2008 was 21.39%. In recent times, although the rate of increase has been falling, the AAGR is still 13.4%, which means that car ownership continues to increase by at least 10% per year. The number of cars owned per 1,000 of population is also displaying steady growth and increased by approximately 1.8 times over five years between 2002 and 2008.



Source : Memento des Transports Terrestres du SENEGAL 2009 (DTT)

Figure-3.10 Movements in Car Ownership in Senegal



Source : JICA Survey Team

Figure-3.11 Movements in Owned Cars per 1,000 of Population (2008)

3-2-4 Summary of Socio-economic Indicators

Some trends of socio-economic indicators of Senegal that have rather close relation to traffic demand are compiled. All indices are increasing and this growing tendency will continue in the future.

According to the Government of Senegal, although the projected growth rates in population and GDP are lower than what actual figures show, population will grow at a rate of 2.77% and GDP at 4.15%.

It is expected that the traffic demand will also increase in line with the growth in these indicators. In the following section, analysis is conducted on the relation between these indicators and traffic demand, and the future traffic demand is estimated.

Table-3.4 Movements in Socio-economic Indicators

Population	long term	1976	2008	AAGR	AAGR 2008-2012
		4,958,085	11,841,123	2.76%	
	short term	2,002	2,008	AAGR	2.77%
		9,858,482	11,841,123	3.10%	
GDP	long term	1980	2009	AAGR	AAGR 2008-2015
		1,905	4,746	3.20%	
	short term	2002	2009	AAGR	4.15%
		3,507	4,746	4.42%	
Number of Automobile ownership	long term	1990	2008	AAGR	-
		8,967	293,800	21.39%	
	short term	2002	2008	AAGR	
		138,134	293,800	13.40%	
Number of Automobile ownership par 1000people	long term	1990	2008	AAGR	-
		1	25	18.14%	
	short term	2002	2008	AAGR	
		14	25	9.99%	

Source: Agence Nationale de la Statistique et de la Demographie (ANSD)

Source: Memento des Transports Terrestres du SENEGAL 2009 by DTT, 2010

3-3 Future Traffic Demand Analysis

3-3-1 Basic outline of the traffic demand forecast

In the estimate of the traffic demand, following traffic demands are basically assumed. In this preparatory survey, three categories of traffic demands are integrated, and the future traffic demand in the project road section will be assumed.

- (1) Natural growth of traffic demand
This is a traffic demand actualized in accordance with population and economic growths. The main part of the traffic demand is occupied.
- (2) Detoured traffic demands
Diverted traffic from other routes to the project route by road condition's improvement.
- (3) Developed and generated traffic demands
This is a new traffic demand caused by development of the region/area or new facilities. In other words, this is a new traffic demand caused by decreased transport costs after road improvement.

Moreover, there is a possibility of traffic demands by the conversion of the traffic mode from nonmotorized, but it is not considered in this preparatory survey.

3-3-2 Future Traffic Demand Analysis

- (1) Natural growth traffic demands

1) Basic outline

The growth of population, growth of GDP and growth of car ownership are indicators related to traffic growth. First of all, the relation between the indicators and traffic volume is clarified, and then the natural growth rate is analyzed. The analysis flow is shown below.

Traffic demand is expected to increase in line with population growth and economic development in the benefiting area of the target road. According to the results of the OD survey, the benefiting area covers a wide scope that includes the regions of Kaolack, Dakar, Fatick and Ziguinchor, etc. Accordingly, traffic demand in the target area is expected to continue increasing from now in line with population growth and economic growth in Senegal.

In this preparatory survey, the relation between traffic increase and indicators that have an impact on traffic volume, i.e. population, GDP and car ownership, is clarified and the future traffic demand is analyzed. Moreover, in forecasting the traffic demand, other indicators are thought to have an impact, however, it was decided to use those three indicators for which data could be obtained.

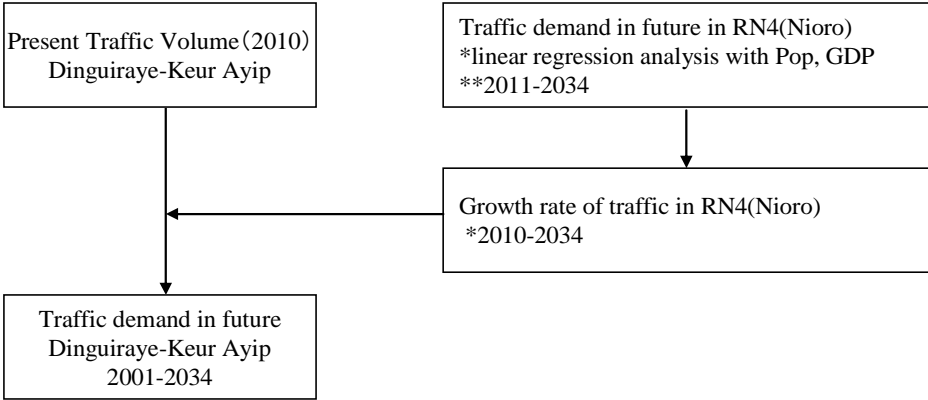


Figure-3.12 Flowchart, Natural Growth Traffic Demand Analysis

2) Movements in traffic demand and socio-economic indicators

Between 1996 and 2008, traffic demand along RN4 displayed an increase of 5.5% in Kaolack Region, 4.7% in NR4 (Nioro du Rip) and 3.5% in Dakar Region. It is forecast that traffic volume will increase greatly in these areas in line with growth of population and economy.

Table-3.5 Increase in Daily Average Traffic Volume by Area

Région	1996	2002	2007	AAGR (1996–2007)
Dakar	5961	7828	8688	3.5%
Diourbel	706	1470	2917	13.77%
Thiès	2169	3548	1934	-1.04%
Fatick	524	438	881	4.8%
Kaolack	627	1045	1130	5.5%
NR4(NIORO)	470	667	776	4.7%
Kolda	143	234	528	12.61%
Ziguinchor	536	325	672	2.1%

Source : Campagne nationale de comptage de trafic sur le réseau des routes classées



Figure-3.13 Regions of Senegal

The trends of the traffic volume in the NR4 (Nioro), the population and GDP in Senegal are shown in Figure-3.14. The point of the results is as follows.

- The increase of the traffic in NR4 (Nioro) is higher than the growth of the population and GDP in the whole country.
- The increase level of the passenger car is equal to that of the population and GDP.
- The increase level of the freight vehicle is higher than that of the population and GDP.

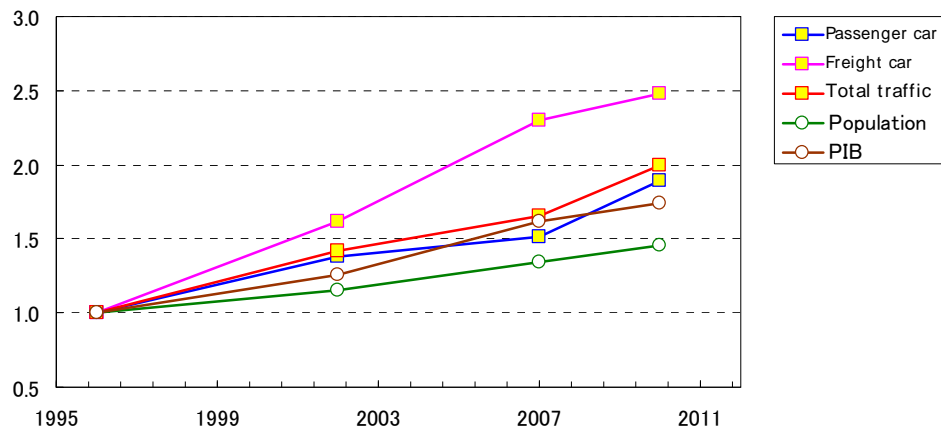


Figure-3.14 Trends of Traffic of NR4 (Nioro) and Socio-economic Indicators, whole Country

3) Growth rate of traffic volume in NR4 (Nioro du Rip)

In the analysis of traffic demand in Senegal, the future traffic demand is calculated by applying the recent rate of growth in socio-economic indicators as the rate of growth in traffic volume. Moreover, it is assumed that the rate of growth in traffic volume remains constant over the assessment period (20 years).

However, judging from the analysis of the relation between traffic volume and socio-economic indicators, it is considered that the rate of growth in socio-economic indicators cannot simply be applied. Moreover, it is forecast that the rate of growth in socio-economic indicators will slow down in the future, i.e. the growth rate will not remain uniform.

Therefore, in this study, future traffic demand is computed through setting a forecasting model that assumes the socio-economic indicators to be explanatory variables and applying the future values of the socio-economic indicators. From the results, the future natural rate of growth in traffic demand is calculated.

As a result of conducting analysis based on the combination of population, GDP and car ownership, the following forecasting model was found to be most accurate. In other words, the model formula that adopts population as the explanatory variable is most accurate regarding cars. Whereas, regarding freight vehicles, the model formula that adopts GDP as the explanatory variable is most accurate.

$$\begin{aligned}
 \text{PassengerCar} &= 7.9X_1 - 277.2 & \text{FreightCar} &= 0.06X_2 - 80.4 \\
 X_1 &= \text{Population(million)} & X_2 &= \text{GDP(billionFCFA)} \\
 r^2 &= 0.94 & r^2 &= 0.99
 \end{aligned}$$

Moreover, the future frames for population and GDP were set based on the following thinking regarding future growth rate.

Population Frame

- 2009-2012: Estimate values in Senegal
- 2012-2020: AAGR gradually decreases by 0.02%^{*1} every year
 - *1: For 10 years from 2010 the trend of estimate values in Senegal will be sustained.
- 2021- : AAGR gradually decreases by 0.07%^{*2} every year
 - *2: The AAGR that fits in the UN published value (25.3 million in 2050) is set.

Table-3.6 AAGR of Population

years	AAGR	remarks
2009-2010	2.78%	Estimate values in Senegal
2010-2011	2.76%	
2011-2012	2.74%	
2012-2020	Decreases gradually by 0.02% every year (2.58%-2.72%)	Trend continuance until 2012
2020-2033	Decreases gradually by 0.07% every year (1.66%-2.51%)	The AAGR that fits in the UN published value is set

GDP Frame

•2009-2015: Estimate values in Senegal

•2015-2025: AAGR=4.15%^{*1}

*1: For 10 years from 2015 the trend of estimate values for the period between 2009~2015 will be sustained.

•2025- : AAGR=2.07%^{*2}

*2: It is assumed that the growth rate will slow down from 2025 onwards (2.07% = 4.15%/2)

Table-3.7 AAGR of GDP

years	AAGR	remarks
2009-2010	1.71%	Estimate values in Senegal
2010-2011	4.09%	
2011-2012	4.54%	
2012-2013	4.72%	
2013-2014	4.87%	
2014-2015	5.00%	
2015-2025	4.15%	AAGR; 2009-2015
2025-2033	2.07%	4.15%/2

Natural traffic demands and average annual growth rates (AAGR) for NR4 (Nioro) were calculated based on the above-mentioned forecasting model. The result is as follows:

Table-3.8 Natural Traffic Demand and AAGR of NR4 (Nioro)

year	Passenger car		Freight car		Total	
	Traffic Volume	AAGR	Traffic Volume	AAGR	Traffic Volume	AAGR
2010	709	-	209	-	918	-
2014	821	3.75%	265	6.12%	1,086	4.30%
2023	1,103	3.33%	422	5.30%	1,525	3.84%
2033	1,402	2.43%	561	2.90%	1,963	2.56%

4) Natural growth of the traffic demand in the section: Dinguiraye - Keur Ayip

The natural growth of the traffic demand in the section of Dinguiraye-Keur Ayip is calculated by multiplying AAGR of NR4 (Nioro) by the average daily traffic between Dinguiraye-Keur Ayip in 2010. The result is as follows.

Table-3.9 Natural Growth Traffic Demand (AAGR) of Dinguiraye-Keur Ayip Section

year	Passenger car		Freight car		Total	
	Traffic Volume	AAGR	Traffic Volume	AAGR	Traffic Volume	AAGR
2010	553	-	177	-	730	-
2014	641	3.75%	226	6.30%	867	4.39%
2023	860	3.33%	360	5.31%	1,220	3.87%
2033	1,093	2.43%	480	2.92%	1,573	2.57%

(2) Detoured traffic demands

There are two routes from Kaolack to the southern area of Senegal out of NR4 Trans-Gambian Corridor. They are the competitive routes of NR4.

-NR5 route (Kaolack – Banjul - Ziguinchor)

-NR1 and NR6 route (Kaolack – Tambacounda - Ziguinchor)

According to the comparison of each distance, NR4 route is the shortest route compared with NR5 and NR1-NR6 route.

In the result of the roadside OD interview survey, there is no user of NR5 from Kaolack towards the southern area of Senegal. Therefore, the detoured traffic demand from NR5 is not expected even with the road improvement project.

Table-3.10 Comparisons of the Distance in Competitive Routes between Kaolack-Ziguinchor

		NR5	NR4	NR1-NR6
Road Distance	km	262	251	687
Time Distance	min	314	301	824
Time of ferry	min	30	10	—

*Road distances are measured by map



Figure-3.15 Competitive routes from Kolack to Ziguinchor

(3) Developed and induced traffic demands

Developed and induced traffic demands were calculated using the following formula which indicates the relation between the ratio of running expenses before and after road development. This approach is mainly used in examination of other roads in Senegal and has thus been adopted in this study.

$$\frac{\Delta T}{T} = \left(\frac{\Delta C}{C} \right)^\alpha$$

T = the traffic volume in the situation without case,

C = VOC without case,

ΔC = the achieved economy on the operational costs of the vehicles,

(α) = the modulus of elasticity of the traffic demand,

ΔT = traffic demand developments.

The parameter changes depending on the service level and varies according to road condition without the project. The parameter of 0.5 or 0.75 was applied in the 'ETUDES ECONOMIQUES DE LA REHABILITATION DES TRONCONS ROUTIERS NIORO-KEUR AYIP (RN4) ET PASSY-SOKONE (RN5)'.

Meanwhile, in our preparatory survey, the safe side parameter of 0.75 is applied and results are as follows.

Table-3.11 Results of Estimated Developed/Induced Traffic

	Passenger car	Bus	Truck (2axle)	Truck (more than 3axle)	Trailer	Total
VOC without case (FCFA/ km)	277.91	324.19	698.46	1,171.75	2,019.85	—
VOC with case (FCFA/ km)	190.70	253.72	548.87	920.70	1,582.91	—
Parameter (α)	0.75	0.75	0.75	0.75	0.75	—
Natural growth traffic demand (2014)	514	127	60	66	100	867
Development and cause traffic demand (2014)	216	40	19	21	32	327

Source: AGEROUTE and JICA Survey Team

(4) Developed traffic demand by Gambian River Bridge

In the study entitled ‘Pont sur la Gambie Rapport final’ by the Organisation pour la Mise en valeur du Fleuve Gambie (O.M.V.G) in 2010, the detoured traffic demands through Tambacounda were added as developed traffic.

The traffic volume is 64veh./day, about 40 percent of the total of the NR6-NR1 detoured traffic (159veh./day).

It is analyzed in this study that a lot of vehicles may avoid the loss of time crossing the Gambia River by ferry and the payment of some unforeseen traffic fee.

Moreover, it is clarified that 10% of the traffic makes a detour to NR1 and NR6 to avoid the Gambia River in the OD survey result which AGEROUTE executed in 2005. And this traffic volume was about 100veh./day in 2004.

In this preparatory survey, the traffic volume of 64veh./day (in 2010) is expected as developed traffic with the Gambia River bridge construction.

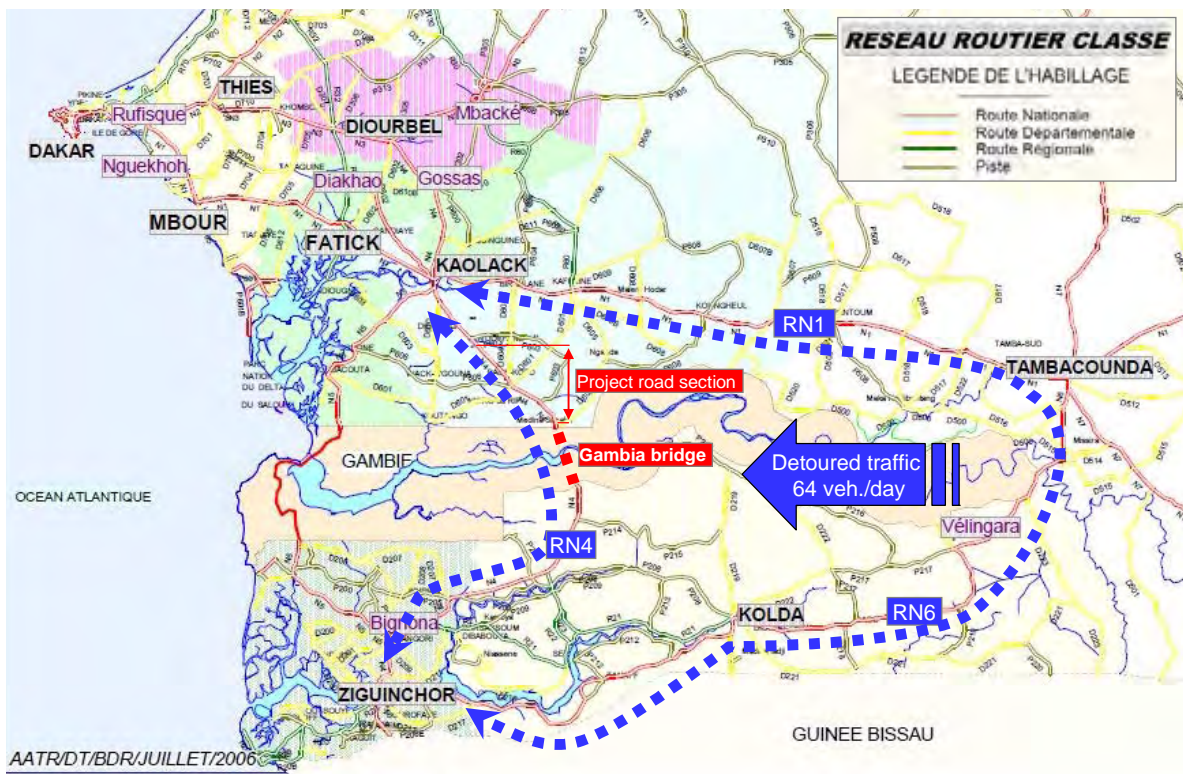
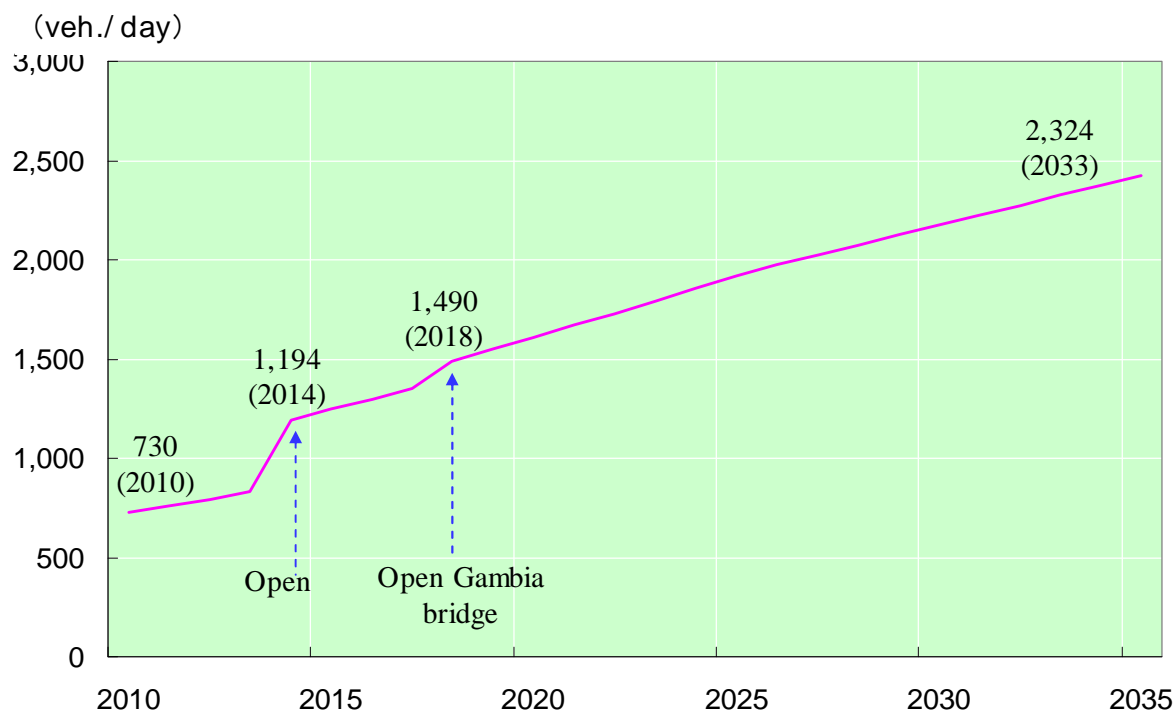


Figure-3.16 Location of Gambian River Bridge and Image of Traffic Flow

3-3-3 The future traffic demands

The traffic demand for the section Dinguiraye - Keur Ayip in the future is summarized as follows. The traffic demand in the future is assumed in total based on the natural growth traffic demand and the development and the cause of traffic demand. It is estimated to be 2,324 veh./day in 2033.



