## **APPENDICES**

### **AP1-1-1 Pilot Project Environmental Screening**

"Environmental Screening" is the first step of the environmental and social consideration study and means of deciding whether the proposed pilot project is likely to have any impacts on the environment.

As the proposed pilot project includes rehabilitation works of existing road without upgrading, the environmental impacts are expected to be of small scale and limited within short term. According to the Article 24 in the environment code of Burundi, any maintenance and rehabilitation works does not require to prepare an EIA study. The result of the screening is shown in the following table. The environmental impacts which will occur in the construction phase are noise, vibration, dust, construction waste and traffic congestion.

Table AP1.1.1, Matrix for Pilot Project Environmental Scope

	Name of Cooperation Project: The Emergency Study on Urban Transport in Bujumbura, Pilot Project (Urgent rehabilitation works)													
					nning nase		C	Construct	ion Phas	se		Operation Phase		
		Likely Impacts	Overall Rating	Land acquisition	Change of land use plan, Control of various activities by regulations for the construction	Reclamation of wetland, etc.	Deforestation	Alteration to ground by cut land, filling, drilling, tunnel, etc.	Operation of construction equipments and vehicles	Construction of roads, tollgates, parking lots, access roads for bridges and other related facilities	Traffic restriction in construction area	Increase of through traffic	Appearance/ Occupancy of toads and related building structures	Increasing influx of settlers
	No 1	Involuntary Resettlement												
nment *	2	Local economy such as employment and livelihood, etc.									В			
Social Environment *	3	Land use and utilization of local resources												
So	4	Social institutions such as social infrastructure and local decision-making institutions												
	5	Existing social infrastructures and services								С				

### APPENDIX 1 SOCIAL AND ENVIRONMENTAL CONSIDERATIONS IN PILOT PROJECT

		m			I	I					
	6	The poor, indigenous and ethnic people									
	7	Misdistribution of benefit and damage									
	8	Cultural heritage									
	9	Local conflict of interests									
	10	Water Usage or Water Rights and Rights of Common									
	11	Sanitation									
	12	Hazards (Risk) Infectious diseases such as HIV/AIDS									
	13	Topography and Geographical features									
nent	14	Soil Erosion									
ironr	15	Groundwater									
Natural Environment	16	Hydrological Situation									
Natı	17	Coastal Zone									
	18	Flora, Fauna and Biodiversity									
	19	Meteorology									
		Landscape									
	21	Global Warming									
	22	Air Pollution						В			
	23	Water Pollution									
ion	24	Soil Contamination									
Pollution	25	Waste						В			
Ъ	26	Noise and Vibration					В	В			
	27	Ground Subsidence									
	28	Offensive Odor						В			
	29	Bottom sediment									
	30	Accidents						В	В	С	

Rating:

- A: Serious impact is expected.
- B: Some impact is expected.
- C: Extent of impact is unknown (Examination is needed. Impacts may become clear as the study progresses.)

No Mark: No impact is expected. IEE/EIA is not necessary.

### Reference:

- 1) Japan International Cooperation Agency (1992) "III Roads: Environmental Guidelines for Infrastructure Projects", Tokyo, Japan.
- 2) Norman Lee and Clive George (2002) "Environmental Assessment in Developing and Transitional Countries", JOHN WILEY & SONS, LTD., London, England.

<sup>\*:</sup> Regarding the impacts on "Gender" and "Children's Right" might be related to all criteria of Social Environment.

### **AP1-1-2** Initial Environmental Examination of Pilot Project

### (1) Project Description

The proposed pilot project is summarized in the following table.

**Table AP1.1.2, Project Description** 

Table AP1.1.2, Project Description						
Item	Description					
Name of	THE EMERGENCY STUDY ON URBAN TRANSPORT IN BUJUMBURA					
Cooperation Project	Pilot Project (Urgent rehabilitation works)					
Project Proponent	Ministry of Transport, Posts and Telecommunications					
	Ministry of Public Works and Equipment, Road Department					
Background	Bujumbura with estimated population of 550,000, the capital city, is the political and economic center of Burundi. However, the basic infrastructures, and road conditions in particular, are extremely poor, and so reconstruction is essential before the living conditions of the people can be improved. Although the demand for transportation in Bujumbura is expected to increase in future due to the increasing economic activity during the rehabilitation period, road volume and the road network are inadequate, and existing structures and traffic control are so poor that traffic congestion in the city center is becoming a major concern.					
Objectives	The implementation of this project will provide an immediate rehabilitation of the collapsed national trunk road 7 to improve the road traffic.					
Location	Musaga Commune, Bujumbura City, Burundi					
	Residential Area					
Beneficiaries Population	Directly: 95,000 or more people					
Topulation	(Living in Rohero and Musaga Commune along the road)					
	Indirectly: 350,000 people (living in Morobe Province)					
Project Components	Overlay works of existing road (National Trunk Road 7)					
Type of Project	Construction / Rehabilitation					
Type of Roads	Highway/ Ordinary, Urban/ Rural Area, Plain/ Mountainous Area					
Target Year/ Traffic Volume	In year 2007, 5,000 cars/ 12 hours					
Extension/ Width/ Lanes	Ext 1.7 km, Width 9.0~9.8 m, No. of Lanes 2					
Road Structure	Bridge					
Supplemental Facilities	Interchanges: 0 points, Toll Gates: 0 points					
Others	The rehabilitation works are limited in the existing right of way and include paving work in bus stops.					

### Reference:

1) Japan International Cooperation Agency (1992) "III Roads: Environmental Guidelines for Infrastructure Projects", Tokyo, Japan.

### (2) Site Condition

The pilot project section of National Trunk Road 7 is located in the southeastern part of Bujumbura and passes through residential areas. The important public facilities along the roadside are an army camp, a school, three public water stations and a bus parking. Water pipe is laid underground along the western roadside.

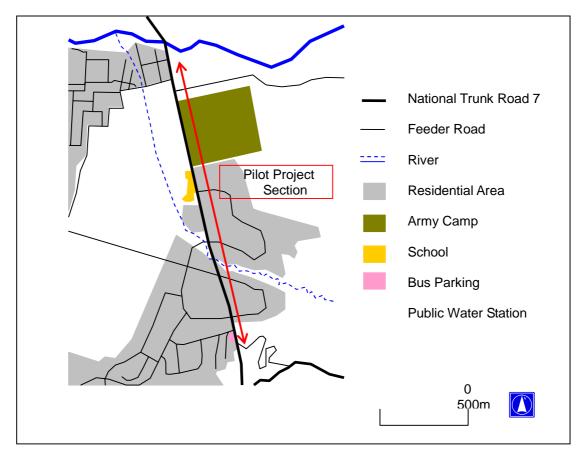


Figure AP1.1.1, Pilot Project Site

### (3) Environmental Impact and Mitigation

### A. Construction Phase

Air Pollution and Offensive Odor:

Convey of construction materials, heavy equipment operation and earthworks will generate harmful dust. Operation of heavy equipment and asphalt plant will generate exhaust gas. These dust and exhaust gas caused by construction works are unavoidable to some degree.

The contractor should keep their construction equipments and asphalt plant in proper condition to avoid the imperfect combustion. If the residents and pedestrians complain about the dust, the preventive measures such as water spraying to reduce the dust should be carried.

Noise and Vibration:

Heavy equipment operation and asphalt plant will generate noise and vibration. However, these noise and vibration caused by construction works is unavoidable to some degree.

To mitigate the nuisance by noise and vibration, the construction planning Consultant should consider the proper execution scheme. Because the pilot project site is located in residential areas, night time construction works should be avoided. The Contractor should keep their construction equipments and asphalt plant in proper condition. If the residents complain about noise and vibration, the Supervision Engineers and the Contractors should reconsider the construction method.

Waste:

The overlay works of the existing paved road will be conducted after tearing up of the old pavement. The torn up pavement will basically be reused as the road bed material. However, some part of old pavement may become the construction waste depending on the construction condition. Other construction waste such as fragments of construction materials and garbage from construction workers will be generated.

The contractor should consider proper disposal plan and manage the construction wastes. The Consultants' supervision team should monitor the waste disposal.

Existing Infrastructures and Facilities:

The Consultants' supervision team and the Contractor should study carefully the buried facilities such as water pipe to avoid the accidental destructions.

### Accident and Traffic Conjunction:

As traffic restrictions will be required in the construction site, temporary traffic conjunction will occur during the construction period. Accidents may be provoked by the traffic restriction. The pavement works in the bus parking area, where many buses and passengers are utilizing, will disturb the service.

To mitigate the traffic conjunction and disturbance, the construction planning Consultant should consider the proper execution scheme and the Contractor should install the sign that explains the construction components and period at the bus parking area well in advance of the construction works. If the drivers or passengers complain about the traffic conjunction and disturbance, the Supervising Engineers and the Contractors should reconsider the construction method.

### B. Operation Phase

Accident and Non-Motorized Transport:

The road accident will be reduced with the improved road condition. On the other hand, as the traffic speed is expected to increase, the accidents may increase.

There are many pedestrians passing through the pilot project section. The traffic volumes are: vehicles about 5,000/12hours, pedestrians about 7,000/12hours, and bicycles about 2,000/12hours, respectively. The road design Consultant should consider the movement of non-motorized transports and incorporate the considerations into the design.

### (4) Environmental Management Plan

### **Construction Materials:**

To prevent illegal exploitation of construction materials such as soil, gravel, etc., a sentence that the construction materials must be procured officially should be added in the conditions of the Contract to be signed by the Contractor. The Consultants' supervising team should monitor the procurement.

### Construction Waste:

To prevent illegal dumping of construction wastes, the conditions of the Contract to be signed by the Contractor should be added with a sentence that the construction wastes must be disposed officially. The Consultants' supervision team should monitor the waste disposal.

### **Environmental Monitoring:**

To immediately identify the environmental and social issues, the Consultants' supervision team should monitor the following items throughout the construction period.

- Noise, vibration, dust, odor and exhaust gas caused by operation of heavy equipments and asphalt plant
- Traffic congestion and accident
- Opinions and complaints from the drivers, residents, pedestrians and passengers.

### A-1-2 Public Consultation on Pilot Project

The public consultation on the emergency work as pilot project was held at the Ministry of Finance on 19th June, 2007. Attended organizations were as follows:

- Ministry of Transport, Posts and Telecommunications
- Ministry of Public Works and Equipment
- OTRACO
- Administrative Office of Musaga Commune
- The 2nd Battalion (Camp Muha)
- Musaga Parking Lot Office
- Office of Gitaramuka Quarter
- Office of Kinanira I Quarter
- Office of Kinanira II Quarter
- Office of Kamesa Quarter
- Local Council of Musaga
- Committee of Parents of Musaga I School

### Contents of discussions:

JICA study team made the following presentation:

- 1. Explanation of Outline of the Project
  - Project Section
  - Anticipated Project Period
  - Design Policy
  - Design Contents
  - Civil Work Sequence
- 2. Facilities for consideration to local people
  - Number and Installation Point of Road Humps
  - Installation Point and Length of Caps on Side Ditch
- 3. Undertakings by Burundian Side

- Arrangement of Temporary Removal of Shops and Container in the Right of Way
- Clarify Boundary between Official and Private Land in Bus Bay Area

Main opinions and questions from participants were as follows:

- Regarding traffic safety, besides installation of safety facilities, regulations of traffic safety are important.
- -Regarding road safety in Bujumbura, separation of traffic lanes among vehicles, bicycles and pedestrians is important.
- Thirteen accidents occurred in last year near Musaga I School where 2,500 students commute. The humps and pedestrian crosswalks are expects to reduce traffic accidents.
- The administrative office will hold a meeting with the local people on this project and order the owners of the illegal shops and container in the right of way to remove them in advance of the commencement of construction works.
- District office will enlighten this project to the local people to get their cooperation in the construction works.
- The cooperation of Japanese side to the minimal requests from the local residence in the construction period is expected for the success of this project.
- Q1: How to decide on the construction company, by tender? A1: By JICA's system including tender.
- Q2: Are signs, street lamps and bus shelters included in this project? A2: These facilities are not included in this project.
- Q3: How were the three installation points of side ditch caps selected? There were four official bus stops along the section in the past. A3: According to site survey, the points where many buses are stopping were selected.
- Q4: Is bridge rehabilitation included in this project? A4: Bank protection works to one river and one channel are included in this project.

### AP1-2 ENVIRONMENTAL SCOPE OF EACH PROJECT

### **AP1-2-1 Road Improvement Plan**

### (1) Development of North-South Axis

### Table AP1.2.1, Result of Environmental Scope

	Project Γ	Description					
Location: Rohero, Kinindo, M		-					
Project Type: Upgrade construction including addition of new lanes							
Length: 7.0 km Road Structure: Including two bridges Remark: -							
Zengun //o iun 110ue su	Assess						
Environmental Item 1)	Construction	Operation	Remarks				
· ·	Phase	Phase					
1. Air pollution	В	B or C	Pollution by exhaust gas from construction machines and increased vehicles.				
2. Water pollution	В	D	Pollution of river and lake water by turbid water and spilling oil in construction phase.				
3. Soil pollution	D	D	Little impacts on soil.				
4. Waste	В	D	Generation of construction waste, surplus soil and other waste in construction phase.				
5. Noise and vibration	В	C or D	Generation of noise and vibration from construction machines and increased vehicle.				
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.				
7. Offensive odors	В	D	Generation of exhaust gas and bad smell substance from construction machines.				
8. Geographical features	D	D	No impacts on geographical features.				
9. Bottom sediment	D	D	No impacts on bottom sediment.				
10. Biota and ecosystem	C or D	D	Impacts on roadside trees.				
11. Water usage	D	D	No impacts on water usage.				
12. Accident	В	С	Increase of possibility of traffic accident by construction works and speeded vehicles.				
13. Global warming	D	С	Potential increase of greenhouse gas by increased vehicles.				
14. Involuntary resettlement	В	D	Resettlement for occupation of right of way.				
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.				
16. Land use and utilization of local resources	A or B	D	Loss of own land and facilities for occupation of right of way.				
17. Social institutions such as social infrastructure and local decision-making institutions	D	D	Little impacts on social institution.				
18. Existing social infrastructures and services	В	D	Moving of existing water pipe, electric cable, or telephone line in construction phase.				
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.				
20. Misdistribution of benefit and damage	D	С	Impacts of change of commercial zone.				
21. Local conflict of interests	D	С	Conflict on future land use in road side during operation phase.				
22. Gender	D	D	No impacts on gender.				
23. Children's rights	D	D	No impacts on children's rights.				
24. Cultural heritage	D	D	No impacts on cultural heritage.				
25. Infectious diseases such as HIV/AIDS etc.	С	D	Spread of HIV/AIDS by construction worker				

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. D: No impact is expected.

### APPENDIX 1 SOCIAL AND ENVIRONMENTAL CONSIDERATIONS IN PILOT PROJECT

### (2) Development of Ring Road

### Table AP1.2.2, Result of Environmental Scope

**Project Description** 

Location: Ngagara, Gihosha, Buyenzi, Bwiza, Rohero

Project Type: Upgrade construction including addition of new lanes

Length: Total 9.3 km Road Structure: Including one bridge Remark: Consisting of 3 road projects

5			0 1 0
	Assess	sment	
Environmental Item 1)	Construction	Operation	Remarks
	Phase	Phase	
1. Air pollution	В	B or C	Pollution by exhaust gas from construction machines and increased vehicles.
2. Water pollution	В	D	Pollution of river and lake water by turbid water and spilling oil in construction phase.
3. Soil pollution	D	D	Little impacts on soil.
4. Waste	В	D	Generation of construction waste, surplus soil and other waste in construction phase.
5. Noise and vibration	В	C or D	Generation of noise and vibration from construction machines and increased vehicle.
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.
7. Offensive odors	В	D	Generation of exhaust gas and bad smell substance from construction machines.
8. Geographical features	D	D	No impacts on geographical features.
9. Bottom sediment	D	D	No impacts on bottom sediment.
10. Biota and ecosystem	C or D	D	Impacts on roadside trees.
11. Water usage	D	D	No impacts on water usage.
12. Accident	В	С	Increase of possibility of traffic accident by construction works and speeded vehicles.
13. Global warming	D	С	Potential increase of greenhouse gas by increased vehicles.
14. Involuntary resettlement	В	D	Resettlement for occupation of right of way.
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.
16. Land use and utilization of local resources	В	D	Loss of own land and facilities for occupation of right of way.
Social institutions such as social infrastructure and local decision-making institutions	D	D	Little impacts on social institution.
18. Existing social infrastructures and services	В	D	Moving of existing water pipe, electric cable, or telephone line in construction phase.
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.
20. Misdistribution of benefit and damage	D	С	Impacts of change of commercial zone.
21. Local conflict of interests	D	С	Conflict on future land use in road side during operation phase.
22. Gender	D	D	No impacts on gender.
23. Children's rights	D	D	No impacts on children's rights.
23. Children's rights 24. Cultural heritage	D D	D D	No impacts on children's rights.  No impacts on cultural heritage.

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. D: No impact is expected.

### (3) Forming Road Network

### Table AP1.2.3, Result of Environmental Scope

**Project Description** 

Location: Ngagara, Buyenzi, Gihosha, Nyakabiga, Rohero, Musaga Project Type: New road construction Length: 0.5km, 0.3km, 0.6km

Road Structure: Including three bridge	_	III. U.SKIII,	g of 3 road projects in different sites
Road Structure. Including three bridge			or 3 road projects in different sites
Environmental Item 1)	Assess Construction Phase	Operation Phase	Remarks
1. Air pollution	В	D	Pollution by exhaust gas and dust from construction machines and works.
2. Water pollution	В	D	Pollution of river and lake water by turbid water and spilling oil in construction phase.
3. Soil pollution	D	D	Little impacts on soil.
4. Waste	В	D	Generation of construction waste, surplus soil and other waste in construction phase.
5. Noise and vibration	В	D	Generation of noise and vibration from construction machines.
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.
7. Offensive odors	В	D	Generation of exhaust gas and bad smell substance from construction machines.
8. Geographical features	D	D	No impacts on geographical features.
9. Bottom sediment	D	D	No impacts on bottom sediment.
10. Biota and ecosystem	D	D	Little impacts on biota and ecosystem.
11. Water usage	D	D	No impacts on water usage.
12. Accident	В	С	Increase of possibility of traffic accident by construction works and increased vehicles.
13. Global warming	D	D	Little impacts on global warming.
14. Involuntary resettlement	В	D	Resettlement for occupation of right of way.
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.
16. Land use and utilization of local resources	В	D	Loss of own land and facilities for occupation of right of way.
Social institutions such as social infrastructure and local decision-making institutions	D	D	Little impacts on social institution.
18. Existing social infrastructures and services	С	D	Impact of existing water pipe, electric cable, or telephone line in construction phase.
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.
20. Misdistribution of benefit and damage	D	С	Impacts of change of access to public transportation.
21. Local conflict of interests	D	С	Conflict on future land use in road side during operation phase.
22. Gender	D	D	No impacts on gender.
23. Children's rights	D	D	No impacts on children's rights.
24. Cultural heritage	D	D	No impacts on cultural heritage.
25. Infectious diseases such as HIV/AIDS etc.	С	D	Spread of HIV/AIDS by construction worker

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. D: No impact is expected.

### (4) Development of City Plan Roads in Northern Area

### Table AP1.2.4, Result of Environmental Scoping

**Project Description** Location: Buterere, Kinama, Ngagara, Cibitoke, Kamenge, Gihosha

Project Type: New road and upgrade construction Length: Total 19.9 km

Road Structure: Including one bridge	]	Remark: Consisting of 8 road projects	
Assessment			
Environmental Item 1)	Construction Phase	Operation Phase	Remarks
1. Air pollution	В	D	Pollution by exhaust gas and dust from construction machines and works.
2. Water pollution	В	D	Pollution of river and lake water by turbid water and spilling oil in construction phase.
3. Soil pollution	D	D	Little impacts on soil.
4. Waste	В	D	Generation of construction waste, surplus soil and other waste in construction phase.
5. Noise and vibration	В	D	Generation of noise and vibration from construction machines.
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.
7. Offensive odors	В	D	Generation of exhaust gas and bad smell substance from construction machines.
8. Geographical features	D	D	No impacts on geographical features.
9. Bottom sediment	D	D	No impacts on bottom sediment.
10. Biota and ecosystem	D	D	Little impacts on biota and ecosystem.
11. Water usage	D	D	No impacts on water usage.
12. Accident	С	С	Increase of possibility of traffic accident by construction works and speeded vehicles.
13. Global warming	D	D	Little impacts on global warming.
14. Involuntary resettlement	В	D	Resettlement for occupation of right of way.
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.
16. Land use and utilization of local resources	В	D	Loss of agricultural land and own facilities for occupation of right of way.
Social institutions such as social infrastructure and local decision-making institutions	D	D	Little impacts on social institution.
18. Existing social infrastructures and services	С	D	Impact of existing water pipe, electric cable, or telephone line in construction phase.
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.
20. Misdistribution of benefit and damage	D	В	Impacts of change of commercial zone and access to public transportation.
21. Local conflict of interests	D	С	Conflict on future land use in road side during operation phase.
22. Gender	D	D	No impacts on gender.
23. Children's rights	D	D	No impacts on children's rights.
24. Cultural heritage	D	D	No impacts on cultural heritage.
25. Infectious diseases such as HIV/AIDS etc.	С	D	Spread of HIV/AIDS by construction worker

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. D: No impact is expected.