Source: JICA Survey Team

Figure-3.17 Future Trends of Traffic Demand for the Dinguiraye-Keur Ayip Section

Table-3.18 Estimated Future Traffic Demands for the Dinguiraye-Keur Ayip Section

year	2010	2014	2018	2023	2028	2033
Natural growth traffic volume	730	867	1,016	1,220	1,409	1,573
Development and cause traffic volume	-	327	386	470	545	609
Traffic volume by Gambian river bridge	-	-	88	103	121	142
Total	730	1,194	1,490	1,793	2,075	2,324
Remarks	Bench mark	Open of Dinguiraye-Keur Ayip	Open Gambian river bridge	10years after open	15years after open	20years after open

Source: JICA Survey Team

3-4 Check to the study of AGEROUTE and Point and Suggestion by JICA survey team

Checked Item	Study of AGEROUTE <Etudes Economiques de la rehabilitation des troncons routiers Nioro-Keur Ayip(RN4)>	Point and suggestion by JICA survey team
Present Traffic Volume (2010)	Basic data of traffic volume use only one survey result at Nioro in 2007.	Average data of three points should be applied. One point by
	Traffic volume in 2010 is the forecast estimated by the traffic volume in 2007 and by the annual growth rate (passenger car 4.5% and freight car 4.2%).	AGEROUTE in 2010, Two points by JICA survey team in 2010. Average daily traffic is calculated by the weighted average of traffic and of section distance.
	914 veh./day (2010).	730 veh./day (2010).
Future traffic demand	Traffic demand in the future is calculated by multiplying the AAGR and the average daily traffic of 2010.	ditto
Natural growth traffic demand	Growth rate according to the type of car.	ditto
	A different growth rate is set in 'the with case' or 'the without case'.	The same growth rate should be set in 'the with case' or 'the without case'. The impact by the project should consider it as a development traffic demand.
	Growth rate of passenger car: Calculation from the population growth rate 2.7% and from income growth rate 2% of 2002-2007. AAGR (2010-2033) is 4.8% or 5.8% or 6.4% by the three hypotheses.	Growth rate is calculated by applying the linear regression analysis of population of the whole country in Senegal. AAGR (2010-2033) is 3.0%.
	Growth rate of freight: Calculation from GDP growth rate 4.2% of 2001-2008. AAGR of 2010-2035 is 4.2% or 6.3% or 7.6% by the three hypotheses.	Growth rate is calculated by applying the linear regression analysis of GDP of the whole country in Senegal. AAGR (2010-2033) is 4.4%.
Developed and induced traffic demand	It is calculated from the difference of the ratio of the Vehicle Operation Cost before and after the road project 441 veh./day in 2010.	It is calculated from the difference of the ratio of the Vehicle Operation Cost before and after the road project 338 veh./day in 2010.
Detoured traffic demand	N.A.	There is no detoured traffic demand from the NR5.
Developed traffic demand by Gambian River Bridge	N.A.	Developed traffic is estimated 64 veh./day in 2010. It is based on the study by O.M.V.G.
Opening year	2015	2014
Estimate period	20 years (2013-2033)	20 years (2014-2033)
Future traffic	4,081 veh./day (2033) Less realistic 3,291 veh./day (2033) Less pessimistic	2,324 veh./day (2033)

Chapter 4
Project Plan

Chapter 4 Project Plan

4-1 Introduction

This project is about road rehabilitation between Dinguiraye-Keur Ayip about 40km on the NR4 in Kaolack region. The following are five existing documents and drawings relative to the road design in this project.

- 1) Prolongation of Technical Design Report between Dinguiraye-Keur Ayip (38.7km), Tender Document (Technical Report, Technical Specifications, Bill of Quantities) [hereinafter referred to as “2010 Technical Survey”]
- 2) Topographic Survey (Drawing)
- 3) Hydrolic and Hydrological Survey
- 4) Inventory of Drainage Structure
- 5) Report on Geology

This Chapter describes whether the design was done appropriately based on the confirmation of the contents of survey report related to the road design. Then regarding the problems to be solved, suggestions are put forward.

4-2 Method

The above existing survey reports were made for the project section based on the latest information. Thus the large modification of design was not carried out in this report on the assumption that the limited modification of design can be done. Because several surveys have been carried out by AGEROUTE for this project until now. The appropriateness of the design contents was judged in this report based on the confirmation of the contents of existing survey reports, the results of site visits, and the hearing of AGEROUTE.

4-3 Present Overall Plan

This project is about road rehabilitation between Dinguiraye-KeurAyip about 40km on the NR4 in Kaolack region.

The table below shows a summary of the Project whose Technical Study was carried out in April 2010.

Table-4.1 Summary of the Project

Item	Content
Length of Section	38.643km
Pavement Structure	Asphalt Concrete : 5cm (carriageway)
	Single Bituminous Surface Treatment : SBST(Shoulder)
	Base course 20cm (Laterite stabilized by Cement)
	Sub Base 20cm (Laterite stabilized by Cement)
Carriageway	10.2m (Carriageway 3.60m×2, Shoulder 1.5m×2) except Baobolong Section
	9.0m (Carriageway 3.00m×2, Shoulder 1.5m×2) for Baobolong Section
Road Drainage	Box Culvert 26 places (Total number of Existing Culvert 36) (Type 2000mm×1000mm, 4000mm×2000mm, 5000mm×3000mm)
Road Furniture	Lane marking, Crosswalk, Girdpost, Traffic Sign, Bus bay
Weigh bridge	Installation of Facilities

Source: Technical Report April 2010 (AGEROUTE)

4-4 Road Design

4-4-1 Geometric Design

The road standard for Economic Community of West African States (ECOWAS) is adopted for the project. The criteria for a new two-lane road adopted are 7.2m (3.6m × 2) wide for the carriageway and 1.5m for the shoulders. The geometric design is applied to the French standard.

Table-4.2 Design Condition

Item	Unit	Parameter	
		Truck Road	Urban Area, Village
Design Speed	Km/h	100	40
Width of Carriageway	m	3.6×2	
Width of Shoulder	m	1.5×2	
Minimum Radius	m	665	120

4-4-2 Pavement Design

The Pavement design of the Project is applied to the Rational method (program "Arize" calculated) which is derived from Laboratoire Central des Ponts et Chaussées (LCPC).

The design criteria are shown in Table-4.3.

Table-4.3 Design Condition for Pavement

Item	Content		
Design Period	20Years		
Axle Load	13t		
Equivalent Standard Axle Load	ESAL 13.15×10 ⁶		
Elasticity Modulus(bar)	Surface	Asphalt Concrete	13,000
	Base Course	Laterite stabilized by Cement	15,000
	Sub Base Course	Laterite stabilized by Cement	8,000
	Subgrade	Laterite	1,000
Coefficient of Poisson (ν)	Surface	Asphalt Concrete	0.45
	Base Course	Laterite stabilized by Cement	0.25
	Sub Base Course	Laterite stabilized by Cement	0.25
	Subgrade	Laterite	0.35
wheel contact width (cm)	12.5		
wheel contact interval (cm)	37.5		
One side Axle Load (t)	6.62		

Source: JICA Survey Team

4-5 Facility Plan

4-5-1 Design of Alignment

(1) Horizontal alignment

The horizontal alignment of the road is to be based on the current horizontal alignment of the existing road. Thus, the horizontal alignment has not been changed.

(2) Vertical alignment

The vertical alignment of the road has been maintained to the present road and the height of the road is elevated to 25cm above the existing road.

(3) Cross Section

The cross section of the road is shown in Fig-4.1 (1) and (2).

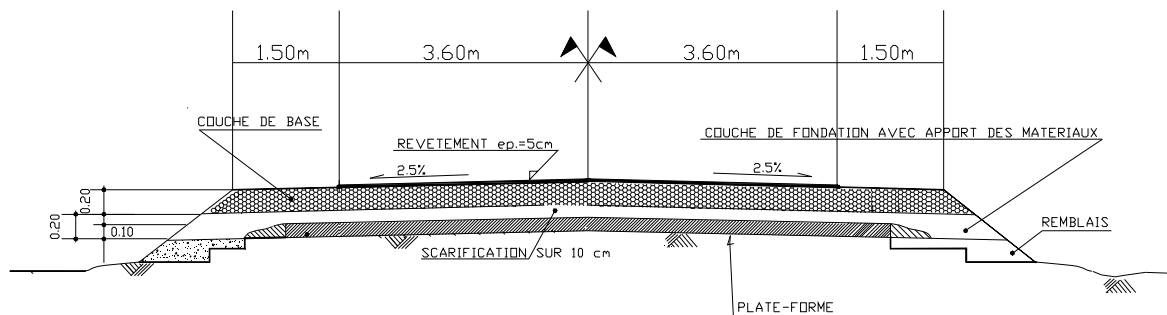


Figure-4.1 (1) Cross Section

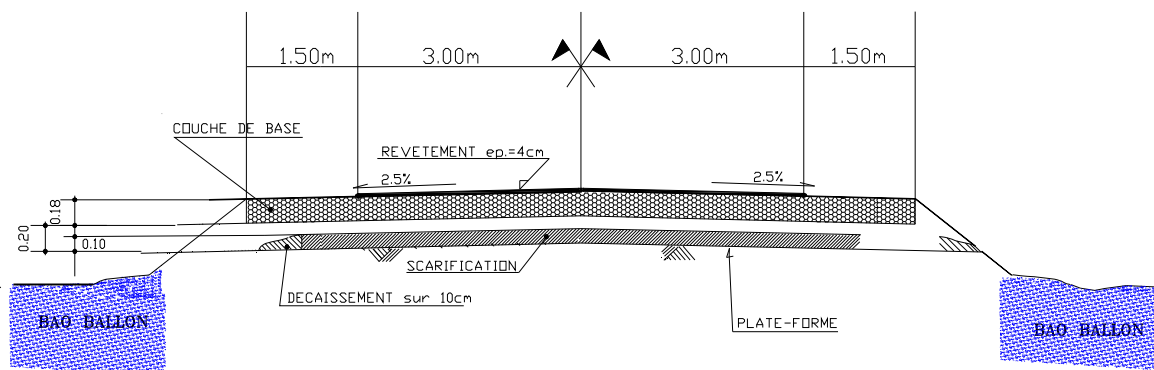


Figure-4.1 (2) Cross Section (Baobolong River Section)

4-5-2 Road Drainage

The existing road crossing culverts (box culvert) are in 36 locations at present. All existing pipe and box culverts are supposed to be replaced by new box culverts whose water flow capacity is enough, except nine (9) culverts in the section of Baobolong River and one (1) culvert in Nioro town.

New type of box culvert is as follows,

- 2 Cell Box culvert (Dimension of water flow capacity 2000mm×1000mm)
- 1 Cell Box culvert (Dimension of water flow capacity 4000mm×2000mm)
- 1 Cell Box culvert (Dimension of water flow capacity 5000mm×3000mm)

The planned road drainage inventory is shown in Table-4.4.

Table-4.4 The Planned Road Drainage

No.	PK	Type of Culvert	Works	New Works Items
1	0 + 8260	1 Pipe culvert ϕ 600	replacement culvert/masonry works	2 cell Box Culvert 2,000mm * 1,000mm
2	1 + 73	1 Box Culvert 1,000*1,200	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
3	2 + 800	5 Pipe culvert ϕ 1,000	replacement culvert/manonry works	1 Cell Box Culvert 5,000mm * 3,000mm
4	4 + 219	4 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
		1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
5	5 + 493	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
6	5 + 500	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
7	7 + 230	3 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
8	8 + 553	1 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
9	9 + 634	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
10	10 + 156	3 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
11	10 + 772	2 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
12	10 + 941	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
13	10 + 980	1 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
14	11 + 187	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
15	11 + 975	2 Box Culvert 2,000*1,000		
		1 Pipe culvert ϕ 800		
16	12 + 531	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
17	13 + 335	2 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
18	20 + 898	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
19	20 + 999	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
20	23 + 529	1 Pipe culvert ϕ 600	Reconstruction Culvert head	
21	23 + 579	1 Pipe culvert ϕ 800	Reconstruction Culvert head	
22	23 + 680	3 Pipe culvert ϕ 800	Reconstruction Culvert head	
23	23 + 830	2 Pipe culvert ϕ 800	Reconstruction Culvert head	
24	23 + 980	2 Pipe culvert ϕ 1,000	Reconstruction Culvert head	
25	24 + 114	2 Pipe culvert ϕ 800	Reconstruction Culvert head	
26	24 + 226	4 Pipe culvert ϕ 1,000	Reconstruction Culvert head	
27	24 + 319	2 Pipe culvert ϕ 1,000	Reconstruction Culvert head	
28	24 + 345	1 Pipe culvert ϕ 800	Reconstruction Culvert head	
29	31 + 140	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
30	31 + 199	3 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
31	31 + 222	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	1 cell Box Culvert 4,000mm * 2,000mm
32	31 + 285	2 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
33	31 + 442	2 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
34	32 + 905	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
35	35 + 280	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
36	36 + 500	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm

Source: AGEROUTE

4-5-3 Road Furniture

Road furniture such as lane marking, Crosswalk, Girdpost, Traffic Sign, Bus bay is planned in the project.

4-5-4 Weigh Bridge

The weigh bridge for heavy vehicles is planned. The location is not yet determined; it will be indicated by the Client before the construction stage.

4-6 Confirmation and Point of Review

4-6-1 Confirmation of Pavement Structure

The pavement structure in the project is the general structure in Senegal. Aggregate is used as base course in other Countries, however aggregate for base course is not general since the existing quarries are situated far from the project area, thus long distance transport affects the project cost.

In addition, the pavement design standards are applied to the French pavement design, so that for comparison purpose, the pavement structure is examined by AASHTO Pavement design method which is applied generally in Africa. As a result of examination, this pavement structure is appropriate.

The design condition of AASHTO Pavement design method for this project is shown in table-4.5.

Table-4.5 Design condition of AASHTO Pavement Design Method for this Project

Item		Content
Design Period	:	20Years
Equivalent Standard Axle Load	:	ESAL 13.15×10^6
Reliability (R)	:	80%
	: ZR	- 0.841
	: S0	0.4
Performance Serviceability Index	: P0	4.2
	: Pt	2.0
Elasticity Modulus	: MR	>CBR15
Layer Coefficient	: Asphalt Concrete	0.44
	: Base Course	0.15 (Laterite stabilized by Cement)
	: Sub Base Course	0.15 (Laterite stabilized by Cement)
Drainage Coefficient	: Base Course	1.2
	: Sub Base Course	1.1

Table-4.6 Result of Examination as per ASSHTO Pavement Design Method for this Project

Item	Content
Equivalent Standard Axle Load	ESAL 13.15×10^6
Standard Deviation (Z0)	- 0.841
Standard Error (S0)	0.4
Difference of Serviceability Index ($\Delta PSI = P0 - Pt$)	$4.2 - 2.0 = 2.2$
Elasticity Modulus (MR)	8,000
CBR	>15
Necessary Structure Number (SN)	3.57
Calculated Structure Number (SN')	3.583 (SN' > SN)

4-6-2 Section of Baobolong River

(1) Actual Condition

Pavement works will be carried out only in the section of Baobolong River crossing (length 1.173km) for the project plan. However, as results of site visits, it was confirmed that the traffic was blocked for approximately 48 hours (from 7th October 2010 to 8th October 2010) due to flood caused by the rise of river water levels. According to Kaolack AGEROUTE Office, top of embankment was heightened 40cm with filling laterite material stabilized by cement. Taking into account the above situation, it is necessary to review the current design criteria in this section.



Before height of embankment 16th Sep. 2010



After height of embankment 26th Nov. 2010

(2) Measures to be proposed

Following measures are proposed for the Section of Baobolong river crossing.

- Pavement works shall be carried out based on the level of heightened embankment.
- Same width of carriageway and shoulder in accordance with ECOWAS shall be applied for other section (refer to Figure-4.2). And the width of carriageway was considered based on the safety of pedestrian engaged in fishery and the secure visibility of traffic
- Existing cross culverts shall be replaced by new box culverts whose water flow capacity is more than the existing one (refer to Table-4.7).
- Slope protection for embankment such as gabion with mortar.

The proposed cross section of the road is shown in Fig-4.2.

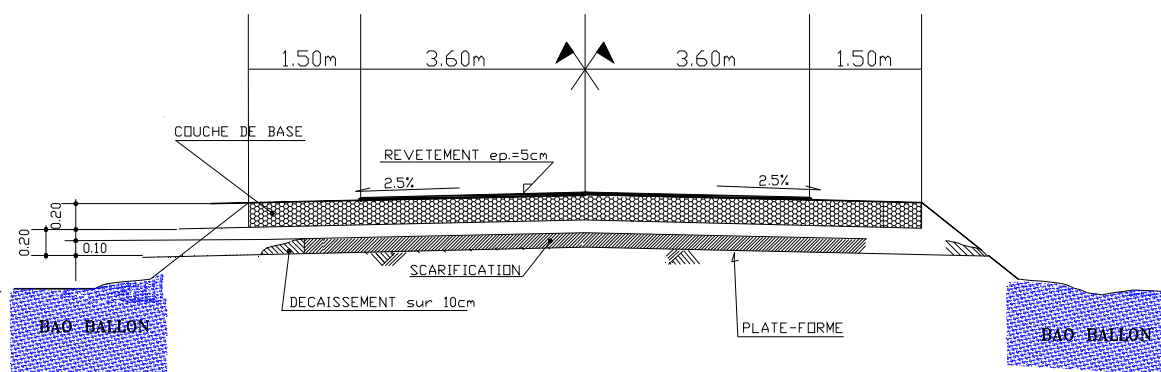


Figure-4.2 Typical Cross Section

The following table shows the type of the box culverts crossing the Baobolong river section.

Table-4.7 Type of the Box Culvert crossing the Baobolong River Section

No.	PK	Type of Culvert	Works	New Works Items
20	23 + 529	1 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
21	23 + 579	1 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
22	23 + 680	3 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
23	23 + 830	2 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
24	23 + 980	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
25	24 + 114	2 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
26	24 + 226	4 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
27	24 + 319	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
28	24 + 345	1 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm

4-6-3 Summary of the Proposed Project

The proposed project contents and type of road crossing drainage are shown in Table -4.8 and in Table-4.9.

Table-4.8 Summary of the Proposed Project

Item	Content
Length of Section	38.643km
Pavement Structure	Asphalt Concrete : 5cm (carriageway)
	Single Bituminous Surface Treatment : SBST(Shoulder)
	Base course 20cm (Laterite stabilized by Cement)
	Sub Base 20cm (Laterite stabilized by Cement)
Carriageway	10.2m (Carriageway 3.60m \times 2, Shoulder 1.5m \times 2) All Section
Slope Protection	Baobolong River Section 1.173km Masonry with mortar
Road Drainage	Box Culverts in 35 places (Total number of Existing Culverts 36) 2 cell Box Culverts 2000mm \times 1000mm 2 cell Box Culverts 4000mm \times 2000mm 2 cell Box Culvert 5000mm \times 3000mm
Road Furniture	Lane marking, Crosswalk, Guirdpost, Traffic Sign, Bus bay
Weigh bridge	Installation of Facilities

Source: 2010 Technical Survey (AGEROUTE)

Table-4.9 Summary of proposed Type of the Box Culvert

No.	PK	Type of Culvert	Works	New Works Items
1	0 + 8260	1 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
2	1 + 73	1 Box Culvert 1,000*1,200	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
3	2 + 800	5 Pipe culvert ϕ 1,000	replacement culvert/manonry works	1 cell Box Culvert 5,000mm * 3,000mm
4	4 + 219	4 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
		1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
5	5 + 493	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
6	5 + 500	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
7	7 + 230	3 Pipe culvert ϕ 800	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
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14	11 + 187	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
15	11 + 975	2 Box Culvert 2,000*1,000		
		1 Pipe culvert ϕ 800		
16	12 + 531	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
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19	20 + 999	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
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29	31 + 140	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
30	31 + 199	3 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
31	31 + 222	2 Pipe culvert ϕ 1,000	replacement culvert/manonry works	2 cell Box Culvert 4,000mm * 2,000mm
32	31 + 285	2 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
33	31 + 442	2 Pipe culvert ϕ 600	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
34	32 + 905	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
35	35 + 280	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm
36	36 + 500	1 Box Culvert 1,000*1,000	replacement culvert/manonry works	2 cell Box Culvert 2,000mm * 1,000mm

4-6-4 Summary of the Modification in the Survey

The summary of the modification in this survey is shown in table-4.10.

Table-4.10 Summary of the Modification in the Survey

No.	Items	2010 Technical Survey (by AGEROUTE)	Modification and Suggestion by JICA Survey Team
1	Finish Level of the pavement in the section across Baobolong River	Finish level will be 25cm higher than the existing ground level. (before embankment by AGEROUTE in Oct.2010.)	Finish level will be 65cm higher than the existing ground level. (before embankment by AGEROUTE in Oct.2010.)
2	Road width in the section across Baobolong River	Road width : 9.0m (Carriageway 3.0m×2+Shoulder 1.5m×2)	Road width : 10.2m (Carriageway 3.6m×2+Shoulder 1.5m×2)

3	Drainage structures in the section across Baobolong River	The existing structures will be extended about 2m in combination with the widening of road.	After demolishing the existing structures, New box culverts will be constructed .
4	Slope in the section across Baobolong River	Slope gradient will be about 1:1.2 (same as the existing one).	Slope gradient will be about 1:2.0 for stability of the road structures, and the slope will be protected by concrete to prevent erosion.
5	Cost Estimation	<ul style="list-style-type: none"> • BOQ does not include an item of SBST paving on the shoulder. • The project length in the estimation is different from the actual length. 	<ul style="list-style-type: none"> • SBST is added in the estimation. • The volume of each item is recalculated by the actual length. • The modified plans of above mentioned drainage structures and slope are reflected to the cost estimation.

Source: JICA Survey Team

The modification in the section across Baobolong River in detail agreed by AGEROUTE is shown in Figure.-4.3.

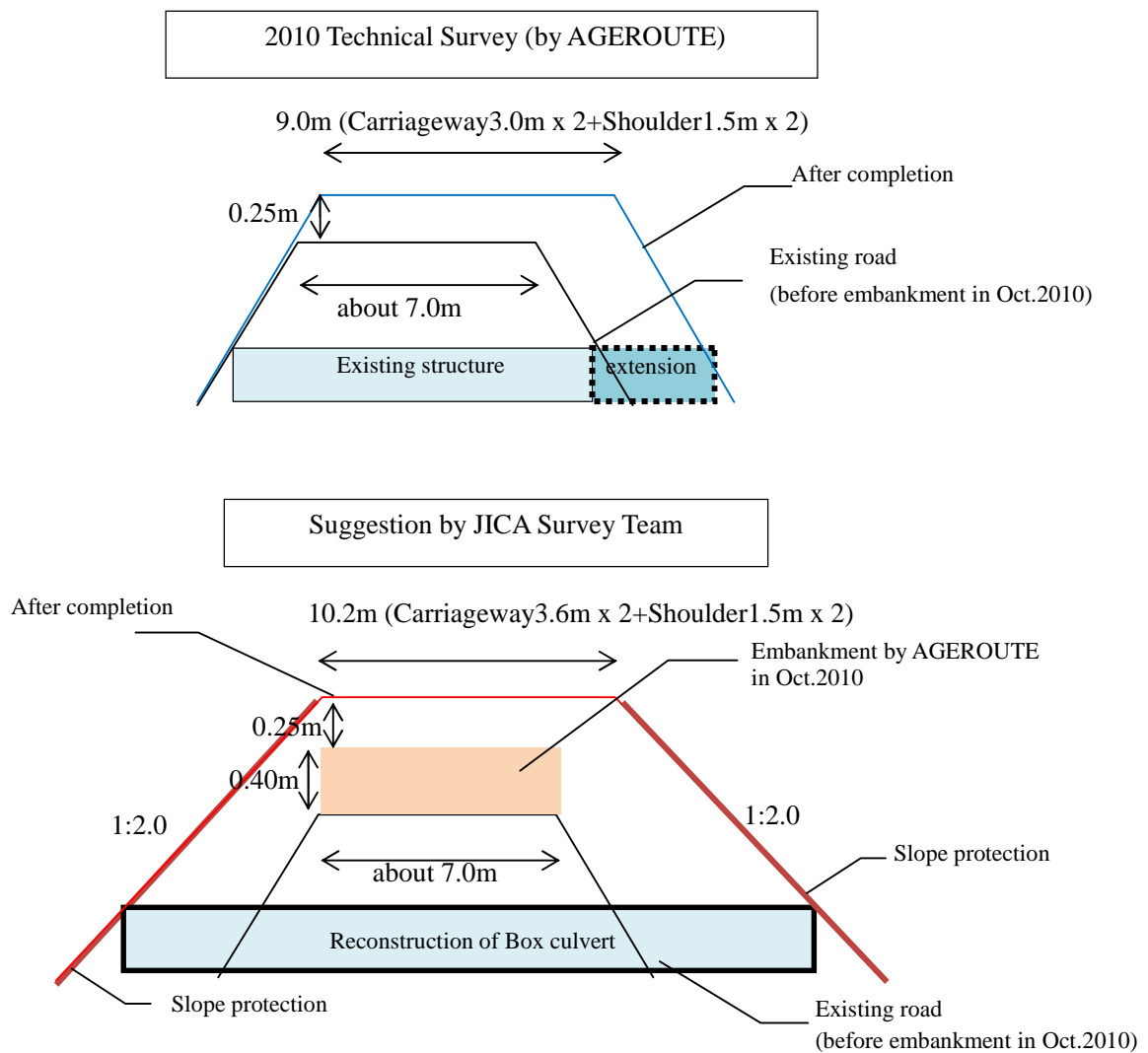


Figure-4.3 Modification in the Section across Baobolong River

4-6-5 Supplementary Preparation of Drawings for Project Implementation

Although the tender drawings have been already prepared in 2010 Technical Survey, the following items are considered to be necessary for project implementation.

- Preparation of lacking cross section
- Input of the finish level in vertical cross-sectional views
- Preparation of detailed drawings of culverts

Modification of drawings will be reflected in the tender drawings by the consultant in the 2010 Technical Survey.

Chapter 5

General Implementation Schedule

Chapter 5 General Implementation Schedule

5-1 Project Cycle

Japanese ODA loan project cycle is divided into 4 stages as Appraisal, Procurement, Implementation and Completion.

The procurement of the contractor and consultant, supervision during the construction, and management and maintenance after completion will be implemented by AGEROUTE, an executing agency. On the other hand, the project evaluation for supervision of procurement and after completion will be implemented by JICA.

Table-5.1 gives the general project cycle for Japanese ODA loan.

Table-5.1 Project Cycle for Japanese ODA loan

Project Cycle	Government of Senegal (or Executing Agency)	JICA	Government of Japan
1.Appraisal	<p>Exchange of Notes</p> <p>↓</p> <p>Loan Agreement</p>	<p>Appraisal Mission</p> <p>↓</p> <p>Loan Agreement</p>	<p>Government Mission</p> <p>↓</p> <p>Pledge</p> <p>↓</p> <p>Exchange of Notes</p>
2.Procurement ①Consultant ②Contractor	<p>Selection of Consultant</p> <p>↓</p> <p>Contract</p> <p>Prequalification(PQ)</p> <p>↓</p> <p>Evaluation of PQ</p> <p>↓</p> <p>Bidding</p> <p>↓</p> <p>Contract</p>	<p>Supervision</p> <p>Approval</p> <p>Concurrence</p> <p>Concurrence</p>	
3.Implementation	<p>Supervision for Implementation</p> <p>↓</p>	<p>↓</p>	
4.Completion	<p>Operation and Maintenance</p>	<p>Evaluation of the project</p>	

5-2 Implementation Schedule

Implementation schedules in the appraisal, procurement and civil work stage are assumed based on the following conditions.

(1) Appraisal and procurement stage

- It is assumed that the pledge from the Government of Japan to the one of Senegal will be effective in March 2011.
- It is assumed that the loan agreement may be effective in May 2011.
- The Selection period of the Consultant is assumed as 9 months after the pledge.
- Pre-qualification (PQ) stage is assumed as 6 months.
- PQ and tender document are assumed to be prepared by AGEROUTE.
- Bidding and contract stage is assumed as 7 months.

(2) Civil work stage

a) Execution scheme

Execution scheme is assumed as bellow in order to plan the implementation schedule.

- Each one plant of asphalt, concrete and laterite stabilized by cement for base course will be prepared in the base camp.
- Earthworks and pavement will be done from the origin to destination, and the temporary road for public vehicles will be prepared during the construction except the section across Baobolong River.
- Culverts and drainage structures will be constructed except in the rainy season and earthworks will be done after the completion of structures. In particular, the construction of structures such as cofferdam and drainage and earthworks across Baobolong River should be done during the season when the water level of the river is low.
- Construction of structures across Baobolong River will be done on halves for public vehicles.

b) Construction duration

Construction duration on this project is considered in comparison of the actual duration of similar projects shown in Table-5.2 below for the following reason.

- Project length of similar projects is almost equal to that of this project.
- Each location is close.
- Similar projects have been completed recently.

Therefore, the construction duration of this project is assumed to take 20 months, and the handover to AGEROUTE is assumed as December 2013.

Table-5.2 Comparison of the project schedule

Section	Length(Km)	Completion	Duration(month)
Kaolack - Dinguiraye	40	Sep.2010	22
Kaolack-Birkelane	37	Oct.2010	18
<i>Dinguiraye-Keur Ayip</i>	39	—	20

Figure-5.1 gives the general implementation schedule for the project.

Chapter 6
Consulting Service

Chapter 6 Consulting Service

6-1 Introduction

In this project, the detailed design and technical specification have already been prepared. Besides, handover to AGEROUTE would be delayed 7months in case of procuring the consultant for preparation of the tender document.

As AGEROUTE does not consider procurement of the consultant in pre-construction stage at present time, the consulting service for the project is Construction Supervision.

Tender document will be prepared by the use of exsisting drawings and technical specifications which were prepared in the 2010 Technical Survey.Modification in this survey will be reflected by the consultant in the 2010 Technical Survey.

6-2 Scope of Consulting Service

The engineering service for the project is to supervise the construction executed by the Contractor and to ensure the quality of road structure.

In carrying out the work, the Consultant shall cooperate fully with the government of Senegal, in particular with AGEROUTE which will administer the contract, and other public agencies related to the project.

AGEROUTE will provide all available data and all reasonable support to the Consultant in the conduct of these services.

Scope of consulting service is assumed as follows:

- Issue of notice to proceed to the Contractor
- Inspection and testing of all materials and structures
- Inspection of the drawings and specifications for design changes
- Check and approval of invoice submitted by the Contractor
- Periodic checking of remaining quantities and constant check on the cost esimates
- Negotiation with the Contractor on the rates for design changes
- Carrying out inspection of the section and certify to AGEROUTE on completion of construction
- Advice and recommendation to AGEROUTE on the efficient implementation of the project road maintenance
- Submission of monthly report outlining the progress and problems of the construction and completion report to AGEROUTE

6-3 Task of Each Engineer and Manning Schedule

Table-6.1 gives the task of each engineer and Figure-6.1 gives manning schedule for the Consultant.

Table-6.1 Task of Each Engineer

Assignment	Tasks
International Engineer	
Project Manager	<ul style="list-style-type: none"> ➤ To establish and maintain effective communication between AGEROUTE and the Consultant. ➤ To Discuss with AGEROUTE and JICA Senegal. ➤ To check the monthly report prepared by the Resident Engineer, and submit it to AGEROUTE ➤ Procurement of the Consultant's accommodation, offices and

	<p>vehicles.</p> <ul style="list-style-type: none"> ➤ Procurement of local consultant ➤ To organize and control each engineer ➤ To prepare necessary documents and submit to AGEROUTE in case of design change. ➤ To negotiate with the Contractor on the rates for design change. ➤ Preparation of the Consultant's invoice ➤ To check and approve executed quantities the Resident Engineer has checked. ➤ To prepare the forecasts of the project's final quantities and final cost on the basis of materials furnished by the Resident Engineer. ➤ To prepare completion report and submit it to AGEROUTE.
Resident Engineer	<ul style="list-style-type: none"> ➤ Supervision of the whole construction site ➤ Discussion with Kaolack AGEROUTE ➤ To supervise and evaluate each engineer , and report to the Project Manager ➤ To supervise distribution and maintenance of the Consultant's accommodation, offices and vehicles ➤ To prepare the monthly report with concerned data. ➤ To summarize and maintain the accurate and up-to date records of the project's physical and financial progress, and report to the Project Manager ➤ To liaise with the Contractor on technical matters. ➤ To promote and coordinate a general plan of safety on the construction site. ➤ To check the work quantities executed by the Contractor with Quantity Surveyor ➤ To discuss with public people along the road side, if required, report to the Project Manager. ➤ To prepare all required data to be compiled to the completion report.
Road Engineer	<ul style="list-style-type: none"> ➤ To reconfirm the survey result the Topographic Surveyor has confirmed. ➤ To confirm the daily progress of the whole construction ➤ To establish the quality control system in cooperation with each engineer. ➤ To supervise the whole earthworks and pavement work ➤ To supervise and lead Soil & Material Engineer and Structural Engineer. ➤ To reconfirm the existing drawings. ➤ To discuss execution scheme with the Contractor and review,

	if required.
Soil & Material Engineer	<ul style="list-style-type: none"> ➤ To confirm the test result executed by Laboratory Technician and control quality of the materials such as asphalt, concrete, laterite stabilized by cement. ➤ To confirm the filling materials from the road excavation or borrow pits are conform to the required specification or not. ➤ To prepare the quality control report to be compiled to the monthly report.
Local Engineer	
Structural Engineer	<ul style="list-style-type: none"> ➤ To supervise construction of the structures such as culverts and drain. ➤ To discuss execution scheme of drainage structures with the Contractor. ➤ To reconfirm temporary scheme and implementation schedule of the construction of drainage structures across Baobolong River. ➤ To prepare the necessary data concerning the drainage structures to be compiled to the report.
Topographic Surveyor	<ul style="list-style-type: none"> ➤ To check the result of the topographic survey executed by the Contractor and report to the Road Engineer. ➤ To modify the vertical and cross-section drawings in accordance with the survey result.
Quantity Surveyor	<ul style="list-style-type: none"> ➤ To check the monthly work quantities from the Contractor and report to the Resident Engineer. ➤ To attend the as-built inspections of structures and confirm whether they are conform to the specifications or not.
Laboratory Technician	<ul style="list-style-type: none"> ➤ To test the materials such as asphalt, concrete, laterite stabilized by cement and filling materials at laboratory or site.
Environmental Engineer	<ul style="list-style-type: none"> ➤ To support relative agencies technically until the notice of Environment Impact Assessment (EIA) report. ➤ To make sure that Monitoring Plan in the specifications is included in the Contractor's contract.
Training Engineer (AGEROUTE)	<ul style="list-style-type: none"> ➤ Training Engineer is a junior engineer designated by AGEROUTE, and he is associated with the terms of supervision during all construction. He can strengthen his experience and technical knowledge in the various aspects of civil works.
Supporting Staff	<ul style="list-style-type: none"> ➤ To assist preparing letters to the Contractor and AGEROUTE, and the monthly and completion report.

6-4 Cost Estimate

(1) Assumptions for Cost Estimates

The base date for cost estimates is January 2011. The remuneration for expatriates and local engineers are based on the indication by JICA. The remuneration for local technicians and supporting staff, and direct cost such as the charge of the office rental, etc are assumed as following assumptions.

Assumption① : Appendix 5-1 shows the estimate of remuneration for local technicians, office rental charge, etc from local consultant.

Assumption② : Appendix 5-2 shows the estimates of international travel cost for round trip on discount business class between Paris and Dakar.

(2) Estimated Cost

The breakdown of costs for consulting services is shown in Table-6.2.

Table-6.2 Breakdown of Cost for Consulting Services

A. Foreign Currency Portion	Unit	Quantity	Rate(Yen)	Amount(Yen)	FCFA equiv.
1. Remuneration					
Expatriates	MM	72	2,630,000	189,360,000	1,113,882,353
Sub-Total				189,360,000	1,113,882,353
2. Direct Cost					
International Travel	R.T	8	500,000	4,000,000	23,529,412
International Communication	month	21	20,000	420,000	2,470,588
Sub-Total				4,420,000	26,000,000
Total				193,780,000	1,139,882,353
B. Local Currency Portion	Unit	Quantity	Rate(Yen)	Amount(Yen)	FCFA equiv.
1. Remuneration					
Engineers	MM	43	877,000	37,711,000	221,829,412
Training Engineer(AGERROUTE)	MM	20	68,000	1,360,000	8,000,000
Technicians	MM	34	59,500	2,023,000	11,900,000
Other Supporting Staff	MM	17	34,000	578,000	3,400,000
Sub-Total				41,672,000	245,129,412
2. Direct Cost					
Living allowance	month	135	25,500	3,442,500	20,250,000
Office Rental in Dakar	month	21	85,000	1,785,000	10,500,000
Office Rental in Kaolack	month	21	51,000	1,071,000	6,300,000
Office Operation	month	21	25,500	535,500	3,150,000
Office equipment	L.S.	1	850,000	850,000	5,000,000
Domestic communication	month	21	170,000	3,570,000	21,000,000
Reporting & Documentation	month	21	12,750	267,750	1,575,000
Transportation	month	21	450,000	9,450,000	55,588,235
Sub-Total				20,971,750	123,363,235
Total				62,643,750	368,492,647

Chapter 7
Project Cost

Chapter 7 Project Cost

7-1 Summary of Project Costs

The project cost consists of (A) Civil works, (B) Price Escalation, (C) Physical Contingency, (D) Environmental Consideration, (E) Consulting Services, (F) Administration Costs and (G) Land Acquisition.

(D) Environmental Consideration and (E) Consulting Services include their price escalation and physical contingency.

The total cost of the project (including VAT) is estimated to have Foreign Currency portion of 311 million Yen and Local Currency portion of 15,068 million FCFA for a grand total equivalent to 2,872 million Yen as summarized below in Table-7.1.

Table-7.1 Summary of Project Cost

Items	Foreign Currency Portion(Yen)	Local Currency Portion(FCFA)		Total	
				(eq.Yen)	(eq.FCFA)
(A) Civil Works	94,085,689	12,362,126,312	(1,970,171,930)	2,195,647,162	12,915,571,541
(B) Price Escalation	3,156,681	1,087,918,403	(168,786,170)	188,102,810	1,106,487,115
(C) Physical Contingency	4,862,118	672,502,236	(106,947,905)	119,187,498	701,102,930
(D) Environmental Consideration	0	213,387,848	(32,550,689)	36,275,934	213,387,848
(E) Consulting Services	208,744,695	709,569,208	(295,547,671)	329,371,460	1,937,479,179
(F) Administration Costs	0	22,037,562	(3,361,662)	3,746,386	22,037,562
(G) Land Acquisition	0	0	(0)	0	0
Grand Total	310,849,183	15,067,541,569	(2,577,366,029)	2,872,331,249	16,896,066,178

Note:(Tax Portion)

7-2 Determination of Main Cost

7-2-1 Civil Works

The construction cost has been calculated based on the estimated quantities of work categories and unit prices as detailed in Appendix 5-3 and 5-4. Cost Estimates consist of the following Bill of Quantity items;

<u>Bill No.</u>	<u>Item</u>
1	Installation
2	Earthworks
3	Roadworks
4	Pavement
5	Culverts and Drainage
6	Road Furniture
7	Weigh bridge

(1) Unit Prices

Unit prices were established based on the previous survey which was implemented by AGEROUTE in April 2010. Their unit prices are the latest prices which were applied to “Kaolack-Birkelane (RN1) Project” completed in October 2010. Unit prices of additional items in this survey are prepared by using unit prices of other similar projects.

Each unit price is divided into foreign currency portion and local currency portion as follows:

1) Foreign Currency Portion

- Imported materials such as reinforced bar, asphalt emulsion, and signboard, etc.

2) Local Currency Portion

- Local components of operating/maintenance costs of construction plant and equipment.
- Local materials such as cement, aggregate, soil and sand, etc.
- Salaries and costs of Local personnel and Contractor.

As a result, most of materials, equipments, labor forces required are possible to be procured in Senegal according to information from AGEROUTE and local contractors.

7-2-2 Environmental Consideration Costs

Environmental consideration costs such as the cost of noise reduction measures for neighborhood residents and the cost of rented land for temporary road during construction are estimated as 1.5% of Civil works. They are accounted for local currency portion.

7-2-3 Consulting Services

The cost of consulting services is derived from the estimated man-months of foreign experts and the local staff as well as other relevant costs for conducting the construction supervision (SV stage).

All costs have been divided into one foreign currency portion and one local currency portion based on following items:

(1) Foreign Currency Portion

- Remuneration for Expatriates
- Direct Costs (international travel, international communications, etc.)

(2) Local Currency Portion

- Remuneration for local engineers, technicians and the other supporting staff.
- Direct Costs (office operations, local communications, transportation, etc.)

7-2-4 Price Escalation

The price escalation is estimated as 1.8% for foreign currency portion and 4.9% for local currency portion as per JICA indication. Each price escalation is applied to civil works and Consulting services.

7-2-5 Physical Contingency

The physical contingency is estimated as 5.0% of all escalated costs for foreign currency portion as well as local currency portion.

7-2-6 Administration Expenses

Administration expenses are the general administration cost such as site visit and AGEROUTE operation. It is estimated by using the information shown by AGEROUTE as in below Table-7.2.

Table-7.2 Breakdown of AGEROUTE Administration Expenses

Items	ADMINISTRATION COST FOR RN 4 (DINGUIRAYE KEUR AYIP)												Total Amount (FCFA)
	January	February	March	April	May	Jun	July	August	September	October	November	December	
Site Visit (Transfer)	660,400	660,400	660,400	660,400	660,400	660,400	660,400	660,400	660,400	660,400	660,400	660,400	7,924,800
Site Visit (another expense)	157,500	157,500	157,500	157,500	157,500	157,500	157,500	157,500	157,500	157,500	157,500	157,500	1,890,000
Sub Total	817,900	817,900	817,900	817,900	817,900	817,900	817,900	817,900	817,900	817,900	817,900	817,900	9,814,800
Information Equipment	1,500,000												1,500,000
Total	2,317,900	1,635,800	1,635,800	1,635,800	1,635,800	1,635,800	1,635,800	1,635,800	1,635,800	1,635,800	1,635,800	1,635,800	21,129,600

7-2-7 Land Acquisition

Since it will not be necessary to relocate the houses to implement the works in this project, the cost for land acquisition is not required.

7-2-8 Custom duty and tax

Imported materials will be exempted from custom duty, and all materials and equipments also will be exempted from consumption duty (VAT) according to information from AGEROUTE.

However, it is not sure if this information is exact or not until Loan Agreement between both governments.

In this report, the percentage of tax for civil works is calculated as 18% and accounted for local currency portion just in case.

7-2-9 Exchange Rates

Exchange rate is applied "100 FCFA=17Yen" as per JICA indication.

7-3 Annual Financial Program

7-3-1 Annual Financial Program

The Proposed Implementation Schedule is based on an analysis of what the international contractor's abilities should be to include the kinds of key equipment that he will be required to provide, the proposed construction methods to be used and other related matters. Using this information, a Summary of Annual Fund Requirement has been prepared and is presented in Table -7.3.