### (5) Development of City Plan Roads in Southern Area

### Table AP1.2.5, Result of Environmental Scope

**Project Description** 

Location: Kinindo, Musaga, Kanyosha

Project Type: New road and upgrade construction Length: Total 27 km

Road Structure: Including four bridges			ark: Consisting of 12 road projects		
Assessment					
Environmental Item 1)	Construction Phase	Operation Phase	Remarks		
1. Air pollution	В	D	Pollution by exhaust gas and dust from construction machines and works.		
2. Water pollution	В	D	Pollution of river and lake water by turbid water and spilling oil in construction phase.		
3. Soil pollution	D	D	Little impacts on soil.		
4. Waste	В	D	Generation of construction waste, surplus soil and other waste in construction phase.		
5. Noise and vibration	В	D	Generation of noise and vibration from construction machines.		
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.		
7. Offensive odors	В	D	Generation of exhaust gas and bad smell substance from construction machines.		
8. Geographical features	D	D	No impacts on geographical features.		
9. Bottom sediment	D	D	No impacts on bottom sediment.		
10. Biota and ecosystem	C or D	C or D	Loss of grove and impacts on lakeside ecosystem.		
11. Water usage	D	D	No impacts on water usage.		
12. Accident	С	С	Increase of possibility of traffic accident by construction works and speeded vehicles.		
13. Global warming	D	D	Little impacts on global warming.		
14. Involuntary resettlement	В	D	Resettlement for occupation of right of way.		
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.		
16. Land use and utilization of local resources	В	D	Loss of agricultural land and own facilities for occupation of right of way.		
17. Social institutions such as social infrastructure and local decision-making institutions	D	D	Little impacts on social institution.		
18. Existing social infrastructures and services	С	D	Impact of existing water pipe, electric cable, or telephone line in construction phase.		
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.		
20. Misdistribution of benefit and damage	D	В	Impacts of change of commercial zone and access to public transportation.		
21. Local conflict of interests	D	С	Conflict on future land use in road side during operation phase.		
22. Gender	D	D	No impacts on gender.		
23. Children's rights	D	D	No impacts on children's rights.		
24. Cultural heritage	D	D	No impacts on cultural heritage.		
25. Infectious diseases such as HIV/AIDS etc.	С	D	Spread of HIV/AIDS by construction worker		

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown.

D: No impact is expected.

### (6) Stone Pavement Project to Improve Living Environment

### Table AP1.2.6, Result of Environmental Scope

Project Description								
Location: All of city Project Ty	Location: All of city Project Type: Stone pavement Length: Total 101.4 km							
Road Structure: - Remark: -								
	Assess	ment						
Environmental Item 1)	Construction	Operation	Remarks					
	Phase	Phase						
1. Air pollution	В	D	Dust from construction works.					
2. Water pollution	D	D	No impacts on water pollution.					
3. Soil pollution	D	D	Little impacts on soil.					
4. Waste	В	D	Generation of construction waste in construction phase.					
5. Noise and vibration	D	C or D	Generation of noise and vibration from increased vehicle.					
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.					
7. Offensive odors	D	D	No impacts on odors.					
8. Geographical features	D	D	No impacts on geographical features.					
9. Bottom sediment	D	D	No impacts on bottom sediment.					
10. Biota and ecosystem	D	D	Little impacts on biota and ecosystem.					
11. Water usage	D	D	No impacts on water usage.					
12. Accident	С	С	Increase of possibility of traffic accident by construction works and increased vehicles.					
13. Global warming	D	D	Little impacts on global warming.					
14. Involuntary resettlement	D	D	No impacts on resettlement.					
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.					
16. Land use and utilization of local resources	D	D	No impacts on land use.					
17. Social institutions such as social infrastructure and local decision-making institutions	D	D	Little impacts on social institution.					
18. Existing social infrastructures and services	D	D	No impacts on infrastructures.					
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.					
20. Misdistribution of benefit and damage	D	В	Uneven distribution of improved road condition.					
21. Local conflict of interests	D	D	No impacts on local conflict.					
22. Gender	D	D	No impacts on gender.					
23. Children's rights	D	D	No impacts on children's rights.					
24. Cultural heritage	D	D	No impacts on cultural heritage.					
25. Infectious diseases such as HIV/AIDS etc.	D	D	No impacts on infectious disperses.					

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown.

D: No impact is expected.

### (7) Intersection Improvement

### Table AP1.2.7, Result of Environmental Scope

**Project Description** 

Location: Ngagara, Buyenzi, Bwiza, Rohero

Project Type: Intersections improvement and traffic restriction Length: -Road Structure: -Remark: Consisting of 4 intersection off-set projects and signal phasing in one intersection

Remark: Consisting of 4 inters	section off-set	projects and	signal phasing in one intersection
	Assess	ment	
Environmental Item 1)	Construction Phase	Operation Phase	Remarks
1. Air pollution	В	D	Pollution by exhaust gas and dust from construction machines and works.
2. Water pollution	D	D	No impacts on water pollution.
3. Soil pollution	D	D	No impacts on soil.
4. Waste	В	D	Generation of construction waste in construction phase.
5. Noise and vibration	В	D	Generation of noise and vibration from construction machines.
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.
7. Offensive odors	D	D	No impacts on odors.
8. Geographical features	D	D	No impacts on geographical features.
9. Bottom sediment	D	D	No impacts on bottom sediment.
10. Biota and ecosystem	D	D	No impacts on biota and ecosystem.
11. Water usage	D	D	No impacts on water usage.
12. Accident	С	B or C	Increase of possibility of traffic accident by construction works and improved traffic system.
13. Global warming	D	D	Little impacts on global warming.
14. Involuntary resettlement	D	D	No impacts on resettlement.
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.
16. Land use and utilization of local resources	D	D	No impacts on land use.
17. Social institutions such as social infrastructure and local decision-making institutions	D	D	No impacts on social institution.
18. Existing social infrastructures and services	D	D	No impacts on infrastructures.
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.
20. Misdistribution of benefit and damage	D	D	No impacts on misdistribution.
21. Local conflict of interests	D	D	No impacts on local conflict.
22. Gender	D	D	No impacts on gender.
23. Children's rights	D	D	No impacts on children's rights.
24. Cultural heritage	D	D	No impacts on cultural heritage.
25. Infectious diseases such as HIV/AIDS etc.	D	D	No impacts on infectious disperses.
TD vi A C · · · · · · · · · · ·	D. C.	<u> </u>	I C E + + C' + + 1

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. D: No impact is expected.

### (8) Traffic Flow Control

### Table AP1.2.8, Result of Environmental Scope

**Project Description** 

Location: Kinama, Cibitoke, Ngagara, Gihosha, Buyenzi, Bwiza, Rohero, Kinindo, Musaga

Project Type: Signalization and traffic restriction Length: - Road Structure: -

Remark: Consisting of signalization in 36 intersections and one-way traffic restrictions in city center

	Assessment		
Environmental Item 1)	Constructio	Operation	Remarks
	Phase	Phase	
1. Air pollution	D	D	No impacts on air pollution.
2. Water pollution	D	D	No impacts on water pollution.
3. Soil pollution	D	D	No impacts on soil.
4. Waste	В	D	Generation of construction waste in construction phase.
5. Noise and vibration	D	D	No impacts on noise and vibration.
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.
7. Offensive odors	D	D	No impacts on odors.
8. Geographical features	D	D	No impacts on geographical features.
9. Bottom sediment	D	D	No impacts on bottom sediment.
10. Biota and ecosystem	В	D	Impacts on roadside trees.
11. Water usage	D	D	No impacts on water usage.
12. Accident	D	B or C	Increase of possibility of traffic accident by improved traffic system.
13. Global warming	D	D	No impacts on global warming.
14. Involuntary resettlement	D	D	No impacts on resettlement.
15. Local economy such as employment and livelihood etc.	D	D	No impacts on local economy.
16. Land use and utilization of local resources	D	D	No impacts on land use.
17. Social institutions such as social infrastructure and local decision-making institutions	D	D	No impacts on social institution.
18. Existing social infrastructures and services	D	D	No impacts on infrastructures.
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.
20. Misdistribution of benefit and damage	D	D	No impacts on misdistribution.
21. Local conflict of interests	D	D	No impacts on local conflict.
22. Gender	D	D	No impacts on gender.
23. Children's rights	D	D	No impacts on children's rights.
24. Cultural heritage	D	D	No impacts on cultural heritage.
25. Infectious diseases such as HIV/AIDS etc.	D	D	No impacts on infectious disperses.

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. D: No impact is expected.