Table-7.3 Summary of Annual Fund Requirement

Year	Foreign Currency Portion		Local Currency Portion		Total	
	(eq.Yen)	(eq.FCFA)	(eq.Yen)	(eq.FCFA)	(eq.Yen)	(eq.FCFA)
1st Year 2012	132,724,727	780,733,688	643,729,045	3,786,641,442	776,453,772	4,567,375,133
2nd Year 2013	178,124,456	1,047,790,918	1,917,753,021	11,280,900,123	2,095,877,477	12,328,691,045
Total	310,849,183	1,828,524,606	2,561,482,066	15,067,541,565	2,872,331,249	16,896,066,178

Breakdown of the annual fund requirement and detailed breakdown of annual fund requirement are shown in Appendix 5-5.

7-4 Comparison of the project cost with the other completed or ongoing projects

Project costs compared with the other projects are shown in Table-7.4

Each project cost is amended in the following items due to the differences of project schedule and construction component.

- Costs of sub-base course and weigh bridge are excluded from the project cost since the other projects does not include them.
- Since thickness of pavement in “Kaolack-Dinguiraye” is 4cm, that in “Kaolack-Birkelane” is 7cm and that in the others are 5cm, costs of pavement are modified as 5cm.
- Since thickness of base course in “Kaolack-Dinguiraye” is 18cm and that in the others are 20cm, cost of base course is modified as 20cm.
- To modify the difference of influence by price escalation, component of price escalation is excluded from the cost in this project.
- To modify the difference of influence by monetary value, exchange rate between FCFA and Yen is used as that in tender.(this project:1FCFA=0.17Yen, “Kaolack-Dinguiraye” and “Kaolack-Passi”(2007):1FCFA=0.26Yen, others(2009):1FCFA=0.2Yen)

Table-7.4 Comparison of the project cost (including VAT)

National Road	Section	Length (km)	Cost (million Yen)	Cost/km (million Yen)	Donor*1	Revision Item
7	Linguere – Boulal	120	5,321	44	AfDB	1FCFA=0.2Yen
7	Boulal – Ourossogui	96	5,465	57	EDF	1FCFA=0.2Yen
6	Tambacounda - Nema Moussa	14	817	58	BOAD/D.F.	1FCFA=0.2Yen
6	Tambacounda - Medina Gounass	66	3,426	52	AfDB/D.F.	1FCFA=0.2Yen
4	Kaolack - Dinguiraye	40	1,930	48	AfDB	1FCFA=0.26Yen, Pavement thickness
5	Kaolack - Passi	18	937	52	AfDB	1FCFA=0.26Yen
1	Kaolack-Birkelane	37	2,163	53	EDF	1FCFA=0.2Yen, Pavement thickness
	Kedougou-Saraya, PK-30-Faleme	83	4,099	49	FAD/BOAD/ JBIC/D.F	1FCFA=0.2Yen Pavement thickness
4	<i>Dinguiraye-Keur Ayip</i>	39	2,016	52	JICA	1FCFA=0.17Yen Excluding items of price escalation, sub-base course and weigh bridge

Source: AGEROUTE

Legend: *1 AfDB=African Development Bank, EDF=European Development Fund,
BOAD= Banque Ouest Africaine de Developpement, FAD= Fonds Africain de Developpement
JBIC=Japan Bank for International Corperation, JICA=Japan International Cooperation Agency
D.F=Domestic Finance

Chapter 8

Procurement

Chapter 8 Procurement

8-1 Implementation Scheme

8-1-1 Borrower

The Borrower shall be the Government of Senegal.

8-1-2 Executing Agency

The Project will be entirely administrated by AGEROUTE, an executing agency for trunk roads in Senegal.

8-2 Contract Package

8-2-1 Civil Works

The project will be implemented in one lot.

A construction period will be allowed commencing the date of Notice to Proceed.

The construction schedule is shown in Figure-5.1.

The prequalification for contractors may be called at once. The criterion shall be considered on the basis of project conditions such as cost, length of road, required equipment, and difficulty and so on for the project.

8-2-2 Consulting Services

The stage for consulting service is assumed as one stage at present time as follows:

- 1) SV stage

8-2-3 Method of Procurement

- 1) Civil Works

The method of procurement for civil works will be by International Competitive Bidding among prequalified contractor (s) in accordance with procurement procedures acceptable to AGEROUTE.

- 2) Consulting Services

It is recommended that the procurement for consulting services will be by International Competitive Bidding among international (expatriate) consultants in accordance with procurement procedures acceptable to AGEROUTE.

Chapter 9
Economic Analysis

Chapter 9 Economic Analysis

9-1 Introduction

There is a full-scale feasibility study report on the proposed road rehabilitation project entitled 'ETUDES ECONOMIQUES DE LA REHABILITATION DES TRONCONS ROUTIERS NIORO-KEUR AYIP (RN4) ET PASSY-SOKONE (RN5)' which was completed in December, 2010 by AGEROUTE in order to examine a detailed economic feasibility on the road rehabilitation project between Dinguiraye-KeurAyip about 40kms on the NR4 in Kaolack region.

This economic study report consists of the following:

- 1) Summary - Conclusion and Recommendations
- 2) General features of the project area
 - 2)-1. Senegal
 - 2)-2. Kaolack and Fatick Regions
- 3) Economic analysis of the project
 - 3)-1. Basic methodology
 - 3)-2. Traffic study
 - 3)-3. Economic analysis
- 4) Conclusion and recommendations

At first, the economic study report is carefully perused.

In this report the road improvement projects of two (2) sections, NR4 and NR5, are examined. The former one, a section between Nioro and Keur Ayip, is the very object of our survey, and the outline results are summarized in the following section of 9.5.1 (1), as fundamental information.

The purpose of *Economic Analysis* in this preparatory survey is mainly to review the above study from various viewpoints by the Japanese experts, in order to ensure the feasibility of the project especially from the aspect of the eligibility for Japanese ODA loan.

9-2 Methodology

Since the economic study was done by AGEROUTE almost at the same timing as our survey, a review of economic analysis was conducted within a very limited extent, following the same methodology of that economic study.

That is;

- Applying the same HDM-IV model, using almost the same parameters, but
- Considering some factors revised in this survey:

Such as,

- i) Present and future traffic volumes,
- ii) Investment costs,
- iii) Maintenance costs, and
- iv) Implementation schedule.

9-3 Modified/Revised Input Data

Modified/revised data, during our preparatory survey, from the previous economic study are summarized as follows:

Table-9.1 Modified/Revised Conditions for Economic Evaluation

Items	Modified in this Survey (A)		The Economic Study (B)		Remarks (A/B)
	Pass. car	Truck	Pass. car	Truck	
i) Traffic Volumes					
In 2010	730veh./day		914 veh./day		0.80
In 2014	1,194 veh./day		1,474 veh./day X0.9		0.90
ii) Traffic Annual Growth Rates (from 2014 to 2033)	2.0-3.8%	2.4-6.5%	5.8%	6.3%	-
iii) Induced Traffic by Gambia River Bridge (Open in 2018)	Considered (1,490 veh./day)		Not considered		
iv) Investment Cost (FCFA million)	14,300.1		12,215.5		1.17
v) Implementation Schedule	Open in 2014		Open in 2015		

Source: JICA Survey Team & Economic Study by AGEROUTE, 2010

There are two major differences between the results by JICA survey team and by AGEROUTE study.

The one is estimated and forecast traffic volume whose details are explained in Chapter 3 and the revised total volumes are almost 80% of the previous ones in 2010 and 90% in 2014. And rather high growth rates are applied in the AGEROUTE study both to passenger cars and trucks.

Another is the total project cost: the amount of 17% in total investment cost is increased from 12,215.5 FCFA million to 14,300.1 FCFA million after due considerations during this survey, and the details are described in Chapter 7.

In addition, the cost allocations in 2012 and 2013 are also examined: 26% of the total in 2012 and 74% in 2013.

9-4 Results of Economic Evaluation

Economic feasibility of the project was examined by applying the revised conditions to the same HDM-IV model the same HDM-IV model to the revised conditions.

The result of the base case shows 17.7% of EIRR (Economic Internal Rate of Return) and 3.8 FCFA million of NPV (Net present Value) under the 12% of social discount rate. This means the project is enough feasible from the viewpoint of economic analysis.

In addition to the base case, some alternatives were also examined in order to analyze sensitivities by fluctuations of cost and traffic volume. The summary results are tabulated in Table-9.2.

Table-9.2 Results of Sensitivity Analysis

	Case	NPV	EIRR
0	Base Case	3.844million	17.7%
1	10% increase in cost	3.029million	16.1%
2	10% decrease in traffic volume	2.814million	16.2%
3	10% increase in cost and 10% decrease in traffic volume	1.999million	14.8%

Since the revised conditions for economic analysis in this survey are rather severe for project implementation, such as an increased cost and less traffic demand, the results indicate less feasibility in EIRR compared to the previous economic study. However, the results show within the range of enough feasible projects from economic viewpoints.

9-5 Considerations

As the results of the economic analysis conducted during this preparatory survey in Senegal are described in Section 9.4, a brief examination was conducted comparing these with the results in various other related studies and information.

9-5-1 Summary Results of Related Previous Studies

Regarding the results of economic study directly related to this project, there are three (3) reports in Senegal.

(1) Economic Study on Road Rehabilitation of Niore - Keur Ayip (RN4); 2010 December

As mentioned earlier, this report provides various basic data and information for our survey.

The results can be summarized as follows:

i) Forecast traffic volume

Based on the traffic volume (914 veh./day) estimated in 2010, future traffic demands are expected considering both continuous annual growth rate by type of vehicle and induced/developed traffic by implementation of the project.

Traffic volume of 1,474 in total is estimated at the project road opening in 2014.

Table-9.3 Estimated Traffic Volume

	Pass. car	Taxi	Van, Pick-up	Mini Bus	Bus	Small Truck	2-axle Truck	3-axle Truck	Trailer	Total
2010	320	137	67	140	30	96	62	17	45	914
Growth Rate (%)	4.5	4.5	4.5	4.5	4.5	4.2	4.2	4.2	4.2	
Normal Traffic(2014)	382	163	80	167	36	113	73	20	53	1,034
Induced Traffic(2014)	160	73	34	53	16	62	34	9	25	441
Total Traffic (2014, Open)	542	236	113	220	52	175	107	29	78	1,474

Source: Economic Study on Road Rehabilitation of Niore - Keur Ayip (RN4)

ii) Project Cost

Meanwhile, the proposed project cost (excluding VAT/GST) is estimated as follows:

Total project cost accounts for 12,215.5 FCFA million and 305.4 FCFA million per km.

Table-9.4 Project Cost

Item	FCFA million	Composition (%)	
Construction Cost	10,521.6	93.0	86.1
1) Installation	484.0	4.3	4.0
2) Earthworks	1,211.9	10.7	9.9
3) Road sub-base works	4,668.1	41.3	38.2
4) Pavement	2,673.1	23.6	21.9
5) Culverts and Drainage	607.4	5.4	5.0
6) Road Furniture	227.1	2.0	1.9
7) Weigh Bridge equipment	650.0	5.7	5.3
Environmental Consideration (1.5%)	157.8	1.4	1.3
Construction Supervision (6%)	631.3	5.6	5.2
Total	11,310.7	100.0	92.6
Physical Contingency (8%)	904.9	-	7.4
Grand Total	12,215.5	-	100.0

Source: Economic Study on Road Rehabilitation of Niore - Keur Ayip (NR4)

iii) Conversion into Economic Cost

The factor of '*Financial cost/ Economic cost*' among general building and public works in Senegal is 1.65, and transferable value in public works is considered almost 20% of the total cost excluding VAT.

The economic cost of the project is FCFA 9,772.4 million and financial cost is FCFA 14,371.2 million, accordingly.

iv) Maintenance Cost

Three alternatives for maintenance works are proposed in case of ‘with project’.

a) Basic maintenance

b) Basic maintenance + periodic works (every 5 years)

c) Basic maintenance + rehabilitation works in case of deterioration (exceeding roughness index = 4)

v) Project Life

Project life is 20 years after operation, that is, from 2015 to 2034.

And residual value of the project is estimated based on the similar projects and their components, and it results in approximate 30% of the initial investment cost.

vi) Benefits

Social benefits, in general, that can be provided from the project implementation consist of two parts.

The ones are quantified benefits such as the reduction of vehicle operating cost, travel time, etc., comparing the conditions between ‘before project’ and ‘after project’.

Others are unquantifiable benefits such as the decrease in traffic accidents, and increase in safety and comfort of travelers, etc.

In the study, the consultant mainly considered the benefits by ‘vehicle operation cost’ between ‘with project’ and ‘without project’.

vii) Evaluation

As the basic economic evaluation, following alternatives are evaluated.

Table-9.5 Economic Evaluation Alternative Cases

Traffic volume Maintenance	Growth		
	Optimistic	Realistic	Pessimistic
1. Rehabilitation + Maintenance	○	○	○
2. Rehabilitation + Maintenance A	○	○	○
3. Rehabilitation + Maintenance B	○	○	○

Source: Economic Study on Road Rehabilitation of Nioro - Keur Ayip (RN4)

The results are tabulated in Table-9.6.

Table-9.6 Results of Economic Evaluations

	Optimistic Traffic		Realistic Traffic		Pessimistic Traffic	
	IRR %	NPV FCFA million	IRR %	NPV FCFA million	IRR %	NPV FCFA million
1. Rehabilitation + Maintenance	30.0	12,958	29.0	11,966	28.0	10,450
2. Rehabilitation + Maintenance A	29.0	15,584	28.0	13,949	27.0	11,634
3. Rehabilitation + Maintenance B	31.0	16,353	30.0	14,791	28.0	12,571

Source: Economic Study on Road Rehabilitation of Nioro - Keur Ayip (NR4)

In addition, some sensitivity analysis is further examined, considering the results showing rather high IRR in Table-9.6.

Finally, the most severe/hard case, plus 10% of cost and less 10% of traffic demand, is recommended with its results of 25.2% of IRR and 11,245 FCFA million of NPV.

(2) *Request paper* on ‘Dinguiraye – Nioro – Keur Ayip Road Rehabilitation’, April 2010

In the paper, there are only simple descriptions such as:

- Total distance of the project: 40 km
- Necessary cost: 12,000 FCFA million
- Economic Rate of Return: 15.3%

(3) Study on ‘Definition and Elaboration of Road Improvement, Gossas – Kaolack – Sokone / Nioro Du Rip / Birkelane’, Feasibility Study Report January 2005

In this study, a part of the project near Kaolack, ‘Diguirai – Nioro’ (about 12 km), is included in ‘Kaolack – Nioro Du Rip’ section of 56.7 km.

- Basic traffic volume: 1,175 veh./day in 2004
- Traffic volume growth : 4.0%/year
- Economic Rate of Return: 15.9%

Table-9.7 Summary of Result Comparisons

Items	A Economic Study, 2010 Dec.		B Request paper, 2010 Apr.	C Partial Study, 2005
	Base traffic volume	914 veh./day, 2010		-
Traffic growth rates	Pass. Veh.	Cargo Veh.	-	4.0%/year
Natural (without project)	4.5%/year	4.2%/year		
(with project)			-	4.0%/year
Realistic	5.8%/year	6.3%/year		
Optimistic	6.4%/year	7.6%/year		
Pessimistic	4.8%/year	4.2%/year		

EIRR	25.2%	15.3%	15.9%
(EIRR, alternative cases)	27.0 – 31.0%	-	-
NPV	11,245 FCFA million	-	-

Source: JICA Survey Team

9-5-2 Other Results of Road Improvement Projects in Senegal

In addition to the above, there are some similar national road improvement projects in Senegal and only some outlines are tabulated. Considering these results that each economic study results in EIRRs of 12.7% to 20.2%, the result in our survey seems to be quite rational under the same conditions of social discount rate of 12%.

Table-9.8 Study Results of National Road Improvement Projects in Senegal

F/S year	Section	National Road	Length	Unit Investment Cost (FCFA million)	IRR
Jan. 2010	Richard Toll - Thilogne	N2	259.5 km	236.7/km	20.2%
Sep. 2009	Thilogne - Bakel	N2	198.0 km	266.0/km	12.7%
Sep. 2007	Ziguinchor – Kolda - Velingara	N6			15.7%

Source: All Feasibility Reports

9-6 Provable Elements of Additional Benefits by this Project

As the quantified benefits by the project implementation both in our survey and the economic study done by AGEROUTE are direct and major ones, reduction of VOC (Vehicle operation cost) and TTC (Travel time cost), there might be other factors of benefits in addition to the above two.

9-6-1 Improvements from Traffic-flow Blocking caused by Natural Disaster

During this field survey, it was heard that a severe traffic blocking at the section (about 1.2 km) crossing Baobolong River, happened because of flood/rise in the water level. The entire traffic passing along NR4 was forced to stop on both sides until the completion of temporal recovery work with about 40 cm height embankment.

- Duration was approximate 48 hours, 07 to 08 October 2010.
- A similar disaster occurred almost 10 years before.

Since our revised construction plan recommends necessity of some additional works in order to avoid such damages, the benefits of improvement from the flood can be expected.

9-6-2 Other Benefits

As there might be, moreover, several beneficial factors that are brought by the project, it is not possible to quantify these in Senegal, because of less theoretical data etc.

- Decrease in traffic accidents,
- Decrease in vehicle troubles,
- Decrease in traffic jam/congestion caused by the above two,
- Improvement of cargo damages by road surface roughness,
- Increase in vehicle passenger comfort

- Increase in accessibilities to various public and social institutions/facilities,
- Increase in various land-use potentials along the project road, etc.

Each of these factors can help increase the EIRR over that of the economic analysis done in the previous section, and the project feasibility might be more preferable.

Chapter 10

**Project Implementation Structure and
Maintenance Program**

Chapter 10 Project Implementation Structure and Maintenance Program

10-1 Project Implementation Structure

10-1-1 Implementation Structure

(1) Organization

Considering the present institutional framework for the project implementation, the overall institutional framework for the Project implementation is shown in Fig-10.1.

Government agencies involved in the project implementation are AGEROUTE (AGENCE DES TRAVAUX ET DE GESTION DES ROUTES DU SENEGAL), MICITIE (MINISTERE DE LA COOPERATION INTERNATIONALE, DES TRANSPORTS AERIENS, DES INFRASTRUCTURES ET DE L'ENERGIE), and FERA (FONDS D'ENTRETIEN ROUTIER AUTONOME).

AGEROUTE is a project implementation agency in charge of the construction works.

In addition, it shall be responsible for following other tasks:

- Preparation of land acquisition and compensation program/schedule;
- Undertaking of actual procedures for the land acquisition and compensation such as public consultation, negotiation, disbursement;
- Organization of tendering procedures;
- Preparation of the program and the schedule for management and maintenance; and
- Organization and carrying out of management and maintenance works.

MICITIE is responsible for assessment and cost estimation of the land acquisition and compensation program.

FERA is a financing agency for all matters in the project implementation, such as land acquisition and compensation, relocation of utilities, management and maintenance after the completion.

AGEROUTE will conduct the administrative work, coordination and preparation between the government and the funding agency, and the Engineering Department will conduct the technical control and supervision of the project.

AGEROUTE will also be responsible for the road maintenance in the post-project period.

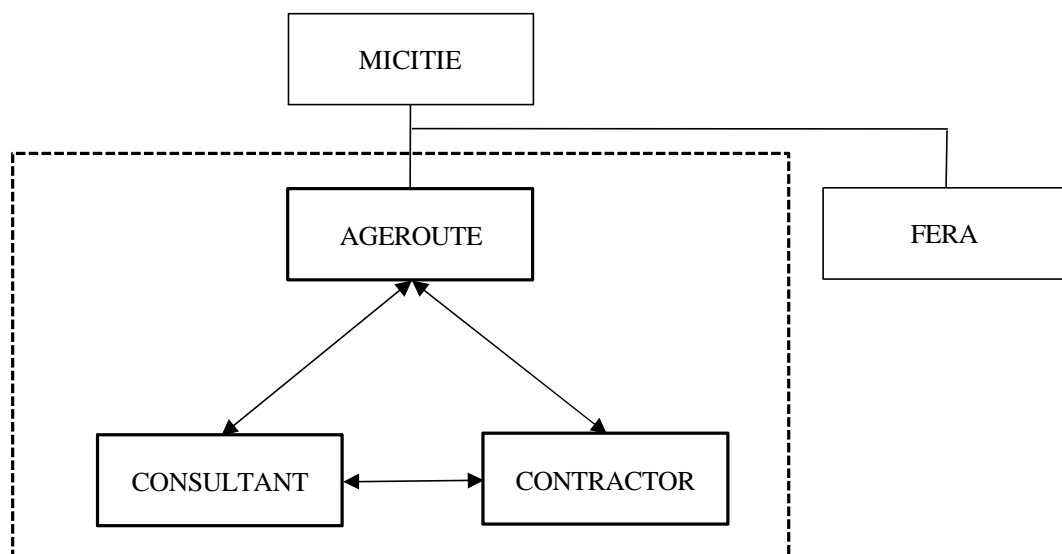


Figure-10.1 Project Implementation Structure

10-2 Maintenance Program

10-2-1 Evolution of the budget of road maintenance AGEROUTE

The budget of road maintenance is increasing relative to those before 2009 because the system of FERA was introduced in 2009.