### A-2-1 Public Transport Plan

### (1) Bus Network Improvement Plan

### Table AP1.2.9, Result of Environmental Scope

**Project Description** 

All of city Location:

Project Type: Improvement of exiting bus route

Remark: Consisting of extension of bus network and strengthening of capacity in North-South Axis

	Assess	ment		
Environmental Item 1)	Construction Phase	Operation Phase	Remarks	
1. Air pollution	-	D	Little impacts on air pollution.	
2. Water pollution	-	D	No impacts on water pollution.	
3. Soil pollution	-	D	No impacts on soil.	
4. Waste	-	D	No impacts on waste.	
5. Noise and vibration	-	D	Little impacts on noise and vibration.	
6. Ground subsidence and soil erosion	-	D	No impacts on subsidence and erosion.	
7. Offensive odors	-	D	No impacts on odors.	
8. Geographical features	-	D	No impacts on geographical features.	
9. Bottom sediment	-	D	No impacts on bottom sediment.	
10. Biota and ecosystem	-	D	No impacts on biota and ecosystem.	
11. Water usage	-	D	No impacts on water usage.	
12. Accident	-	B or C	Increase of possibility of traffic accident by improved bus network system.	
13. Global warming	-	D	Little impacts on global warming.	
14. Involuntary resettlement	-	D	No impacts on resettlement.	
15. Local economy such as employment and livelihood etc.	-	B or C	Decrease of opportunity for employment as private transporter.	
16. Land use and utilization of local resources	-	D	No impacts on land use.	
17. Social institutions such as social infrastructure and local decision-making institutions	-	D	No impacts on social institution.	
18. Existing social infrastructures and services	-	D	No impacts on infrastructures.	
19. The poor, indigenous of ethnic people	-	D	No impacts on ethnic people.	
20. Misdistribution of benefit and damage	-	В	Uneven distribution of benefit and damage between OTORACO and private transporters.	
21. Local conflict of interests	-	В	Conflict on bus route between OTORACO and private transporters.	
22. Gender	-	D	No impacts on gender.	
23. Children's rights	-	D	No impacts on children's rights.	
24. Cultural heritage	-	D	No impacts on cultural heritage.	
25. Infectious diseases such as HIV/AIDS etc.	-	D	No impacts on infectious disperses.	

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown.

D: No impact is expected.

### (2) Bus Terminal development Plan

### Table AP1.2.10, Result of Environmental Scope

**Project Description** 

Location: Kinama, Rohero, Kanyosha Project Type: Construction of bus terminal.

Remark: Consisting of a bus centre construction and two bus terminal constructions.

Remark: Consisting of a bus c	Assess		bus terminal constructions.	
Environmental Item 1)	Construction	Operation	Remarks	
Environmental tem 1)	Phase	Phase	Kemarks	
1. Air pollution	В	B or C	Pollution by exhaust gas from construction machines and increased bus near new bus terminals.	
2. Water pollution	В	D	Pollution of river and lake water by turbid water and spilling oil in construction phase.	
3. Soil pollution	D	D	Little impacts on soil.	
4. Waste	В	D	Generation of construction waste, surplus soil and other waste in construction phase.	
5. Noise and vibration	В	C or D	Generation of noise and vibration from construction machines and increased bus.	
6. Ground subsidence and soil erosion	D	D	No impacts on subsidence and erosion.	
7. Offensive odors	В	D	Generation of exhaust gas and bad smell substance from construction machines.	
8. Geographical features	D	D	No impacts on geographical features.	
9. Bottom sediment	D	D	No impacts on bottom sediment.	
10. Biota and ecosystem	C or D	D	Impacts on trees in construction site.	
11. Water usage	D	D	No impacts on water usage.	
12. Accident	В	B or C	Increase of possibility of traffic accident near new bus terminals.	
13. Global warming	D	D	Little impacts on global warming.	
14. Involuntary resettlement	C or D	D	Little impacts on resettlement.	
15. Local economy such as employment and livelihood etc.	В	D	Increase of opportunity for employment as construction worker.	
16. Land use and utilization of local resources	A or B	D	Loss of sports stadium and own land for occupation of bus terminals.	
17. Social institutions such as social infrastructure and local decision-making institutions	D	D	Little impacts on social institution.	
18. Existing social infrastructures and services	В	D	Moving of existing water pipe, electric cable or telephone line in construction phase.	
19. The poor, indigenous of ethnic people	D	D	No impacts on ethnic people.	
20. Misdistribution of benefit and damage	D	В	Impacts of change of commercial zone.	
21. Local conflict of interests	D	С	Conflict on future land use near new bus terminals during operation phase.	
22. Gender	D	D	No impacts on gender.	
23. Children's rights	D	D	No impacts on children's rights.	
24. Cultural heritage	D	D	No impacts on cultural heritage.	
25. Infectious diseases such as HIV/AIDS etc.	С	D	Spread of HIV/AIDS by construction worker	
D. ' A.C. ' ' ' 1	D.C.	·	1004 (61 )	

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown.

D: No impact is expected.

### (3) Other Public Transport Plan

### Table AP1.2.11, Result of Environmental Scope

**Project Description** 

Location: All of city

Project Type: Public transport management except for bus

Remark: Control and restriction of taxi, bike taxi and bicycle taxi

Remark. Control and restricted	Assess		
Environmental Item 1)	Construction Phase	Operation Phase	Remarks
1. Air pollution	-	D	Little impacts on air pollution.
2. Water pollution	-	D	No impacts on water pollution.
3. Soil pollution	-	D	No impacts on soil.
4. Waste	-	D	No impacts on waste.
5. Noise and vibration	-	D	Little impacts on noise and vibration.
6. Ground subsidence and soil erosion	-	D	No impacts on subsidence and erosion.
7. Offensive odors	-	D	No impacts on odors.
8. Geographical features	-	D	No impacts on geographical features.
9. Bottom sediment	-	D	No impacts on bottom sediment.
10. Biota and ecosystem	-	D	No impacts on biota and ecosystem.
11. Water usage	-	D	No impacts on water usage.
12. Accident	-	B or C	Increase of possibility of traffic accident by improved transport system.
13. Global warming	-	D	Little impacts on global warming.
14. Involuntary resettlement	-	D	No impacts on resettlement.
15. Local economy such as employment and livelihood etc.	-	A or B	Decrease of opportunity for employment as taxi transporters.
16. Land use and utilization of local resources	-	D	No impacts on land use.
17. Social institutions such as social infrastructure and local decision-making institutions	-	D	No impacts on social institution.
18. Existing social infrastructures and services	-	D	No impacts on infrastructures.
19. The poor, indigenous of ethnic people	-	D	No impacts on ethnic people.
20. Misdistribution of benefit and damage	-	В	Uneven distribution of benefit and damage between bus and taxi transporters.
21. Local conflict of interests	-	В	Conflict on route for passenger transport between bus and taxi transporters.
22. Gender	-	D	No impacts on gender.
23. Children's rights	-	D	No impacts on children's rights.
24. Cultural heritage	-	D	No impacts on cultural heritage.
25. Infectious diseases such as HIV/AIDS etc.	-	D	No impacts on infectious disperses.
D ', Y G , , ', ' 1	D.C.		1 C E + + C' + + 1

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown.

D: No impact is expected.