Table-10.1 Budget for Maintenance, AGEROUTE

Unite : FCFA million

Year	A Reqired Budget		B Composed Budget		C Implemented Budget		Implemented Rate	
							(C/A)	(C/B)
2005	20,000	proportion	15,000	proportion	10,053	proportion	50.3%	67.0%
2006	20,000	1.00	16,500	1.10	8,604	0.86	43.0%	52.1%
2007	30,000	1.50	18,000	1.09	13,100	1.52	43.7%	72.8%
2008	40,000	1.33	18,000	1.00	9,600	0.73	24.0%	53.3%
2009	45,000	1.13	37,000	2.06	32,066	3.34	71.3%	86.7%
2010	60,989	1.36	45,000	1.22	39,000	1.22	63.9%	86.7%
2011	40,242	0.66						
2012	30,586	0.76						

Source : AGEROUTE

The above table shows that the amounts disbursed fluctuate between 8.600 and 13.100 FCFA millions by 2009 to increase significantly in 2009 and 2010, reaching respectively 32.100 FCFA millions and 39.000 FCFA millions. The amount for 2009 is 3.3 times larger than that of 2008.

But the needs are not covered 100% and the rate of the budget implementation is less than 90% for 2009 and 2010. The balance is deferred until the following year.

In the draft budget for coming years are expected 40.200 FCFA millions (plus the amount of 21,600 FCFA millions, the balance of 2010) for 2011 and 30.600 FCFA millions in 2012.

Table-10.2 Breakdown of the Maintenance Budget, 2010 & 2011

	2010				
	Total		Kaolack		
	Budget (FCFA million)	Composition	Budget (FCFA million)	Composition	Share
Daily	15,258.30	25.0%	642.83	10.2%	4.2%
Periodical	38,585.47	63.3%	5,600.00	89.0%	14.5%
Others	7,145.07	11.7%	52.00	0.8%	0.7%
Total	60,988.84		6,294.83		10.3%

	2011				
	Totale		Kaolack/Kaffrine		
	Budget (FCFA million)	Composition	Budget (FCFA million)	Composition	Share
Daily	12,535.45	20.6%	280.00	4.4%	22.0%
Periodical	21,014.50	34.5%	1,320.00	21.0%	6.3%
Others	6,692.00	11.0%	0.00	0.0%	0.0%
Total	40,241.95		1,600.00		4.0%

Source : AGEROUTE

The above table shows that the cost of daily maintenance occupies the proportion of 20 to 30%

and that of the periodic maintenance has the proportion of 50 to 60%.

The Dakar region where the capital is located occupies the largest proportion (16 to 19%) and the proportion for the Kaolack region where the road project is targeted is 10% in 2010, a relatively large proportion, but only 4% of the total budget in 2011.

10-2-2 Configuration of the items of road maintenance

AGERROUTE configures the frequency of road maintenance on each item as shown below with and without project case.

Table-10.3 Items of road maintenance with project case

No.	Item	Frequency	Unit	Quantity/Km
1.1	Tree trimming, Weeding, Drain cleaning			1
	Rehabilitation of small structures, Supervision on site, etc	once a year	km	5
1.2	Cold asphalt mixture and crushed stone+DBST	once a year	m ²	1
1.3	Drainage Work	once a year	km	1
1.4	Pavement Marking	once every 4 years	km	1
1.5	Road Sign	once every 4 years	km	1
1.6	Rehabilitation against potholes with construction machine	once every 5 years	m ²	510
1.7	Surface treatment (in case of over 30% degradation)	once every 5 years	m ²	510
1.8	Replacement of surface course (in case of over IRI4)	once every 12 years	m ²	510

Source: AGERROUTE

Table-10.4 Items of road maintenance without project case

No.	Item	Frequency	Unit	Quantity/Km
1.1	Tree trimming, Weeding, Drain cleaning			
	Rehabilitation of small structures, Supervision on site, etc	once a year	km	1
1.2	Cold asphalt mixture and crushed stone+DBST	once a year	m ²	
1.3	Drainage Work	once a year	km	1
1.4	Shoulder rehabilitation 2×2	once every 5 years	m ³	1000
1.5	Pavement Marking	once every 4 years	km	1
1.6	Road Sign	once every 4 years	km	1
1.7	Surface treatment (in case of over 30% degradation)	once every 10 years	m ²	350

Source: AGERROUTE

10-2-3 Configuration of the Unit Prices of road maintenance

The unit prices for 2010 are established based on 2007 modified prices as shown by AGEROUTE. Annual average growth rate of 7% applies to the modification from 2007 to 2010 prices. The growth rate is defined in consideration of the price fluctuation of materials in public project field.

Table-10.5 Unit Prices of road maintenance

Unit : FCFA

Items	Unit	Unit price of road maintenance (excluding VAT)		
		2007	Growth Rate	2010
Daily maintenance				
Tree trimming, Weeding, Drain cleaning			7%	
Rehabilitation of small structures, Supervision on site, etc	km	650,000	7%	796,278
Cold asphalt mixture and crushed stone+DBST	m ²	15,000	7%	18,376
Drainage Work	Ft/km	1,050,000	7%	1,286,295
Pavement Marking	Ft/km	1,500,000	7%	1,837,565
Road Sign	Ft/km	1,000,000	7%	1,225,043
Rehabilitation against potholes with construction machine	km	600,000	7%	735,026
Periodic maintenance (rehabilitation)				
Cutting	Ft/km	800,000	7%	980,034
Base course	T	45,000	7%	55,127
Shoulder rehabilitation 2×2	m ²	9,000	7%	11,025
Asphalt concrete (7cm)	T	81,000	7%	99,228
Shoulder (SBST)	m ²	1,800	7%	2,205
Drainage Work	Ft/km	1,050,000	7%	1,286,295
Rehabilitation of civil structures	Ft/km	800,000	7%	980,034
Pavement Marking	Ft/km	1,500,00	7%	1,837,565
Road Sign	Ft/km	1,000,000	7%	1,225,043
Periodic maintenance (low-cost pavement)				
DBST	m ²	3,557	7%	4,357
Asphalt concrete (4cm)	m ²	7,657	7%	9,380
Asphalt concrete (5cm)	m ²	9,682	7%	11,861
Asphalt concrete (7cm)	m ²	13,732	7%	16,822

Source: AGEROUTE

10-2-4 Evaluation Standard for Maintenance Program

In evaluation of the road condition of existing roads in Senegal, International Roughness Index (IRI) applies mainly to the general evaluation of road condition on each road as an indication for implementing road maintenance.

In addition to IRI, the service level evaluated quantitatively on cracking ratio, stripping ratio, the number of pothole and rutting ratio is calculated.

Road service level is divided into 4 steps (level 0~3), level 3 is regarded as the best. Standard service level for road network is regarded at more than level 2, at least. IRI survey is executed about once every 3 years.

Chapter 11

Environmental and Social Considerations

Chapter 11 Environmental and Social Considerations

11-1 Introduction

(1) Objectives of the Study

In this Study, in response to Senegal's request for grant aid from Japan and based on the assumption that grant aid will be provided for the targeted road section, facts and other data will be confirmed and relevance of existing documents and study results will be examined. The Environmental Impact Assessment (EIA) is in process by the responsible organization and its approval will be anticipated within a few months. Also it is planned to promote project formulation by providing technical support to the appraisal mission scheduled to be implemented in January 2011.

(2) Target area of the Study

A road section of approx. 40km running between Dinguiraye and Keur Ayip in Kaolack region and related area

(3) Scope of the Study

Our consultant group will prepare study reports (in English and French) as work progresses and in accordance with the Terms of Reference provided by JICA. We will also provide an explanation to and hold a discussion with the Agency for the Construction and Management of Roads (AGEROUTE), the implementing organization on the side of Senegal, and the Ministry of Environment, of Natural Resources Protection of Catchment basins and of Artificial Lakes (MEPNBRL), the responsible organization for environmental and social considerations, and submit the study reports.

(4) Methodology of the Study

The existing materials and documents related to environmental considerations, namely, "The Social and Environmental Assessment Study" prepared by AGEROUTE in February 2010 will be examined and category classification will be conducted based on JICA Guidelines for Environmental and Social Considerations issued on April 1, 2010.

The Survey Team will reconfirm the environmental considerations in accordance with JICA Guidelines for Environmental and Social Considerations. In conducting this Study, possible influences arising during the construction period will be confirmed, including the influence on the public infrastructure located on and around the road site and on residences located along the road site.

The Survey Team will also identify the latest status of EIA procedure required for the Project, and encourage AGEROUTE to hold the stakeholder meeting (s) in line with JICA Guidelines.

11-2 Legal and Institutional Framework

11-2-1 Laws, Regulations and Standards of Reference

The first Environmental Code (1983) had no enforcement order and did not define requirements for environmental evaluation in the framework of the authorization process. Decree No. 5295 (2 August 1999) aimed at coordinating the environmental approval process. Ministerial decree No. 1986 MH establishes a Cellule de Suivi des Impacts environnementaux du Projet Sectoriel Eau (a unit to monitor the environmental impacts of the water sector project). Eighteen years after the first code, the new Environmental Code and its enforcement orders make impact studies obligatory and set out their scope and content as well as the public consultation process. Projects are classified into two categories:

- Category 1. Installations or activities representing a danger to public health and hygiene, nature, and environment in general, or a nuisance for neighboring communities (projects likely to have considerable impact).
- Category 2. Installations or activities that do not cause such damage for the issues outlined above (projects with limited impacts which can be mitigated).

EIA Procedures

Executing Agency will carry out the screening for all investments included in the program and will determine the actions necessary to comply with environmental and social safeguard issues. Based on the preliminary screening, it will be determined whether an Environmental Impact Assessment (EIA) or Resettlement Action Plan (RAP), or both, will be required. The Directorate of Environmental Assessment (Direction de l'Environnement et des Etablissements Classés (DEEC)) and its deconcentrated structure will make the final decisions on sub-project categorization, type of safeguard instrument to be prepared, and review and clearance of these instruments.

Based on this preliminary screening, Executing Agency will request the preparation of EIA and RAP by the consultants in charge of the preparation of detailed studies and the bidding documents. Executing Agency will also implement RAP and will be responsible for the monitoring and implementation of EAs and RAPs for all project investments.

As required, consultants will be engaged to prepare RAPs or EIAs as and when necessary. These specific sub-project instruments will be prepared based on specific Terms of Reference (TORs), reviewed and cleared by the DEEC. Similarly, the safeguard instruments will also be reviewed and cleared by the same entities prior to disclosure.

Category 1 projects are automatically subject to EIA and public consultations, while Category 2 projects are subject to a declaration backed up by relevant documentation. This Project is identified as Category 1 in its scale. The environmental assessment process is linked to the authorization process and the scope, content, and acceptability of EIA are under the authority of DEEC.

<u>Procedure</u>	<u>AGEROUTE</u>	<u>MEPNBRLA</u>
Category 1		EIA required
Category 2		Not required
TOR	Submittal →	Approval
↓		
Stakeholder Meeting		
↓		
EIA	Submittal →	Approval

Figure-11.1 Flow of EIA Procedure

Contents of EIA

Standard contents of EIA in accordance with the relevant laws and regulations are as follows:

- Chapter 1 concerns the introduction (context, objective and methodology);
- Chapter 2 is relative to the description of the project;
- Chapter 3 political, institutional and legal of EIA;
- Chapter 4 treats biophysical and socio-economic conditions of Project area;
- Chapter 5 is about the analysis of the situation " without project";
- Chapter 6 concerns the process of consultation of the stakeholders;
- Chapter 7 is about identification, assessment and analysis of the impacts of the project;
- Chapter 8 concerns the plan of environmental management;
- The last chapter is about Appendices.

Other Legal Framework Concerned

- The Code of Local Communities
- The Code of Hygiene

- The Forest Code
- The Mining Code
- The Law n° 81-13 of March 4 1981 on Structural Code of Water
- The Highway Code
- The Code of Work

Comparison of Senegal Regulation and JICA Guidelines

Table-11.1 JICA Guidelines and Senegal Regulation

Items	JICA Guidelines	Senegal Regulation
0. Categorization	JICA classifies projects into four categories according to the extent of environmental and social impacts, taking into account an outline of project, scale, site condition, etc. (2.2.1)	Projects are classified into two categories: Category 1. Installations or activities representing a danger to public health and safety, hygiene, nature, and environment in general, or a nuisance for neighboring communities (projects likely to have considerable impact). Category 2. Installations or activities that do not cause such damage for the issues outlined above (projects with limited impacts which can be mitigated).
1. A wide range of impacts must be addressed.	The types of impacts addressed by JICA cover a wide range of environmental and social issues.	The types of impacts addressed cover a wide range of environmental and social issues.
2. Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage.	JICA applies a Strategic Environmental Assessment (SEA) when conducting Master Plan Studies etc., and encourages project proponents to ensure environmental and social considerations from an early stage to a monitoring stage.	Strategic Environmental Assessment (SEA) is defined in the Environmental law.
3. JICA is responsible for accountability when implementing cooperation projects.	JICA ensures accountability and transparency when implementing cooperation projects.	Executing Agency ensures accountability and transparency when implementing the projects.
4. JICA asks stakeholders for their participation.	JICA incorporates stakeholder opinions into decision-making processes regarding environmental and social considerations by ensuring the meaningful participation of stakeholders in order to have consideration for environmental and social factors and to reach a consensus accordingly. JICA replies to stakeholders' questions. Stakeholders who participate in meetings are responsible for what they say.	Category 1 projects are automatically subject to an Environmental Impact Assessment (EIA) and public consultations.
5. JICA discloses information.	JICA itself discloses information on environmental and social considerations in collaboration with project proponents in order to ensure accountability and to promote the participation of various stakeholders.	Executing Agency itself discloses information on environmental and social considerations in order to ensure accountability and to promote the participation of various stakeholders.
6. JICA enhances organizational capacity.	JICA makes efforts to enhance the comprehensive capacity of organizations and operations in order for project proponents to have	Executing Agency enhances the comprehensive capacity of organizations and operations to have

	consideration for environmental and social factors, appropriately and effectively, at all times.	consideration for environmental and social factors, appropriately and effectively.
7. JICA makes serious attempts at promptness.	JICA addresses request of acceleration for the prompt implementation of projects while undertaking environmental and social considerations.	Executing Agency accelerates for the prompt implementation of projects while undertaking environmental and social considerations.
8. Impacts to be Assessed	The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.	The impacts to the culture, tradition and minority ethnic group is not assessed.

11-2-2 Institutional Aspect

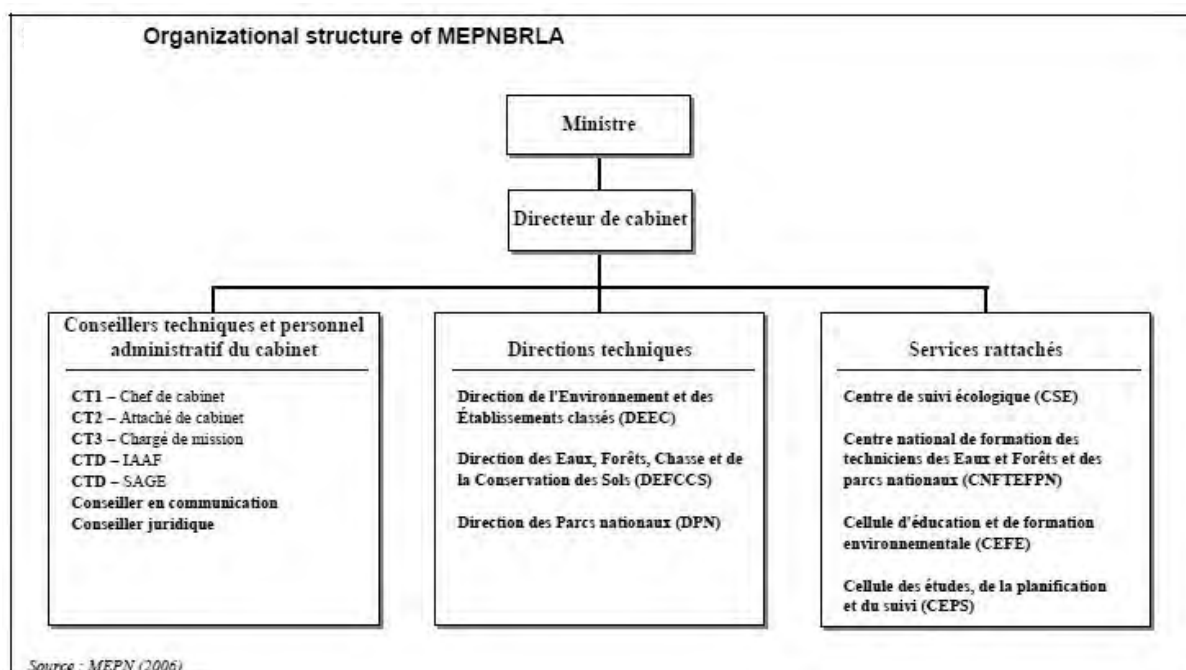
Functions and organization of the Ministry of Environment

Le Ministère de l'Environnement, de la Protection de la Nature, des Bassins de Rétention et des Lacs Artificiels (Ministry of the Environment, of Natural Resources Protection of Catchment basins and of Artificial Lakes): MEPNBRLA has the mission to "promote rational management of natural resources, to control surface waters for agriculture-forestry-pastoral ends and to work toward improving the living environment of the population in a perspective of sustainable development and poverty reduction." This mission was reaffirmed through a sectoral policy letter.

According to Decree No. 2004-589 of 30 April 2004, MEPNBRLA ensures the following functions:

- Combating pollution and nuisances of all kinds;
- Preserving wildlife and flora;
- Rational utilization of forest potential and managing the forest economy;
- Managing surface waters;
- Recovering land invaded by salt;
- Protecting water courses against the invasion of aquatic plants;

- Protecting national parks and other protected areas;
- Protecting threatened plant and animal species;
- Preparing and implementing hunting legislation and regulations and overseeing the development of ecotourism;
- Combating brush fires, soil degradation, and desertification;
- Supporting local communities for collection and treatment of household waste;
- Promoting and developing environmental education; and
- Managing monitoring and monitoring mechanisms for climate change and modifications to the status of environment.



Source: Senegal Country Environmental Analysis, November 12, 2008, World Bank

Figure-11.2 Organizational Structure of MEPNBRLA

DEEC is in charge of implementing Government environmental policy, legislation and environmental regulations, environmental assessments, protection, monitoring, compliance, and monitoring aimed at ensuring that natural resources are managed rationally. In the past, DEEC was also in charge of the technical supervision of the “Commission Nationale sur le Développement Durable” (CNDD) National Committee for Sustainable Development. This task is now carried out by the “Direction du Plan”. DEEC is a relatively recent body compared to other MEPNBRLA institutions and has limited influence. An operational environmental code was only passed in 2001, and has only been implemented during the last few years.

The Institutional Organizations of the Road Sector

- The Autonomous agency of Roadworks (AGERROUTE)
- The Direction of Public Works
- The Direction of Surface Transportation (DTT)

Other Institutional Organizations Concerned with the Project

Other institutional actors are also concerned by the project: the Direction of urbanism and architecture; the Direction of regional development; the Direction of Local Collectivities; the National Office of the purification of Senegal (ONAS); the National Direction of hygiene; the

Direction of Civil Protection; societies, agents of networks (SONES, SDE, ONAS, SONATEL, SENELEC); NGOs and the actors of civil society.

11-3 Site Conditions of the Project

11-3-1 Biophysical Condition

Physical and Climatic Environment

The local climate is Sudan-Sahel_like type with enough rainfall. The general topography of the project zone is flat. The hydrography is only constituted of the Baobolong River, originated from the Gambia River. Tropical ferruginous soils are dominant, followed by brown-red soils. Soils of hydromorphs and allomorphs in the Baobolong Valley form the local pedology.

The plant formations are composed of shrubby savannas and raised/flat steppes with low forests. Four Classified forests cover 7,900 ha (Saboya, Ngayène, Mamby and Bread-crumbed). The wild fauna essentially shows the terrestrial, mammalian and reptilian species.

Vegetation and Fauna

The local plant formations are composed of raised savannas and shrubs, presenting numerous woody and herbaceous species. In shallows and valleys (Baobolong), the western *Anacardium* (Cashew tree) and the *Mangifera indica* (mango tree) receive the ambient humidity. A communal forest reaching 100 ha spreads to the entry of the village of Paoskoto, toward the Northeast.

Fauna is likely to disappear because of bushfires and wild deforestation. Only Baobolong zone attracts some species of animal. National parks to be conserved are not found in the vicinity of the Project area. Animal species are often met in the project area or sometimes in its vicinity:

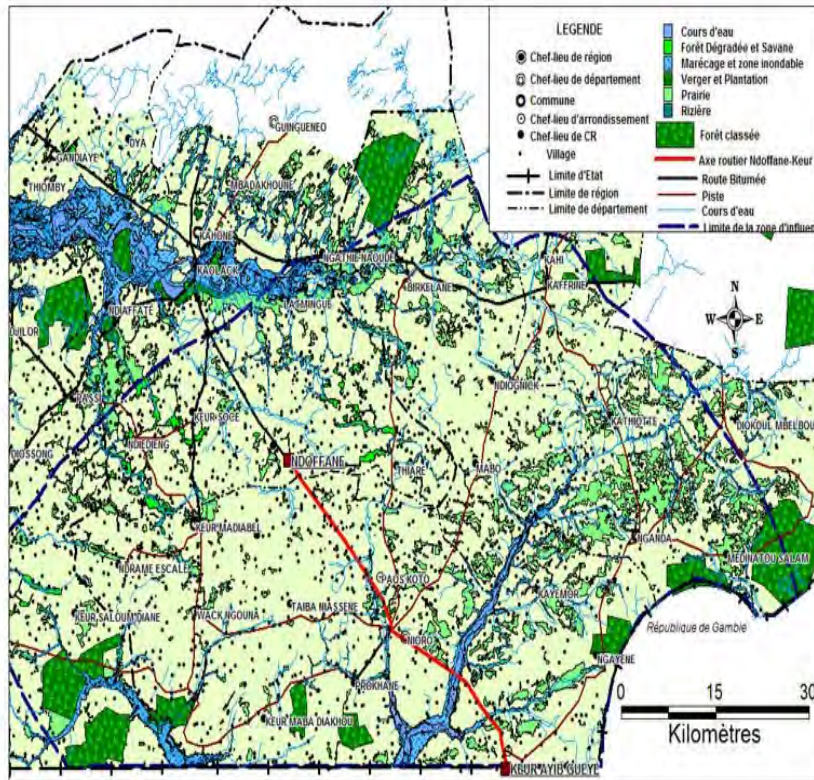
Geography

Distinguishing types of the following soils are found:

- Tropical ferruginous soils washed and descended in the detritus formations. Continental soil eroded by winds and rains in advanced deterioration.
- Brown-red Soils little eroded, but rich in organic that present a good resistance to erosion especially on glazes.
- Soils of fine texture, rich in humus and clay and hydromorphs present a big capacity of water retention. These are the rich and heavy soils of blackish color from strong clay and often localized in shallows or pans.