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C 47         98478         B NZU I I IPRGERY 7100305         2000         40           C 50         98478         B NZU I I I I R GERY 7 100305         2000         40           C 50         98478         B NZU I I I I R GERY 7 100305         2000         40           C 51         98483         B NZU I I I I R GERY 7 100500         200         40           C 52         98485         B NZU I I I I I I I I I I I I I I I I I I I	C. 4.7         R8475         SLUZU         INPRGEDY         7700205         2000         40           C. 53         982483         SLUZU         MPRGEDY         7700206         200         40           C. 50         982483         SLUZU         MPRGEDY         7700209         200         40           C. 52         982483         SLUZU         MPRGEDY         7700209         200         40           C. 53         982485         SLUZU         MPRGEDY         7700209         200         40           C. 53         982485         SLUZU         MPRGEDY         7700209         200         40         1         SCREADER         A11         98250         SUZU         MPRGEDY         7700309         200         40         1         SCREADER         A11         98250         SUZU         MPRGEDY         7700309         200         40         4         SCREADER         A11         111         A11         98250         SUZU         MPRGEDY         7700309         200         40         4         SCREADER         B2         SUZU         MPRGEDY         7700309         200         40         4         SCREADER         B2         SUZU         MPRGEDY         7700000         <	742 1000 1000 1000 1000 1000 1000 1000 10	_	N PR67PY	7100303	2000	40										
C 50         96450         SLZÚ         N PRGÉPY         7100306         200         40           C 50         96450         SLZÚ         N PRGÉPY         7100306         2002         40           C 50         96450         SLZÚ         N PRGÉPY         7100309         2002         40           C 52         96450         SLZÚ         N PRGÉPY         7100060         2002         40           C 52         96450         SLZÚ         N PRGÉPY         7100060         2002         40           C 53         96450         SLZÚ         N PRGÉPY         7100060         2002         40         1         5 crapaced         A 1         98205         ISUZU         N PRGÉPY         7100060         100         2         5 crapaced         A 1         98205         ISUZU         N PRGÉPY         7100060         100         2         5 crapaced         A 1         98205         ISUZU         N PRGÉPY         7100010         2         5 crapaced         A 1         98205         ISUZU         N PRGÉPY         7100010         3         5 crapaced         A 1         98205         ISUZU         N PRGÉPY         7100006         1882         98206         1882         98206         1882	C 48         98477         BUZU INPRGEPY         7100306         200         40           C 53         98489         BUZU INPRGEPY         7100302         40         INC COND.         40         Real Inc.         Inc.         Character         A 58         BUZU INPRGEPY         7100301         2002         40         INC Cond.         A 58         BUZU INPRGEPY         7100302         40         INC Cond.         B 50	84 , 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+	NDDBRDY	7100305	2000	40										
± 8489         SUZU         MV-118         200034         2002         ± 40           € 52         98485         SUZU         N PRGEPY         71005691         2002         40           € 53         98486         SUZU         N PRGEPY         71005601         2002         40           € 53         98486         SUZU         N PRGEPY         71000601         2002         40           € 53         98486         SUZU         N PRGEPY         71000601         2002         40           € 54         SARS         SUZU         N PRGEPY         71000601         2002         40           € 54         SARS         SUZU         N PRGEPY         71000902         40         1         Scrapped         A-15         98250         SUZU         C R.R. & SO         1435568         1884           € 55         SESCI         SUZU         N PRGEPY         7100090         2003         40         4         Scrapped         B-2         98258         SUZU         N RREP         7100000         1         Scrapped         B-2         98258         SUZU         N RREP         7100000         1         Scrapped         B-2         98258         SUZU         N RREP         71000	6.52         BLAZU         MV-118         200.034         2002         40           C. 52         98458         ISUZU         MV-118         200.034         202         40           C. 52         98458         ISUZU         N REGREY         7100590         200         40           C. 52         98458         ISUZU         N REGREY         7100601         200         40         IN Conction         Busing         MRANGE         Model         Chas. No.         1884           C. 53         98458         ISUZU         IN PREGRY         7100703         200         40         1 Scrapped         A11         98205         ISUZU         CHR-630         1484         1884           C. 5         98458         ISUZU         MV-123         13000156         2003         40         4 Scrapped         A11         98206         ISUZU         CHR-630         14000         1 Scrapped         B2         98206         ISUZU         MRA-123         1700397         100         2 Scrapped         B2         98206         ISUZU         MRA-120         100         2 Scrapped         B2         98206         ISUZU         MRA-120         1000000         18         98206         ISUZU         MRA-120	0.50		N PR66PY	7100306	2000	40										
C 50         96483         BUZU N PRGEPY         7100599         2002         40           C 52         96485         BUZU N PRGEPY         7100601         2002         40         I Scranced         A 15         98188         ISUZU N PRGEPY         7100601         2002         40         I Scranced         A 15         98188         ISUZU N PRGEPY         7100602         2002         40         I Scranced         A 11         98205         ISUZU N PRGEPY         7100702         2002         40         I Scranced         A 11         98205         ISUZU N PRGEPY         7100702         2003         100         2 Scranced         A 11         98205         ISUZU N PRGEPY         7100702         2003         100         2 Scranced         A 11         98205         ISUZU N PRGEPY         7100703         2003         40         5 Scranced         A 11         98205         ISUZU N PRGEPY         7100703         100         5 Scranced         A 11         98205         ISUZU N PRGEPY         7100401         100         5 Scranced         A 11         98205         ISUZU N PRGEPY         7100401         100         2 Scranced         B 21         98205         ISUZU N PRGEPY         7100401         100         2 Scranced         B 21         98205         ISUZU N	C 50         96483         B LZU NPRGEPY         T100599         2002         40           C 53         96486         B LZU NPRGEPY         T100601         2002         40         In Condition Bus No         Rear No Manufac         Model         Chas No         1784           C 53         96486         B LZU NPRGEPY         T100601         2002         40         1         Scrabed         ASS         1884         1812         Char As         145568         1884           C 53         96486         B LZU NATA         NATA         13000152         2003         40         2         Scrabed         ASS         1812         Char As         145566         1884           C 56         96486         B LZU NATA         NATA         13000152         2003         40         3         Scrabed         BS         1812         MT12LL         3000056         1889           C 56         96501         B LZU NATA         MT12L         30000152         2003         40         5         Scrabed         BS         98296         SUZU NTREGEPY         7100001         1889           C 56         96502         B LZU NATA         MT12LL         300001         11         Scrabed         BS         9829	0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55	1121131	MV-118	3000034	2002	100										
C 62         96485         BUZU NPRGEPY         7100601         2002         40         No. Condition Bus No. Manufac.         Model         Chas. No. Year           C 55         96485         BUZU NPRGEPY         7100602         40         1         Scapped         A.15         98189         ISUZU CHR.680         1435563         1984           -         96488         BUZU NPRGEPY         7100702         40         1         Scapped         A.15         98205         ISUZU CHR.680         1435563         1984           -         96498         ISUZU NPRGEPY         71007025         2003         100         2         Scrapped         A.19         98205         ISUZU CHR.680         1435563         1984           -         96499         ISUZU NPRGEPY         7100395         2003         40         5         Scrapped         A.19         98205         ISUZU NPRGEPY         7100395         2003         40         5         Scrapped         B.2         98208         ISUZU NPRGEPY         7100309         2003         40         5         Scrapped         B.2         98208         ISUZU NPRGEPY         7100307         1989           -         98507         ISUZU NPRGEPY         7100402         2003	C 52         96485         SUZU NPR66PY         7100501         2002         40         No. Condition Bus No.         Real No. Manufac.         Indeel         Chas. No. Year           C 55         96486         SUZU NPR66PY         7100501         2002         40         Incompleted         A.1         98.1020         CHR.480         15.000         198.4           -         96493         SUZU NPR66PY         7100703         2003         10         2         Scrapped         A.1         98.205         18.02         CHR.480         19.0006         198.4           -         96493         SUZU NPR66PY         7100393         2003         40         5         Scrapped         A.1         98.205         18.02         CHR.480         19.0006         198.4           -         96499         SUZU NPR66PY         7100393         2003         40         5         Scrapped         B.1         98.205         INT12LL         3000050         19.88           C 56         98500         SUZU NPR66PY         7100402         2003         40         6         Scrapped         B.2         98.205         INT12LL         3000057         19.88           C 56         98500         SUZU NPR66PY         7100402	2832		N PR66PY	7100599	2002	07										
C 55         98488         ISUZU NPRRBEY 7100602         2002         40         Londtion Bus No         Real Natural         Indeel Chas. No         Year           C 55         98488         ISUZU NPRRBEY 71000602         2002         40         1 Scrapped         AT1         98100         1 SLZ         AT1         98200         18 LZ         AT15563         18 SER         18 LZ         AT1510         CHR-680         18 SER         18 LZ         AT1511         2000050         19 SER         18 LZ         AT1121L         2000050         19 SER         AT1121L         2000	C 53         98486         BUZU NPRSEPY         7100502         202         40         Condition Bus No.         Real No. Manufac.         Model         Chas. No.         Chas. N	253		_	7100601	2002	40										
C 55         9848B         ISUZU         NPR66PV         7100703         200         40         1         Scrapped         A11         98205         ISUZU         CHR-680         1435566         1984           -         9849B         ISUZU         MV-123         13000125         2003         100         2         Scrapped         A11         98205         ISUZU         CHR-680         1435566         1984           -         98549B         ISUZU         MV-123         13000169         2003         40         3         Scrapped         A19         98285         ISUZU         CHR-680         1984           -         98507         ISUZU         MV-123         13000139         2003         40         5         Scrapped         B20         98285         ISUZU         MT112LL         3000057         1989           -         98507         ISUZU         NPR66P         7100402         2003         40         5         Scrapped         B21         98296         ISUZU         MT112LL         3000057         1989           -         98507         ISUZU         NPR66P         7100402         2005         40         4         Scrapped         B24         98296	C 56         98488         BUZU NPR66PY         7100703         200         4         5 squaped         A 1         98405         ISUZU CHR 480         1435563         1984           -         98499         BUZU MY-123         13000125         2003         100         2         Sgrapped         A 19         98205         ISUZU CHR 480         1435566         1984           -         98499         BUZU MY-123         13000125         2003         40         4         Sgrapped         A 19         98205         ISUZU CHR 480         1435566         1984           -         98507         BUZU MPR66P3         7100397         2003         40         5         Sgrapped         B 20         98236         ISUZU MPR66P3         7100397         2003         40         5         Sgrapped         B 20         98236         ISUZU MPR66P3         7100401         2003         40         5         Sgrapped         B 20         98236         ISUZU MPR66P3         7100401         2003         40         6         Sgrapped         B 20         98236         ISUZU MPR66P3         7100401         2003         40         6         Sgrapped         B 20         98236         ISUZU MPR66P3         71000001         18         Sgra	25 ' '	1	-	7100602	2002	40	_			lanufac	Model	Chas. No.	Year	Capacity		
-         98498         ISUZU         MV-123         13000125         2003         100         2         Scrapped         A11         98205         ISUZU         MV-123         13000169         2003         100         3         Scrapped         A19         98285         ISUZU         CHR-680         1455566         3           5         98501         ISUZU         NRR68P3         7100395         2003         40         4         Scrapped         B 20         98295         ISUZU         MT112LL         3000051           -         98502         ISUZU         NRR68P3         7100399         2003         40         6         Scrapped         B 27         98295         ISUZU         MT112LL         3000051           -         98505         ISUZU         NRR68P3         7100402         2003         40         7         Scrapped         B 27         98296         ISUZU         MT112LL         3000051           -         98506         ISUZU         NRR68P4         7100402         2003         40         4         Scrapped         B 24         98296         ISUZU         MT112LL         3000070           -         98507         ISUZU         NRR68P4         7102042	98498         INUZU         INV-123         13000125         2003         100         2         Scrapped         A-11         98205         ISUZU         CHR-8 00         1455566         1984            98499         ISUZU         NPRGEPP         7.000169         3         Scrapped         B-2         SINZU         CHR-8 00         1000050         18           C.54         98502         ISUZU         NPRGEPP         7.000399         2003         40         5         Scrapped         B-2         98285         ISUZU         NPRGEPP         7.000397         1989         1989         19828         ISUZU         NPRGEPP         7.000399         2003         40         6         Scrapped         B-7         98286         ISUZU         NPRGEPP         7.000401         19         98288         ISUZU         NPRGEPP         7.000402         19         98288         ISUZU         NPRGEPP         7.000402         19         98289         ISUZU         NPRGEPP         7.000402         19         98289         ISUZU         NPRGEPP         7.000402         19         98288         ISUZU         NPRGEPP         7.000402         19         98289         ISUZU         NPRGEPP         7.000402			Н	7100703	2002	40	1 Scranced			ш	CHR-680	1435563	19.84	100		
- 98499 BUZU NPR68P3 7100397 2003 40 4 Scrapped A19 98285 ISUZU CHR-680 3000006 1 C 56 98202 BUZU NPR68P3 7100398 2003 40 5 Scrapped B20 98288 ISUZU NPR68P3 7100398 2003 40 5 Scrapped B21 98289 ISUZU NT112LL 3000067	-         98499         ISUZU         MY-123         13000169         2003         4 Scrapped         B 20         98285         ISUZU         MY-121         3000016         1889           -         98501         ISUZU         NPR68P3         7100398         2003         40         4 Scrapped         B 20         98285         ISUZU         MT112LL         3000061         1889           -         98502         ISUZU         NPR68P3         7100399         2003         40         6 Scrapped         B 27         98295         ISUZU         MT112LL         3000061         1889           -         98505         ISUZU         NPR66P         7100401         2003         40         6 Scrapped         B 20         98296         ISUZU         MT112LL         3000067         1889           -         98506         ISUZU         NPR66P         7100402         2003         40         8 Scrapped         B 20         98296         ISUZU         MT112LL         3000067         1889           -         98507         ISUZU         NPR66P         7100402         2003         40         11 Scrapped         B 20         98296         ISUZU         MT112LL         3000077         1989		NZNSI		13000125	2003	100	$\vdash$			Н	CHR-880	1435566	19.84	100		
-         98501         ISUZU         NPR66P3         7100397         2003         40         4         Scrapped         B 20         98288         ISUZU         MT112LL         3000051           C 57         98502         ISUZU         NPR66P3         7100396         2003         40         5         Scrapped         B 21         98289         ISUZU         MT112LL         3000051           -         98505         ISUZU         NPR66P         7100402         2003         40         6         Scrapped         B 22         98298         ISUZU         MT112LL         3000062           -         98506         ISUZU         NPR66P         7100402         2003         40         8         Scrapped         B 32         98300         ISUZU         MT112LL         3000070           -         98506         ISUZU         NPR66P         7100403         2005         40         4         Scrapped         B 32         98300         ISUZU         MT112LL         3000070           C 62         98529         ISUZU         NPR66P4         7102045         2005         40         12         Scrapped         B 24         98307         ISUZU         MT12LL         3000070 <t< td=""><td>-         98501         BUZU         NRR68P         7100397         2003         40         4         Scrapped         B ZO         89288         SUZU         MT112LL         3000050         1989           C 56         98502         BUZU         NRR68P         7100398         2003         40         5         Scrapped         B Z         98295         ISUZU         MT112LL         3000057         1889           -         98505         BUZU         NRR68P         7100401         2003         40         7         Scrapped         B Z         98295         ISUZU         MT112LL         3000067         1889           -         98505         BUZU         NRR68P         7100402         2003         40         7         Scrapped         B Z         9300         ISUZU         MT112LL         3000067         1889           -         98505         BUZU         NRR68P         7101402         2003         40         1         Scrapped         B Z         9300         ISUZU         MT112LL         3000077         1889           -         98529         ISUZU         NRR68P4         7102045         2005         40         1         Scrapped         B Z         9300</td><td></td><td>nznsi</td><td></td><td>13000169</td><td>2003</td><td>100</td><td><math>\dashv</math></td><td></td><td><math>\dashv</math></td><td><math>\dashv</math></td><td>CHR-880</td><td>3000008</td><td>1989</td><td>100</td><td></td><td></td></t<>	-         98501         BUZU         NRR68P         7100397         2003         40         4         Scrapped         B ZO         89288         SUZU         MT112LL         3000050         1989           C 56         98502         BUZU         NRR68P         7100398         2003         40         5         Scrapped         B Z         98295         ISUZU         MT112LL         3000057         1889           -         98505         BUZU         NRR68P         7100401         2003         40         7         Scrapped         B Z         98295         ISUZU         MT112LL         3000067         1889           -         98505         BUZU         NRR68P         7100402         2003         40         7         Scrapped         B Z         9300         ISUZU         MT112LL         3000067         1889           -         98505         BUZU         NRR68P         7101402         2003         40         1         Scrapped         B Z         9300         ISUZU         MT112LL         3000077         1889           -         98529         ISUZU         NRR68P4         7102045         2005         40         1         Scrapped         B Z         9300		nznsi		13000169	2003	100	$\dashv$		$\dashv$	$\dashv$	CHR-880	3000008	1989	100		
C 56         98502         ISUZU NPR 68P3         7100396         2003         40         5         Scrapped         B 21         98289         ISUZU NPR 68P3         710011         3000057           - 98505         ISUZU NPR66P         7100402         2003         40         6         Scrapped         B 27         98295         ISUZU NPR66P         7100402         2003         40         6         Scrapped         B 29         1802U NPR66P         7100402         2003         40         7         Scrapped         B 29         1802U NPR66P         7100402         2003         40         8         Scrapped         B 24         98295         ISUZU NPR66P         7100402         2003         40         9         Scrapped         B 24         98302         ISUZU NPR66P         7100403         2005         40         10         Scrapped         B 41         98309         ISUZU NPR66P         7100406         2005         40         11         Scrapped         C 49         98482         ISUZU NPR66P         7100070         10         Scrapped         C 54         98482         ISUZU NPR66P         7100208         2005         40         12         Scrapped         C 54         98482         ISUZU NPR66P         7102085         2005	C 56         98502         ISUZU         NPR 66P3         7100388         2003         40         5         Scrapped         B 21         98289         ISUZU         MT112LL         3000051         1989           c 57         98503         ISUZU         NPR 66P9         7100401         2003         40         6         Scrapped         B 20         98296         ISUZU         MT112LL         3000060         1989           -         98503         ISUZU         NPR66P         7100401         2003         40         7         Scrapped         B 20         98300         ISUZU         MT112LL         3000060         1989           -         98504         ISUZU         NPR66P         7100402         2003         40         8         Scrapped         B 24         9830         ISUZU         MT112LL         3000076         1989           -         98504         ISUZU         NPR66P4         7101046         2005         40         13         Scrapped         B 24         9830         ISUZU         NPR66PY         7102045         2005         40         13         Scrapped         B 24         98296         ISUZU         NPR66PY         7102047         2005         40         14 <td></td> <td>_</td> <td>-</td> <td>7100397</td> <td>2003</td> <td>9</td> <td>-</td> <td></td> <td><math>\dashv</math></td> <td>+</td> <td>M T112LL</td> <td>3000050</td> <td>1989</td> <td>8</td> <td></td> <td></td>		_	-	7100397	2003	9	-		$\dashv$	+	M T112LL	3000050	1989	8		
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C 60         98528         ISUZU NPR66P4         7101900         2005         40         11         Scrapped         C 49         98482         ISUZU NPR66PY         7102045         2005         40         12         Scrapped         C 49         98482         ISUZU NPR66PY         7100307           C 63         98530         ISUZU NPR66PY         7102045         2005         40         13         Scrapped         C 49         98487         ISUZU NPR66PY         7102045           C 63         98531         ISUZU NPR66PY         7102045         2005         40         14         Scrapped         C 49         98487         1SUZU NPR66PY         7102047           -         98533         ISUZU NPR66PY         7102162         2005         40         15         Scrapped         B 28         98296         ISUZU NPR66PY         7102150         2005         40           -         98534         ISUZU NPR66PY         7102152         2005         40 <td< td=""><td>C 60         98528         ISUZU         NPR 66P4         7101900         2005         40         11         Scrapped         C 49         98311         ISUZU         NPR 66P7         7100598         2002           C 61         98529         ISUZU         NPR 66P4         7102045         2005         40         12         Scrapped         C 49         98482         ISUZU         NPR 66P7         7 100598         2002           C 63         98531         ISUZU         NPR 66P4         7 102085         2005         40         14         Scrapped         C 54         98497         ISUZU         NPR 66P7         7 100507         2002           -         98532         ISUZU         NPR 66P4         7 102186         2005         40         15         Scrapped         C 54         98296         ISUZU         NPR 66P7         7 100507         2002           -         98534         ISUZU         NPR 66P4         7 102162         2005         40         15         Scrapped         B 28         98296         ISUZU         NPR 66P4         7 102162         2005         40           -         9858B         ISUZU         NPR 66P5         7 102162         2005         40         40</td><td>5 .</td><td>nZnSi</td><td>115</td><td>347000164</td><td>2005</td><td>100</td><td>+</td><td></td><td>╁</td><td></td><td>M T112LL</td><td>3000070</td><td>1989</td><td>88</td><td></td><td></td></td<>	C 60         98528         ISUZU         NPR 66P4         7101900         2005         40         11         Scrapped         C 49         98311         ISUZU         NPR 66P7         7100598         2002           C 61         98529         ISUZU         NPR 66P4         7102045         2005         40         12         Scrapped         C 49         98482         ISUZU         NPR 66P7         7 100598         2002           C 63         98531         ISUZU         NPR 66P4         7 102085         2005         40         14         Scrapped         C 54         98497         ISUZU         NPR 66P7         7 100507         2002           -         98532         ISUZU         NPR 66P4         7 102186         2005         40         15         Scrapped         C 54         98296         ISUZU         NPR 66P7         7 100507         2002           -         98534         ISUZU         NPR 66P4         7 102162         2005         40         15         Scrapped         B 28         98296         ISUZU         NPR 66P4         7 102162         2005         40           -         9858B         ISUZU         NPR 66P5         7 102162         2005         40         40	5 .	nZnSi	115	347000164	2005	100	+		╁		M T112LL	3000070	1989	88		
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	-   98592   ISUZU   NPR66P5   7102272   2006	•	ISUZN	NPR 66P5	7102271	2006	40										
- 98592 ISUZU NPR68P5 7102272 2006		ı	ISUZN	NPR 66P5	7102272	2006	40										