Hydrography and Underground Waters

The hydrographic condition in the project area is simple, made up of the Baobolong River that flows from the Gambia River. The river streams from the Northeast toward the Southwest, in a distance of 40 kilometers in Senegalese territory. Its water level is dependent on rainwater and of the Gambia River. Other affluents of the river are intermittently reserved during the dry season.



Source: Etude D'Impact Environnemental et Social, Février 2010

Figure-11.3 Location Map

11-3-2 Socio-Economic Conditions

Administrative and Demographic Situation of the Zones of Direct Influence of the Project

The table below indicates the different local communities crossed by the road alignment that will be therefore mostly concerned by the positive impact, but also by the negative impacts. They will be affected by different impacts bound to the realization of the infrastructure. Those are composed of 2 major towns (Ndoffane and Nioro), 3 farming communities (Koumbal, Paos Kotto and Médina Saakh) and 21 villages.

Table-11.2 List of Localities and Population Benefited by the Project

DEPARTEMENT NIORO	275,148
COMMUNES	20,451
<i>Commune NIORO</i>	14,041
<i>Commune de KEUR MADIABEL</i>	6,411
ARD. MEDINA SABAKH	67,836
CR KAYEMOR	18,304
CR MEDINA SABAKH	31,805
CR NGAYENE	17,727
ARD. PAOS KOTO	110,472
CR GAINTHE KAYE	22,307
CR PAOS KOTO	43,375
CR PROKHANE	24,224
CR TAIBA NIASSENE	20,565

ARD. WACK NGOUNA	76,388
CR KEUR MABA DIAKHOU	23,135
CR KEUR MADONGO (EX K, MADIABEL)	6,281
CR NDRAME ESCALE	18,717
CR WACK NGOUNA	28,256

Source: JICA Survey Team

11-3-3 Consultation with Local Stakeholders

In principle, AGEROUTE consults with local stakeholders through means that induce broad public participation to a reasonable extent, in order to take into consideration the environmental and social factors in a way that is most suitable to local situations, and in order to reach an appropriate consensus. JICA assists AGEROUTE by implementing cooperation projects as needed.

In an early stage of cooperation projects, JICA holds discussions with AGEROUTE and both parties reach a consensus on frameworks for consultation with local stakeholders. In order to have meaningful meetings, JICA encourages AGEROUTE to publicize in advance that they plan to consult with local stakeholders, with particular attention to directly affected people. JICA encourages AGEROUTE to prepare minutes of their meetings after such consultations occur

Table-11.3 Minutes of Meeting held in December, 2010

Comments by Stakeholders	Response by the Project
<ul style="list-style-type: none"> • <i>This Project is accepted by the local residents with expectations. Because, the road section is very important for regional economy, and plays a large role of an international trunk road.</i> • <i>The detour under construction forms a long distance for a while, and continues at a long period. A respiratory inflammation may be caused by the dust on the road. Therefore, such cooperation with a local health center will be anticipated. The Project may leave the detour of a farm village as an agricultural road at the end of construction.</i> • <i>Activity and movement of residents and livestock may be partly restricted during the works. Because, such farmland and social facilities (weekly market, health center, mosque, well, school, etc.) are built along the road in some area.</i> • <i>Construction sites which a contractor installs may affect the lifestyle of the area during construction. In particular, health education will be needed to both the local community and laborers and sanitary goods be distributed to avoid the problem caused between laborers and local women namely HIV/AIDS.</i> • <i>There is a possibility of accidents at the time of road crossing for the children or livestock during the construction.</i> • <i>The flow of Baobolong River from branch rivers increases and overflows easily in the rainy season. It is necessary to review the estimated flood cycle (present is 100 years), the scale of a structure, etc. in view of the</i> 	<p>The project will be implemented in cooperation with the local community.</p> <p>The detour under construction forms the shortest distance for a while, and continues within the shortest period. A respiratory inflammation may be treated in a local health center. The Project may leave the detour of a farm village as an agricultural road at the end of construction.</p> <p>Activity and movement of residents and livestock may be secured by the Contractor's attention.</p> <p>Construction sites which a contractor installs may affect at the minimum the lifestyle of the area during construction. Health education will be conducted to both the local community and laborers and sanitary goods be distributed.</p> <p>Possibility of accidents should be the minimum at the time of road crossing for the children or livestock construction.</p> <p>Estimated flood cycle (present is 100 years), the scale of a structure, etc. will be reviewed. Also, monitoring the influence on a flow or fish will be conducted during/after construction.</p> <p>Details for the proposed site of the quarries/sand for the construction material along the existing road should be listed for the approval of Mineral-resources office. At the end of construction, the contractor should level and conduct reafforestation in consideration of its geology. These should be</p>

recent climate change. Also, monitoring the influence on a flow or fish will be required during/after construction. AGEROUTE takes charge of an internal monitoring and the Ministry of Environment (MEPNBRLA) takes an external.

- Details for the proposed site of the quarries/sand for the construction material along the existing road should be listed for the approval of Mineral-resources office. The end of construction, the contractor should level and conduct reforestation in consideration of its geology. Then, it can be used as pasturing space for livestock. These should be confirmed at the time of handover of construction works.
- Water salination is serious as the local water resources (surface water, groundwater) of the region. Watering works to the road under construction need clarification of the required quantity, independent on the residents' drinking water. Possible influence to the groundwater should be considered at the watering. The solid waste processing should also be monitored in the Project area.

confirmed at the time of handover of construction works.

The minimum watering works to the road under construction need clarification of the required quantity, independent on the residents' drinking water. Possible influence to the groundwater should be reduced at the minimum. The solid waste processing should also be monitored in the Project area.



Photo Stakeholder Meeting

11-4 Impacts of the Project on the Environment

11-4-1 Negative Environmental and Social Impacts

The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. Items to be addressed in the project are narrowed down to the needed ones through the scoping process.

In addition to the direct and immediate impacts of projects, the derivative, secondary, and cumulative impacts as well as impacts associated with indivisible projects will also be assessed with regard to environmental and social considerations, so far as it is rational. The life cycle impact of a project period is also considered. Various kinds of relevant information are needed in order to assess impacts on the environment and local communities.

According to the JICA Guidelines, the checklists for Social and Environmental Considerations are prepared in the following table. These checklists include categories and items related to environment. When using these checklists, the appropriate items should be checked based on the sector and nature of the project.

Table-11.4 Checklists for Environmental and Social Considerations

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) Y (c) N (d) N	(a) EIA reports have been already prepared in official process. (b) EIA reports will be likely approved by authorities of Senegal. (c) EIA reports will be unconditionally approved. (d) Other environmental permits are not required.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from Local stakeholders? (b) Have the comment from stakeholders (such as local residents) been reflected in the project design?	(a) Y (b) Y	(a) Contents of the project and the potential impacts have been adequately explained to Local stakeholders based on appropriate procedures, including information disclosure. Understanding is obtained from Local stakeholders. (b) The comment from stakeholders (such as local residents) has been reflected in the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Alternative plans of the project have been examined in view of social and environmental considerations.
2 Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken? (b) Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse?	(a) Y (b) N	(a) There is a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality to some extent. Ambient air quality complies with the country's air quality standards. Mitigating measures to construct the fence will be taken with local participants. (b) Industrial areas do not exist near the route.

	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare land resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? (b) Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater? (c) Do effluents from various facilities, such as parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?	(a)N (b)N (c) N	(a) There is not a possibility that soil runoff from the bare land resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas. Water quality is within the local standards. (b) There is not a possibility that surface runoff from roads will contaminate water sources, such as groundwater subject to the local standards. (c) Facilities, such as parking areas/service areas are not constructed.
	(3) Wastes	(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?	(a)N	(a) Facilities, such as parking areas/service areas, are not constructed.
	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a)N	(a) Noise and vibrations from the vehicle and train traffic comply with the country's standards.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) The project site located in protected areas is not designated by the country's laws or international treaties and conventions.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (e) Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive	(a)N (b)N (c)N (d)N (e)N (f) N	(a) The project site does not encompass primeval forests, tropical rain forests, ecologically valuable habitats. (b) The project site does not encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions. (c) Significant ecological impacts are not anticipated. (d) Adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock, by installation of traffic signal or suspension of the construction work during their crossing. (e) There is not a possibility that installation of roads will cause impacts, such as destruction of forest (only branch cut), poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests. (f) The project site is located at developed areas.

		loss of natural environments?		
	(3) Hydrology	(a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	(a) N	(a) There is not a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows.
	(4) Topography and Geology	(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a)N (b)N (c) N	(a) There is not any soft ground on the route that may cause slope failures or landslides. (b) There is not a possibility that civil works, such as cutting and filling will cause slope failures or landslides. Protection works will be conducted. (c) There is not a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites. Protection works will be conducted.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihood and living standards developed based on socioeconomic studies on resettlement?(d) Are the compensations going to be paid prior to the resettlement?(e) Are the compensation policies prepared in document?(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, and people below the poverty line, ethnic minorities, and indigenous peoples?(g) Are agreements with the affected people obtained prior to resettlement?(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?(i) Are any plans developed to monitor the impacts of resettlement?(j) Is the grievance redress mechanism established?	(a)(b) (c)(d) (e)(f) (g)(h) (i)(j)	(a) Involuntary resettlement is not caused by project implementation. No land acquisition is required subject to temporary use of agricultural land. (b) Not applicable. (c) Not applicable.(d) N/A(e) N/A(f) N/A(g) N/A(h) N/A(i) N/A(j) N/A

	(2) Living and Livelihood	<p>(a) Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?</p> <p>(b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)?</p> <p>(e) Is there any possibility that roads will impede the movement of inhabitants?</p> <p>(f) Is there any possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?</p>	<p>(a)N (b)N (c)Y (d)Y (e)N (f) N</p>	<p>(a) Existing roads are available. There is not a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment.</p> <p>(b) There is not any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population.</p> <p>(c) There is a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project. Adequate considerations will be given to public health, if necessary.</p> <p>(d) There is a possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents). Speed limit will be regulated for mitigation.</p> <p>(e) There is not any possibility that roads will impede the movement of inhabitants.</p> <p>(f) Structures associated with roads (such as bridges) will not be constructed.</p>
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Local archeological, historical, cultural, and religious heritage does not exist in the vicinity of the Project area.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There is not a possibility that the project will adversely affect the local landscape.
	(5) Ethnic Minorities and Indigenous Peoples	<p>(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?</p> <p>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?</p>	<p>(a)N (b)N</p>	<p>(a) Ethnic minorities and indigenous peoples do not exist in the vicinity of the Project area.</p> <p>(b) All of the rights of indigenous peoples in relation to land and resources are respected.</p>

	(6) Working Conditions	<p>(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?</p> <p>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?</p> <p>(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?</p> <p>(d) Are appropriate measures being taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?</p>	<p>(a)N (b)Y (c)Y (d)Y</p>	<p>(a) The project proponent is not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project.</p> <p>(b) Tangible safety considerations is in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials.</p> <p>(c) Intangible measures is planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc..</p> <p>(d) Appropriate measures will be taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents.</p>
5 Others	(1) Impacts during Construction	<p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p>	<p>(a)Y (b)Y (c)Y</p>	<p>(a) Adequate measures are considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes).</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), adequate measures will be considered to reduce impacts.</p> <p>(c) If construction activities adversely affect the social environment, adequate measures will be considered to reduce impacts. Such responsibilities are specified in the specifications of the construction contract.</p>
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a)Y (b)Y (c)Y (d)Y</p>	<p>(a) The proponent will develop and implement monitoring program for the environmental items that are considered to have potential impacts.</p> <p>(b) Waters - Pollution, Soils - Erosion / refinement - Pollution / deterioration, Vegetation / fauna - Rate of deterioration - Rate of reforestation - Linear plantations, Human environment - Improvement of life - Activities - socioeconomic - Occupation spaces - Hygiene and health - Pollution - Safety in the yards. Monitoring will be conducted by the executing agency by monthly report submission.</p> <p>(c) The proponent will establish an adequate monitoring framework (the existing department, officers in charge, measuring apparatus, and adequate budget to sustain the monitoring works).</p> <p>(d) Regulatory requirements pertaining to the monitoring report system are identified, such as the format and monthly reports from the proponent to the regulatory authorities. Responsible staff is organized in AGEROUTE with the measuring apparatus for air and noise.</p>

6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation).(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	(a) N (b) N	(a) N/A(b) N/A
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) N/A

Identification of Major Environmental Constraints

In the “Etude D’Impact Environnemental et Social Rapport Provisoire, Février 2010”, several outstanding matters relating to environmental and social considerations are mentioned for further inspection. Following it, the Study Team conducted a site investigation during the survey period, and the observation is identified in the table below as compared with both.

Table-11.5 Site Investigation

Remarks in the Report of AGEROUTE	Observation by the Team
In Nioro there are some risks to conduct the deforestation.	Only the low shrubs should be cut down.
Occupation is found of the space by the habitat and social facilities (weekly markets, sanitary structures, mosque, hydraulic infrastructures, schools etc.) that are in most cases constructed along the existing road. Concerning the weekly market at Keur Ayib, some kiosks should be moved in part or in total during the period of works.	The mini-market stands on the terminal point at Keur Ayib of the existing road section. They occupy a part of road side. Provisional measures for movement will be taken during construction.
There are some probabilities of use of private land to install the base camp of the contractor yard.	ROW (50m) is available for the contractor’s use including detour. When temporary use of residents’ assets is required, the due procedure will be taken subject to no land acquisition required.
Road section across the Baobolong River in the Firgui village should be reviewed on its width. Existing culverts will be improved to avoid flooding due to the recent climate change.	Since the present road width across the river is about 7m, additional expansion/banking by a few meters will be required. Although there are fishermen who are engaged for coastal fishery, a small number is counted. As a countermeasure against the flood damage suffered, double layers above the existing road were accumulated in October, 2010. Electric poles recently moved are not obstacles to the rehabilitation plan.
Communal forests in the farming communities of Paos Kotto, Koumbals and Médina Sabakhs occupy a surface of about 60,000 hectares.	Since there is the existing road, necessary permits were taken.
Fauna and flora of trees/fruits bring the real economic income for the community.	Some wild animals have been observed. A slight influence may be caused during and after

	construction.
The project may use the new quarries, or the existing ones in the project affected area. The exploitation of the quarries may locally cause negative effects on the quality of air. These effects will be negligible on the environment but they could cause a sanitary threat for workers and the community. Also, the exploitation of the quarries could destruct the present vegetation on the sites.	Following four places for the lateritic extraction are proposed. National highway No. 4. pk3+200 At Nioro entrance, the national highway No. 4, pk10+00 From, 3.5-km, pk3+500 on Sinthiou Wanar road. National highway No. 4, pk28+600 Although some influences, such as air pollution, are considered, they are at the low level.
The mosque of Keur Ndary is under construction. The imam's stall is located within 10 m of the existing road.	Protection fence from the dust/noise will be constructed by citizens' participation in the community.
The water used for the road construction should be secured, avoiding the pollution to the ground water.	The specifications for the construction are to mitigate the possible impact. Monitoring will be conducted by the stakeholders.



Photo Mini-markets at Keur Ayip



Photo Baobolong River

11-4-2 Scoping

By the following “Scoping”, alternatives will be chosen for analysis, a range of significant and potentially significant impacts, and study methods.

Table-11.6 Scoping of the Negative Impacts

Activities	Contents	Negative impacts	Prediction of Impacts
Land Acquisition	<ul style="list-style-type: none"> • Beaconing of works • Works mechanized of preparation of the land 	• Erosion of soils	• Small scale
		<ul style="list-style-type: none"> • Disruption of customs • Disruption riparian activities 	<ul style="list-style-type: none"> • A few people • To be treated locally
		• Dismissal disposal of the solid garbage and rubbles	• A few occasions
		• Disruption of the traffic	• Very rare
		• Disruption of the public energy	• A few electric poles
Site Mobilization with living facilities	Occupation of forest zones	• Deforestation and reduction of the plant land	• Only tree branches
	Tipping of oils and waste waters Dismissal of solid garbage	• Contamination of waters and soils	• Partly, if occurred
	Occupation of private or agricultural land	<ul style="list-style-type: none"> • Social and human conflicts • Loss of cultures or agricultural products 	<ul style="list-style-type: none"> • A few occasions • Small area
	Failure of safety protection of the workers	<ul style="list-style-type: none"> • Affection/pollution by the noise, dust and gases • Accident during the work 	<ul style="list-style-type: none"> • Can be mitigated • Very rare
	Improper signaling of the yard	• Collision of the construction machine with other ordinary cars	• Subject to the Contractor’s failure
	Demobilization of yard	• Social and human conflicts with communities	• A few cases
Recruitment of yard workers	Presence of foreign workers outside the community	• Social conflicts with local people	• A few cases
		• Poaching / lumbering	• A few, if any
		• Propagation of the ISTS / AIDS	• Can be avoided
Installation of the facility of asphalt and crushing	<ul style="list-style-type: none"> • Occupation of agricultural / forest zones • Spread of the noise, gas and dust • Disposal of Liquid and solid wastes • Proximity with dwelling zone 	• Destruction of the plant land	• Very small area
		• Reduction of the arable areas	• Small area
		<ul style="list-style-type: none"> • Atmospheric pollution • Respiratory affections 	<ul style="list-style-type: none"> • Can be mitigated • Can be treated locally
		• Contamination of waters and soil	• Mitigated at to the minimum
Opening and exploitation of the zones of Quarry	Deforestation	<ul style="list-style-type: none"> • Reduction of the plant table setting • Erosions of soils exposed 	<ul style="list-style-type: none"> • Only tree branches • A few places
	Improper signaling	• Risks of accidents	• Very rare
	Spread of dust	• Respiratory affections	• Can be treated locally

	Occupation of private or agricultural sites	<ul style="list-style-type: none"> Deterioration of agricultural land Social conflicts 	<ul style="list-style-type: none"> Very small area A few, if any
Detour	Destruction of vegetation and agricultural land	<ul style="list-style-type: none"> Reduction of the plant land Reduction of the arable areas 	<ul style="list-style-type: none"> Very small area Small area
Excavations, preparatory works, leveling, paving and facility construction	Spread of the particles of dust	<ul style="list-style-type: none"> Atmospheric pollution risk 	<ul style="list-style-type: none"> Can be mitigated
	Operation of construction machinery	<ul style="list-style-type: none"> Erosion of soils Deterioration of cultivated area 	<ul style="list-style-type: none"> A few places Small area
	Disposal of fuel	<ul style="list-style-type: none"> Contamination of waters and soils 	<ul style="list-style-type: none"> Can be mitigated at the minimum
	Demolition of the culverts and scouring	<ul style="list-style-type: none"> Pollution by the illegal disposal of the solid garbage 	<ul style="list-style-type: none"> Can be avoided
	Risk of river banking	<ul style="list-style-type: none"> Disruption of the drinking for the livestock 	<ul style="list-style-type: none"> Can be avoided by the Contractor
	Improper signaling of the yard	<ul style="list-style-type: none"> Disruption of the local traffic Risks of accidents 	<ul style="list-style-type: none"> Very rare cases Rare cases
Transportation of the materials	Spread of dust Improper behavior of the drivers	<ul style="list-style-type: none"> Atmospheric pollution risk Risk of accidents 	<ul style="list-style-type: none"> Can be mitigated A few occurred
Use after the construction	Increase of the traffic Increase of users (all the sections)	<ul style="list-style-type: none"> Pollution of exhaust gases and noise 	<ul style="list-style-type: none"> Can be mitigated at the minimum
		<ul style="list-style-type: none"> Risks of accident Insecurity and risk of aggression 	<ul style="list-style-type: none"> Very rare cases Can be avoided

11-4-3 Mitigation Measures against the Negative Impact Scoped

To reduce or to eliminate these impacts, the following mitigation is proposed in the Plan of Environmental and Social Management as suitable applicable measures.

Table-11.7 Mitigation Measures

Activities	Contents	Negative impacts	Mitigation Measures
Land Acquisition	<ul style="list-style-type: none"> Beaconing of works Works mechanized of preparation of the land 	<ul style="list-style-type: none"> Erosion of soils 	<ul style="list-style-type: none"> Reforestation stabilization of the shoulders
		<ul style="list-style-type: none"> Disruption of customs Disruption riparian activities 	<ul style="list-style-type: none"> Information and Campaign Social support
		<ul style="list-style-type: none"> Dismissal disposal of the solid garbage and rubbles 	<ul style="list-style-type: none"> Appropriate disposal of the solid garbage and rubbles toward authorized sites
		<ul style="list-style-type: none"> Disruption of the traffic 	<ul style="list-style-type: none"> Information and campaign Temporary installation of traffic facility Signaling, passages, footbridges, Traffic control by the Police
		<ul style="list-style-type: none"> Disruption of the public energy 	<ul style="list-style-type: none"> Coordination with the concerned services Information of the people Assiduous rehabilitation of the network

Site Mobilization with living facilities	Occupation of forest zones	<ul style="list-style-type: none"> Deforestation and reduction of the plant land 	<ul style="list-style-type: none"> Implication of the forest Services Compensatory reforestation Recovering after works
	Tipping of oils and waste waters Dismissal of solid garbage	<ul style="list-style-type: none"> Contamination of waters and soils 	<ul style="list-style-type: none"> Collection and reuse of the used oils Collection and disposal of the solid garbage Facilities of suitable sanitary
	Occupation of private or agricultural land	<ul style="list-style-type: none"> Social and human conflicts Loss of cultures or agricultural products 	<ul style="list-style-type: none"> Choice of the sites in relation with owners or local Communities Recovery of the sites after use
	Failure of safety protection of the workers	<ul style="list-style-type: none"> Affection/pollution by the noise, dust and gases Accident during the work 	<ul style="list-style-type: none"> Responsible Hygiene Security (HSE) Protective facilities Kit for the first care Campaign of the workers
	Improper signaling of the yard	<ul style="list-style-type: none"> Collision of the construction machine with other ordinary cars 	<ul style="list-style-type: none"> Signaling and campaign
	Demobilization of yard	<ul style="list-style-type: none"> Social and human conflicts with communities 	<ul style="list-style-type: none"> Restoration of the site Transfer of facilities
Recruitment of yard workers	Presence of foreign workers outside the community	<ul style="list-style-type: none"> Social conflicts with local people 	<ul style="list-style-type: none"> Priority recruitment of the local people Priority recruitment of unskilled workers
		<ul style="list-style-type: none"> Poaching / lumbering 	<ul style="list-style-type: none"> Campaign of the yard worker Monitoring by the forest services
		<ul style="list-style-type: none"> Propagation of the ISTS / AIDS 	<ul style="list-style-type: none"> Campaign (workers / community) Distribution of condoms (yard)
Installation of the facility of asphalt and crushing	<ul style="list-style-type: none"> Occupation of agricultural / forest zones Spread of the noise, gas and dust Disposal of Liquid and solid wastes Proximity with dwelling zone 	<ul style="list-style-type: none"> Destruction of the plant land 	<ul style="list-style-type: none"> Proper choice of the site Implication of the forest Services Compensatory reforestation
		<ul style="list-style-type: none"> Reduction of the arable areas 	<ul style="list-style-type: none"> Proper choice of the authorized sites Recovery of the sites after works
		<ul style="list-style-type: none"> Atmospheric pollution Respiratory affections 	<ul style="list-style-type: none"> Proper choice of the site Protection of the workers Campaign of the road side residents
		<ul style="list-style-type: none"> Contamination of waters and soil 	<ul style="list-style-type: none"> Protective measures and collection of oil
Opening and exploitation of the zones of Quarry	Deforestation	<ul style="list-style-type: none"> Reduction of the plant Erosions of soils exposed 	<ul style="list-style-type: none"> Exploitation of the quarry allowed
	Improper signaling	<ul style="list-style-type: none"> Risks of accidents 	<ul style="list-style-type: none"> Signaling and campaign
	Spread of dust	<ul style="list-style-type: none"> Respiratory affections 	<ul style="list-style-type: none"> Protection of the workers Regular watering of the distribution (crushing site)
	Occupation of private or agricultural sites	<ul style="list-style-type: none"> Deterioration of agricultural land Social conflicts 	<ul style="list-style-type: none"> Exploitation of the quarry allowed Prior agreement of the land owners Rehabilitation after works
Detour	Destruction of vegetation and agricultural lands	<ul style="list-style-type: none"> Reduction of the plant land Reduction of the arable areas 	<ul style="list-style-type: none"> Implication of the forest Services Compensatory reforestation Proper choice of the route Recovery of the sites after works

Excavations, preparatory works, leveling, paving and facility construction	Spread of the particles of dust	<ul style="list-style-type: none"> • Atmospheric pollution risk 	<ul style="list-style-type: none"> • Protection of the workers • Regular maintenance of the machinery • Regular watering of the road
	Operation of construction machinery	<ul style="list-style-type: none"> • Erosion of soils • Deterioration of cultivated area 	<ul style="list-style-type: none"> • Limited operation of the machinery • Monitoring and campaign
	Disposal of fuel	<ul style="list-style-type: none"> • Contamination of waters and soils 	<ul style="list-style-type: none"> • Protective measures and collection of oil
	Demolition of the culverts and scouring	<ul style="list-style-type: none"> • Pollution by the illegal disposal of the solid garbage 	<ul style="list-style-type: none"> • Collection and disposal toward the allowed location in the community
	Risk of river banking	<ul style="list-style-type: none"> • Disruption of the drinking for the livestock 	<ul style="list-style-type: none"> • To avoid destruction of the pools • To improve the pools for effective use • To dig new pools to avoid the accidents at the time of crossing the road.
	Improper signaling of the yard	<ul style="list-style-type: none"> • Disruption of the local traffic • Risks of accidents 	<ul style="list-style-type: none"> • Signaling and campaign
Transportation of the materials	Spread of dust Improper behavior of the drivers	<ul style="list-style-type: none"> • Atmospheric pollution risk • Risk of accidents 	<ul style="list-style-type: none"> • Protection of the vehicles • Monitoring of the transportation at the bypass and diversion • Campaign of the drivers
Use after the construction	Increase of the traffic Increase of users (all the sections)	<ul style="list-style-type: none"> • Pollution of exhaust gases and noise 	<ul style="list-style-type: none"> • Landscape planning around the shoulders • Plantation of alignment tree
		<ul style="list-style-type: none"> • Risks of accident • Insecurity and risk of aggression 	<ul style="list-style-type: none"> • Regular inspection of the road • Installation of Humps/Road crossing • Speed limit • Police control • Campaigns of road safety for drivers and residents • Lighting and regular police monitoring

11-5 Review of Monitoring Plan

11-5-1 Monitoring Plan

After the project had started, AGEROUTE will monitor whether any unforeseeable situations occur and whether the performance and effectiveness of mitigation measures are consistent with the assessment's prediction. They then take appropriate measures based on the results of such monitoring.

In cases where sufficient monitoring is deemed essential for appropriate environmental and social considerations, such as projects for which mitigation measures should be implemented while monitoring their effectiveness, AGEROUTE must ensure that project plans include feasible monitoring plans.

AGEROUTE should make efforts to make the results of the monitoring process available to local project stakeholders. When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. AGEROUTE should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.

By environmental monitoring, it is necessary to verify all activities of inspection, control and intervention aiming to verify that (i) all requirements and conditions concerning protection of environment are respected effectively before, during and after works; (ii) the protective measures of environment prescribed or foreseen are put in place and permit to reach the proposed objectives; (iii) the risks and uncertainties can be managed and corrected in an appropriate time.

The environmental monitoring should be conducted by AGEROUTE. They will monitor whether the relative elements to environment and security are written down in the implementation. During the phase of construction, the engineer will advise that the supervision of works on the yard should take the contractor's responsibilities for the social and environmental considerations.

By environmental monitoring, it is necessary to verify the activities of observation and measures aiming to determine the real impacts of the project, compared to the prediction of impacts achieved at the time of EIA preparation. Monitoring is the extension of the impact survey on environment. It is about a fundamental operation of the scientific method that consists in verifying, by experience, hypotheses put forward concerning the sources of impact, the affected resources and the protective measures of environment. Monitoring and assessment are complementary. Monitoring aims at correcting "in real time", through a continuously monitoring the methods to execute the interventions and management of infrastructures.

Monitoring Indicators

The indicators are parameters whose use provides quantitative or qualitative information on the impacts and the environmental and social profits of the Project. The indicators serve with a controllable accurateness the directly or indirectly impact generated by the activities of the components of the Project. They provide a summary observation of states, constraints and permit to observe the achieved progress or the deterioration undergone in the time or in relation to targets. They reveal past tendencies and serve, to a certain extent, as forecast instruments. As such, they constitute an essential component in the Environmental and Social assessment of the Project.

For the project, indicators are proposed to be followed by the Offices of Control and the Consultants of AGEROUTE, and also, of the environmental services (DREEC, etc.) and the local 5communities):

Table-11.8 Indicators to be Monitored by AGEROUTE

- | |
|---|
| <ul style="list-style-type: none">• Recruitment of Environment Experts to assure the monitoring of works• Effectiveness of the insertion of environmental considerations during the execution;• Efficiency of the systems of elimination of the garbage from the works yard• % of contractors respecting the environmental arrangements in their yards• Number of open quarries and restorations by contractors• Level of application of the environmental and social measures of mitigation |
|---|

- Numbers of persons conscious of environmental and social management
- Number of jobs created locally (local manpower for works)
- Level of implication of local communities in the monitoring of the works
- Quality and functionality of achieved infrastructures
- Number of campaign (on the project, hygiene, safety during the works)
- Number of local associations and NGOs implied in the monitoring
- Number of affected people and compensated by the project
- Number and nature of social conflicts caused by the works
- Number of accidents caused by the works
- Number of complaints recorded at the time of the works
- Regularity and effectiveness of the monitoring.

11-5-2 Institutional Arrangements of Monitoring

The monitoring will be conducted internally by the Offices of control of the works and local authorities (for the permanent monitoring of the project), and by AGEROUTE for the Project (for monthly regular monitoring) during the whole phase of the execution of the project.

Also, the assessment will be conducted externally by DREEC of the independent Consultants for the assessment at the mid-term and final stages.

The following table presents the device of monitoring that should integrate the preparation of plans, estimates and various documents of bids and other relative contractual documents to the project.

Table-11.9 Responsibilities of the Main Organization

Organization	Roles
AGEROUTE	AGEROUTE is responsible for management of the road (execution, maintenance, etc.). AGEROUTE is going to designate among the issues of Projects, a Point Focal Environment (PFE / AGEROUTE) that is to assure the coordination of the environmental and social aspects of the components and to act as interface between the project, the local communities and the other institutions concerned by the environmental management of the project.
Local communities situated in the project area	The local communities are to participate in the monitoring of proximities recommended, especially for information and the campaign of the local people.
NGOs and the civil society	NGOs, OCBs and other environmental organizations of civil society will also participate in, to inform, to educate the people on the environmental and social aspects of the project, and also to the monitoring of proposed items.
Construction contractor	They must execute environmental and social measures and must observe instructions and other environmental prescriptions contained for works.
Consulting company	They must assure the control of the effectiveness and the efficiency of the execution of environmental and social measures and the observation of instructions and other environmental prescriptions contained for services.

Table-11.10 Monitoring Plan during Construction Works

Items and Indicators	Methods and Devices of monitoring	Responsible	Period
Waters Pollution	Monitoring of the procedures and installation of dismissal of the waste waters Control of the underground waters and surface around the project area Monitoring of the use of surface waters Monitoring of measures taken for the control of the erosion	Environment Expert AGEROUTE Hydraulic service DREEC Townships of Kaolack	Entire works
Soils Erosion / refinement / Pollution / deterioration	Visual assessment of the measures of control of the erosion of soils Permit of authorization of opening the borrow pits and quarries Verification of the adequacy of the site Number of quarries recovered and afforested Existence of system of garbage treatment	Environment Expert AGEROUTE Hydraulic service DREEC Townships	Beginning, mid-course and after operation infrastructure in exploitation
Vegetation fauna Rate of deterioration Rate of reforestation Plantations in the street	Visual assessment of the vegetation deterioration Visual assessment of the measures of reforestation / plantations Control of clearing activities Control and monitoring of sensitive zones	Environment Expert AGEROUTE Foresters Communes Service	Beginning, mid-course and after operation
Human environment Living life Socio-economic activities Occupation of land	Monitoring of dwelling / expropriation acquisition, private land / of verges and other agricultural fields Priority of employment of local people Preservation of the cultural facility Monitoring of land use Monitoring of the sources of economic income Information of administrative and local authorities Campaign of local people Monitoring of the land use (fields, private property, etc.) Compensation for the use of private property Priority of employment of local people Consideration to sacred, cultural and archaeological sites Agreement on the use of local water resources	Environment Expert AGEROUTE DREEC Communes	Beginning, mid-course and after operation
Hygiene and health Contamination and Pollution Safety in the yards	<u>Verification:</u> The presence of disease vectors and the apparition of illnesses by the works Various illnesses in the projects (IST / VIH / AIDS, bilharzias, malaria, etc.) Observation of hygiene measures on the site Consistent of the practices of management of biomedical garbage (the whole process), availability of management plan	Environment Expert AGEROUTE DREEC Service of hygiene Townships	Beginning, mid-course and after operation; infrastructure in exploitation
	<u>Verification:</u> Availability of safety orders in case of accident Existence of a suitable signaling Observation of traffic control Observation of the speed control Protective use of safety wears	Office of control	monthly

The main objective of the environmental monitoring program is to verify the validity and the accurateness of the assessment of impacts estimated at the time of EIA preparation. The program of monitoring also permits to verify the efficiency of the measures of attenuation of the impacts and protective of environment foreseen in the preparation of the impact survey, namely when important impacts, including aspects of risk and uncertainty, are identified. In case proposed measures become useless, they can be abandoned. Instead, alternative measures can be substituted in order to cope with some attributable or induced undesirable effects caused by the project.

11-6 Conclusion

In the Project area, a seriously protective measure or the particular activities of monitoring will not be required. Moreover, it will not be necessary to relocate houses to implement the works. Some negative impacts in the phase of construction will affect natural resources (namely the existing waters, soils, and air), and the life and the economic activities of communities along the road. One could also fear the risks of accidents during the construction works and the illegal disposal of the yard garbage, namely in the existing rivers. However, effects will be easily controllable if arrangements of the monitoring are conducted.

The road may give negative impacts in terms of pollutions, noise, and accident of the road. But these risks can be avoided or greatly reduced with the application of simple measures of signaling, campaigning, monitoring and management. The measures recommended for the reduction of negative impacts are globally in conformity with the national requirements concerning the management of natural resources and the environment protection.

The rehabilitation of this road will accentuate the transformation of the entire region of Kaolack and its vicinity and will play a real socio-economic development role. The project is to improve the conditions of life and existence of the local community, to improve the socio-economic condition of the inhabitants of the area and to permit an optimal exploitation of potentialities and local resources.

In conclusion, the study shows that the negative impacts identified and analyzed on the environment will be of an extensively acceptable level to socio-economic advantages generated, provided environmental and social measures are taken effectively in consideration of the implementation of the Project,

JICA classifies projects into four categories according to the extent of environmental and social impacts, taking into account an outline of project, scale, site condition, etc. As their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily. Hence, the proposed project may be classified as Category B.

APPENDICES

- Appendix 1 Member list of the Survey Team
- Appendix 2 Study Schedule
- Appendix 3 List of Parties Concerned in the Recipient Country
- Appendix 4 Other Relevant Data
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 - 5-1 Estimate of Direct Cost for Consulting service
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Appendix 1 Member List of the Survey Team

Name	Work Assignment	Position
Mr. Nobuharu SHIMIZU	Team Leader/Road Engineer	Ingérosec Corporation
Mr. Ryuichi OIKAWA	Traffic Demand Analyst	Yachiyo Engineering Corporation
Mr. Osamu Otsu	Financial and Economic Analysis Specialist	Yachiyo Engineering Corporation
Mr. Makoto MATSUURA	Cost Estimate Specialist	Ingérosec Corporation
Mr. Koichi ISHII	Environmental and Social Consideration Specialist	Ingérosec Corporation
Mr. Atsushi ITO	Interpreter	Ingérosec Corporation

Appendix 2 Survey Schedule

No.	Month	Date	Day of Week	Team Leader/Road Engineer	Traffic Demand Analyst	Financial and Economic Analysis Specialist	Cost Estimate Specialist	Environmental and Social Consideration Specialist	Interpreter	
				Nobuharu Shimizu	Ryuichi Oikawa	Osamu Otsu	Makoto Matsuura	Koichi Ishii	Atsushi Ito	
1	11	21	Sun	AF275【Narita(12:55)→Paris(17:15)】						
2	11	22	Mon	AF718【Paris(16:25)→Dakar(21:05)】						
3	11	23	Tue	Courtesy visit to Embassy, JICA, AGEROUTE/Inception report discussion						
4	11	24	Wed	Organization of document/ Negotiation for traffic survey	Discussion with concerned Senagal institutions/ Organization of document/Negotiation for traffic survey	Discussion with concerned Senagal institutions/ Organization of document	Discussion with concerned Senagal institutions/ Organization of document	Discussion with concerned Senagal institutions/ Organization of document	Interpretation of discussions/ Organization of document	
5	11	25	Thu	Organization of document/ Discussion with AGEROUTE	Organization of document/ Discussion with AGEROUTE	Organization of document/ Discussion with AGEROUTE	Organization of document/ Discussion with AGEROUTE	Organization of document	Translation of document	
6	11	26	Fri	Site investigation/Discussion with AGEROUTE Kaolack						
7	11	27	Sat	Site investigation						
8	11	28	Sun	Team discussion/ Organization of document						
9	11	29	Mon	Organization of document/ Discussion with ANSD/ Meeting for traffic survey	Dakar→Kaolack	Organization of document/ Discussion with ANSD	Dakar→Kaolack	Organization of document	Interpretation of discussions	
10	11	30	Tue	Organization of document/ Discussion with ANSD	Traffic Survey	Organization of document/ Discussion with ANSD	Traffic Survey	Organization of document	Translation of document/ Interpretation of discussions	
11	12	1	Wed	Discussion with JICA, AGEROUTE, local environmental consultant	Organization of document/ Discussion with JICA	Organization of document/ Discussion with JICA	Organization of document/ Discussion with JICA	Discussion with JICA/local environmental consultant	Translation of document/ Interpretation of discussions	
12	12	2	Thu	Discussion with local contractor, traffic survey contractor	Organization of document/ Discussion with traffic survey contractor	Organization of document	Discussion with local contractor / Preparation of document	Organization of document	Translation of document/ Interpretation of discussions	
13	12	3	Fri	Organization of document	Analysis of traffic survey result	Organization of document	Preparation of document	Organization of document	Translation of document/ Interpretation of discussions	
14	12	4	Sat	Organization of document	Analysis of traffic survey result	Organization of document	Preparation of document	Organization of document	Translation of document/ Interpretation of discussions	
15	12	5	Sun	Team discussion/ Organization of document						
16	12	6	Mon	Discussion with AGEROUTE, traffic survey contractor	Discussion with AGEROUTE/ Analysis of traffic survey result	Discussion with AGEROUTE/ Organization of document	Discussion with AGEROUTE/ Preparation of Draft-Final Report	Discussion with MEPNBRLA/ Preparation of Draft-Final Report	Interpretation of discussions	
17	12	7	Tue	Discussion with AGEROUTE, local contractor/ Preparation of document	Discussion with AGEROUTE/ Analysis of traffic survey result	Preparation of Draft-Final Report	Discussion with local contractor, local consultant	Preparation of Draft-Final Report	Interpretation of discussions	
18	12	8	Wed	Discussion with AGEROUTE /Preparation of document	Discussion with AGEROUTE/ Analysis of traffic survey result	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Interpretation of discussions	
19	12	9	Thu	Progress Reporting to JICA/ Preparation of Draft-Final Report						
20	12	10	Fri	Discussion with AGEROUTE / Organization of document	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Translation of document	
21	12	11	Sat	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Organization of document	
22	12	12	Sun	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Organization of document	
23	12	13	Mon	Preparation of Draft-Final Report / Discussion with AGEROUTE	Preparation of Draft-Final Report / Discussion with AGEROUTE	Preparation of Draft-Final Report / Discussion with AGEROUTE	Preparation of Draft-Final Report / Discussion with AGEROUTE	Preparation of Draft-Final Report	Translation of document/ Interpretation of discussions	
24	12	14	Tue	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Translation of document	
25	12	15	Wed	Courtesy visit and Reporting to Embassy, JICA, AGEROUTE	Courtesy visit and Reporting to AGEROUTE	Courtesy visit and Reporting to Embassy, JICA, AGEROUTE	Courtesy visit and Reporting to AGEROUTE	Courtesy visit and Reporting to AGEROUTE	Courtesy visit and Reporting to AGEROUTE	
26	12	16	Thu	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Dakar→Kaolack	Dakar→Kaolack	
27	12	17	Fri	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Stakeholder Meeting	Stakeholder Meeting	
28	12	18	Sat	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Preparation of Draft-Final Report	Organization of document	
29	12	19	Sun	AF719【Dakar(23:35)→】						
30	12	20	Mon	AF719【→Paris(6:00)】, AF276【Paris(13:30)→】						
31	12	21	Tue	AF276【→Narita(9:10)】						

Appendix 3 List of Parties Concerned in the Recipient Country

Agence des Travaux et Gestion des Routes au Senegal (AGEROUTE)

M. Ibrahima NDIAYE	General Maneger
M. Oumar SY	Directeur des Grands Travaux et des Ouvrages d'Art
M. Lamine CISSE	Directeur de la Gestion et de l'Entretien du Réseau
M. Karamoto TRAORE	Chef de la Division des Ouvrages d'art et des Ponts
M. Cheikh Mouhamadou Khalifa BA	Chargé de Projet
M. DIASSE	AGEROUTE Kaolack

Fonds d'Entretien Routier Autonome (FERA)

Mr. Sagar DRAME	Administrateur
Mr. Pierre SENE	Responsable Administratif et Financier