### APPENDIX 3 CAPACITY ASSESSMENT QUESTIONNAIRE

### **General information confirmation sheet for mechanics**

<u>Ge</u>	<u>neral</u>
1.	Name and Surname:
2.	Title:
3.	Age:
4.	The academic background:
5.	Qualification (maintenance qualification etc.):
6.	Experience of Vehicle (or equipment) maintenance (How many years?)
<u>Te</u>	chnical questions
1.	What is the duration of the periodical maintenance?
2.	What measures do you take when overheating at site?
3.	What are the causes of breakdown when there is white smoke coming out?
4.	Write in few lines the causes of disappearance of power of vehicle.

5. What is the difference between the two-wheeled vehicle and four-wheeled vehicle.

### General information confirmation sheet for Management/Store keepers

General
---------

1.	Name and Surname:
2.	Title:
3.	Age:
4.	The Academic background:
5.	Experience of Stock keeping (How many years?):
<u>On</u>	<u>duty</u>
1.	What is the inventory control?
	•
2.	What is important in the inventory control?
3	What (How to) delivery and stock management are you doing now?
٥.	What (now to) delivery and stock management are you doing now:
1	How do you do when a record and an actual stock are different?
7.	Tiow do you do when a record and an actual stock are different:
_	Do you know the difference of first marriage parts and class marriage parts 2 ff
Э.	Do you know the difference of first moving parts and slow moving parts? If you know, what are these parts?

### **General information confirmation sheet for Management**

Gener	al
-------	----

1. Name and Surname:
2. Title:
3. Age:
4. The Academic background:
6. Experience of Workshop management (How many years?):
<u>Management</u>
1. What is important in the Materials/Equipment management?
2. Current problem in equipment management (Technically)?
3. What is the problem in the personnel arrangement?
4. How to confirm a branch office bus condition?
5. What are the points where there are a lot of occurrences of the breakdown and the cause?