Ministère de l'Environnement, de la Protection de la Nature, des Bassins de Rétention et des Lacs Artificiels (MEPNBRLA)

Mr. Radelina Didof Sarr	Chief Division EIE
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Agence Nationale de la Statistique et de la Démographie (ANSD)

M. Ousseynou SARR	Ingénieur Statisticien Economiste
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Embassy of Japan, Senegal

Mr. Kosei BANURA	Deuxième Secrétaire
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JICA Senegal Office

Mr. Hisatoshi OKUBO	Représentant Résident
Mr. Shinji UMEMOTO	Chef de Bureau
Mrs. Ayumi TAKAGI	Adjoint au Représentant Résident
Mr. NDONE Mamadou	Adjoint au Représentant Résident

Consultant local

M. Giuliano GRECO	Dr. Giuliano GRECO Consultant
M. Mbaye Mbengue FAYE	Consultant en Gestion Environnementale & Sociale

Entrepreneur local

M. Driss HOUAR

M. Idrissa DIACK

M. Babacar BA

SOCIETE D'ENTREPRISE HOUAR

Président Directeur Général

SOCIETE DE GENIE CIVIL SOGEC SARL

Directeur Général

SOCIETE DE GENIE CIVIL SOGEC SARL

Directeur Technique

Appendix 4 Other Relevant Data

List of Reference Materials Obtained

No.	Title	Form	Original or Copy	Publisher	Year
1	Lettre de Politique Sectorielle pour les Transports Période 2010 - 2015	Electronic Data	Copy	Ministère de la Coopération internationale, de l'Aménagement du Territoire, des Transports aériens et des Infrastructures	2010
2	PROGRAMME GRANDS PROJETS ROUTIERS 2010-2015	Electronic Data	Copy	Ministère de la Coopération internationale, de l'Aménagement du Territoire, des Transports aériens et des Infrastructures	2010
3	MANUEL DES PROCEDURES DE GESTION ADMINISTRATIVE, TECHNIQUE, FINANCIERE ET COMPTABLE	Electronic Data	Copy	FERA	2009
4	portant création, organisation et fonctionnement du Fonds d'Entretien routier autonome au Sénégal.	Electronic Data	Copy	MINISTERE DES INFRASTRUCTURES' ET DE L'ASSAINISSEMENT	-
5	PRESENTATION DU FERA	Electronic Data	Copy	FERA	-
6	Entretien periodique de 116 km de route revetues Cahier de Prescriptions Techniques(Kaolack-Dinguiraye)	Electronic Data	Copy	AGEROUTE	2007

No.	Title	Form	Original or Copy	Publisher	Year
7	Appel d'Offres international pour les travaux de construction de la route KITA - SARAYA- KEDOUGOU: Tronçon SARAYA – FALEME (PK 0 + 000 au PK 30 + 000) BORDEREAU DES PRIX UNITAIRES	Electronic Data	Copy	AGEROUTE	2007
8	DEVIS QUANTITATIF ET ESTIMATIF: SARAYA-KEDOUGOU (Tronçon n°1)	Electronic Data	Copy	AGEROUTE	2007
9	Travaux de réhabilitation de la route Tambacounda - Médina Gounass Vérification des offres financières - Pli n°1	Electronic Data	Copy	AGEROUTE	2007
10	Etude de trafic Rapport genere automatiquement VILLE : Ndiafate RUE : CF N4 N5 - Passi	Electronic Data	Copy	AGEROUTE	-
11	Etude de trafic Rapport généré automatiquement VILLE : Nioro RUE : Keur Ayib - Nioro	Electronic Data	Copy	AGEROUTE	-
12	Etude de trafic Rapport généré automatiquement VILLE : Sokone RUE : Karang - Passi	Electronic Data	Copy	AGEROUTE	-
13	RAPPORT FINAL DEFINITIF Projet : Comptage sur le Réseau routier classé	Electronic Data	Copy	AATR	2008
14	RESULTATS DEFINITIFS DU TROISIEME RECENSEMENT GENERAL DE LA POPULATION ET DE L'HABITAT – (2002) Rapport National de Présentation	Electronic Data	Copy	ANSD	2008

No.	Title	Form	Original or Copy	Publisher	Year
15	SITUATION ECONOMIQUE ET SOCIALE DE SENEGAL 2008	Electronic Data	Copy	ANSD	2009
16	SITUATION ECONOMIQUE ET SOCIALE-REGION DE FATICK-edition 2008	Electronic Data	Copy	ANSD	2009
17	SITUATION ECONOMIQUE ET SOCIALE-REGION DE KAOLACK-edition 2008	Electronic Data	Copy	ANSD	2008
18	NOTE D'ANALYSE DES COMPTES NATIONAUX DEFINITIFS 2007, SEMI - DEFINITIFS 2008 ET PROVISOIRES 2009	Electronic Data	Copy	ANSD	2010
19	BUDGET_PROGRAMME TRIENAL 2010_2011_2012	Electronic Data	Copy	AGEROUTE	2010
20	Budget-Entretien-Routier-2007-2010	Electronic Data	Copy	AGEROUTE	2010
21	ETUDES ECONOMIQUES DE LA REHABILITATION DES TRONCONS ROUTIERS NIORO-KEUR AYIP (RN4) ET PASSY-SOKONE (RN5) RAPPORT	Electronic Data	Copy	AGEROUTE	2010
22	ETUDES ECONOMIQUES DE LA REHABILITATION DU TRONCON ROUTIER DINGUIRAYE-NIORO DU RIP-KEUR AYIP (RN4) RESUME DU RAPPORT	Electronic Data	Copy	AGEROUTE	2010

No.	Title	Form	Original or Copy	Publisher	Year
23	MEMENTO DES TRANSPORTS TERRESTRES DU SENEGAL (VERSION FINALE)	Electronic Data	Copy	MINISTRE DES TELECOMMUNICATIONS, DES TICS, DES TRANSPORTS TERRESTRES ET DES TRANSPORTS FERROVIAIRES DIRECTION DES TRANSPORTS TERRESTRES	2009
24	PREVISIONS CHARGES DE SUPERVISION RN 4 (DINGUIRAYE KEUR AYIP)	Electronic Data	Copy	AGEROUTE	2010
25	PROGRAMME D'ENTRETIEN ROUTIER ANNUUEL 2010 (PERA 2010)	Electronic Data	Copy	AATR	2009
26	DIECTION DES GRANDS TRAVAUX ET OUVRAGES D'ART (dgtoa) RAPPORT D'ACTIVITES PROJETS ROUTIERS	Electronic Data	Copy	AGEROUTE	2010
27	ETUDE DE DEFINITION ET D'ELABORATION DES TRAVAUX A REALISER SUR LES TRONCONS DE ROUTE GOSSAS - KAOLACK - SOKONE / NIORO / BIRKELANE	Electronic Data	Copy	AATR	2004
28	PONT SUR LA GAMBIE Actualisation des etudes RAPPORT FINAL	Paper Document	Copy	OMVG	2010
29	RESEAU ROUTIER CLASSE	Electronic Data	Copy	AGEROUTE	-

Appendix 5 References

- 5-1 Estimate of Direct Cost for Consulting service
- 5-2 Estimate of International Travel Cost
- 5-3 Total Summary of Civil Work
- 5-4 Bill of Quantity
- 5-5 Breakdown of Annual Fund Requirement

5-1 Estimate of Direct Cost for Consulting service

Dakar 6th January 2011

**ATT.: MR NOBUHARU SHIMIZU
INGEROSEC CORPORATION**

PROFORMA INVOICE

PROJECT : PREPARATORY SURVEY ON TRANS-GAMBIAN CORRIDOR
UPGRADING PROJEC IN THE REPUBLIC OF SENEGAL

REFERENCE : Your request for cost of Consulting Services of 6th January 2011

Nr	Description	Unit	Rate (CFA)
1	Remuneration of Technician	Man/Month	350 000
2	Supporting Staff	Man/Month	200 000
3	Office Operation	Month	150 000
4	Living Allowance	Month	150 000
5	Office rental in Kaolack	Month	300 000
6	Office rental in Dakar	Month	500 000
7	Office Equipment	Set	5 000 0000
8	Domestic Communication	Month	1 000 000
9	Reporting & Documentation	Set/6 months	450 000

Please note that the rates are without VAT

5-2 Estimate of International Travel Cost

機務法規:貿易外取引の管理に関する省令
別表第一
主務官庁:財務省

旅客運賃見積書

(1) 渡航者氏名

株式会社 アンジェロセック 御中

(2) 旅行経路 (出発地から最終到着地まで)

① PARIS-(AF)-DAKAR-(AF)-PARIS

* AF... AIR FRANCE

(3) 円貨払い旅客運賃
区間及び往復又は片道の別

金額 人数

(4) 外貨払い旅客運賃
区間及び往復又は片道の別

金額 人数

		2011年1月11日 1 EUR=¥109.40 にて算出			
①	C/RT	EUR 4086.00	¥447,100	1	¥447,100
	* FRANCE,SENEGAL TAX		¥18,080	1	¥18,080
	* 燃油特別付加運賃及び航空保険超過負担料		¥19,700	1	¥19,700
	発券(手配)手数料(3.0%)		¥13,413	1	¥13,413
	合計		¥498,293	1	¥498,293

* 航空運賃、燃油特別付加運賃、航空保険超過負担料、空港税等につきましては、航空券発券時の設定額、換算レートにより変動します

C... AF DISCOUNT BUSINESS CLASS

OW...ONE WAY TRIP RT...ROUND TRIP

右記の通り相違ありません。

NISSIN TRAVEL SERVICE CO., LTD.

日本航空サービス株式会社

11.1.11

03-3459-0451

旅行会社名押印及び署名 T.KOBYAMA

日付 2011年1月11日

TOTAL SUMMARY OF CIVIL WORK

Bill NUMBER	Description of Works	Total Amount					
		Foreign Currency Portion		Local Currency Portion		Total	
		(Yen)	(eq.FCFA)	(Yen)	(eq.FCFA)	(Yen)	(eq.FCFA)
1	INSTALLATION	0	0	82,280,000	484,000,000	82,280,000	484,000,000
2	EARTHWORKS	0	0	382,148,433	2,247,931,959	382,148,433	2,247,931,959
3	ROADWORKS	0	0	636,219,163	3,742,465,664	636,219,163	3,742,465,664
4	PAVEMENT	54,309,040	319,464,940	424,598,036	2,497,635,508	478,907,076	2,817,100,448
5	CULVERTS AND DRAINAGE	33,220,721	195,416,005	97,951,858	576,187,399	131,172,579	771,603,404
6	ROAD FURNITURE	6,555,928	38,564,285	32,934,755	193,733,852	39,490,683	232,298,137
7	WEIGH BRIDGE	0	0	110,500,000	650,000,000	110,500,000	650,000,000
	TOTAL	94,085,689	553,445,230	1,766,632,245	10,391,954,382	1,860,717,934	10,945,399,612

Bill of Quantity

Bill No.1: Installation

Item Number	Description of works	Unit	Quantity	Unit Rate		Total Amount		
				F/C(Yen)	L/C(FCFA)	F/C(Yen)	L/C(FCFA)	Total(eq. Yen)
1.1	Preparation for base camp and temporary yard	set	1	51,425,000	302,500,000	0	302,500,000	51,425,000
1.2	Installation and demolition of equipment	set	1	30,855,000	181,500,000	0	181,500,000	30,855,000
Installation Total						0	484,000,000	82,280,000

Bill No2: Earthworks

Item Number	Description of works	Unit	Quantity	Unit Rate		Total Amount		
				F/C(Yen)	L/C(FCFA)	F/C(Yen)	L/C(FCFA)	Total(eq. Yen)
2.1	Preparation for shoulder and slope	m ²	117,861	25	146	0	17,207,706	2,925,310
2.2	Tree trimming (diameter>1m ,1m from GL)	No.	39	13,026	76,624	0	2,988,336	508,017
2.3	Embankment from borrow pit	m ³	144,332	966	5,682	0	820,094,424	139,416,052
2.4	Embankment by making use of cutting soil	m ³	12,654	1,797	10,571	0	133,765,434	22,740,124
2.5	Cutting for disposal	m ³	52,052	775	4,560	0	237,357,120	40,350,710
2.6	Loading and haul of soil in excess of 1Km	m ³ /km	104,519	23	137	0	14,319,103	2,434,248
2.7	Displacement for soil in bad condition	m ³	193	1,273	7,487	0	1,444,991	245,648
2.8	Scalification of existing pavement	m ³	347,787	499	2,935	0	1,020,754,845	173,528,324
Earthworks Total						0	2,247,931,959	382,148,433

Bill of Quantity

Bill No3: Roadworks

Item Number	Description of works	Unit	Quantity	Unit Rate			Total Amount		
				F/C(Yen)	L/C(FCFA)	F/C(Yen)	L/C(FCFA)	Total(eq. Yen)	
3.1	Procurement and embankment of laterite for subbase course	m ³	11,593	1,040	6,119	0	70,937,567	12,059,386	
3.2	Agitation and compaction of laterite with cement on the site for subbase course	m ³	85,787	1,307	7,687	0	659,444,669	112,105,594	
3.3	Embankment and compaction of base course by laterite agitated with cement at the plant	m ³	84,628	1,307	7,687	0	650,535,436	110,591,024	
3.4	Procurement of cement for subbase, base course and shoulder	t	16,103	20,756	122,094	0	1,966,079,682	334,233,546	
3.5	Loading and haul of soil for subbase, base course and shoulder	m ³ /km	2,886,630	23	137	0	395,468,310	67,229,613	
Roadworks Total						0	3,742,465,664	636,219,163	

Bill No4: Pavement

Item Number	Description of works	Unit	Quantity	Unit Rate			Total Amount		
				F/C(Yen)	L/C(FCFA)	F/C(Yen)	L/C(FCFA)	Total(eq. Yen)	
4.1	Procurement of asphalt emulsion for prime coat	t	395	137,491	808,772	54,309,040	0	54,309,040	
4.2	Coating of prime coat	m ³	394,759	24	139	0	54,871,501	9,328,155	
4.3	Producing and paving of carriageway by asphalt concrete	m ³	13,941	26,843	157,900	0	2,201,283,900	374,218,263	
4.4	Procurement and paving of shoulder(SBST)	m ³	115,929	354	2,083	0	241,480,107	41,051,618	
Pavement Total						54,309,040	2,497,635,508	478,907,076	

Bill of Quantity

Bill No5: Culverts and drainage

Item Number	Description of works	Unit	Quantity	Unit Rate		Total Amount		
				F/C(Yen)	L/C(FCFA)	F/C(Yen)	L/C(FCFA)	Total(eq. Yen)
5.1	Construction of earth ditch	ml	40,768	47	275	0	11,211,200	1,905,904
5.2	Demolition of existing structures	No.	35	29,844	175,554	0	6,144,390	1,044,546
5.3	Demolition of top slab of existing structures	No.	0	5,647	33,216	0	0	0
5.4	Preparation for improvement of existing structures	No.	0	86,641	509,652	0	0	0
5.5	Excavation for construction of structures	m ³	1,337	815	4,795	0	6,410,915	1,089,856
5.6	Embankment around the structures	m ³	9,230	1,419	8,348	0	77,052,040	13,098,847
5.7	Procurement and implementation of concrete	-	-	-	-	-	-	-
5.7.1	Leveling concrete C150	m ³	310	13,205	77,676	0	24,079,560	4,093,525
5.8	Concrete Q350	m ³	2,133	20,693	121,724	0	259,637,292	44,138,340
5.9	Procurement and implementation of reinforced bar Fe E40	kg	170,669	195	1,145	33,220,721	0	33,220,721
5.10	Masonry	m ³	2,016	2,624	15,436	0	31,118,976	5,290,226
5.11	Kerb	ml	7,729	2,323	13,662	0	105,593,598	17,950,912
5.12	Gabion	m ³	308	15,763	92,725	0	28,559,300	4,855,081
5.13	Widening of top slab of existing structure	No.	0	99,970	588,060	0	0	0
5.14	Slope protection along Baobollong River	m ³	6,792	660	3,884	0	26,380,128	4,484,622
Culverts and drainage Total						33,220,721	576,187,399	131,172,579

Bill of Quantity

Bill No6: Road furniture

Item Number	Description of works	Unit	Quantity	Unit Rate		Total Amount		
				F/C(Yen)	L/C(FCFA)	F/C(Yen)	L/C(FCFA)	Total(eq. Yen)
6.1	Procurement and implementation of milliary	No.	38	13,457	79,158	0	3,008,004	511,361
6.2	Roadside furniture	-	-	-	-	-	-	-
6.2.1	Roadside furniture made of reinforced concrete or plastic	No.	271	16,967	99,808	2,758,893	10,819,187	4,598,155
6.3	Road sign	No.	193	32,790	192,880	3,797,036	14,890,336	6,328,393
6.4	Sign board	-	-	-	-	-	-	-
6.4.a	Sign board s<0.2m ²	No.	39	32,654	192,081	0	7,491,159	1,273,497
6.4.b	Sign board 0.2m ² <s<0.5m ²	No.	77	47,905	281,796	0	21,698,292	3,688,710
6.4.c	Sign board s>0.5m ²	No.	97	39,230	230,765	0	22,384,205	3,805,315
6.5	Marginal strip and center strip	m ²	8,637	771	4,533	0	39,151,521	6,655,759
6.6	Reflecting device	No.	7,729	1,634	9,612	0	74,291,148	12,629,495
Road furniture Total						6,555,928	193,733,852	39,490,683

Bill No7: Weigh station

Item Number	Description of works	Unit	Quantity	Unit Rate		Total Amount		
				F/C(Yen)	L/C(FCFA)	F/C(Yen)	L/C(FCFA)	Total(eq. Yen)
7.1	Construction of weigh station	set	1	59,500,000	350,000,000	0	350,000,000	59,500,000
7.2	Maintenance of weigh station	set	1	51,000,000	300,000,000	0	300,000,000	51,000,000
Weigh Bridge Total						0	650,000,000	110,500,000

5-5 Breakdown of Annual Fund Requirement

Item	Year																	
	Total						2012						2013					
	F/C (Yen)	L/C (FCFA)	Total (eq.Yen)	Total (eq.FCFA)	F/C (Yen)	L/C (FCFA)	Total (eq.Yen)	Total (eq.FCFA)	F/C (Yen)	L/C (FCFA)	Total (eq.Yen)	Total (eq.FCFA)	F/C (Yen)	L/C (FCFA)	Total (eq.Yen)	Total (eq.FCFA)		
Eligible Items																		
Civil Work	94,085,689	10,391,954,382	1,860,717,934	10,945,399,612	14,237,452	2,416,886,426	425,108,144	2,500,636,142	79,848,237	7,975,067,956	1,435,609,790	8,444,763,470						
Price Escalation	3,156,681	919,132,233	159,409,161	937,700,945	256,274	118,427,435	20,388,938	119,934,929	2,900,407	800,704,798	139,020,223	817,766,016						
Physical Contingency	4,862,118	565,554,331	101,006,354	594,155,025	724,686	126,765,693	22,274,854	131,028,552	4,137,432	438,788,638	78,731,500	463,126,473						
Sub total(A)	102,104,488	11,876,640,946	2,121,133,449	12,477,255,582	15,218,412	2,662,079,554	467,771,936	2,751,599,623	86,886,076	9,214,561,392	1,653,361,513	9,725,653,959						
Environmental Consideration	0	164,180,994	27,910,769	164,180,994	0	164,180,994	27,910,769	164,180,994	0	0	0	0						
Price Escalation	0	8,044,869	1,367,628	8,044,871	0	8,044,869	1,367,628	8,044,871	0	0	0	0						
Physical Contingency	0	8,611,293	1,463,920	8,611,294	0	8,611,293	1,463,920	8,611,294	0	0	0	0						
Sub total(B)	0	180,837,156	30,742,317	180,837,159	0	180,837,156	30,742,317	180,837,159	0	0	0	0						
Consulting Service	193,780,000	368,492,647	256,423,750	1,508,375,000	109,932,000	217,572,647	146,919,350	864,231,471	83,848,000	150,920,000	109,504,400	644,143,529						
Price Escalation	5,024,471	25,813,579	9,412,779	55,369,291	1,978,776	10,661,060	3,791,156	22,300,919	3,045,695	15,152,519	5,621,623	33,068,372						
Physical Contingency	9,940,224	19,715,311	13,291,826	78,187,217	5,595,539	11,411,685	7,535,525	44,326,620	4,344,685	8,303,626	5,756,301	33,860,597						
Sub total(C)	208,744,695	414,021,537	279,128,355	1,641,931,508	117,506,315	239,645,392	158,246,031	930,859,010	91,238,380	174,376,145	120,882,324	711,072,498						
Non-Eligible Items																		
Administration Costs	0	18,675,900	3,174,903	18,675,900	0	7,361,100	1,251,387	7,361,100	0	11,314,800	1,923,516	11,314,800						
VAT	0	2,577,366,026	438,152,225	2,577,366,029	0	696,718,240	118,442,101	696,718,241	0	1,880,647,786	319,710,124	1,880,647,788						
Land Acquisition expense	0	0	0	0	0	0	0	0	0	0	0	0						
Price Escalation	0	0	0	0	0	0	0	0	0	0	0	0						
Physical Contingency	0	0	0	0	0	0	0	0	0	0	0	0						
Sub total(D)	0	2,596,041,926	441,327,128	2,596,041,929	0	704,079,340	119,693,488	704,079,341	0	1,891,962,586	321,633,640	1,891,962,588						
Grand Total(A+B+C+D)	310,849,183	15,067,541,565	2,872,331,249	16,896,066,178	132,724,727	3,786,641,442	776,453,772	4,567,375,133	178,124,456	11,280,900,123	2,095,877,477	12,328,691,045						