### **General information confirmation sheet for Drivers**

General
1. Name and Surname:
2. Title:
3. Age:
4. The Academic background:
5. Experience of Driving (How many years?):
<u>Technical</u>
1. Have you already driven a medium or large vehicle?
2. If yes, what kind of vehicle did you drive?
3. What are the causes of overheating and how do you do when it occurs?
4. How do you do when the traffic accident occurs?
4. How do you do when the traine addition docurs:

5. Do you know the before and after driving check, if yes what kind of check do

you do.

### **General information confirmation sheet for Conductors**

General
---------

<u> </u>	neral
1.	Name and Surname:
2.	Title:
3.	Age:
4.	The Academic background:
<u>Otl</u>	<u>her</u>
1.	Do you think what relation exists between a driver and a conductor?
2.	How much weight in kilograms is the regulated weight of the luggage room which is not supposed to be exceeded?
3.	What is the passengers number are you authorized to take in your bus (two kinds)?
	,
4.	How do you do in case the passenger brought luggage when the luggage rack has reached the regulated weight (maximum weight)?
5.	When the luggage room reaches a regulated amount (weight) at the same
	time, how do you do in case of you to whom a new passenger brought luggage?
6.	How do you do when the traffic accident occurs?

Appendix 4 Breakdown Detail and Working Hour

	Breakdown detail & Working hours	g hours																		
	Year & Model				2004						2005						2006			
$Ty_{I}$	Type of Brake.	Work. Hour/ea	NPR	MT	CHR	MV	Total	(%)	NPR	MT	CHR	MV	Total	(%)	NPR	MT	CHR	MV	Total	(%)
	1 Engine	NPR·MT:32, CHR·MV:56	32	2	112	0	208	12.9	96	0	99	0	152	7.7	2	0	0	0	49	3.0
7	2 Transmission	16	0	16	0	0	16	1.0	16	32	0	0	48	2.4	99	0	0	0	99	2.6
3	3 Differencial	8	24	0	0	0	24	1.5	40	8	0	0	48	2.4	16	0	0	0	16	0.8
4	4 Brake	NPR·MT: 6,CHR·MV:7	288	18	35	21	362	22.4	438	18	14	49	519	26.5	444	12	0	49	505	23.8
5	5 Clutch	NPR·MT:6, CHR·MV:10	24	9	10	0	40	2.5	24	0	10	0	34	1.7	18	9	0	20	44	2.1
9	6 Shock absorber FRT	2	0	4	0	0	4	0.2	9	2	0	0	8	0.4	0	0	0	0	0	0.0
7	7 Shock absorber RR	2	0	2	0	0	2	0.1	9	4	0	0	10	0.5	0	0	0	0	0	0.0
, x	8 Spring	NPR·MT:4, CHR·MV:8	40	8	48	8	104	6.4	09	24	32	40	156	8.0	192	16	16	89	292	13.8
Ш	Sub Total		408	118	205	29	092	47.1	989	88	112	68	975	49.7	790	34	16	137	726	46.1
5	9 Periodical Service	2	196	24	32	20	272	16.9	202	20	22	32	276	14.1	226	22	4	30	292	13.8
16	10 Electrical	NPR·MT:3, CHR·MV:4	153	33	52	20	258	16.0	171	45	32	09	308	15.7	162	42	52	72	328	15.5
11	11 Tire	1	70	9	3	3	82	5.1	100	8	2	15	125	6.4	126	8	1	10	145	8.9
12	12 Body	NPR: 6, MT. CHR. MV: 4	186	36	20	0	242	15.0	222	32	24	0	278	14.2	324	04	∞	4	376	17.8
	TOTAL		1,013	217	312	72	1,614	100.0	1,381	193	192	196	1,962	100.0	1,628	146	91	253	2,118	100.0
	Ratio (%)		62.8	13.4	19.3	4.5	100.0		70.4	8.6	8.6	10.0	0.001		76.9	6.9	4.3	11.9	100.0	
			2004	2005	2006															
		Total working hours	1,614	1,962	2,118															
		Increasing rate(%)	100	121.561	131.227															

### APPENDIX 5 TOOLS AND EQUIPMENT LIST

### Tools and Equipment list

No.	TOOL NAME	Q'ty	No.	TOOL NAME	Q'ty
1	Mechanic Tool set	3	34	Transmission jack	0
2	Adjustable wrench	7	35	Transmission bearing puller	0
3	Adjustable pipe wrench	1	36	Tube flaring and cutting tool	0
4	Adjustable reamer	0	37	Universal puller set	0
5	Air hydraulic garage juck	0	38	U-bolt nut wrench	0
6	Chisel Punch set	2	39	Valve lifter	0
7	Cutting grinder	1	40	Valve rubber cap	0
8	Diesel compression gauge	1	41	Valve compound	0
9	Dial indicator set	0	42	V-block	0
10	Diff jack	0	43	Wood mallet	0
11	Drilling machine	1	44	Vernier caliper	1
12	Ball peen hammer	5	45	Vertical lift	0
13	Bearing puller	6	46	Vice grip plier	0
14	Bearing grease packer	0	47	Vice	2
15	Blind bearing puller	0	48	Socket wrench set	0
16	Anchor pin puller	0	49	Straight shank twist drill	0
17	Bolt clipper	0	50	Stud remover	0
18	Drain plug wrench	0	51	Test hammer	4
19	Drain plug wrench set	0	52	Thread restorer	0
20	Drum pump	0	53	Thickness gauge	0
21	Drum carrier	3	54	Radiator cap tester	0
22	Double Sledge Hammer	0	55	Rigid Rack	10
23	Double offset box wrench set	0	56	Screw plate	0
24	Double-face Sledge hammer	0	57	Screw extractor	0
25	Engine brush	0	58	Screw pitch gauge	0
26	Files set	1	59	Scraper blade	1
27	Funnel	3	60	Service creeper	0
28	Garage lamp	0	61	Square	0
29	Gasket cutting punch set	0	62	Solder	0
30	Hand valve lapper	0	63	Straight edge	0
31	Hexagon socket set	0	64	Snapring plier	0
32	High Power Wrench	0	65	Piston filler gauge	0

No.	TOOL NAME	Q'ty	No.	TOOL NAME	Q'ty
66	Piston ring tool	0	102	Pilot bearing puller	0
67	Wheel puller	1	103	Pitman arm puller	0
68	Wheel bearing puller	1	104	Plasti-gauge	0
69	Work Bench	5	105	Plastic hammer	2
70	Wire brushes	0	106	Portable electric grinder	1
71	Wire stripper	0	107	Portable hydraulic juck	10
72	Toe-in Gauge	2	108	Polyetylen can	0
73	Tie-rod end remover	0	109	Oil drain	0
74	Tie-rod end lifter	0	110	Oil bucket pump	0
75	Turningradius Gauge	0	111	Oil sylinge	0
76	Torque wrench	0	112	Oil measure	1
77	TORX socket wrench set	0	113	Oil filter wrench	1
78	Tool tray	0	114	Oiler	0
79	Tool and parts rack	0	115	Booster cable	0
80	Oil pressure gauge	0	116	Brake cylinder hone set	0
81	Oil stone	0	117	Brake booster tester	0
82	Oil seal puller	0	118	Brake spring plier	0
83	Outside micrometer set	1	119	Brake lining rivetter kit	0
84	Parts washing stand	0	120	Brake drum gauge	0
85	Piston ring compressor	0	121	Body puller set	0
86	Electric bench grinder	0	122	Body fender tool set	0
87	Electric drill	1	123	Porto power set	0
88	Electric disk sander	0	124	Gas cutting tool-regulator set	0
89	Electric shear	0	125	Hydraulic press	0
90	Grease gun	0	126	Cast iron anvil	0
91	Hack saw	1	127	Cast iron swage block	0
92	Hack saw blade	3	128	C-Clamp	0
93	Hand rivetter tool kit	0	129	Tire Inflator	0
94	Hand truck	0	130	Tire Pressure gauge	0
95	High pressoure grease pump	0	131	Tire Lever	2
96	High pressure car washer	0	132	Tire Service Tool Set	0
97	Hydraulic Garage Juck	0	133	Tire Spreder	1
98	Impact driver set	0	134	Tubeless tyre canger	0
99	Integral hand screw driver	0	135	Wheel Dolly	0
100	Iron bench level	1	136	Lubricator	0
101	Magnetic base	0	137	Magnetic finger	0

No.	TOOL NAME	Q'ty	No.	TOOL NAME	Q'ty
138	Metal cutting snips	0	166	Milling machine	1
139	Needle file set	1	167	Lathe machine	1
140	Air blow gun	0			
141	Air compressor	0			
142	Air compressor oil	0			
144	Air Chuck	0			
145	Air Chuck Gauge	0			
146	Air rivetter	0			
147	Air rotary cutter	0			
148	Air Hose	0			
149	Air Hose band	0			
150	Air hose joint	0			
151	Air valve lapper	0			
152	Quick hose connecter	0			
153	Arc welder	0			
154	Battery charger	1			
155	Battery quick charger	1			
156	Battery tester	0			
157	Battery starter	0			
158	Battery-syringe	0			
159	Battery filler	0			
160	Battery hydrometer set	0			
161	Circuit tester	0			
162	Electric soldering iron	0			
163	Insulation tester	0			
164	Solderless terminal kit	0			
165	If any				

APPENDIX 6 VEHICLE LEDGER

Sortie Garage Observationd Mécanicien ENTRETIEN:EN FICHE DE SUIVI DE VEHICULES Index Travaux à effectuer ou pannes O.R IJ. Н Prochain INDEX PROCHAIN VIDANGE Prochaine DATE

# APPENDIX 7 MAINTENANCE CHECK SHEET

## Vehiele Periodical maintenance record sheet

name   Mechanic name   Km In   Date in Date out	Exaust muffler (damage & condition)  Driving room  Steering ( operating condition )  Brake pedal (play and working condition )  Parking brake ( working condition )  Clutch pedal (operating condition )  Clutch pedal (operating condition )  Wiper (working condition )  Wiper (working condition )  Contents and Spare parts	
Tighten T Clean up C Res.No Driver name Lubricant L	Each bolt (tightening) Brake master/wheel cylinder/Disk cali Brake lining front (damage, wear-out) Brake lining rear (damage, wear-out) Brake shoe front (movement) Brake shoe rear (movement) Brake shoe rear (movement) Brake pad (damage, wear-out) Brake back, pipe (leakage and damage) Brake hose, pipe (leakage and damage) Front wheel bearing (grease, pray, etc) Tire (depth of ditch, damage) Wheel nut bolt (damage & loosening) Steering gear box bolt Each Ball joint dust boots (damage and leakage) Steering rod (tightening & damage etc) Transmission, Transfer (oil & leakage) Propeller shaft, drive shaft (tightening & damage etc) Universal joint (leakage & damage) Exhaust pipe (damage & condition) Exhaust pipe (damage & condition)	LAdust manner (vannage & Comercent)
No require.OKVChangeXAdjustA RepairOver haulI	gine room  gine oil and leaking filter Element and leaking cleaner Element and leaking cleaner Element (blocking) t belt (damage and loosening) ver sterg. belt (damage & loose) liator (leaking) tery (liquid and terminal) tery (liquid and terminal) tery (condition) trer (conditi	

### How to Overhaul Brake system

- 1. Use the rigid rack and wheel stopper
- 2. Remove the axle shaft and Rear hub
- 3. Cleaning method of Dram and Brake
- 4. Change the Bearing grease
- 5. Change the Hub seal
- 6. Change the Brake lining
- 7. Check the trouble of Brake system
- 8. Check the Vacuum booster
- 9. Change the wheel cylinder cup
- 10. Fix the shoe adjuster lock
- 11. Lubricate the Brake adjuster and Back plate
- 12. Install the Brake shoe
- 13. How to adjust the Bearing
- 14. How to bleed the Brake oil
- 15. How to adjust the Brake
- 16. Install the Axle shaft

### 1. Using the rigid rack and wheel stopper

- 1) Reason of using rigid rack and wheel stopper
  - Support the bus for safety.
- 2) What's difference?





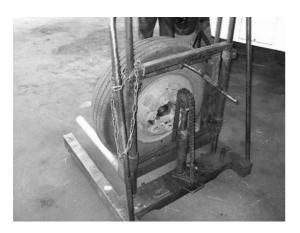
- Rigid rack supporting point
- We cannot trust the support of rigid rack 100%.
- Rigid rack + Jack

### 2. Remove the axle shaft and Rear hub

- 1) Hitting point of axle shaft
  - · How to use 'Double hammer'
    - The role of corn and spring washer
  - Keep the bearing



- 2) How to use wheel hub remover
  - Attention for damaging the hub seal



3) How to keep wheel hub bearing and short parts



### 3. Cleaning method of Brake dram and brake

- Inside of the Brake dram
- Brake lining
- Back plate



NOTICE!

<u>Dust of the Brake lining is harmful to the human body</u>



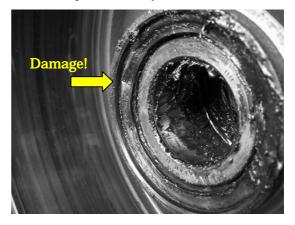
### 4. Change the Bearing grease

- How to change the Bearing grease.
- Arrangement / Safekeeping small parts



### 5. Change the Hub seal

- Replace carefully

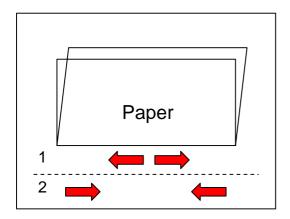


Lubricant of Oil seal.



### 6. Change the Brake lining

1) How do you break paper properly? 1 or 2?



From inside to Outside to avoid the cockle.

### 2) How do you rivet lining properly?



### 7. Check the Trouble of Brake system

1) Inspector found the leaking of oil from Inside of Brake dram.

You must confirm the following matters carefully.

### Brake oil

· Wheel cylinder cup

### Grease

· Hub seal

### Diff oil + Grease

- Axle shaft seal



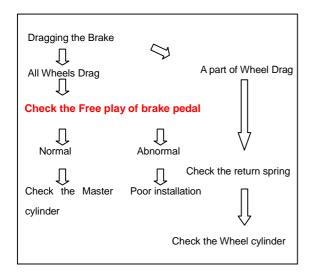
### 2) Brake dragging



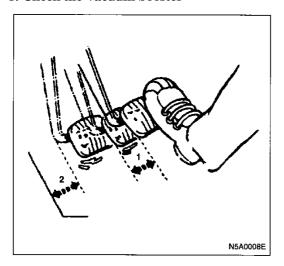
NOTICE! First Check the Brake Switch!

Check the Free play of brake pedal! 4 - 7mm

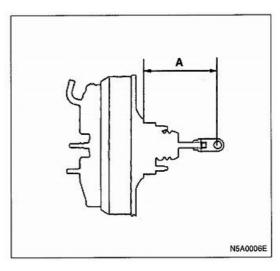
Flow chart of brake digging trouble shoots



### 8. Check the Vacuum booster



- 1) How to check the vacuum booster (on the car)
- Start with engine and stop the engine one or two minutes later.
- 2. Step on several times brake pedals and check a change of the pedal height.
- 3. If the vacuum booster is normal, the second, the third times stepped pedal height is higher than I stepped to the first.
- 4. Engine shutdown. Pedal it several times till do not pedal height change.
- 5. Start engine with having stepped a brake pedal.
- 6. If a device operates normally, the pedal is slightly in the depths.
- 2) Check the vacuum booster (Unit)

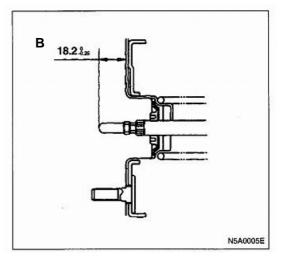


heck the push rod length

A=129mm (with apacer)

A=109mm (without spacer)

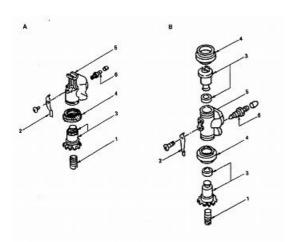
C



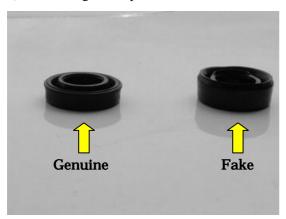
B=18.2mm

### 9. Check the Wheel cylinder cup

1) Direction of wheel cylinder cup



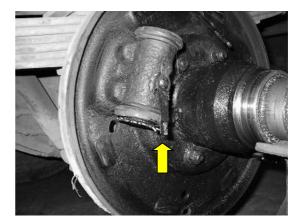
2) Check the genuine parts or not.

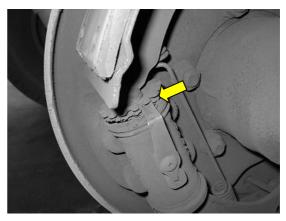


3) How to clean the inside of cylinder



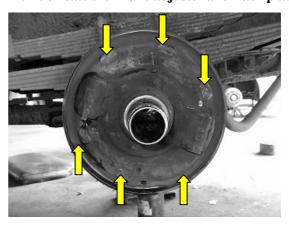
10. Fix the Shoe adjuster lock plate





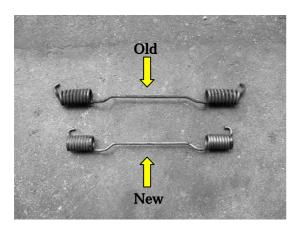
Make sure the lock plate fit the brake adjusting gear.

### 11. Lubricate the Brake adjuster and Back plate

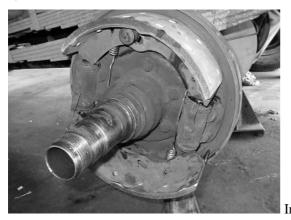


12. Install the Brake shoe

1) The reason of damaging the return spring

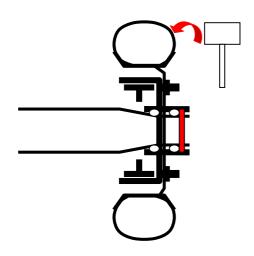


2) How to install the brake shoe



stall brake shoe one by one. If you install both sides in same time, return spring stretches easily over the limit.

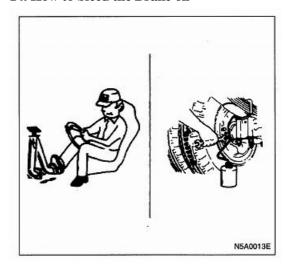
### 13. How to adjust the hub bearing (Preload)



1. Tighten the Adjust nut.

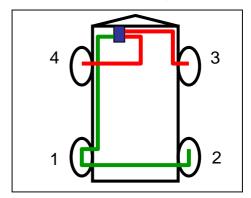
- 2. Turn a tire and worked bearing, then beat several times tire with a hammer.
- 3. Confirm that a tire does not have a play
- 4. loosen a Adjust nut 1 round for unclockwise
- 5. Beat several times tire again with a hammer and confirm the Free play of the tire.
- 6. Tighten the Adjust nut slowly till there is not the free play.
- 7. Install a lock washer.

### 14. How to bleed the Brake oil



- 1. Air in the brake hydraulic circuit will result in dangerous reduced braking efficiency.
- 2. Bleed the brake circuit In the following sequence.
- 3. Engine stop

Brake oil bleeding circuit



- 1. Left hand rear wheel
- 2. Right hand rear wheel
- 3. Right hand front wheel

### 4. Left hand front wheel

### 5.

\* If no bleeding nipple at left hand rear wheel, start the right hand rear wheel.

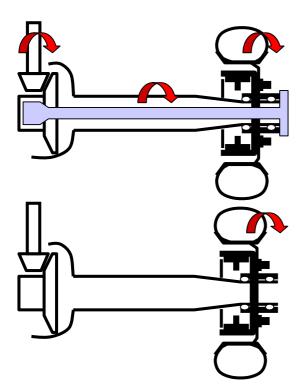
### 15. How to adjust the Brake

### 1) Without axle shaft



Before installing rear axle shaft you should adjust rear brake.

### 2) The reason



Axle shaft makes load of differential, propeller shaft, and another side of wheel. Therefore it is difficult to adjust gap of brake lining and brake dram.

### 16. Install the Axle shaft

Do not forget installing shaft corn, spring wash and nut. Without these small parts, it has damage the axle shaft stud bolts.